IBM

Reusable Server Kernel Programmer's Guide and Reference

Version 3 Release 1.0

SC24-5964-00

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SC24-5964-00

Note:

Before using this information and the product it supports, read the general information under “Notices” on page 503.

| **First Edition (February 2001)**

| This edition applies to Version 3, Release 1, Modification 0 of IBM® z/VM (product number 5654-A17) and to all subsequent releases
| and modifications until otherwise indicated in new editions.

Contents

Preface

This book describes how you can use the *Reusable Server Kernel* to develop and execute server programs on CMS.

Who This Book is For

This book is for programmers who want to develop server programs and run them in the Conversational Monitor System (CMS) environment on VM/ESA 2.2.0 or later.

What You Should Know Before Reading This Book

This book covers advanced material in server construction and is not for beginning programmers. To use the material in this book, readers should:

- Know one of the supported programming languages, and
- Understand concurrent programming concepts, including both general techniques and specific concepts relevant to CMS Application Multitasking, and
- Have experience with CMS application development and the tools and facilities used by CMS application developers (for example, the `GENMOD` command and the Callable Services Library), and
- Have a working knowledge of CMS and z/VM as they appear to the CMS application developer, and
- Have application development experience with at least one z/VM connectivity technology, such as TCP/IP.

What This Book Contains

This book contains descriptions and reference information for the reusable server kernel. Specifically, it includes the following sections:

- Chapter 1, “Basic Concepts” on page 1 provides a brief description of basic server concepts and gives an overview of the reusable server kernel.
- Chapter 2, “Connectivity and Line Drivers” on page 13 describes how the server kernel supports heterogeneous transport technologies and describes the programming interfaces the server author must use to exchange data with clients.
- Chapter 3, “DASD Management” on page 31 illustrates the reusable server kernel's support for high-speed, block-oriented DASD I/O.
- Chapter 4, “File Caching” on page 37 describes the reusable server kernel's support for caching files in VM Data Spaces.
- Chapter 5, “Authorization” on page 41 provides information on the server kernel's authorization engine.
- Chapter 6, “Enrollment” on page 49 describes the server kernel's support for managing enrollment data.

- Chapter 7, “Indexing by Prefixes” on page 53 describes the server kernel's support for managing record indices based on lookup by key prefix.
- Chapter 8, “Anchors” on page 55 illustrates the server kernel's support for letting the server program set and query the value of a server-wide anchor word.
- Chapter 9, “Memory Management” on page 57 describes the server kernel's callable storage allocation primitives.
- Chapter 10, “Worker Machines” on page 59 shows how the reusable server kernel makes it easy for the server author to run work in a set of related virtual machines.
- Chapter 11, “Run-Time Environment” on page 65 provides information on the run-time environment the reusable server kernel supplies.
- Chapter 12, “Initialization and Profiles” on page 71 provides information on initializing and configuring the server.
- Chapter 13, “Monitor Data” on page 79 provides information on how the server kernel uses CP's APPLDATA facility to accrue monitor data.
- Chapter 14, “Command Descriptions” on page 85 provides information on how to enter reusable server kernel commands and explains the format of each command.
- Chapter 15, “Function Descriptions” on page 219 provides information on the application programming interfaces the reusable server kernel provides.
- Chapter 16, “RSK Sockets” on page 337 provides information on the Reusable Server Kernel socket library.

This book also supplies a set of appendices:

- Appendix A, “Sample PROFILE RSK” on page 379 provides information on the server profile file, `PROFILE RSK`.
- Appendix B, “Sample User ID Mapping File” on page 383 provides information on the user ID mapping file.
- Appendix C, “Authorization Data File Formats” on page 385 provides information on the internals of the files the server kernel uses to hold authorization data.
- Appendix D, “Enrollment Data File Format” on page 391 describes the format of the files the server kernel uses to hold enrollment information.
- Appendix E, “Storage Group File” on page 393 describes the format of the file the server kernel uses to hold descriptions of storage groups.
- Appendix F, “Reserved Names” on page 395 provides information on the conventions the server kernel uses to name objects it manipulates and lists the names and name prefixes the server kernel reserves for its own use.
- Appendix G, “More Detail On Reason Codes” on page 397 provides information on reason codes and associated recovery actions.
- Appendix H, “Messages” on page 411 provides information on messages and associated recovery actions.
- Appendix I, “Language Bindings” on page 437 provides information on language bindings.

- Appendix J, “What's Changed Since the Beta” on page 501 describes how the GA level of the reusable server kernel differs from the levels made available during beta testing.

Where to Find More Information

You can find more information about the z/VM library and its components and features by examining the books listed in the bibliography in the back of this publication.

How to Send Your Comments to IBM

Your feedback is important in helping us to provide the most accurate and high-quality information. If you have comments about this book or any other VM documentation, send your comments to us using one of the following methods. Be sure to include the name of the book, the form number (including the suffix), and the page, section title, or topic you are commenting on.

- Visit the z/VM web site at:

  `http://www.ibm.com/servers/eserver/zseries/zvm`

  There you will find the feedback page where you can enter and submit your comments.

- Send your comments by electronic mail to one of the following addresses:

Internet:	pubrcf@vnet.ibm.com
IBMLink™:	GDLVME(PUBRCF)

- Fill out the Readers' Comments form at the back of this book and return it using one of the following methods:
  - Mail it to the address printed on the form (no postage required in the USA).
  - Fax it to 1-607-752-2327.
  - Give it to an IBM representative.

First Edition for z/VM® (February 2001)

This edition contains updates for the General Availability of z/VM V3R1.0.

- A new command, `CONFIG SPL_CATCHER`, lets the server administrator specify a user ID to which the reusable server kernel will `CP TRANSFER` spool files it is unable to decode. For more information, see “Spool Considerations” on page 22.
- A PL/X application programming interface allows for socket programming. This interface, the RSK socket library, provides many of the basic operations you would need to communicate with other socket programs. See Chapter 16, “RSK Sockets” on page 337 for the available functions.
- Application Programming Interfaces are provided to:
  - create an index
  - delete an index
  - insert a record number
  - list record numbers

See Chapter 7, “Indexing by Prefixes” on page 53 for details.

Chapter 1. Basic Concepts

Motivation

Most operating systems suitable as server platforms offer a variety of technologies to the server author. For example, such operating systems might offer one or more sets of communication interfaces, a threading interface, a file system interface, an enrollment and authorization interface, storage management primitives, and so on. In some cases, the technologies offered the server author are complex, advanced technologies for which the deployment strategies, programming interfaces, and even the problems solved are apparent only after much study.

The problem created by such systems is that they foist the technology assimilation, assessment, deployment, and integration responsibilities onto the server author. To use the system's technologies in a smart way, the server developer must learn all the system's technology elements, understand their APIs, understand the problems each element is designed to solve, and understand how these apparently-discrete technology elements relate to one another. This creates a large burden for the server developer, and it creates a situation in which each server author (at different companies, for example) must endure the same learning curve in order to construct a server that exploits the technology of the operating system underneath it. Alternatively, such systems create the problem that server authors do not exploit the systems' technologies because they do not understand the technologies or how to apply them; this creates a problem for the server applications being developed -- they do not use the system optimally.

To overcome these problems on z/VM, IBM studied the problem of z/VM server construction and identified problems common to many servers. Further, it identified the technologies relevant to solving those problems in an optimal way and is delivering server enablers employing these technologies. IBM's first efforts in this area produced *Server Tasking Environment/VM* and its follow-on, *CMS Application Multitasking*; these very significant CMS enhancements moved CMS from a single-processor, single-threaded programming environment to a parallel, multithreaded system. Continued work in this area has produced not more operating system code but rather has produced an “empty” server program that server writers can use as a starting point for server construction. This “empty” server, called the *reusable server kernel*, consists of a text library of routines and a macro library of function prototypes and constant definitions. To construct an actual server program, the server author attaches application-specific code to a set of interfaces in the reusable server kernel. The result of such attachment is a server program heavily exploitive of the z/VM system's best technologies.

A specific example of the reusable server kernel's ability to relieve the server author of technology exploitation will be helpful. It is well known that building a z/VM server in a multithreaded fashion helps boost the server's performance and makes the server easier to design and understand. A server author desiring to write such a program on his own would need to understand how to use CMS Application Multitasking to construct a multithreaded program, and he would also need to decide upon a strategy for dividing the server into multiple threads of execution. The reusable server kernel, though, lets the server author *ignore* how to use CMS's tasking primitives to implement such a structure; instead, the reusable server kernel itself organizes the server into this form, maintaining its own structures and strategies for doing so. The only work left for the server author is to identify (through a server kernel-provided programming interface) one or more “get request, do request, answer client” loops, or “services.” The server kernel replicates these services on multiple threads, doing so in response to the workload moving through the server. In other words, it is the server kernel that makes the author's code multithreaded, not the author.

The reusable server kernel provides help in more than just multithreading. Additional help is provided in these areas:

Table 1 (Page 1 of 3). Additional Help Areas

Topic	Description	Page
Connectivity	A big part of server design and development is the selection and deployment of connectivity strategies for the server program. The reusable server kernel includes line drivers for both bulk-data and operator-oriented protocols and unifies all of these line drivers under a single interface. The server writer develops no communication code when he uses the reusable server kernel.	13
DASD I/O	The reusable server kernel organizes the server's DASD volumes into one or more *storage groups*. This set of storage groups can be brought online, brought offline, changed in size, and so on through a set of APIs or a set of commands. I/O to these storage groups is thread-synchronous, thread-blocking, and does not serialize on the base virtual processor. When the server runs in an XC-mode virtual machine, the reusable server kernel can be configured to use CP's MAPMDISK facility to perform I/O to its storage groups. Using MAPMDISK lets the server program feel the benefits of caching and the I/O efficiencies of the paging subsystem. In other virtual machine types, or if using MAPMDISK is inappropriate for some other reason, the reusable server kernel can use DIAGNOSE `X'0250'` or DIAGNOSE `X'00A4'` for storage group I/O.	31

Table 1 (Page 2 of 3). Additional Help Areas

Topic	Description	Page
File Caching	Many servers, such as HTTP daemons, are read-intensive with respect to CMS's file systems (minidisk, Shared File System, and Byte File System). The reusable server kernel offers a file caching API that lets the server cache such files in a VM Data Space. The caching support offers an open-read-close model for file reading; when the server opens a file through this API, the reusable server kernel loads the file into a VM Data Space and keeps it there for reuse until it becomes stale or is forced out because of storage contention. The server can instruct the server kernel to perform code page translation or record delineation scheme transformations on the file as part of loading it into the cache. This lets the cached file be kept in the data space in the form most useful to clients.	37
Authorization	The reusable server kernel provides callable entry points for managing the authorization of users to objects. These entry points implement a class-oriented paradigm wherein the objects, classes, and access types for each class are completely defined by the server writer. The authorization data can reside on CMS minidisks or in either accessed or unaccessed Shared File System directories.	41
Enrollment	Most servers maintain some kind of user database. In the abstract, these databases are usually nothing more than indexed access methods. The reusable server kernel offers an API containing insert, delete, and lookup operations for records having fixed-length, 64-byte keys and up to 65,450 bytes of data. The reusable server kernel holds the records in a VM Data Space, hashing them for quick lookup, and backs the VM Data Space with a file in the Shared File System. The hashing scheme makes it possible to hold many hundreds of thousands of records with very good performance.	49
Indexing by Prefixes	The reusable server kernel provides APIs that allow the server application to build and interrogate indices by prefix. The reusable server kernel keeps each index in its own VM Data Space while allowing multiple RSK-based service machines concurrent access.	53
Anchors	Callable entry points let the server program set and query the value of a server-wide anchor word.	55

Table 1 (Page 3 of 3). Additional Help Areas

Topic	Description	Page
Memory Management	The reusable server kernel provides callable storage allocation and release primitives designed for multithreaded servers and suitable for most situations. In addition, these APIs can allocate and release storage in a VM Data Space.	57
Run-time Environment	The reusable server kernel provides an automatic storage management convention that improves the performance of the server by minimizing the number of storage management calls needed to manage automatic storage (that is, execution stack storage). This convention prevents storage management calls in most cases.	65
Worker Machines	The reusable server kernel provides a facility that lets the server author run server work in a pool of virtual machines, instead of all in a single machine. The server kernel takes care of autologging these worker machines and moving data between the central server and the workers. This is useful for offloading complex functions or for isolating risky or time-consuming operations.	59
Configuration and Operation	The reusable server kernel's operation is configurable and controllable through a set of commands. These commands let the operator start and stop services, manipulate storage groups, and perform other tasks related to server management. This set of commands can be used by an exec through `ADDRESS RSK` as part of an initialization strategy or can be submitted through several of the reusable server kernel's line drivers.	71
Socket Library	The RSK socket library is a PL/X application programming interface for socket programming. Although the library does not provide a one-for-one correspondent for every IUCV socket function, it does provide many of the basic operations needed to communicate with other socket programs.	337

Overall Server Organization

Fundamentally, a *server program* is a program that accepts requests from *clients* and generates responses for those clients. Some servers are very transaction-oriented; they accept a single, entire request from a client, produce an entire response for the client, and then wait for another request from the client. Other servers are much more stream-oriented; in these situations, the server and client carry on a running dialogue over which they exchange information freely with one another, perhaps not according to any strict request/response paradigm. The server author's choice of interaction paradigm is based usually on the kind of work being performed and the kind of communication technology being used. Personal preference no doubt also plays a role in this choice.

Whether the relationship is transaction-oriented or stream-oriented, the primary job of the server is to handle requests from clients. Though handling of such system facilities as communications, virtual storage, disk, and I/O devices is part of the overall picture in the server, the essential job of the server is to *interact with the client*. All of the logic in the server supports this fundamental operation. Even interaction with the server operator is a form of interacting with a client, though at first glance it might seem that interacting with the operator is fundamentally different from interacting with “regular” clients.

The reusable server kernel strongly emphasizes this fundamental property by organizing the server writer's work precisely along these lines. The server writer's primary responsibility is to provide one or more routines, called *services*, whose job is to interact with a client over an abstract channel. The server writer also provides a server mainline, the responsibility of which is to bring up the server, wait for it to finish, and then take it down. Figure 1 illustrates this organization.

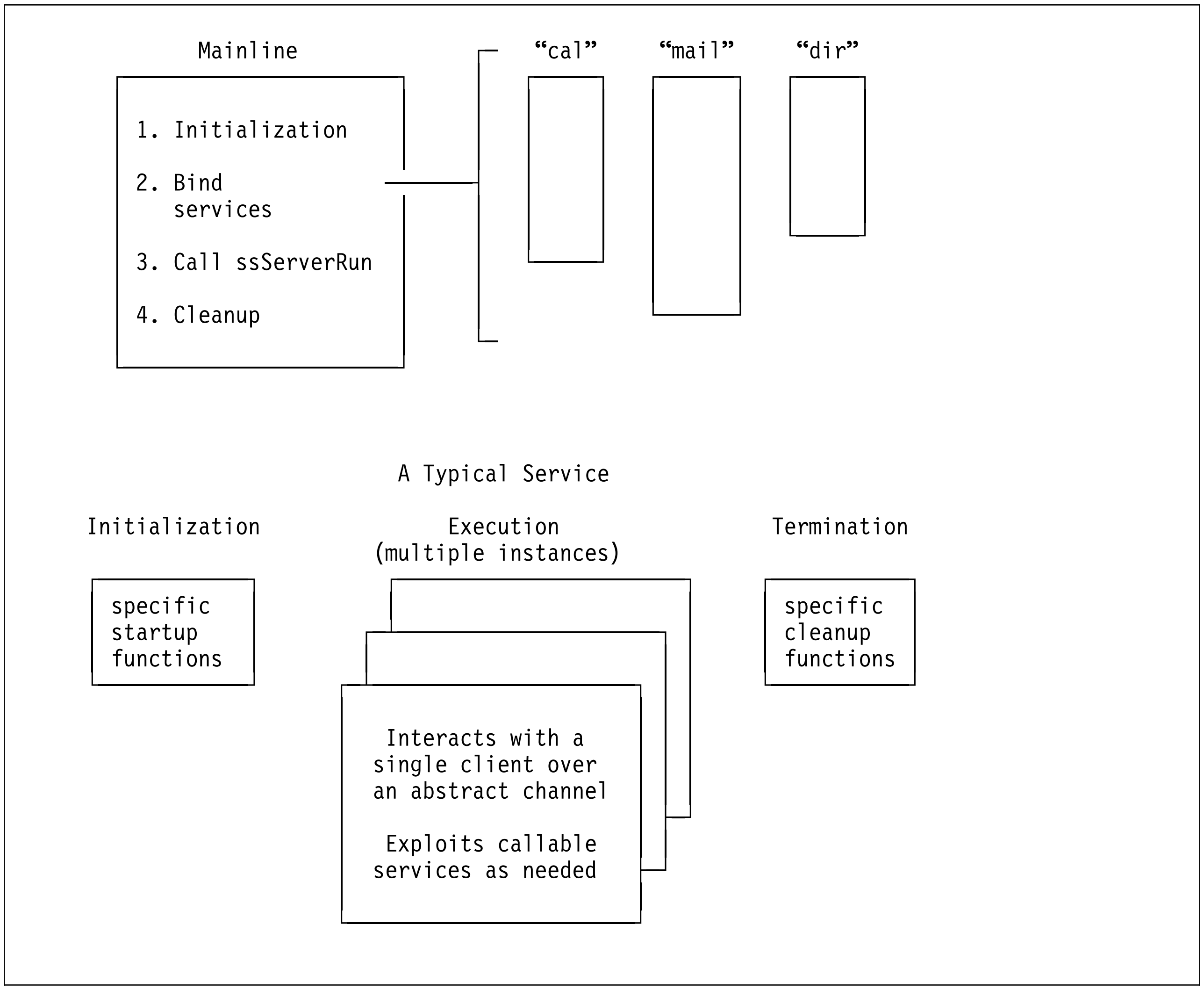

Mainline
1. Initialization
2. Bind services
3. Call ssServerRun
4. Cleanup
“cal”
“mail”
“dir”
A Typical Service
Initialization
specific startup functions
Execution (multiple instances)
Interacts with a single client over an abstract channel
Exploits callable services as needed
Termination
specific cleanup functions

Figure 1. Reusable Server Kernel Overview

Jobs of the Mainline

The server mainline gets control shortly after the server module is invoked. It has a few essential responsibilities:

1. It may perform server-wide initialization, such as reading and processing a configuration file, checking and adjusting the virtual machine configuration, or starting a console log.
2. It must identify, or *bind*, one or more services. Binding a service makes it known to the reusable server kernel and thereby makes it eligible to be "started" through operator command.
3. It must call entry point `ssServerRun` to run the server program. Control returns to the mainline when the server has ended.
4. It may perform server-wide termination processing, such as closing a console log.
5. It must return to its caller.

More About Services

Service identification takes place during server initialization, in the mainline provided by the server author. The reusable server kernel provides a callable interface, `ssServiceBind`, which lets the server writer identify the set of services available. The server writer should arrange the mainline so that it calls `ssServiceBind` once for each service being offered. Once a service is bound, it is available for use for the life of the server.

`ssServiceBind` accepts as parameters a case-insensitive, eight-byte name for the service and certain descriptive information about the service. In response to the call, it builds a data structure called the *service block* or *S-block*, which is illustrated in Table 2.

Table 2. Service Block, or S-Block

Offset	Length	Usage
0	8	Used by IBM
8	8	Service name
16	4	Service name length
20	4	Address of initialization routine
24	4	Address of service routine
28	4	Address of termination routine
32	4	Service type
36	4	Service lockword
40	4	Current start count
44	4	Monitor data row index

Perhaps the most important parameters to `ssServiceBind` are the addresses of these key entry points:

- **Initialization entry point:** a reusable server kernel line driver calls a service's *initialization* entry point when it starts the service but before it lets the service do any work for clients, but only if the service is completely idle -- that is, only if the service is not currently handling clients through any other line driver.

  The initialization entry point should be prepared to accept a parameter list organized according to Table 3. The return code and reason code in this parameter list are output parameters to be filled in by the initialization entry point. If the initialization entry point produces a nonzero return code, the start attempt will fail.

Table 3. Initialization Entry Point Parameter List. R1 points to this data structure on entry.

Offset	Length	Usage
0	4	A(return code)
4	4	A(reason code)
8	4	A(S-block)

- **Service entry point:** a reusable server kernel line driver activates a service's *service* entry point in response to work accruing from clients. When a new client arrives, the line driver dedicates a thread -- an *instance* of the service -- to the new client and causes that thread to call the service entry point.[1] A given client is always served by the same instance, and a given instance serves exactly one client.

  The line drivers provided by the reusable server kernel are *parallelizing*, that is, they attempt to run a service's service entry point on more than one thread concurrently if necessary. Configuration parameter `SRV_THREADS` controls the maximum number of threads on which a given line driver will attempt to run a given service's service entry point. For more information, see Table 31 on page 75.

  The service entry point should be prepared to accept a parameter list organized according to Table 4. By way of this parameter list, the reusable server kernel passes the service entry point the address of a crucial data structure called the *client block* or *C-block*. The C-block, which represents the partnership among the client, the line driver, and the instance, contains information the instance uses to interact with the reusable server kernel and also contains fields identifying and characterizing the client. For more information on the C-block, see “From Line Driver to Instance” on page 17.

Table 4. Service Entry Point Parameter List. R1 points to this data structure on entry.

Offset	Length	Usage
0	4	A(S-block)
4	4	A(C-block)

1 Do not confuse *starting an instance* with a call to CMS's `ThreadCreate` function. The reusable server kernel keeps a pool of threads on which it runs service instances. Each such thread resides in its own dispatch class. Depending upon workload, there may be more than once instance of a given service executing at any given moment. In other words, the reusable server kernel parallelizes the server according to the workload moving through the server.

The relationship between the line driver and the instance is carried out through the CSL's queuing primitives, using a queue owned by the line driver, called the *line driver queue*. Information necessary to use this queue is contained in the C-block. To send messages to one another, the line driver and the instance use `QueueSend` to place messages on the queue. To receive messages from each other, the line driver and the instance use one of the "receive" primitives, such as `QueueReceiveBlock`, once again operating on the line driver queue. The selective-receipt facility of the CSL's queue routines is used so that the line driver and the set of instances using the line driver queue can all use the queue without interfering with one another.[2] Specific information about the exchange of messages between line drivers and services is available in Chapter 2, "Connectivity and Line Drivers" on page 13.

When handling of the client is complete, the service entry point should return to its caller.

- **Termination entry point:** a line driver drives a service's *termination* entry point as part of "stop" processing, if the service is not currently started through any other line drivers.

  The parameter list for the termination entry point is described in Table 5.

Table 5. Termination Entry Point Parameter List. R1 points to this data structure on entry.

Offset	Length	Usage
0	4	A(S-block)

Note: For information on the rest of the S-block fields, see "Writing Your Own Line Driver" on page 27.

Anything Else?

Beyond this, the organization of the server program is up to the server author. The usual approach will be to implement a mainline and one or more services, along perhaps with some service threads that perform encapsulated operations on shared data or some other repetitive work. The server author is strongly encouraged to use CMS Application Multitasking functions for communication among threads, implementation of critical sections, and performing other server-related operations.

Calling The Entry Points

Calls to the reusable server kernel's entry points are coded as ordinary assembler or PL/X function calls. Language bindings for each of these languages are provided in macro libraries — `DMSGPI` for assembler and `DMSRP` for PL/X.

[2] Each IPC key generated by the reusable server kernel, whether for external or internal use, has `BKW` (`X'C2D2E6'`) as its first three characters. This permits author-supplied code to exploit line driver queues for other purposes when it seems helpful.

DMSGPI Macros

The names of the macros are:

Macro	Description	Page
SSASMANC	Anchor bindings	437
SSASMAUT	Authorization bindings	438
SSASMCAC	File cache bindings	445
SSASMCLI	Client bindings	449
SSASMENR	Enrollment bindings	451
SSASMMEM	Memory bindings	455
SSASMSGP	Storage group bindings	458
SSASMSRV	Service and server bindings	463
SSASMTRI	Trie API bindings	467
SSASMUID	User ID bindings	469
SSASMWRK	Worker machine bindings	471

DMSRP Macros

The names of the macros are:

Macro	Description	Page
SSPLXANC	Anchor bindings	473
SSPLXAUT	Authorization bindings	474
SSPLXCAC	File cache bindings	479
SSPLXCLI	Client bindings	482
SSPLXENR	Enrollment bindings	484
SSPLXMEM	Memory bindings	487
SSPLXSGP	Storage group bindings	488
SSPLXSRV	Service and server bindings	492
SSPLXTRI	Trie API bindings	495
SSPLXUID	User ID bindings	496
SSPLXWRK	Worker machine bindings	497

These macros are invoked with the same conventions as the CMS Application Multitasking macros, namely:

- for Assembler, just invoke the macro through its name.
- for PL/X, use `%include syslib(`*macro*`);`.

Of course, you must make these macro libraries available to your compiler or assembler by using the `GLOBAL MACLIB` command.

A single standard for procedure linkage is used throughout the server. This standard affords each procedure, whether customer-written or IBM-supplied, an extremely fast method for obtaining and releasing automatic storage (that is, storage for local variables and save areas). All of the reusable server kernel entry points expect the server author to use this linkage to call them, and the reusable server kernel drives all customer-written routines (thread entry points, server entry point, and so on) using this linkage. Macros are provided to implement the procedure linkage. For more information, see Chapter 11, “Run-Time Environment” on page 65.

Building a Server Module

To create a server using the reusable server kernel, the server author writes a set of application-specific code, calling the reusable server kernel entry points as desired. Using an appropriate language processor, the server author prepares one or more object modules (files of file type TEXT) containing his application. Exactly one of these object modules defines entry point RSKMAIN, which is the server's entry point.[3]

To build his module, the server writer link-edits his object code with the reusable server kernel object library and any other object libraries needed. The result of the link-edit is a module containing both the author's application and the appropriate reusable server kernel code. For example, if the server were implemented in a single object deck called SAMPLE, this sequence of CMS commands would accomplish the link-edit:

```
GLOBAL TXTLIB BKWLIB DMSPSLK DMSAMT VMMTLIB VMLIB CMSSAA
LOAD SAMPLE ( CLEAR DUP   AUTO   LIBE NOINV FULLMAP RLDSAVE
INCLUDE VMSTART ( NOCLEAR DUP   AUTO   LIBE NOINV FULLMAP RLDSAVE RESET VMSTART
GENMOD SAMPLE ( MAP STR
```

The effect of these commands is to produce SAMPLE MODULE, the resultant server, and SAMPLE LOADMAP, the load map associated with the module.

Notes:

1. If there were multiple customer-supplied object modules, they would be accounted for in this procedure by inserting the appropriate INCLUDE commands after the LOAD of the server mainline.
2. It is important to note that BKWLIB appears ahead of DMSAMT in the text library search order. BKWLIB contains a DMSLESB (language environment selector text deck) that overrides the one found in DMSAMT.

Setup At A Glance

In addition to the module you build, you will need these additional files to run your server:

Table 6 (Page 1 of 2). Files Needed to Run Your Server

File	Description
BKWRTE MODULE	This is the run-time environment manager program for the server. Place this file somewhere in the server's file mode search order.

[3] This is very much like the APPLMAIN required by a CMS Application Multitasking program. In fact, the reusable server kernel *is* a CMS Application Multitasking program and provides its own APPLMAIN. RSKMAIN is the label of the first instruction of the actual server code written by the server author.

Table 6 (Page 2 of 2). Files Needed to Run Your Server

File	Description
`BKWUME TEXT`	This is the reusable server kernel's message repository. Make sure your server's virtual machine issues `SET LANGUAGE ( ADD BKW USER` as part of its `PROFILE EXEC`.
`PROFILE RSK`	The reusable server kernel runs this exec just after your server module begins execution; the `PROFILE RSK` you write contains the configuration and startup commands you need for your specific environment.
User ID Mapping File	Controls the reusable server kernel's translation from connectivity-specific client identifiers to a normalized, flat client name space.

If you plan to use certain other features of the reusable server kernel, you will need to perform additional setup operations, according to:

Table 7. Additional Setup Tasks

Feature	Task	Page
Storage groups	You will need to provide a *storage group configuration file*.	31
Authorization API	You will need to set up *authorization data*.	41
Enrollment API	You will need to set up *enrollment files*.	49
Worker API	You will need to set up *worker machines*.	59

Other Considerations

The reusable server kernel manages the server as a CMS Application Multitasking program. All the information contained in the publication *z/VM: CMS Application Multitasking* applies to programs written using the reusable server kernel. For more information, see *z/VM: CMS Application Multitasking*.

Chapter 2. Connectivity and Line Drivers

Server authors usually desire that their servers support many connectivity methods, for this increases the variety and number of clients that can be served. For example, a database server might desire to use TCP/IP and spool files as connectivity methods for clients; this would let clients reside on a variety of networks and platforms. Similarly, a server author might desire that the server program accept operator commands and deliver operator responses over a number of channels (`CP MSG`, `CP SMSG`, virtual console I/O); this would let the server program be operable remotely or locally, with no extra work being done by the server author.

A major problem in supporting heterogeneous connectivity is that the server author must learn a set of communication interfaces for each connectivity technology to be supported, and he must write exploiting code for each connectivity API. Further, the higher levels of such exploiting code are usually similar, regardless of the transport technology being exploited; for example, most connection-oriented transports support *initialize*, *send*, *receive*, and *terminate* primitives, and the server's treatment of those primitives is remarkably similar from one transport to the next. Thus an additional problem, duplication of effort, is also apparent.

The reusable server kernel relieves the server author of the burden of supporting multiple connectivity technologies. It furnishes the server writer with a set of line drivers and does so in a way that hides most communication differences from the server writer. Each line driver performs these basic functions for the server core:

- It creates and deletes service instances in response to the arrival and departure of clients.
- It collects bytes from clients and delivers them to service instances according to the mapping between service instances and clients and in the order in which said bytes arrive.
- It acts as the transmission agent for the set of service instances, sending bytes to clients in the order in which the respective clients' service instances emit them.
- It ascertains the identities of clients, mapping them into a single user identity space, and informs service instances of said identities.

Each of these functions is performed in a way consistent with the APIs and capabilities of the respective connectivity technologies.

The reusable server kernel provides a set of line drivers, one driver for each transport protocol it supports:

- APPC/VM (global, local, and private resource managers)
- IUCV
- TCP/IP
- UDP/IP
- Spool files
- MSG/SMSG
- Virtual console
- Subcom

Each driver is organized according to Figure 2 on page 14.

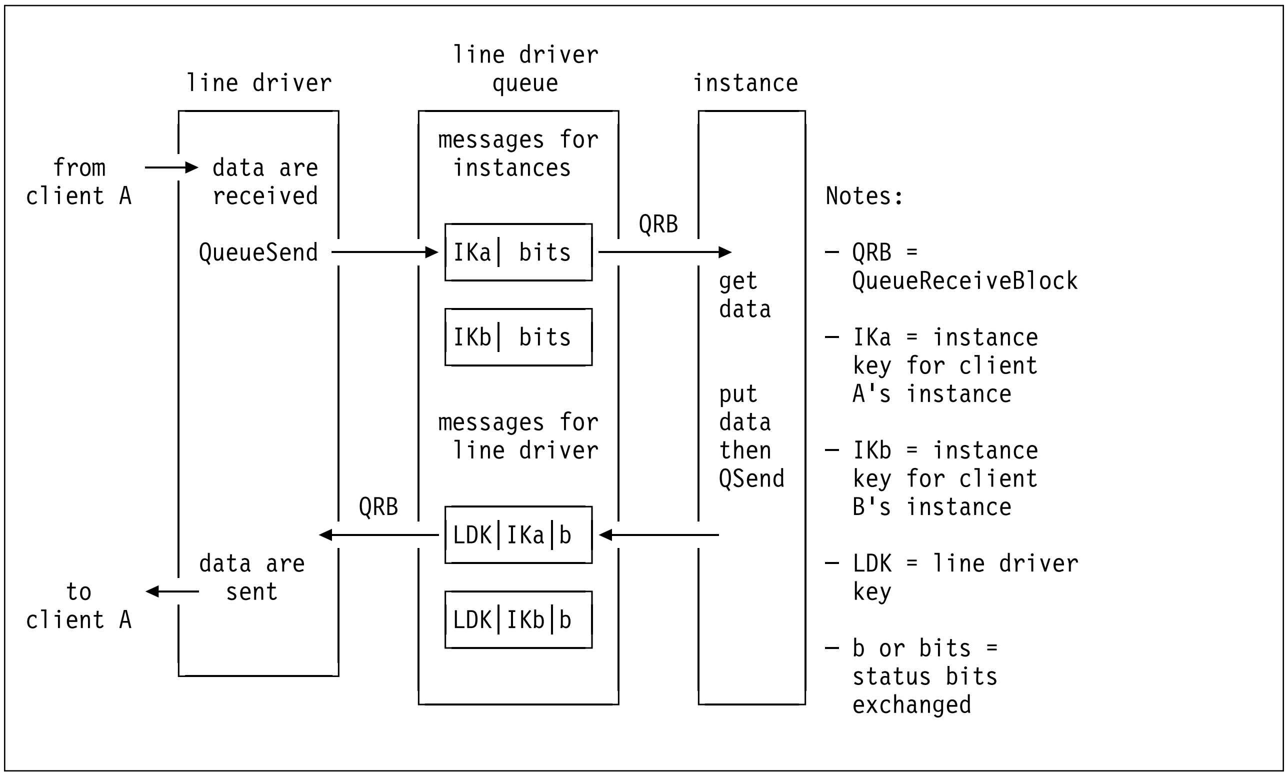


Figure 2. Line Driver Organization

The Service Instance's View

As introduced earlier, a service instance interacts with a line driver through two mechanisms:

- When a line driver starts an instance, it passes the instance a control block that describes the partnership among the client, the line driver, and the instance. This control block is called the *client block* or *C-block*.
- To interact with one another, the line driver and the instance exchange messages using a CMS queue maintained by the line driver. This queue is called the *line driver queue*. They also enqueue and dequeue data on a set of reusable server kernel-maintained client buffers. These buffers are accessed with the `ssClientDataGet` and `ssClientDataPut` primitives.

This section describes the C-block and the messages exchanged through the line driver queue.[4]

[4] For the server writer's convenience, macros `SSPLXSRV COPY` and `SSASMSRV MACRO` contain mappings of the C-block and the messages exchanged by way of the line driver queue.

The Client Block, or C-Block

As mentioned in “More About Services” on page 6, the relationship between a line driver and an instance of a service is carried out through a control block -- the *C-block* -- and a CMS queue. Some of the most important information in the C-block, then, is information describing the queue to be used and how it is to be used. This information appears in the C-block in the form of queue handles and message keys. Table 8 summarizes the fields of the C-block.

Table 8 (Page 1 of 2). Client Block, or C-Block

Offset	Length	Usage	Description
0	4	S-block pointer	The address of the S-block for the service with which this instance is affiliated.
4	8	Line driver name	The name of the line driver with which the service is interacting. The names are given in Table 9 on page 16.
12	4	Line driver status word	Specific information about the line driver. The bits of the status word have these meanings: **Bit** — **Meaning** `X'80000000'` — The line driver is *record-oriented*: • When supplying the instance with client input, the line driver organizes the client's input as a sequence of records. Each record is prefixed with a four-byte length field. The value stored in the four-byte length field does *not* include the length of the length field itself. • When producing output for the client, the instance must organize the output as a sequence of records, as described previously. The MSG/SMSG, CONSOLE, SUBCOM, and SPOOL drivers are record-oriented.
16	4	Line driver queue handle	The queue handle the instance should use to receive messages from and send messages to its associated line driver.
20	4	Line driver service ID	The service ID of the line driver queue. This might be useful to the instance in some situations.
24	4	Instance identifier	An integer identifier assigned to this instance by the line driver. This numeric identifier will never be reused by this line driver.
28	4	Instance thread ID	The CMS thread ID of the thread on which the instance is running.
32	32	Instance key	The key the line driver will use when it transmits messages needing the instance's attention. Such messages will be placed on the line driver queue, are indicative of client activity, and are organized according to Table 12 on page 18. The instance key is the key the instance should use in its *receive* (for example, `QueueReceiveBlock`) call.
64	32	Line driver key	The key the instance should use when it transmits messages needing the line driver's attention. Such messages should be placed on the line driver queue, are usually indicative of the instance's having queued data for transmission to the client, and are organized according to Table 13 on page 18.
96	64	Mapped user ID of client	The reusable server kernel's best attempt at assessing the user ID of the client. Depending on the communication transport being used, this assessment is made in several different ways, as shown in Table 10 on page 16.
160	4	Total bytes into instance	The total number of bytes the instance's client has sent the instance so far.

Table 8 (Page 2 of 2). Client Block, or C-Block

Offset	Length	Usage	Description
164	4	Total bytes from instance	The total number of bytes the instance has sent to the client so far.
168	4	Bytes waiting for instance	The number of bytes waiting to be consumed by the instance.
172	4	Bytes waiting for line driver	The number of bytes waiting to be consumed by the line driver.
176	8	Start STCK	The time at which the client began communicating with the server, stored according to the format of the Store Clock (`STCK`) instruction.
184	8	Reserved for IBM	
192	128	Reserved for IBM	
320	Varies	Line-driver-specific data	The data is organized differently for each line driver, as shown in Table 11 on page 17.

Table 9. Line Driver Names. All names are padded on the right with spaces (X'40').

Line Driver	Name in C-Block
APPC/VM	`APPC`
IUCV	`IUCV`
TCP/IP	`TCP`
UDP/IP	`UDP`
SPOOL	`SPOOL`
MSG/SMSG	`MSG`
Console	`CONSOLE`
Subcom	`SUBCOM`

Table 10. User ID Mapping Schemes

Transport	Method
APPC/VM	Security user ID of conversation, mapped through user ID mapping file
IUCV	Field `IPVMID` of connection pending EIB, mapped through user ID mapping file
MSG	User ID and node of origin of message, mapped through user ID mapping file
TCP/IP	IP address of client, mapped through user ID mapping file
UDP/IP	IP address of client, mapped through user ID mapping file
Spool	User ID and node of origin of spool file, mapped through user ID mapping file
Console	Literal `*`
Subcom	Literal `*`

Table 11. Line-Driver-Specific Portion of C-Block

Line Driver	Data	
TCP/IP	0.4 4.4	IP address of client Port number of client
UDP/IP	0.4 4.4	IP address of client Port number of client
APPC/VM	0.8 8.17	Security user ID of client Locally known LU of client
IUCV	0.8	Field `IPVMID` from connection pending EIB
Spool	0.8 8.8 16.8 24.4	Reserved for IBM User ID of client Node of client Spool ID of reader file (character form)
MSG/SMSG	0.4 4.8 12.8	Reserved for IBM User ID of client Node of client
Console	None present	
Subcom	None present	

From Line Driver to Instance

A reusable server kernel line driver transmits a message to the instance each time something “interesting” happens with respect to the client. This message serves to notify the instance that something has happened and to advise the instance that it might wish to take a corresponding action. The message contains status bits that indicate exactly how the relationship with the client has changed. This message is organized according to Table 12 on page 18. The instance can pick up these notifications using `QueueReceiveBlock`,[5] using the line driver queue handle and instance key from the C-block.

Each message to an instance will have its *message type* field set to `ss_srv_msgtype_instance`.[6] Usually the instance's reaction to such a notification will be to attempt to retrieve data from the client and process it. To do so, the instance should use `ssClientDataGet`.

When the instance sees a message in which the *line driver STOP* bit is set, it should:

- Emit any remaining transmissions intended for its current client
- Transmit a *STOP acknowledgement* message to the line driver
- Return to its caller.

For more information, see “From Instance to Line Driver” on page 18.

5 `QueueReceiveImmed` is also acceptable.

6 Defined in `SSPLXSRV COPY` and `SSASMSRV MACRO`.

Table 12. Message from Line Driver to Instance. The reusable server kernel always transmits this message using key offset 0 and key length 32.

Offset	Length	Usage
0	32	Instance's key
32	4	Message type
36	2	Client status bits X'8000' Client has closed connection X'4000' Connection closed abnormally X'2000' Client has finished sending X'1000' Line driver requests STOP X'0800' New data from client

From Instance to Line Driver

To send data to the client, the instance should use routine `ssClientDataPut` and then notify its line driver of the new data by using `QueueSend`. The precise form of the message the instance should transmit is given in Table 13.

The instance should set the *message type* field to `ss_srv_msgtype_linedriver` in each message it transmits to the line driver.

To inform the line driver that it has queued additional information for the client, the instance should set the *instance has queued output* bit in the message it transmits to the line driver.

To acknowledge a stop request from the line driver, or to indicate that it is spontaneously stopping for its own reasons, the instance should set the *stop acknowledgement* bit in the message it transmits to the line driver.

Table 13. Message from Instance to Line Driver. The instance always transmits this message using key offset 0 and key length 32.

Offset	Length	Usage
0	32	Line driver's key
32	4	Message type
36	32	Instance's key
68	2	Instance status bits X'8000' Stop acknowledgement X'4000' Instance has queued output

TCP/IP Considerations

To use TCP/IP, the server machine must be configured for TCP/IP operation. Typically this means that the server must be enabled to use IUCV to communicate with the TCP/IP service machine. These CP directory considerations apply:

- The server machine must be permitted to connect to the TCP/IP service machine. Typically the TCP/IP service machine has `IUCV ALLOW` in its own CP directory entry; when this is the case, no special work is required in the server machine's directory entry.

- The server machine's `MAXCONN` must be set high enough to let TCP/IP activity proceed. The reusable server kernel's TCP/IP line driver consumes one IUCV path ID per started service.

These other considerations apply:

- When the TCP/IP line driver starts a service, it binds the service's port number onto the adapter address specified in the `START` command and issues `listen()` with a backlog queue size of 10.
- Clients should connect to the reusable server kernel using stream sockets.
- The reusable server kernel creates all its sockets in addressing family `AF_INET`.
- The TCP/IP line driver uses the reusable server kernel's user ID mapping facility with connectivity identifier `TCP` to map the client's IP address into a single-token user ID.[7] Because IP addresses can be spoofed, this feature should be exploited only if the IP network is trusted.
- If the reusable server kernel is not able to map the user ID, then it behaves according to the setting of configuration parameter `NOMAP_TCP`:

OFF	Connection is closed
ON	User ID `$UNKNOWN` is passed to instance

UDP/IP Considerations

Like using TCP/IP, using UDP/IP requires that the server machine be configured for TCP/IP operation. Again, this means that the server must be enabled to use IUCV to communicate with the TCP/IP service machine. To achieve this, follow the same procedures as you would use to set up for TCP/IP operation. Be aware that the UDP/IP line driver consumes one IUCV path per started service, just as the TCP/IP line driver does; plan your MAXCONN accordingly.

The following other considerations apply:

- When the UDP/IP line driver starts a service, it binds the service's port number onto the adapter address specified in the `START` command.
- Clients should send to the server using datagram sockets and should expect the server's response to come as one or more datagrams.
- The reusable server kernel considers each received datagram to be representative of a distinct transaction. When a datagram arrives, the reusable server kernel creates a service instance and passes the datagram's contents to the service instance through `ssClientDataPut`. In other words, a service instance will only ever “see” **one** inbound datagram from a client. Each inbound datagram is considered to be its own transaction and accordingly is delivered to a separate instance.
- For a given service instance, the reusable server kernel will emit as many response datagrams to the client as are necessary, until the service indicates completion of the transaction through usual means (*stop acknowledgement* bit set in IPC message to line driver).

[7] In the call to `ssUseridMap`, parameter *nodename* is filled with the IP address and parameter *userid* is filled with `*`.

- The UDP/IP line driver uses the reusable server kernel's user ID mapping facility with connectivity identifier `UDP` to map the client's IP address into a single-token user ID.[8] Because IP addresses can be spoofed, this feature should be exploited only if the IP network is trusted.
- If the reusable server kernel is not able to map the user ID, then it behaves according to the setting of configuration parameter `NOMAP_UDP`:

OFF	Datagram is ignored
ON	User ID `$UNKNOWN` is passed to instance

IUCV Considerations

To use IUCV, the server virtual machine must be configured for IUCV operation. Typically this means the following for the server's CP directory entry:

- `IUCV ALLOW` should be specified so that clients can connect to the server virtual machine.
- `OPTION MAXCONN` must be set large enough to handle the number of clients you anticipate will be connected to the server concurrently. Allow one connection for each client.

For more information, see *VM/ESA: Connectivity Planning, Administration, and Operation*.

The following specific considerations apply to the use of IUCV. These considerations will be particularly helpful in writing clients.

- The server kernel uses CMS's `CMSIUCV` and `HNDIUCV` macros for IUCV path management, so as not to interfere with other IUCV or APPC/VM usage in the server virtual machine.
- The reusable server kernel opens an `HNDIUCV` exit for each service it starts. Usually, the name of the exit matches the name of the service. The server operator can override this with the `IUCV START` command if some other exit name must be used.
- A client wishing to connect to an reusable server kernel-managed service must specify the name of the service's exit routine in the `IPUSER` field of its `IUCV CONNECT` parameter list.
- The server kernel issues `IUCV ACCEPT` with `MSGLIM` set to 65535. The server administrator can force a lower value by installing an appropriate IUCV control statement in the server's CP directory entry.
- The reusable server kernel produces the client's mapped user ID by calling `ssUseridMap` with connectivity identifier `IUCV`, specifying the **local nodename** and the VM user ID of the client (field `IPVMID` of the connection pending EIB) as the remaining inputs.
- If the reusable server kernel is not able to map the user ID, then it behaves according to the setting of configuration parameter `NOMAP_IUCV`:

OFF	Path is severed
ON	The `IPVMID` field of the connection pending EIB is passed to the instance

[8] In the call to `ssUseridMap`, parameter *nodename* is filled with the IP address and parameter *userid* is filled with `*`.

- The reusable server kernel lets the client use `IUCV SEND` with either `DATA=PRMMSG` or `DATA=BUFFER`. However, the reusable server kernel always transmits using `DATA=BUFFER`.
- The reusable server kernel does not permit the client to use `IUCV SEND,TYPE=2WAY`. All sends to the server must be one-way sends. If the client attempts a two-way send, the reusable server kernel will sever the path.
- The server kernel will tolerate IUCV priority messages but never sends them.
- Data arriving from the client is queued to the affiliated service instance in the order that the message pending interrupts arrive, without regard to any other factors.
- The server kernel is optimized for 64 KB transfers between the client and the server. In fact, the reusable server kernel never transmits more than 64 KB in a single IUCV message. Best results will be achieved when the client takes this optimization into account.
- The reusable server kernel does not permit the client to use `IUCV QUIESCE` or `IUCV RESUME`. It will sever the path if the client tries these. Similarly, the reusable server kernel never uses these macros itself.

APPC/VM Considerations

To use APPC/VM, the server virtual machine must be configured for APPC/VM operation. Typically this involves one or more of these:

- Adding proper IUCV-related statements to the virtual machine's directory entry. These statements control the names of the resources the machine is allowed to identify and the number of concurrent conversations the machine is allowed to use. Sometimes permitting clients to connect is also accomplished here.
- If the virtual machine is managing an APPC/VM private resource,
  - The virtual machine must IPL CMS with parameter `AUTOCR`.
  - The virtual machine should run with Fullscreen CMS off.
  - File `PROFILE EXEC` should contain `SET SERVER ON`.
  - File `$SERVER$ NAMES` must be set up to map the resource name to the name of the server program and to identify the clients permitted to connect.

For more information, see *VM/ESA: Connectivity Planning, Administration, and Operation*.

The following specific considerations apply to the use of APPC/VM. These considerations will be particularly helpful in writing clients.

- To allocate a conversation to the server, the client should use the LU name appropriate for the server virtual machine's location and resource type and a TPN equal to the one used in the server's `APPC START` command. For more information, see Chapter 14, “Command Descriptions” on page 85.
- The APPC/VM line driver accepts either mapped or basic conversations. Be aware, though, that inbound APPC record boundaries are not visible to the instance and that the instance has no control over record boundaries in outbound APPC records.
- The APPC/VM line driver uses the connectivity identifier `APPC`, the LU of the client, and the user ID of the client as input to its user ID mapping function. For more information on user ID mapping, see Chapter 12, “Initialization and

Profiles" on page 71. The client's node is taken to be his LU (field `CPEVPLKL` of the connection pending extended data) and his user ID is taken to be field `IPVMID` of the connection pending EIB. If the conversation was allocated with SECURITY(NONE), the server kernel substitutes `$UNKNOWN` for the `X'0000000000000000'` user ID CP supplies in the EIB.

- If the reusable server kernel is not able to map the user ID, then it behaves according to the setting of configuration parameter `NOMAP_APPC`, as follows:

OFF	Conversation is severed
ON	The `IPVMID` field of the connection pending EIB (or `$UNKNOWN`, if SECURITY(NONE)) is passed to the instance.

- The reusable server kernel does not support SYNCLVL(CONFIRM) or SYNCLVL(SYNCPT) conversations. Attempts to use these will result in a sever.

Spool Considerations

These considerations apply when using spool files as a connectivity mechanism:

- Requests from clients arrive at the server virtual machine's reader from either the same node as the server or from remote nodes through RSCS or functional equivalent.
- Spool files containing requests must be encoded using one of the following techniques:
  - NETDATA encoding (`NEW` option of `SENDFILE`)
  - DISK DUMP encoding (`OLD` option of `SENDFILE`)

  | If a file encoded with some other technique arrives, the reusable server kernel will `CP TRANSFER` it to the user ID specified by the `SPL_CATCHER` configuration parameter, or if no such user ID is specified, the file will remain in the server's reader in USER HOLD status.

  No matter which encoding is used, each data record of the sent file is extracted and given to the service as a record of input. (The spool driver is record-oriented.)
- The reusable server kernel considers only those reader files having filetype matching the value of configuration parameter `SPL_INPUT_FT`. All other reader files are ignored.
- When a spool file arrives, the reusable server kernel scans the reader for new work. When it finds a file whose filetype matches configuration parameter `SPL_INPUT_FT`, and whose filename matches a started service, and which is not in a hold of some kind, the driver reads the file's data from the spool and attempts to deliver the data to the started service.
- When `SPOOL START` is issued, the reusable server kernel scans the reader for new work, just as it would scan as a result of spool file arrival, but with the following addition: if a file would have been delivered to the newly-started service *except for the fact that the file has been found to be in USER HOLD state*, the file is changed to NOHOLD and its data is delivered to the newly-started service.
- If the file name of the spool file does not match the name of any started service, and if implicit VM routing is enabled for the spool driver, then the

reusable server kernel delivers the file's data records to the CMS service, provided the CMS service has been started. For more information about implicit routing, see Chapter 12, “Initialization and Profiles” on page 71.

- While processing of a file is underway, the file remains in the reader in USER HOLD state.
- If delivery of the file's data to its service fails, or if the service fails to consume all of the data of the spool file, the file is left in the reader in USER HOLD state. Otherwise the file is purged.
- The spool driver uses the reusable server kernel's user ID mapping facility with connectivity identifier `SPOOL` to map the origin user ID and origin node of the spool file into a single-token user ID. For more information on the user ID mapping facility, see Chapter 12, “Initialization and Profiles” on page 71. This user ID is passed to the service instance as the client's user ID. However, if the spool driver's call to the user ID mapping facility reveals that no mapping exists, action is taken, if `NOMAP_SPOOL` is:
  - OFF, the file is placed in USER HOLD status and a message is issued to the server console.
  - ON, the file is passed to the service instance, with the origin user ID passed directly as the “mapped” user ID.
- The SPOOL line driver parallelizes requests. If a client sends multiple requests to the same service, the two requests might finish in an order other than the one in which they were sent. This applies also to the situation where the multiple requests are sent to different services.

MSG/SMSG Considerations

The `CP MSG` and `CP SMSG` commands can be used to send work to service instances being managed by the reusable server kernel. The following considerations apply:

- Each MSG or SMSG should bear as its first token the prefix supplied on the `MSG START` command that started the service. For example, to send a request called SHUTDOWN to the service started with prefix CAL_OPER running in virtual machine SERVER, an operator might issue this command:

  ```
  TELL SERVER CAL_OPER SHUTDOWN
  ```
- If the first token of the message (in the above example, CAL_OPER) does not match the name of any request processor registered in the server, and if implicit VM routing is enabled for the MSG/SMSG line driver, then the reusable server kernel delivers the command to the CMS service, provided the CMS service has been started.

  For more information about implicit routing, see Chapter 12, “Initialization and Profiles” on page 71.
- Each message the MSG/SMSG line driver places in a line driver queue contains a single MSG or SMSG sent to the server virtual machine.
- The MSG/SMSG line driver uses the user ID mapping facility with connectivity identifiers `MSG` and `SMSG` to map the user ID and node of the message sender to a single-token user ID. This user ID is the one passed to the request processor in the C-block header. However, if the driver's call to the user ID mapping facility reveals that no mapping exists, action is taken as follows:

  - If NOMAP_MSG is OFF, the message is ignored and an error message is written to the server console.
  - If NOMAP_MSG is ON, the message is sent to the service instance, with the origin user ID passed directly as the "mapped" user ID.
- The MSG/SMSG line driver is record-oriented.
- The MSG/SMSG line driver parallelizes requests. If a client sends multiple requests to the same service, the two requests might finish in an order other than the one in which they were sent. This applies also to the situation where the multiple requests are sent to different services.
- When the MSG/SMSG driver builds output, it prefixes each line of service output with the prefix assigned to the service, padded to 8 characters. For example, for service CAL_OPER above, each line of output produced by the CAL_OPER service would be prefixed with `CAL_OPER`.

Virtual Console Considerations

The reusable server kernel runs the server virtual machine's console in line mode. These considerations apply:

- When entering a command for a service, the operator should use the prefix supplied on the `CONSOLE START` command as the first token of the command line. For example, to send a request called SHUTDOWN to the service called CAL_OPER, the operator should enter the following on the virtual machine's console:

  ```
  CAL_OPER SHUTDOWN
  ```

- If the first token of the command (in the above example, `CAL_OPER`) does not match the name of any request processor registered in the server, and if implicit VM routing is enabled for the console line driver, then the reusable server kernel delivers the command to the CMS service, provided the CMS service has been started. For more information about implicit routing, see Chapter 12, "Initialization and Profiles" on page 71. The console driver:
  - Always supplies * as the mapped client user ID.
  - Is record-oriented.
  - Parallelizes the services it starts. Requests sent to a given service are begun in the order in which they are typed, but they might complete in a different order.
- When the console driver routes output to the console, it prefixes each line of service output with the prefix assigned to the service, padded to 8 characters. For example, for service CAL_OPER above, each line of output produced by the CAL_OPER service would be prefixed with `CAL_OPER`. For this reason, if it is possible in your environment, the server virtual machine's console should be wider than 80 columns. IBM recommends that you use at least 90 columns for the console.

Subcom Considerations

The reusable server kernel supplies a subcom, `RSK`, to which execs may direct commands; the output of such commands is written to the virtual console. These considerations apply:

- When issuing a command to a service, the exec writer should use the prefix supplied on the `SUBCOM START` command as the first token of the command. For example, to issue a command called SHUTDOWN to the service called CAL_OPER, the exec writer might code:

  ```
  address 'RSK' 'CAL_OPER SHUTDOWN'
  ```

- If the first token of the command (in the above example, `CAL_OPER`) does not match the name of any request processor registered in the server, and if implicit VM routing is enabled for the SUBCOM line driver, then the reusable server kernel delivers the command to the CMS service, provided the CMS service has been started. For more information about implicit routing, see Chapter 12, “Initialization and Profiles” on page 71.
- The SUBCOM driver always supplies * as the mapped client user ID.
- The SUBCOM line driver is record-oriented.
- The SUBCOM driver does not return to the calling EXEC until the command is complete.
- The SUBCOM driver routes service output to the virtual console, in the manner of the console line driver.
- Because services do not generate return codes, the server author should not use Rexx variable `rc` as an indication of the completion status of commands issued through the SUBCOM driver.

Line Driver Commands

As mentioned earlier, services are started and stopped by line drivers. This is done through line driver *commands*. Largely speaking, line driver commands are present to perform these important functions:

- *Starting* a service is nothing more than connecting it to a reusable server kernel line driver -- the *start* operation is an instruction to a line driver to prepare for communication and connect its communication device or channel to a named service. In other words, an operator starts a service by issuing a command that's interpreted by a specific line driver; in response to the command, the line driver begins driving work through the service.
- *Stopping* a service is nothing more than informing a line driver that its communication method should be shut down; as a consequence of this, no more client activity will be reflected to the corresponding service through that line driver. The stop can be graceful or immediate.

Though the reusable server kernel contains a number of line drivers, the command sets understood by all of the line drivers are roughly the same. Each line driver supports `START` and `STOP` commands and a few queries. The syntax of these commands differs slightly from line driver to line driver to accommodate differences in transport attributes; for example, the TCP/IP line driver expects a port number to appear in its START command, while the spool line driver expects a file name.

For more information on the line driver commands, see Chapter 14, “Command Descriptions” on page 85.

More Detail on Line Drivers

A line driver is nothing more than a service that supplies other services with a method to interact with clients. Here is an overview and some information about how you can write your own line drivers.

Line Drivers as Services

Recall that in the reusable server kernel, a *service* is just a routine that takes input from a line driver and which delivers output to a line driver. The line driver takes care of routing data between the client and the service.

Consider also that a reusable server kernel line driver is itself a program that takes input from a client; this input is just operator commands (`START`, for example). Similarly, a reusable server kernel line driver is itself a program that produces output for its “client” (the operator). This output is command response text, such as the result of a `LIST` command.

Because of this nature of a line driver, we can see that a line driver can be implemented *as a reusable server kernel service*. To send commands to and receive responses from this service, we just have to `START` it through some other line driver; we would then have a means to send it commands and gather its responses.

For example, consider the TCP/IP line driver. It accepts commands -- such as `START` -- from its operator and produces command responses for its operator. How does it do this? Well, it does so *by way of the line driver over which it is interacting with the operator*. In other words, the TCP/IP line driver **is a *service* sourced by some other line driver**, such as the console line driver.

Continuing this, we see that if we want to issue commands to the TCP/IP line driver by using the virtual console, we must start the TCP/IP line driver by using the command `CONSOLE START TCP`.[9] If we also wanted to control the TCP/IP line driver by way of MSG and SMSG, we could issue `MSG START TCP`. After having done both of these commands, we could control the TCP/IP line driver by all of these methods:

- Typing a command on the virtual console, the first token of said command being `TCP`.
- Sending a `CP MSG` to the server virtual machine, the first token of said message being `TCP`.
- Sending a CP SMSG to the server virtual machine, the first token of said message being `TCP`.

9 Note that `TCP` is the service name of the TCP/IP line driver.

Self-Sourced Line Drivers

Now, consider the console line driver. Like the TCP/IP line driver, the console line driver is implemented as a service. This means that the commands supported by the console line driver, such as `CONSOLE START`, are issued to the console line driver by way of some other line driver, and the responses to said commands are delivered to the operator through said other line driver.

For example, if we were to issue `MSG START CONSOLE`, we would be able to use the `CP MSG` command to issue commands like `CONSOLE START`. When we did so, the response from the console line driver would appear at the virtual machine from which we issued `CP MSG`, because that's how the MSG/SMSG line driver disposes of responses from the services it controls.

But look again at that console line driver. When the reusable server kernel starts, the console line driver's command set (`CONSOLE START` and so on) is already usable by typing those commands on the virtual console. This is possible because the console line driver is built to be *self-sourcing*. In other words, it is capable of *starting itself*, and it does so when the reusable server kernel initializes.

The CONSOLE, SUBCOM, MSG/SMSG, and SPOOL line drivers are all self-sourcing. This means that when the reusable server kernel initializes, all of the following methods are available for issuing commands to these drivers:

- You can type `CONSOLE START` (for example) on the virtual console and the console line driver will handle the command and write the response to the virtual console.
- You can issue a `CP MSG` or `CP SMSG` command to send a command to the MSG/SMSG line driver from elsewhere (making sure the first token of that message or special message is `MSG`), and the MSG/SMSG line driver will handle the command and respond to you through CP's `MSG` command.
- From a REXX EXEC, you can use `ADDRESS RSK` to issue a command to the SUBCOM line driver (making sure the first token of that command is `SUBCOM`), and the SUBCOM line driver will handle the command and respond by writing its output to the virtual console.
- You can send a file to the SPOOL driver; it will process the lines therein as commands and return a file to you containing the results.

Writing Your Own Line Driver

The notion that the reusable server kernel implements line drivers as services permits the server author to add his own line drivers. To add a line driver, the server author just uses `ssServiceBind` in his `RSKMAIN` to bind the service, just as he would do for any other service he writes, except:

- He must at least specify service type `ss_srv_srvtype_ld` in his call to `ssServiceBind`. This informs the reusable server kernel that the service being bound is in fact a line driver.
- If he is writing a self-sourced line driver, he must specify `ss_srv_srvtype_ldss` in his call to `ssServiceBind`. This informs the reusable server kernel that the service being bound is a self-sourced line driver.

After calling `ssServiceBind`, `RSKMAIN` should proceed as usual, eventually calling `ssServerRun`. These considerations apply:

- The reusable server kernel does not take any special action for regular line drivers; the server author must use PROFILE RSK to start his line driver (for example, CONSOLE START MYDRIVER to enable his line driver to interact with the server operator through the virtual console).
- For a self-sourced line driver, the reusable server kernel does the following shortly after ssServerRun begins:
  - It drives the line driver's initialization entry point (known because of the ssServiceBind call the author placed in RSKMAIN).
  - If initialization worked, the reusable server kernel *creates a thread* and runs the line driver's service routine (again, known because of the recently-performed ssServiceBind) on that thread, *passing the service routine a C-block address of X'00000000'*.

    The C-block address being zero is the self-sourced line driver's cue that it should initialize its device and prepare to accept its command set over its device.

Finally, the reusable server kernel provides entry point ssServiceFind so that an author-supplied line driver can retrieve descriptive information saved by ssServiceBind. This permits author-supplied line drivers to respond to their equivalent of the IBM-supplied drivers' START command. ssServiceFind takes a service name as input and returns the address of the service's S-block. For more information, see Table 2 on page 6.

Some of the fields of the S-block are relevant to the server author only in the context of author-supplied line drivers. These are:

- The *current start count* is a counter used to indicate the number of START commands that are current against the service. The counter is used in this manner:
  - If the counter is zero when a line driver performs a START of this service, the line driver should drive the service's initialization routine prior to letting the service's service routine get control.

    In any case, the line driver should increment the counter just prior to driving the service's service routine.
  - When the line driver performs a STOP operation, it should first stop all its instances of the service's service routine and then decrement the counter. If the counter becomes zero as a result of this decrement, the line driver should drive the service's termination routine.
- The *lockword* is intended for use with the Compare and Swap instruction (CS). It is a line driver's means for ensuring mutual exclusion in examination and setting of the start count and in the driving of a service's initialization and termination routines. If the lock word is zero then it is considered not to be held. Any nonzero value marks the lock as held. If an attempt to get the lock through CS fails, call ThreadYield before trying again.

Authorization

Permission to start and stop services can be controlled through configuration parameter `AUTHCHECK_LD` and the `AUTH` command set. This capability lets the server administrator set up subordinate operators who can control some services but not others. For more information, see “Other Services' Use of Authorization” on page 46.

Chapter 3. DASD Management

Authors of certain kinds of servers will require a DASD subsystem capable of high volume, high speed, parallelized I/O with a block-oriented model. The reusable server kernel DASD subsystem meets these requirements, is integrated with CMS Application Multitasking, and recognizes the CMS thread, not the VCPU or the virtual machine, as the entity that performs DASD I/O. Specific programming information is found in the `ssSgp` API descriptions, and operator-oriented information is found in the descriptions of the `SGP` command set.

DASD Subsystem Overview

The reusable server kernel accomplishes its DASD objectives through the following scheme:

- Defined to the reusable server kernel are one or more sets of CMS minidisks, each such minidisk formatted at 4 KB (kilobyte) blocksize and reserved (CMS `FORMAT` and `RESERVE` commands). Such minidisks provide the raw storage for the DASD model implemented by the server kernel. Each set of such minidisks is called a *storage group*.[10]
- For each storage group, the server kernel creates one or more VM data spaces. The total number of pages in the data spaces is equal to the total number of data blocks on the constituent minidisks.
- Through MAPMDISK, each storage group's minidisk set is mapped into the pages of its data space set.[11]
- To read DASD blocks, the reusable server kernel performs MVCL from the appropriate pages in the appropriate data space. In response to this, CP pages in the mapped DASD blocks as required. Paging is a virtual machine's fastest route through CP to the DASD; further, significant amounts of real and expanded storage are used by CP on the virtual machine's behalf to “cache the DASD blocks” (that is, keep the data space pages resident).
- To write DASD blocks, the reusable server kernel performs MVCL to the appropriate pages in the appropriate data space and follows the MVCL with MAPMDISK SAVE. After MAPMDISK SAVE, the reusable server kernel waits in a thread-blocking fashion for the save-complete external interrupt to arrive. Control returns to the calling thread only when the write is entirely complete.

The techniques described above are used by the server kernel on the server application's behalf; see Figure 3 on page 32.[12] In addition, all code and data structures involved in this scheme exhibit the execution traits desired in a

[10] The reusable server kernel contains no support for linking storage group minidisks at server startup or performing the CMS `FORMAT` and `RESERVE` commands against minidisks prior to attempting to add them to a storage group for the first time. These initialization processes need to be taken care of by the server operator using traditional methods. Further, the reusable server kernel DASD engine *requires* that its storage group minidisks be formatted at 4 KB and reserved. It will not operate upon minidisks that do not meet these criteria.

[11] For FBA DASD, each minidisk must start at a multiple-of-eight block number on the real DASD volume for data space mapping to work correctly.

[12] When VM Data Spaces are not available, the reusable server kernel uses DIAGNOSE `X'250'` in asynchronous, MDC-enabled fashion instead; if for some reason DIAGNOSE `X'250'` doesn't work, then DIAGNOSE `X'A4'` is used.

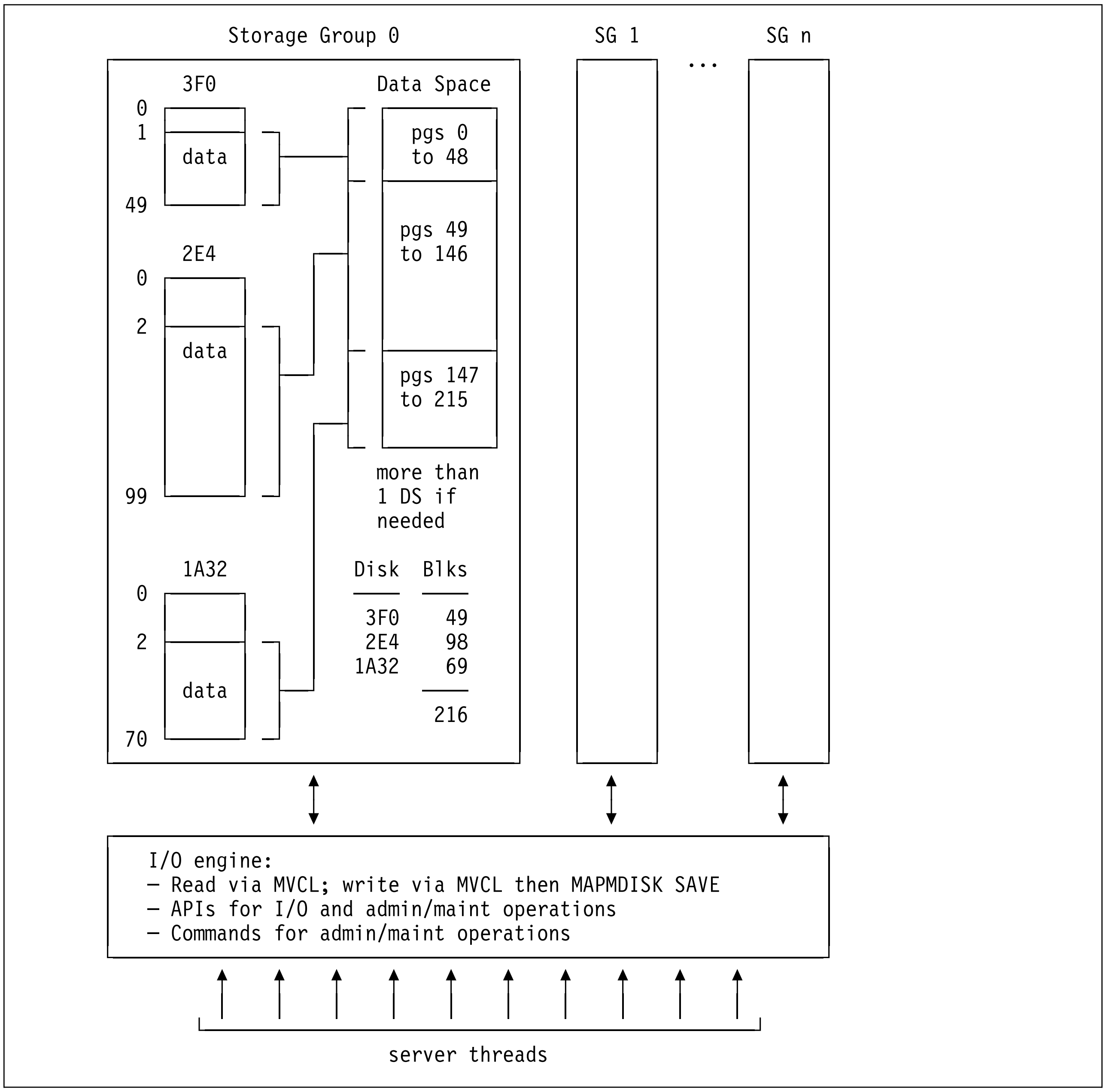


Figure 3. Reusable Server Kernel DASD

multithreaded CMS model: they are all thread-blocking, thread-synchronous, 31-bit-capable facilities.

Limits

The reusable server kernel DASD subsystem exhibits these limits:

- The maximum number of storage groups is 1024.
- The maximum number of data blocks per storage group is `X'FFFFFFFF'` (16 TB).
- The maximum number of minidisks per storage group is 13,000.

- The total number of dataspace-mapped DASD blocks cannot exceed X'FFFFFFFF' (16 TB).[13]

Modes of Operation

A given storage group can be started in one of two I/O modes:

- *Block R/O*: the server program can read the DASD blocks but cannot write them. It is permissible for one or more of the minidisks in the storage group to be linked read-only.
- *Block R/W*: the server program can read or write the DASD blocks individually. All minidisks in the storage group must be linked read/write.

Each storage group's I/O mode is selected individually.

Programming Interfaces

Management and control of storage groups can be done through a set of storage group APIs. Callable APIs are provided to:

- Create and delete storage groups
- Vary storage groups online and offline
- List and query the defined storage groups
- Perform storage group I/O
- Find the number of a started storage group, given its name

These entry points all begin with name `ssSgp` and are described later in this book.

Administrator and Operator Considerations

A set of operator commands implements a subset of the storage group APIs. Commands are available to perform these functions:

- Create and delete storage groups
- Start and stop storage groups
- List and query the defined storage groups

For more information, see Chapter 14, “Command Descriptions” on page 85.

Creating a Storage Group

To build up a storage group from scratch, the server administrator performs these steps:

[13] The server kernel automatically switches to DIAGNOSE X'250' when this limit would be exceeded.

Table 14. Building a Storage Group

Step	Task	Command	Description	Page
1	Select some minidisks to make up the storage group.	`CP LINK` `CMS FORMAT`	Format each minidisk at 4 KB blocksize and reserve it. Make sure the server's virtual machine links the minidisks at startup time, for example, through `PROFILE EXEC` or `PROFILE RSK`. If FBA DASD is used, make sure each minidisk starts on a multiple-of-eight block boundary on the real FBA device.	N/A
2	Create the storage group	`SGP CREATE`	This informs the reusable server kernel of the minidisks' existence and instructs it to treat them together as a storage group. The server kernel records this information in the storage group configuration file.	180
3	Start the storage group	`SGP START`	This makes the storage group available for I/O and the `ssSgpRead` and `ssSgpWrite` APIs can be used against it. You will probably want to put the `SGP START` command in `PROFILE RSK` so that the storage group starts each time the server starts.	184

Changing the Minidisks in A Storage Group

To change the minidisk configuration of a storage group use these steps:

Table 15. Changing the Minidisk Configuration

Step	Task	Command	Description	Page
1	Stop the storage group	`SGP STOP`	This brings the storage group offline.	185
2	Delete the storage group	`SGP DELETE`	This removes the storage group's definition from the storage group configuration file.	181
3	Create the storage group anew	`SGP CREATE`	This records the new storage group definition in the storage group configuration file.	180
4	Start the storage group	`SGP START`	This makes the storage group available for I/O.	184

Deleting A Storage Group

To delete a storage group use these steps:

Table 16 (Page 1 of 2). Deleting a Storage Group

Step	Task	Command	Description	Page
1	Stop the storage group	`SGP STOP`	This brings the storage group offline.	185

Table 16 (Page 2 of 2). Deleting a Storage Group

Step	Task	Command	Description	Page
2	Delete the storage group	`SGP DELETE`	This removes the storage group's definition from the storage group configuration file.	181

Chapter 4. File Caching

Servers having file-read-intensive workloads will find it beneficial to cache frequently-read files. Usually the application relies upon CMS's FSREAD cache and minidisk caching to achieve good performance, but these facilities have their limits.

To overcome these limits and extend the caching facilities available to the server writer, the reusable server kernel offers a file caching scheme based on VM Data Spaces.[14] A *file cache* is simply a data space whose contents -- files -- are controlled for the server by the server kernel. The server author decides the number and sizes of file caches he creates; he has both APIs and operator commands at his disposal for both creating and deleting file caches. Using APIs alone, the server program requests that files be cached in these data spaces; in response to the server's requests, the server kernel reads files using conventional CMS file APIs and holds them in data spaces, removing them either when they become stale or when data space storage becomes constrained. When storage constraints are an issue, the server kernel removes files in LRU (least recently used) fashion. Such removal is not visible to the server program.

Managing the Set of Caches

To create a file cache, the server operator can issue the `CACHE CREATE` command, or the server itself can call entry point `ssCacheCreate`. The cache is given an eight-byte name which the server kernel uses unchanged in a call to `ssMemoryCreateDS` to create the corresponding data space. Thus, cache names must be unique among all subpools the server kernel manages. The size of the cache is specified in pages.

To delete a cache, use either the `CACHE DELETE` command or entry point `ssCacheDelete`. The command or API call will not complete until all cached files are closed. Further, once the deletion has started, the caching of new files will not be permitted.

To obtain statistical information about a particular file cache, the server can call `ssCacheQuery`. Similarly, the server operator can issue the `CACHE LIST` command to see tabular output reflecting statistical information about all of the caches known to the server kernel.

For more information on how the server kernel maintains monitor data for each file cache, see Chapter 13, “Monitor Data” on page 79.

[14] If VM Data Spaces are not available, the file caching facilities of the reusable server kernel do not work.

File Operations

To cache a file, the server calls entry point `ssCacheFileOpen`, supplying the name of the file to be cached. Any name acceptable to CSL routine `DMSOPEN` can be used. The server kernel keeps track of cached files using these `DMSOPEN`-acceptable names. In response to the call, the server kernel loads the file into the cache, making it ready for reading through another entry point, `ssCacheFileRead`; in addition, if the server kernel was able to load the file contiguously into data space storage, it informs the caller of this, returning to it the ALET and address the server can use to access the cached file directly. In any case, `ssCacheFileOpen` returns the size in bytes of the cached file. Finally, note that the file can be opened multiple times simultaneously; this permits open-read-close logic to be applied freely on a per-client basis.

Once the server has opened the file, it can read the file's data through one of two methods:

- If the file was loaded contiguously, the server can enter AR mode and read the data directly from the data space, using the ALET, address, and length returned by `ssCacheFileOpen`.
- If the file was not loaded contiguously, or if the server author chooses not to use AR mode, the server can call entry point `ssCacheFileRead` to read the data. This entry point's inputs are simply a file token, a zero-origin byte offset, and a length. It simply reads the cached data into the buffer passed by the caller. The server kernel permits multiple `ssCacheFileRead` calls to be in progress simultaneously against a given file.

When the server is done reading the file, it issues call `ssCacheFileClose`. The file remains in the cache for subsequent use, unless it becomes stale or is pushed out because of storage contention.

Transformations

Recognizing that the server is likely to need to perform code page transformations on the files it manipulates, the server kernel includes a translation function with its caching support. When the server opens a file, it specifies a translation table to be applied to the file's data as it is loaded into the cache. The translation table can come from these places:

- The server kernel offers an entry point, `ssCacheXlTabSet`, which the server can call to identify a translation table that should be eligible for use as part of file loading. The table is known by an integer identifier and is nothing more than a 256-byte table to be applied to the file's data using the Translate (TR) instruction. The integer identifier supplied to `ssCacheXlTabSet` is also one of the inputs to `ssCacheFileOpen`.
- For the server author's convenience, the server kernel predefines certain tables:

Table ID	Table Function
0	No translation at all
1	1047 to 819 (EBCDIC to ASCII)
2	819 to 1047 (ASCII to EBCDIC)

The server kernel recognizes these tables' identifiers without the server having to invoke `ssCacheXlTabSet` first.

Just as it might have to perform code page translation on files it serves to clients, the server might also have to perform record boundary delimiter transformations. For example, a Unix client might want the records to be delimited by a line feed (X'0A'), while a DOS client might want a carriage return and line feed (X'0D0A') at the end of each record. Depending on the file's contents, it might even be appropriate not to insert any delimiters at all - a .JPG file, for example, falls into this category. Recognizing this, the server kernel lets the caller tell `ssCacheFileOpen` what should be done about record delimiting. Both line-end marker and prefixed record-length schemes are supported.

Example

Suppose that an HTTP server needs to serve file `INDEX HTML VMHOME:EWEBADM.VMPAGE` to a browser. As part of serving this file to the browser, the HTTP server will need to translate the file's data from EBCDIC to ASCII and will need to insert a CR-LF pair (X'0D0A') after each record. To serve the file, the server would call `ssCacheFileOpen`, requesting that appropriate data translation and record massaging be done as part of the load into the cache. The server kernel would return a *file token* as an output of `ssCacheFileOpen`, and if the file had been loaded contiguously into the data space, it would also return the ALET and address of the data space buffer in which the file resides. Finally, if the load is successful, `ssCacheFileOpen` also returns the size in bytes of the loaded, transformed file.

The server can read the file's contents using either `ssCacheFileRead` or AR mode. However, if all that is needed is to send the file's contents to the browser, the server can just call `ssClientDataPut`, passing it the ALET, address, and length returned by `ssCacheFileOpen`.

After the file has been sent, the server issues `ssCacheFileClose`. The file remains in the cache for the next client.

Stale Data

The server kernel's file caching scheme accommodates the notion that file contents change over time and that cached information can become stale as a result. When the server calls `ssCacheFileOpen`, the server kernel checks the file's update time and compares it against the update time of the cached copy. If there is a discrepancy, the file is reloaded. The currently cached copy -- now stale -- is disposed of according to whether it is still in use (that is, is still open); if it is not in use it is dropped immediately, but if it is still open it is marked as stale and dropped when the server finally closes it. This scheme preserves consistency for open files while providing a means for new opens to see the latest version of a file.

Cache Utilization

It is important to recognize that the server kernel can have more than one copy of a file in a cache at one time. This can happen in these situations:

- If a file is loaded into a cache using several different code page translations or several different record delimiting schemes, a cached copy will be kept for each such representation requested. For example, if `INDEX HTML` were opened using EBCDIC-to-ASCII and CR-LF delimiting, and then it were opened again using no code page translation and CMS two-byte-length record prefixing, the server kernel would keep both copies in memory.

- If a cached file is still open, it will not be dropped from the cache, even if the server kernel detects that it has become stale. The stale file will not be dropped until it is closed.

Constraints

The sever author and administrator should keep these file caching constraints in mind:

- File cache names are used directly as input to `ssMemoryCreateDS`. The server writer and administrator must work to avoid name conflicts.
- The number of files that can be held in a cache is not strictly limited, but the overall size of a file cache is limited to 2 GB (the size of a data space). This means that a transformed file cannot exceed 2 GB. Note that multiple file caches are supported.
- The number and aggregate size of data spaces creatable by the server is controlled by `XCONFIG ADDRSPACE` in the server virtual machine's CP directory entry.
- Files whose transformed size would be greater than 16 MB (megabytes) are never cached contiguously.

Chapter 5. Authorization

Overview

Many servers appear to their clients as access methods for server-held objects. File system servers are a common example of these. For example, the CMS Shared File System implements an object class called *file* supporting a certain set of operations and an object class called *directory* supporting another set of operations. The users of the Shared File System transmit requests to an SFS server, asking the server to perform operations on these objects. The SFS server performs the operations and returns appropriate responses to the clients. No operations are possible against SFS-held objects other than those defined on objects of class *file* or *directory*.

Servers implementing such access methods usually require that the operations requested by clients be performed on the objects if and only if certain authorization guidelines are met. Consider again the Shared File System: to write to a file, a user must have write authority to it.[15] To support this checking of operations, the Shared File System contains its own authorization engine for managing the authorization rules. The authorization model used by the CMS Shared File System is built around objects, users, and actions; all of the interfaces to the authorization engine serve to manipulate and interrogate a rule base which records "who can do what to whom." Some of these interfaces, such as the `GRANT AUTHORITY` and `REVOKE AUTHORITY` commands, are externalized. Others are internal-only interfaces for the server's exclusive use.

The general model for authorization exemplified by the Shared File System applies to many different kinds of servers. To ease the development burden of the server writer, the reusable server kernel provides a set of APIs implementing a general-purpose authorization engine. The authorization model implemented by the reusable server kernel is an object-user-action model, just like the one implemented by the Shared File System. To use the reusable server kernel's authorization facility, the server author calls the API, performing such actions as defining an object class, defining a particular object, permitting a user to perform an operation, and testing whether an operation is permissible. A set of commands, intended for operator use, parallels the APIs provided.

The reusable server kernel authorization engine treats object classes, object names, user names, and permissions as abstract entities. It does not associate any particular meaning with these items. It merely facilitates the implementation of an authorization strategy by providing a rule engine capable of building, maintaining, and interrogating a rule base describing a relationship of objects, users, and actions. The object classes and operations defined, the objects defined, the users defined, and the permissions granted are left for the server writer to decide.

[15] In truth, to *open* a file for write, the user must have write authority to it, even if he never actually writes to the file.

Entry Points

The reusable server kernel authorization API offers entry points that perform a number of different operations on the rule base. In particular, these are some of the programming interfaces available:

Table 17. Programming Interfaces

Programming Interfaces	Description	Page
`ssAuthCreateClass`	Creates an object class and associates a set of operations with it.	223
`ssAuthCreateObject`	Creates a named object as an instance of a particular object class.	225
`ssAuthTestOperations`	For a given user, object, and set of operations, determines which of the specified operations are permissible.	227
`ssAuthPermitUser`	Adds, modifies, or deletes a specific rule in the rule base.	229
`ssAuthDeleteUser`	Removes all rules for a given user from the rule base.	231
`ssAuthDeleteClass`	Removes all objects of a given class from the rule base and optionally removes the class from the rule base.	240
`ssAuthDeleteObject`	Removes all rules for a given object from the rule base and optionally removes the object from the rule base.	250

A set of queries and some maintenance APIs are also provided.

Naming Conventions and Other Limits

To name objects, users, classes, and permissions, the authorization API uses character strings composed from an unrestricted alphabet.[16]

Table 18 describes other conventions related to the naming of these items:

Table 18. Authorization API Naming Conventions

Item	Format	Length
Object	V	1-256
User	V	1-64
Class	F	8
Action	F	4

Note:

- The authorization API supports a maximum of 32 operations per object class.

[16] "Unrestricted alphabet" means that any of the 256 8-bit code points can appear in these names.

Group Authorization Considerations

The reusable server kernel's authorization model and API extend easily to group authorization situations.[17] To implement a group scheme, the programmer can perform the mapping of user ID to group name outside the scope of the reusable server kernel's authorization API and use the group names as “user IDs” in the reusable server kernel authorization API calls. In cases where group authorization provides acceptable security, using the authorization API in this way reduces the size of the authorization data and thereby decreases the time needed to search it.

Persistent Storage of Authorization Data

The reusable server kernel keeps the authorization database in several disk files. These disk files let the authorization data persist from one invocation of the server program to the next.

The general idea is that the authorization database is divided into several files:

Table 19. Authorization Data File Format

File Format	Description	Page
Data	Contains class, object, user and rule definitions. The records in this file are chained to one another to build up logical groupings, such as the set of rules associated with a given object or the set of objects belonging to a given class.	385
Index	Contains hash tables that partition the data file records into equivalence classes (that is, hash buckets) to improve the performance of searches.	387
Log	Contains all tracking of the writes to the index and data files for recovery purposes.	388

The reusable server kernel is able to keep its authorization data in any of these disk repositories:[18]

- On CMS minidisks
- In the CMS Shared File System

All of the authorization files must be kept in the same kind of repository. Mixing repositories is not permitted.

Recognizing the critical nature of authorization data, the reusable server kernel manages its authorization files such that the authorization database can be recovered (that is, its internal consistency can be restored) if some kind of failure occurs. The management and recovery scheme used is a function of the repository in which the data files reside. When CMS minidisks are used, the reusable server kernel keeps twin copies of the authorization database and also keeps a log file to enable recovery after a failure. When the CMS Shared File System is used, just

[17] In *group authorization*, access rights are extended to users not based on their individual identities but rather on their membership in a group of some kind. Unix and VMS are two systems where file authorization is based partially on users' organization into groups.

[18] Configuration parameter `AUT_LOCATION` file tells the reusable server kernel where the data is being kept.

one copy of the authorization database is kept and the Shared File System's commit/backout facilities are exploited to maintain consistency.

When the reusable server kernel starts, it initializes the authorization data base (makes it completely empty) if it appears that the database has never been initialized. This assessment is made using the following criteria:

- *Shared File System:* if the index file appears not to be initialized, then an empty index is written.
- *Minidisks:* if the log file appears not to be valid, or if the log file appears valid but the index file appears not to be initialized, then an empty index is written.

You should back up your authorization index and data files frequently enough so that you can restore them without loss of data in case they are initialized accidentally.

The following sections give more specifics on the details of the various repositories.

Using CMS Minidisks

To keep the authorization files on minidisks, set configuration parameter `AUT_LOCATION` appropriately and supply names for:

- Copy 1 of the data file (configuration parameter `AUT_DATA_1`),
- Copy 2 of the data file (configuration parameter `AUT_DATA_2`),
- Copy 1 of the index file (configuration parameter `AUT_INDEX_1`),
- Copy 2 of the index file (configuration parameter `AUT_INDEX_2`),
- The authorization log file (configuration parameter `AUT_LOG`).

These files do not all have to be on the same minidisk; you can spread them across minidisks if you want.[19] The only constraint is that *for each minidisk on which authorization files reside, there must be no open-for-output files on the minidisk other than the authorization files themselves*. In other words, do not put any of your server's other output files on the same minidisk with authorization data files. If this constraint is not observed then the reusable server kernel's commit and recovery logic **will not work** and if a failure occurs you might end up with unrecoverable authorization data.

When minidisks are used, the reusable server kernel guarantees consistency by using the log file to record changes that will be made and then applying the changes to the two copies sequentially. If an entire update does not complete successfully, the reusable server kernel uses the log file to decide how to recover the consistency of the authorization data and make the two copies identical again. If the update was completely applied to the first copy and then the update of the second copy failed, realigning the two copies does not lose the update. If the update was never completely applied to the first copy, the update will be backed out.

[19] In fact, it would be a good idea to put the files for copy 1 on one physical DASD pack and the files for copy 2 on a different physical DASD pack.

Using the CMS Shared File System

To use the CMS Shared File System, set configuration parameter `AUT_LOCATION` appropriately and supply names for:

- Copy 1 of the data file (configuration parameter `AUT_DATA_1`),
- Copy 1 of the index file (configuration parameter `AUT_INDEX_1`),

The data and index files need not reside in the same directory or even the same file pool server.[20] The directories in which the files reside can be accessed directories or unaccessed directories.

When the Shared File System is used, the reusable server kernel does not maintain a second copy of the data and index files and it does not keep a log file; it ignores the configuration parameters associated with these extra files (configuration parameters `AUT_DATA_2`, `AUT_INDEX_2`, and `AUT_LOG`). This is made possible because the Shared File System supports commit and backout semantics; the reusable server kernel does not have to manage recovery on its own.

When the Shared File System is used, the reusable server kernel uses this technique to maintain consistency of the authorization data:

1. At startup, the reusable server kernel gets a work unit ID and opens the two files on that work unit.
2. Each time an API call changes the database, the reusable server kernel writes the changes to the index and data files and then commits the work unit.
3. If one of the writes fails or the commit fails, the reusable server kernel backs out the work unit.

This method guarantees that the index and data files are always committed together and that the committed copies are always consistent with one another.

Migrating Among Repositories

To migrate your authorization data to the Shared File System from minidisks, follow the instructions in Table 20.

Table 20. Migrating Authorization Data from Minidisks to SFS

Step	Description	Command	Page
1	Make sure the server shuts down normally so that the two copies of authorization data are each internally consistent and identical to one another.	`SERVER STOP`	179
2	Move one copy to the desired Shared File System server(s) and directory(ies).	CMS's `COPYFILE`	n/a
3	Change the reusable server kernel's `AUT_` configuration parameters to reflect the new names and locations of the authorization data.	Use XEDIT to change `PROFILE RSK`.	74

Migrating from the Shared File System to minidisks is a little more complicated; follow the instructions in Table 21 on page 46.

[20] If you put the two files in two different servers, each server must be at least VM/ESA Version 1 Release 1.0 or later.

Table 21. Migrating Authorization Data from SFS to Minidisks

Step	Description	Command	Page
1	Duplicate your index and data files so that you have two identical copies of each (four files in all).	CMS's COPYFILE	n/a
2	Install the copies on the target minidisks.	CMS's COPYFILE	n/a
3	Using CMS Pipelines, an EXEC, XEDIT, or some other tool, make a file of the following format and content (this will be the initial log file): • RECFM F • LRECL 256 • Put one record in the file. The first twelve bytes of the record should be X'000000020000000200000000'. The content of the remainder of the record is unimportant. Install this file on the target minidisk.		n/a
4	Update your reusable server kernel configuration parameters to point to the new target repository and update the names of the index, data, and log files.	Use XEDIT to change PROFILE RSK.	74

Parallelism

The reusable server kernel lets multiple threads read the authorization data simultaneously but requires updating threads to serialize and perform their work exclusively of all other threads (in other words, either multiple readers are allowed or one writer is allowed).

Administrative Commands

The reusable server kernel provides a service, called AUTH, which provides a command interface to many of the authorization APIs. This command set is useful in thses circumstances:

- Commands to manipulate the authorization database can appear in PROFILE RSK and be issued each time the server starts.
- An operator can manipulate the authorization database by sending authorization commands to the AUTH service through the CP MSG command or by typing them on the server console.

For more information on the authorization command set, see Chapter 14, “Command Descriptions” on page 85

Other Services' Use of Authorization

The presupplied services and line drivers are capable of using the authorization database as a way to protect their command sets. For example, the AUTH service -- that is, the implementer of the AUTH command set -- offers a means by which the server administrator can instruct it to examine the authorization database to determine whether a certain user is permitted to issue AUTH commands. The starting and stopping of author-supplied services can be similarly protected.

As shipped, all such controls are inactive, that is, no permission checking is in effect. The following sections describe how such authorization checking can be activated.

Overview

The basic idea is that certain services and line drivers interrogate a corresponding configuration parameter to decide whether to check authorizations for the command sets they implement. When a service or line driver's authorization configuration parameter is set `ON`, the service or line driver calls `ssAuthTestOperations` each time it handles a command. The purpose of this call is to determine whether the requesting user has permission to issue the prospective command. If the call to `ssAuthTestOperations` succeeds, the line driver or service will attempt the requested operation. Table 22 generally illustrates how a line driver or calls `ssAuthTestOperations`.

Table 22. Line Driver and Service Calls to ssAuthTestOperations

Coordinate	Value
Object	Name of the service being manipulated.
User	The user ID attempting to manipulate the service.
Action	For a start, `STRT`. For a stop, `STOP`. For connection reporting, `RPRT`. For actual use thereof, `EXEC`.

Activation

To activate authorization checking for line drivers and services, perform the these initialization steps with respect to the authorization database:

Table 23 (Page 1 of 2). Activating Authorization Checking for Services and Line Drivers

Step	Task	Command	Description	Page
1	Create an object class to which objects representing services will belong.	AUTH CRECLASS	The name of the object class is not important, but operations `STRT`, `STOP`, `RPRT`, and `EXEC` must be defined on objects of the class.	93
2	Create an authorization object corresponding to the service that will be protected.	AUTH CREOBJECT	You should create the new object as a member of the class you just created with `AUTH CRECLASS`. The name of the new object should match the name of the service as it was given in the `ssServiceBind` API call.	94
3	Grant privileges for each user who will be permitted to START the service.	AUTH PERMIT	Arrange for the user ID to have permission to perform the `STRT` operation on the object that represents the service.	102

Table 23 (Page 2 of 2). Activating Authorization Checking for Services and Line Drivers

Step	Task	Command	Description	Page
4	Grant privileges for each user who will be permitted to STOP the service.	AUTH PERMIT	Arrange for the user ID to have permission to perform the `STOP` operation on the object that represents the service.	102
5	Grant privileges for each user who will be permitted to enable a line driver's connection reporting feature.	AUTH PERMIT	Arrange for the user ID to have permission to perform the `RPRT` operation on the object that represents the service.	102
6	Grant privileges for each user who will be permitted to use a given service.	AUTH PERMIT	Arrange for the user ID to have permission to perform the `EXEC` operation on the object that represents the service.	102

Once the authorization database has been set up, it remains to inform line drivers and services that they should actually *check* the authorization data you've configured. This is accomplished by using the `CONFIG` commands:

- To enable line drivers' checking of your newly-created authorization records, issue `CONFIG AUTHCHECK_LD ON`. When you do this, each line driver will handle a given user's `START` or `STOP` commands only if the authorization data permits it.
- To inform a given service that it should check your newly-created authorization records, set the service's appropriate configuration parameter (see Table 24 and Table 31 on page 75).

Table 24. Authorization Configuration Parameters

Service	Parameter	Page
AUTH	`AUTHCHECK_AUTH`	118
CACHE	`AUTHCHECK_CACHE`	119
CMS	`AUTHCHECK_CMS`	120
CONFIG	`AUTHCHECK_CONFIG`	121
CP	`AUTHCHECK_CP`	122
ENROLL	`AUTHCHECK_ENROLL`	123
MONITOR	`AUTHCHECK_MONITOR`	125
SERVER	`AUTHCHECK_SERVER`	126
SGP	`AUTHCHECK_SGP`	127
TRIE	`AUTHCHECK_TRIE`	128
USERID	`AUTHCHECK_USERID`	129
WORKER	`AUTHCHECK_WORKER`	130

All of the aforementioned configuration parameters can be set in `PROFILE RSK` each time the server starts. For more information, see “PROFILE RSK” on page 72.

Chapter 6. Enrollment

One problem common to many servers is the notion of enrolling users. In the abstract, this problem is nothing more than implementing or exploiting some kind of indexed access method. Users' records are kept in a repository of some kind and inserted, removed, and retrieved using the chosen access method, the user identifiers serving as indices.

Recognizing this commonality, the reusable server kernel implements an indexed access method suitable for use in storing enrollment data. The server kernel offers an API for programmed manipulation of enrollment sets -- record insertion, deletion, and retrieval, to name a few operations -- and it offers a corresponding command set that lets the server operator perform these operations easily. The command set is implemented as a service, so it is available through any of the server kernel's line drivers - CONSOLE, MSG, and so on.

The reusable server kernel stores related enrollment records together in an enrollment *set*. Each enrollment set bears an eight-byte name; the server operator refers to an enrollment set by that name when he uses the ENROLL command set, and the server author refers to an enrollment set by that same name when he uses the enrollment API. The server kernel can manage multiple enrollment sets concurrently.

To ensure good performance, the reusable server kernel exploits VM Data Spaces to hold enrollment sets. When the server kernel is instructed to make an enrollment set ready for use, it reads the enrollment records from a Shared File System file into a VM Data Space, organizing them in the data space for quick access. Each enrollment set resides in its own data space, and a data space being used for enrollment contains nothing but records of that enrollment set. Note that the reusable server kernel's enrollment facility requires the underlying processor to support VM Data Spaces. Processors not offering VM Data Spaces cannot support the enrollment facility.

Because a data space can be up to 2 GB in size, and because z/VM lets a single virtual machine manage many such data spaces concurrently, the number of enrollment records the reusable server kernel can manage has no limit, practically speaking. The data structures used ensure that the server kernel can hold several hundred thousand enrollment records in a single data space without appreciable lookup, insertion, or replacement delays.

As the enrollment records change, the reusable server kernel appends information to the corresponding SFS file, said appended records being indicative of the changes that are occuring against the enrollment set. At an appropriate time, the operator or the server program itself indicates that it is time to commit the changes; in response to this, the server kernel uses CSL routine `DMSCOMM` to commit the changes to the SFS file. Each enrollment set's corresponding SFS file is open on its own work unit, each such work unit being used for no other purpose than I/O to a single enrollment file.

Eventually the server operator or server program determines that activity to an enrollment set is complete and instructs the reusable server kernel to unload the enrollment data. The server kernel closes the corresponding SFS file, deletes the data space, and the enrollment set is thereby closed. If the server program terminates and the enrollment set is still open, the server kernel closes it automatically before terminating, committing any uncommitted changes. If the Shared File System should ever indicate that it cannot commit changes, the reusable server kernel backs out the changes, using SFS's rollback support.

Because of the cumulative nature of the SFS file that holds an enrollment set, it is occasionally helpful to remove redundant information from such a file. An EXEC to perform such cleanup is provided. When an enrollment set is being cleaned, it cannot be in use for any other purpose; it must be unloaded prior to being cleaned and reloaded afterward.

Each enrollment record consists of a 64-byte key and a corresponding piece of enrollment data. The reusable server kernel imposes no structure on the enrollment data itself; the structure of the enrollment data is left to the server author. However, the server kernel does impose the restriction that an enrollment record cannot contain more than 65,450 bytes of data (this limit comes from the record-length limit of CMS file systems). Zero-length data is permitted on enrollment records.

Last, recognizing the utility of a general-purpose indexed access method capable of holding data on this scale, the reusable server kernel implements *transient* enrollment sets. A transient enrollment set is empty when opened, is never written to disk, and all memory of it is lost when it is closed. While it is open, though, all of the server kernel's indexing and retrieval facilities are available, and VM Data Spaces are exploited just as they are for permanent enrollment sets. This gives the server author a way to keep track of large numbers of tagged, transient data items concurrently. Said data items can be stored in an enrollment set, where the reusable server kernel keeps them in a VM Data Space until they are again requested by the server program. Note also that because transient enrollment data is never written to a CMS file, it is not necessary for the reusable server kernel to limit the data length quite so much. For transient enrollment sets, the amount of data that can be stored in a given record is limited to 16 MB - the maximum amount movable through the Move Long (MVCL) instruction.

Programming Interfaces

The server program can use the following programming interfaces to manipulate enrollment sets:

Table 25 (Page 1 of 2). Enrollment APIs

Programming Interface	**Description**	**Page**
`ssEnrollCommit`	Commit changes to an enrollment set.	274
`ssEnrollDrop`	Close a permanent enrollment set, either committing or rolling back the uncommitted changes, or destroy a transient enrollment set.	276
`ssEnrollList`	Generate a list of the enrollment sets currently loaded.	278
`ssEnrollLoad`	Load an enrollment set from an SFS file into a VM Data Space, or initialize a transient enrollment set.	280
`ssEnrollRecordGet`	Retrieve a record from an enrollment set.	283

Table 25 (Page 2 of 2). Enrollment APIs

Programming Interface	Description	Page
`ssEnrollRecordInsert`	Insert a record into an enrollment set.	285
`ssEnrollRecordList`	Generate a list of the indicies of all the records in the enrollment set.	287
`ssEnrollRecordRemove`	Remove a record from an enrollment set.	289

Operator Commands

The ENROLL service implements a set of operator commands:

Table 26. Enrollment Commands

Command	Description	Page
`COMMIT`	Commits changes to an enrollment set.	158
`DROP`	Unloads an enrollment set from a data space.	159
`GET`	Retrieves a record from an enrollment set.	160
`INSERT`	Inserts a record into an enrollment set.	161
`LIST`	Generates a summary of the loaded enrollment sets.	162
`LOAD`	Loads an enrollment set into a data space.	163
`RECLIST`	Generates a list of the keys of the records in an enrollment set.	164
`REMOVE`	Removes a record from an enrollment set.	165

Chapter 7. Indexing by Prefixes

Overview

The reusable server kernel's enrollment API provides a simple indexed access method that lets the server author use a fully-formed index to return exactly one record whose key matches the supplied fully-formed index. This solves the enrollment problem well but ignores a large class of indexing problems relevant in server development. In particular, it ignores the problem of returning a set of records whose keys are matched by a prefix the caller supplies. This problem appears in many situations, such as telephone directory lookup or web page indexing.

The reusable server kernel contains APIs that let the server application build and interrogate indices that permit the retrieval of record sets according to lookup by prefix. For each such index, the reusable server kernel APIs provide insertion and lookup operations, identifying the inserted or retrieved records by record number (the indexing API holds onto record *numbers*, ***not*** records themselves). The reusable server kernel keeps each such index in its own VM Data Space and lets multiple RSK-based service machines access the indices concurrently. An index does not persist across invocations of the server program; the server must rebuild the index each time it starts.

More specifically, the provided APIs are:[21]

- `ssTrieCreate:` creates an index. The caller specifies a name for the index and the size (in pages) for the index. The reusable server kernel creates a data space to hold the index and returns the ASIT and ALET to the caller.
- `ssTrieDelete:` destroys an index. The reusable server kernel destroys the corresponding data space.
- `ssTrieRecordInsert:` the caller supplies the index name, a record number, and the key to be associated with the record number. The reusable server kernel inserts the record number into the index.
- `ssTrieRecordList:` the caller supplies an index name and a key prefix. The reusable server kernel searches the index and returns a list of all the record numbers whose corresponding keys match the prefix specified by the caller.

Example

Suppose a company phone book is contained in a CMS F-format file, with the 40-column employee name appearing in columns 36 to 75. An RSK-based phone directory lookup engine might read the phone file into memory and then form an index on the employee names. To index each record, the engine would call `ssTrieRecordInsert`, identifying the record by number and supplying the 40-column employee name field as the record's key. Once all records have been indexed, the

[21] The APIs take their name from the data structure used to implement the index. This data structure is called a *trie* (rhymes with *sky*) and is described, for example, in Aho, Hopcroft, and Ullman, *Data Structures and Algorithms*, Addison-Wesley, 1985, ISBN 0-201-00023-7.

server is ready to begin servicing lookup requests; given a prefix, the engine can call `ssTrieRecordList`, thereby retrieving the record numbers of all the records whose key matches the prefix of interest.

Index Sharing

An application using the trie APIs will probably work alone most of the time, that is, its indices will be private. In this manner of operation, the application creates the index by name and then refers to it by name when performing insertion and lookup operations.

However, the reusable server kernel does provide the basic structure necessary for the application to share an index among multiple virtual machines (for example, worker machines). When `ssTrieCreate` creates an index, it supplies the caller with the ASIT and ALET of the data space containing the index. If the application desires to share the index with (for example) a worker machine, it should call CSL routine `DMSSPCP` to permit the worker to access the index data space read/write and then it should send the ASIT to the worker. The worker should use `DMSSPLA` to generate its own ALET for the space and then call the trie APIs as appropriate, identifying the index by ALET. Note that the worker must have read/write access to the data space, even if it is performing only lookups. This is because the trie APIs use storage in the data space to implement necessary locking primitives.

The reusable server kernel makes no attempt to recover from program checks that will occur in worker machines if the owning virtual machine should delete the index. When deletion of an index (that is, a call to `ssTrieDelete`) is required, the application must take care to inform the workers and receive their acknowledgements prior to deleting the index.

No Record Deletion?

For reasons of complexity, there is no `ssTrieRecordDelete` function. If it becomes necessary to “delete a record,” the application should simply ignore that record's number when it appears in the output of `ssTrieRecordList`.

Commands

A very simple built-in service, `TRIE`, offers a command, `LIST`, that can be used to display pertinent information about the indices the server has created. For each such index, the reusable server kernel displays the index name and ASIT, the index size, the amount of data space storage actually being used, the number of records being held, and the number of nodes in the trie.

There are no command equivalents for the `ssTrieRecordInsert` and `ssTrieRecordList` entry points.

Chapter 8. Anchors

The reusable server kernel lets the application set and query the value of an application-wide anchor word. This is similar in intent to CMS's ANCHOR macro and its `ThreadSetUserData` and `ThreadQueryUserData` CSL routines. Unlike ANCHOR, the reusable server kernel facility is callable. Unlike the thread functions, the reusable server kernel facility provides application-wide scope.

A server program would typically use the anchor services for holding the address of some server-wide control block. This control block would typically be acquired early in the server's life and the `ssAnchorSet` function would be called to record the address of this control block. When the address of the control block is required, the server can call `ssAnchorGet` to retrieve the control block's address.

Note also that `ssAnchorGet` returns the address and length of the buffer in which the server may place data to be accrued by the CP monitor (APPLDATA -- DIAG X'00DC').

The reusable server kernel does not use CSL routines `ThreadSetUserData` or `ThreadQueryUserData`. The server writer is free to use these routines as he wishes.

The ANCHOR macro works correctly only in virtual uniprocessor situations. It is not recommended for use in virtual multiprocessor situations.

Chapter 9. Memory Management

Fast, efficient allocation and release of primary storage (memory) is vital to the execution of a server program. CMS provides the CMSSTOR facility for storage management; CMSSTOR works very well for single-threaded, assembler-only, base-VCPU-only programs, but for multithreaded, parallel servers CMSSTOR shows its limits. In particular, the following characteristics of CMSSTOR are undesirable for server writers:

- *Base-only execution:* though the macro can be invoked from non-base processors, CMSSTOR actually runs on the base VCPU. This means that the base VCPU becomes a serialization point for the server.
- *Assembler only:* callable support is not provided.
- *Base address space only:* CMSSTOR is not capable of managing storage in a data space.

To overcome these difficulties, the reusable server kernel implements a "front end" for CMSSTOR whose purpose is to relieve these constraints. The following entry points are provided:

- `ssMemoryCreateDS`: creates a data space and prepares to manage the storage thereof. The caller sees the data space as a subpool.
- `ssMemoryAllocate`: allocates storage, either from a data space or the primary address space.
- `ssMemoryRelease`: releases storage.
- `ssMemoryDelete`: deletes a subpool and the corresponding data space.

For management of data space storage, the reusable server kernel storage management facility provides an interface that lets the caller see a data space as a subpool, as follows:

- To create a data space and assign a subpool name to it, the caller invokes `ssMemoryCreateDS`, passing it the subpool name to use and the size of the data space. Subject to any constraints imposed by the virtual machine's `XCONFIG ADDRSPACE` directory entry, the reusable server kernel creates the data space, prepares to manage the storage therein, and returns to the caller the new data space's ASIT and ALET.

  `ssMemoryCreateDS` accepts a storage key and option array on input and passes these directly to CSL routine `DMSSPCC` (Create Data Space). If the caller of `ssMemoryCreateDS` supplies a zero-length option array, `ssMemoryCreateDS` uses all of `DMSSPCC`'s defaults, except that the data space is created SHARE.

  Regarding establishing addressability to the data space, `ssMemoryCreateDS` calls `DMSSPLA` with the WRITE and SYNCH options.
- To allocate and release storage in the data space, the caller uses `ssMemoryAllocate` and `ssMemoryRelease`, referring to the data space by its subpool name.
- To delete the data space, the caller uses `ssMemoryDelete`.

For the primary address space, the reusable server kernel storage management facility is a front-end for CMSSTOR, as follows:

- For each subpool name ever used in a call to (that is, “seen by”) `ssMemoryAllocate`, the reusable server kernel keeps track of storage allocated through `ssMemoryAllocate` and storage released through `ssMemoryRelease`. In other words, for each subpool, the reusable server kernel maintains a free storage subpool cache that can be manipulated without serializing on the base VCPU.[22]
- When `ssMemoryAllocate` is called, it performs the following steps in an attempt to locate storage for the caller:

Step	Description
1	The subpool's cache is checked, and if *max_bytes_needed* can be satisfied from there then the request completes.
2	`CMSSTOR OBTAIN` is consulted in variable fashion, the lower bound being the largest qualifying size available in the cache (or *min_bytes_needed*, if all cache pieces are too small) and the upper bound being *max_bytes_needed*.
3	The request is satisfied from either the result of `CMSSTOR OBTAIN` or whatever was available in the cache, whichever is larger.

- When `ssMemoryRelease` is called, the released storage is added to the appropriate subpool cache, and if the free storage in the cache is above the maximum free amount specified by the `MEM&_MAXFREE` configuration parameter, the cache is trimmed.
- When `ssMemoryDelete` is called, the cache for the named subpool is destroyed, all storage being released through `SUBPOOL DELETE`.

The application should not call `SUBPOOL DELETE` for subpools that have been manipulated through calls to `ssMemoryAllocate` and `ssMemoryRelease`; such an invocation will confuse the reusable server kernel. Use `ssMemoryDelete` instead.

After the application ends, the reusable server kernel issues `ssMemoryDelete` for each subpool cache remaining.

For more information on the forms of the subpool names used internally by the reusable server kernel, see Appendix F, “Reserved Names” on page 395.

[22] In fact, non-trivial serialization occurs only when two VCPUs try to manipulate the same subpool.

Chapter 10. Worker Machines

In some server situations, a single virtual machine performing complex operations for lots of clients simultaneously is an inconvenient, risky, or unachievable proposition. For example, if the clients are submitting code for the server to run as the clients' proxy, it would be desirable for each such client submission to run in an environment where it cannot tamper with, harm, or even innocently interfere with the execution of other clients' similar submissions. Similarly, if the server must run code that is under test or is at risk for terminating abnormally, the server designer should have at his disposal a means for running such code in isolation. In some cases, performance of the server might even improve if client work could be distributed among a set of worker virtual machines, each such worker performing a dedicated function for multiple clients simultaneously or perhaps working alone on behalf of a single client. These are no doubt only a few of the possible scenarios where the ability to run some of the server's work in other virtual machines would be an attractive feature.

The reusable server kernel recognizes these situations and offers an API that lets the server author distribute work among sets of subordinate virtual machines. These subordinates, called *workers*, usually run on the same CP instance as the main server. Sets of subordinates are defined to the main server via operator commands, probably in `PROFILE RSK`. The server kernel establishes communication connections to workers in response to API calls made by service instances; however, the format and meaning of the data actually exchanged with workers is left to the server author. In addition, when the workers are running on the same CP instance as the main server, the server kernel uses the `XAUTOLOG` and `FORCE` commands to log on and log off workers as appropriate. Finally, it should be emphasized that the relationship with the worker machine is mediated entirely by the service instance. The server kernel never shunts data directly from a client to a worker or vice-versa.

Functional Overview

For organizational purposes, the server kernel organizes worker machines into groups called *classes*. The virtual machines making up a class are all functionally equivalent to one another as far as the server author is concerned. In other words, when a service instance needs help from a worker, any member of the class will do; the server author leaves it up to the server kernel to select a class member and establish a connection to it. The server kernel is able to manage multiple worker classes simultaneously.

To initiate a connection to a worker, a service instance calls entry point `ssWorkerAllocate`, specifying the class from which the server kernel is to select a worker machine and specifying some details about how the connection is to be allocated. In response to this call, the reusable server kernel evaluates the load on each worker in the class, selects the least-loaded member, and attempts to establish an IUCV connection to it. The service instance can influence the selection algorithm slightly; it can specify either that the server kernel should `XAUTOLOG` another worker only if all currently logged-on workers are full, or it can specify that the server kernel should route the new connection to an empty or newly-autologged worker if possible, resorting to multiple connections to a single worker only if the class is sufficiently active. When `ssWorkerAllocate` returns to its caller, either the connection to the worker is in place or all reasonable attempts to contact a worker have been exhausted.

Each member of a worker class -- in other words, each worker virtual machine -- has associated with it a maximum number of IUCV connections it can handle simultaneously. The server author or server operator specifies this limit via operator command when he adds the worker to the class. For the purpose of worker machine selection, the load being imposed on a given worker is taken to be the fraction of its IUCV capacity in use. For example, a worker capable of handling four IUCV connections but handling only two at the moment is considered by the server kernel to be 50% utilized, while if that worker were handling only one IUCV connection at the moment, it would be considered to be 25% utilized. The load distribution algorithm selects the least-loaded machine, using round-robin to break ties.

If the caller requests it, the reusable server kernel can set alternate user ID and security label (seclabel) information for the worker as part of selecting the worker. To be able to set a worker's alternate user ID and seclabel, the controlling virtual machine must have permission to issue Diagnose `X'D4'`. See *z/VM: CP Programming Services* for more information. If you attempt to use the reusable server kernel's alternate user ID machinery and your virtual machine does not have the privilege necessary to issue Diagnose `X'D4'`, your virtual machine will take a program check. It is your responsibility to recover from this. Also note that the reusable server kernel always uses the subcode `X'04'` form of Diagnose `X'D4'`.

Once the connection to the worker is established, the service instance communicates with the worker using the `ssClient` APIs and CMS IPC, just as it would communicate with a client. More specifically, `ssWorkerAllocate` returns a C-block that represents the connection between the service instance and the worker. To write to the worker, the service instance uses `ssClientDataPut` followed by a CMS IPC message telling the server kernel that it has generated new data to be sent to the worker. Reading from the worker is similar; after it sees a CMS IPC message informing it that new data are available, the service instance calls `ssClientDataGet` to retrieve what the worker sent.

When a service instance is done using a worker, it notifies the reusable server kernel via CMS IPC, just as it would do to notify a server kernel line driver that it had finished with a client. The IPC message causes the server kernel to sever the IUCV connection to the worker. In the event that the worker terminates the connection first, the service instance is notified and must acknowledge the connection loss, just as it must respond to a line driver when it learns of the loss of communication to a client.

Server Configuration Considerations

The worker API uses IUCV to move data between the main server and the workers, and when the workers are running on the same CP instance as the main server, the worker API employs the CP `XAUTOLOG` and `FORCE` commands to start and stop worker machines. The following configuration considerations apply:

- The main server must be permitted to `IUCV CONNECT` to each worker machine. There are many ways to arrange this. Perhaps the simplest way is to insert `IUCV ALLOW` into the CP directory entry for each worker machine. Any method that lets the connection proceed is just fine.

- If the workers are running on the same CP instance as the main server, the main server virtual machine must be permitted to `XAUTOLOG` and `FORCE` worker machines. `XAUTOLOG` requires class A or B or an entry in the CP directory entry of each worker machine. `FORCE` requires CP class A.

Distributing Worker Machines

Some installations might choose to employ CSE (Cross-System Extensions) or PVM (Passthru Virtual Machine) to distribute IUCV and thereby run worker machines on systems other than the local CP. For example, specialized hardware might be available on some other processor, and a worker machine might be placed there to handle requests originating from other systems.

On a per-class basis, the server operator decides whether the server kernel is to manage workers as local or distributed. If the class is specified to be local, the server kernel employs `XAUTOLOG` and `FORCE` to log workers on and off as necessary. If the class is specified as distributed, the server kernel skips all such management steps, merely attempting `IUCV CONNECT` and returning an error if the connection attempt fails.

When a class is specified as distributed, the server operator or server designer is responsible for making sure that the worker machines are autologged at an appropriate time and that they are reset if errors or abends occur. A system management tool such as IBM's *Host Management Facilities/VM* can be used for this purpose.

When the server kernel issues `IUCV CONNECT` to connect to a worker machine, it does so in a manner that can be distributed to other systems if CP is appropriately configured. To make this work, the system administrator must specify `DISTRIBUTE IUCV YES` in the CP system configuration file (`SYSTEM CONFIG`). He must also make sure that the IUCV carrier (e.g., PVM) is working properly.

API Details

To allocate a connection to a worker machine, the service instance calls `ssWorkerAllocate`, passing it a few pieces of information:

- The address of its own C-block
- The worker class in which the connection should be allocated
- An indication of how the server kernel is to select a worker:
  - The instance can ask that the server kernel attempt to minimize the number of worker machines logged on, routing connections to logged-on, not-completely-full workers whenever possible, or
  - The instance can ask that the server kernel route connections to empty or not-yet-logged-on workers whenever possible, choosing partially-busy, already-logged-on workers only when necessary.
- An integer specifying the number of workers the server kernel should try before giving up and returning failure to the caller.
- Optional alternate user ID and seclabel information.

Subject to these parameters, the server kernel selects a worker machine and tries to establish a connection to it. If the attempt fails, the server kernel will retry a small number of times, and if the worker proves unreachable, the server kernel will record this fact (so it can skip the worker when it handles subsequent `ssWorkerAllocate` calls) and move to another worker. The server kernel will iterate in this way until either the caller's specified number of tries expires or the whole worker class proves unreachable. Normally the retry strategy is not a factor - the usual case will be that the worker will be waiting for work and will accept the server kernel's `IUCV CONNECT` request immediately.

When `ssWorkerAllocate` returns to the calling instance, it supplies two pieces of information that are crucial to the instance's being able to interact with the assigned worker:

- It supplies a three-byte unsigned binary integer that uniquely identifies the connection to the worker. This integer is called the *connection ID*. This integer is returned in an unsigned four-byte buffer, the uppermost byte of said buffer always being zero.
- It supplies the address of a C-block that represents the connection to the worker. This is called the *worker C-block*.

To detect activity on the worker connection, the instance issues `QueueReceiveBlock` against its **line driver queue**, just as it normally does. Recall that under normal circumstances, this API call completes when the instance's line driver sends a message to the instance, informing the instance that something significant has happened with respect to its client. When using the worker API, though, the instance needs to be aware that messages indicative of *worker* activity will *also* arrive on its line driver queue. The instance can detect that a received IPC message is indicative of worker activity by examining the *message type* field of the received IPC message. A message indicative of worker activity contains `X'01'` as the high-order byte of the message type; the lower three bytes of the type field are the 24-bit connection ID returned by `ssWorkerAllocate`. Thus the instance can wait for either client activity or worker activity with a single call to `QueueReceiveBlock`, and the arriving message will tell the instance whether it's the client or a worker that needs attention.

To exchange data with the worker, the instance calls the `ssClient` APIs just as usual, using the *ss_cli_iam_instance* qualifier. Data are moved between the instance and the worker in the same manner as they are moved between instance and client. When the instance must send an IPC message to the “worker line driver” -- for example, to inform the server kernel that it has used `ssClientDataPut` to queue data for transmission to the worker -- it forms the instance-to-line-driver message just as it would for any line driver interaction and then transmits the IPC message to the queue handle appearing in the *worker* C-block. The server kernel receives the message and operates on the worker connection accordingly.

The Worker C-Block

The worker C-block contains a few fields that will be of special interest to the service instance. These fields are:

- A queue handle that represents the queue to which the instance should transmit CMS IPC messages relevant to the connection to the worker.

- A line driver key that should be used as the key in any such transmitted messages.
- The *vc_userid* field of the worker C-block contains the user ID of the worker virtual machine.

Further, certain fields in the worker C-block are zero because they are irrelevant in the context of a connection to a worker machine. For example, a worker C-block does not contain a pointer to an S-block.

Operator Commands

The reusable server kernel supplies a service, `WORKER`, which lets the server operator manipulate worker classes. The commands are given in the following table.

Table 27 (Page 1 of 2). WORKER Commands

Command	Description	Page
`WORKER ADD`	Lets the operator add a worker machine to a worker class, specifying the number of IUCV connections the worker machine is capable of handling simultaneously. This command would usually be found in `PROFILE RSK`, though the operator is free to issue it while the server is running.	209
`WORKER CLASSES`	Displays the existing worker machine classes and some brief status information about each class.	210
`WORKER DELCLASS`	Deletes an entire worker class. Normally this just means that any instances connected to workers in the class would receive an IPC message asking them to stop their activity. The `FORCE` option will cause the server kernel to sever the IUCV connections, to inform the instances that communication to the workers has been lost, and to `CP FORCE` any workers running disconnected. When `DELCLASS` processing completes, the worker class is no longer available for use.	211
`WORKER DELETE`	Operates on a single worker machine in a manner similar to `DELCLASS`.	212
`WORKER DISTRIBUTE`	Informs the server kernel that a worker class should be managed as if its worker machines are distributed across systems.	213
`WORKER MACHINES`	Displays a table of status information about the machines in a given class.	214
`WORKER RESET`	Clears any persistent error information the server kernel may have remembered about worker machines. This restores the workers to usable status and is useful after manual intervention has resolved a problem with a given worker machine or class of worker machines.	216

Table 27 (Page 2 of 2). WORKER Commands

Command	Description	Page
`WORKER STATUS`	Displays a table of status information about each worker connection existing at the moment.	217

Writing a Worker Machine Program

IBM does not supply a program to run in the worker machine. The server author must write this program, being aware of the following configuration and execution considerations:

- The worker machine's CP directory entry and profiles must be configured so that the worker machine will start itself completely if autologged. If the worker machine is running a CMS-based program, `IPL CMS PARM AUTOCR` is appropriate in the worker's CP directory entry and the worker's `PROFILE EXEC` should be rigged so that the worker program starts automatically. If the worker program is running under some other operating system, the other operating system's corresponding mechanisms should be employed.
- The server kernel will attempt to `IUCV CONNECT` to the worker machine, using `RSKWORK` as the first eight bytes of the user data area of its connection parameter list. If the worker program is CMS-based, this means that the worker program will need to issue `HNDIUCV SET` to identify an exit named `RSKWORK`. When the server kernel attempts to connect, the worker program's `RSKWORK` exit routine will be driven. The worker program should respond with `CMSIUCV ACCEPT`.
- The format and meaning of the data exchanged on the IUCV connection is up to the server author.
- Eventually it will be time to bring down the IUCV connection. The server kernel will `IUCV SEVER` if the service instance instructs it that the relationship between the instance and the worker is to be ended; in this case the worker program should respond with `IUCV SEVER`. If the worker machine is the one that decides when the connection is over, it should issue `IUCV SEVER` and the server kernel will respond with its own `IUCV SEVER`, reflecting the connection loss to the service instance.
- If the main server is configured such that it might route multiple IUCV connections to a worker simultaneously, the worker program should be prepared to handle multiple IUCV connections simultaneously.
- The worker program should not use `IUCV SEND,TYPE=2WAY`, `IUCV QUIESCE`, or `IUCV RESUME`. The server kernel is not prepared to handle these and will respond with `IUCV SEVER`.

Finally, it is interesting to note that the reusable server kernel itself could be used as the base for a program to be run in the worker machine. The server kernel's IUCV line driver is capable of being the recipient of IUCV activity generated by the server kernel's worker API.

Chapter 11. Run-Time Environment

To facilitate the writing of well-performing programs and to provide high-performance interprocedure linkage, the reusable server kernel implements its own procedure linkage convention. The reusable server kernel entry points themselves (for example, `ssSgpStart`) all expect to be driven using this convention, and routines provided by the server writer (for example, `RSKMAIN`, service entry points, thread entry points, and so on) are all driven by the reusable server kernel using this convention. This convention greatly reduces the need to call a storage management interface to allocate and release save areas and local variable storage. This keeps overhead down, letting procedure linkage happen without excessive SVCs or other calls.[23]

Associated with each thread is a chain of control blocks known as *dynamic storage area frames* or *stack frames*. Each stack frame is at least 4 KB in size. Contained in each frame is a *frame header* and one or more *dynamic storage areas* (DSAs). The anchor for this chain of DSA frames is held in a control block called the *run-time anchor block* (RAB). An example is shown in Figure 4 on page 66.

23 The linkage resembles the linkage used among internal entry points in the CMS Application Multitasking kernel.

DSA frame

0	A(next DSA frame)
4	size (bytes) of this frame
8	64–byte save area for use by frame overflow handler
72	first DSA in frame
??	next DSA in frame (etc. for several DSAs)
??	last DSA in frame
??	unused space

Dynamic Storage Area (DSA)

0	unused word
4	A(previous DSA)
8	A(next DSA)
12	60–byte save area for R14..R12
72	unused area
84	next available byte in DSA frame
88	unused area
120	procedure's automatic storage

Run–Time Anchor Block (RAB)

0	A(first DSA frame)
4	A(first byte past frame end)
8	A(frame overflow handler)

Figure 4. Run-Time Environment Control Blocks

The register contents at procedure entry are described in Table 28.

Table 28 (Page 1 of 2). Register Contents at Procedure Entry

Register	Description
R1	Pointer to an OS Type I parameter list. The entries in this list are addresses of the actual parameter values.
R12	Pointer to the RAB, organized as shown above.

Table 28 (Page 2 of 2). Register Contents at Procedure Entry

Register	Description
R13	Pointer to a DSA, organized as shown above.
R14	Return address.
R15	Called procedure's entry address.

When a procedure is entered, it uses the save area pointed to by R13 in the usual OS fashion (STM R14,R12,12(R13)). It then computes the size of the DSA it needs (120 bytes plus amount of automatic storage needed) and compares that to the amount left in the frame; this comparison is done by adding the amount needed to the next available byte (NAB) in the caller's save area and comparing that to the frame end field in the RAB. If there is enough space in the frame, the new DSA is built starting at the byte pointed to by the NAB field in the current DSA, and this new DSA is chained to the caller's DSA in the usual OS fashion. If not enough space is left, then the frame overflow handler is called to add a new frame to the end of the frame list (the frame overflow handler's address is in the RAB). The frame overflow handler is cognizant of the registers used during procedure entry and returns with the registers set such that the linkage processing can continue as if no overflow had occurred.

When a procedure exits, it unchains its save area, restores the caller's registers (including the caller's R13, which comes from the *previous DSA pointer* field in the exiting procedure's DSA), and returns to the caller through BR R14.

The reusable server kernel provides PL/X and assembler macros implementing these entry and exit conventions. For PL/X, the macros are invoked through the OPTIONS clause on the PROCEDURE statement. For assembler, the macros are invoked directly by the assembler programmer. *The assembler programmer must ensure that the amount of DSA storage he requests is an integral number of doublewords.* An example is shown in Figure 5 on page 68 and Figure 6 on page 69.

```
@PROCESS ENVIRONMENT(VM/ESAOS) OPT(MAX);

/* illustration of linkage convention */

sstest: procedure
(
 pl_epptr,                   /* A(eplist)  */
 pl_tpptr,                   /* A(tplist)  */
 pl_scptr                    /* A(scblock) */
)
options
(
 id                          /* generates identifier          */
 reentrant                   /* no static data, please        */
 amode(31)                   /* AMODE 31                      */
 rmode(any)                  /* can live anywhere             */
 datareg(13)                 /* R13 locates automatic storage */
 savearea(120)               /* size of fixed part of DSA     */
 stack('SSPRLG','SSEPIL')    /* entry and exit macros         */
);

/* note BYVALUE because the pointer values we want are */
/* in the array pointed to by R1 */
declare sstest entry
(
 pointer(31) byvalue,
 pointer(31) byvalue,
 pointer(31) byvalue
)
external as ('RSKMAIN');

declare
 pl_epptr    pointer(31),    /* pointer to eplist             */
 pl_tpptr    pointer(31),    /* pointer to tplist             */
 pl_scptr    pointer(31);    /* pointer to SCBLOCK            */

respecify (r12) restricted;  /* stay away from RAB pointer    */

/* body of procedure goes here */

end sstest;
```

Figure 5. PL/X Linkage

```
***
*
*  Illustration of linkage convention
*
***
*
* Procedure entry:
*
RSKMAIN  CSECT ,                      Declare CSECT
RSKMAIN  AMODE 31                     Establish AMODE
RSKMAIN  RMODE ANY                    Establish RMODE
         STM   R14,R12,12(R13)        Save registers
         LR    R11,R15                R11 is base register
         USING RSKMAIN,R11            Establish addressability
         LA    R0,DSASIZE             R0 = size of DSA needed
         SSPRLG                       R1,R2 -> new DSA, R0 = new NAB
         LR    R15,R13                R15 -> caller DSA
         LR    R13,R2                 R13 -> my DSA
         ST    R15,4(,R13)            Write my backward pointer
         ST    R13,8(,R15)            Write caller's forward pointer
         LM    R15,R2,16(R15)         Restore R15-R2
*
* Your code goes in here... stay away from R11-R13.  R14
* and R15 can be used as needed for calls to other routines.
*
* Note that your automatic storage area (the storage you
* requested via R0 when you called SSPRLG) starts at offset
* X'78' into the save area returned by SSPRLG.
*
*
* Procedure exit (note RC is in R15):
*
         L     R13,4(,R13)            R13 -> caller's DSA
         LA    R0,DSASIZE             Size of DSA I used
         SSEPIL                       Release it
         L     R14,12(,R13)           Get return address
         LM    R0,R12,20(R13)         Restore rest of registers
         BR    R14                    Return to caller
*
* Other stuff
* Note DSASIZE is a multiple of 8 bytes!
DSASIZE  EQU   200                    200-120 = 80 bytes of local vars
         REGEQU                       Register equates
*
         END
```

Figure 6. Assembler Linkage

Like all other routines, the server entry point `RSKMAIN` is driven using this linkage convention. The parameter list array passed to `RSKMAIN` through R1 is organized as described in Table 29 on page 70.

Table 29. Parameter List Array for RSKMAIN

Offset	Usage
0	Pointer to the extended parameter list with which CMS invoked the module.
4	Pointer to the tokenized parameter list with which CMS invoked the module.
8	Pointer to the SCBLOCK for the module, if the module is a nucleus extension.

The reusable server kernel uses CMS Application Multitasking's support for custom language run-time environments to implement its convention for procedure linkage. `BKWRTE MODULE` is the language environment manager for the reusable server kernel and needs to be present in the file mode search order when the server module starts. CMS loads `BKWRTE` as a nucleus extension prior to giving control to the server module. `BKWRTE` must remain loaded as a nucleus extension for the life of the server program.

Chapter 12. Initialization and Profiles

This chapter describes the flow of control during server execution and describes how to set up `PROFILE RSK`. For descriptions of the various command sets, see Chapter 14, “Command Descriptions” on page 85.

To accomplish most of the work of initializing and configuring the server, the server author writes a Rexx exec, `PROFILE RSK`. In this exec the server author supplies commands necessary to configure the server, start it, and wait for its completion. The reusable server kernel runs `PROFILE RSK` as part of server startup.

Most of the work done in `PROFILE RSK` is accomplished through `ADDRESS RSK` and command sets implemented by the reusable server kernel. These command sets fall into a few broad categories:

- `CONFIG` commands, meant to set certain configuration parameters needed by the reusable server kernel during execution.
- `SGP` commands, meant to manipulate storage groups.
- `AUTH` commands, meant to provide a means for manipulating the authorization database.
- `CACHE` commands, meant to provide a means for configuring file caches.
- `ENROLL` commands, meant to manipulate enrollment data.
- `WORKER` commands, meant to define pools of worker machines.
- Line driver commands, meant to manipulate line drivers and the relationships between line drivers and services.

Flow of Control

The general flow of control during the execution of the server is illustrated in Figure 7 on page 73. The execution of the server has these general stages:

Step	Description
1	The module begins, and the reusable server kernel performs some rudimentary initialization.
2	The reusable server kernel passes control to `RSKMAIN`, the server entry point provided by the server author.
3	`RSKMAIN` performs whatever setup is needed, including binding its services through calls to `ssServiceBind`.
4	`RSKMAIN` calls `ssServerRun` to begin the server.

Step	Description
5	ssServerRun passes control to PROFILE RSK. The processing in PROFILE RSK proceeds in several stages, as follows: 1. The profile may perform appropriate initialization. 2. The profile issues several CONFIG commands to set configuration parameters for the reusable server kernel. 3. The profile issues the RUNSERV command to begin the execution of the server. In response to RUNSERV, the reusable server kernel brings up line drivers and makes APIs available for use. When RUNSERV returns, the reusable server kernel is ready for operation. 4. The profile issues any AUTH, CACHE, or other commands necessary to configure the server. 5. The profile issues one or more line driver START commands to start services. At this point the server is running. 6. The profile issues the WAITSERV command to wait for the server to end. 7. The profile may perform appropriate termination activities. 8. The profile returns to its caller.
6	ssServerRun returns to RSKMAIN. The return and reason code from ssServerRun indicate whether the server was able to be started.
7	RSKMAIN performs termination processing.
8	RSKMAIN returns to the reusable server kernel, supplying a return code.
9	The reusable server kernel performs termination and returns to CMS. The return code supplied to CMS by the server module is the return code of RSKMAIN.

Execution Conditions within RSKMAIN

RSKMAIN has only two reusable server kernel APIs at its disposal:

- ssServiceBind, to bind services.
- ssServerRun, to start the server and wait for its completion.

No other APIs are permitted. Attempts to call them will produce unpredictable results.

PROFILE RSK

Shortly after the server module begins execution, PROFILE RSK gets control. This is just a Rexx exec that performs initialization, configures the server, starts it, waits for it to end, and then performs termination functions.

For the server author's convenience, any parameters present on the command line used to invoke the server module are passed to PROFILE RSK such that they can be retrieved with parse arg.

In general, anything one can do from Rexx is permitted in PROFILE RSK. However, here are some things to keep in mind:

- Some CONFIG commands are usable only before RUNSERV while others are usable anytime. For more information, see Table 31 on page 75.

```
CMS
 │
 └─► server module

     1. init anchor block

     2. establish subcom handler

     3. establish CONFIG command

     4. call RSKMAIN

        a. server—wide initialization

        b. bind services

        c. call ssServerRun

           (1) invoke PROFILE RSK

               (a) issue CONFIG commands

               (b) issue RUNSERV command

                   ((1)) load user ID mapping file

                   ((2)) init cradle subsystems

                   ((3)) return to PROFILE RSK

               (c) issue AUTH, SGP, CACHE commands

               (d) issue line driver START commands

               (e) issue WAITSERV command

           (2) return to RSKMAIN

        d. server—wide termination

        e. return to caller

     5. remove subcom handler

     6. perform cleanup

     7. return to CMS
```

Figure 7. Flow of Control

- All of the rest of the commands sets (for example, `AUTH`) are usable only between `RUNSERV` and `WAITSERV`, that is, only while the server is running. Attempts to use these commands at other times produce RC=-3.

For a sample of `PROFILE RSK`, see Appendix A, “Sample PROFILE RSK” on page 379.

Starting and Stopping

Table 30 illustrates the syntax for the `RUNSERV` and `WAITSERV` commands. Issue these from Rexx using `ADDRESS RSK`.

Table 30. RUNSERV and WAITSERV Commands

Command	Usage	Syntax	Notes
`RUNSERV`	Used within `PROFILE RSK` to start the server.	`►►──RUNSERV──────►◄`	Return codes: **0** Server started OK; **x** Some other situation
`WAITSERV`	Used within `PROFILE RSK` to wait for the server to stop.	`►►──WAITSERV─────►◄`	Return codes: **0** Server terminated normally; **x** Some other situation

Configuration Parameters

The reusable server kernel defines certain *configuration parameters* so that the server author or system programmer can control the manner in which the server behaves. These configuration parameters are manipulated by a command, `CONFIG`, which is useful in `PROFILE RSK`. `CONFIG` is issued through `ADDRESS RSK`. Most `CONFIG` commands are useful only prior to issuing `RUNSERV`, but some are useful anytime.

The parameters and their meanings are given in Table 31 on page 75. For definitions of the commands used to manipulate these parameters, see Chapter 14, “Command Descriptions” on page 85.

In truth, `CONFIG` is a *service* meant for the manipulation of configuration variables. This means that a command such as `MSG START CONFIG` could be used to permit remote manipulation of configuration variables.

Table 31 (Page 1 of 3). Configuration Variables

Variable	Function	When?	Notes
AUT_CACHE	Sets the number of rows of authorization data to cache.	Anytime.	Specify *rows* as a positive integer.
AUT_DATA_1	Sets the name of copy 1 of the authorization data file.	Pre-RUNSERV	
AUT_DATA_2	Sets the name of copy 2 of the authorization data file.	Pre-RUNSERV	Ignored when AUT_LOCATION is SFS.
AUT_FREE	Sets the maximum number of row buffers to keep on the free row buffer list.	Anytime.	Specify *rows* as a positive integer.
AUT_INDEX_1	Sets the name of copy 1 of the authorization index file.	Pre-RUNSERV	
AUT_INDEX_2	Sets the name of copy 2 of the authorization index file.	Pre-RUNSERV	Ignored when AUT_LOCATION is SFS.
AUT_LOCATION	Sets the repository for the authorization data.	Pre-RUNSERV	
AUT_LOG	Sets the name of the authorization logfile.	Pre-RUNSERV	Ignored when AUT_LOCATION is SFS.
AUTHCHECK_AUTH	Sets whether the AUTH service will perform authorization checking for its commands.	Anytime.	
AUTHCHECK_CACHE	Sets whether the CACHE service will perform authorization checking for its commands.	Anytime.	
AUTHCHECK_CMS	Sets whether the CMS service will perform authorization checking for its commands.	Anytime.	
AUTHCHECK_CONFIG	Sets whether the CONFIG service will perform authorization checking for its commands.	Anytime.	
AUTHCHECK_CP	Sets whether the CP service will perform authorization checking for its commands.	Anytime.	
AUTHCHECK_ENROLL	Sets whether the ENROLL service will perform authorization checking for its commands.	Anytime.	
AUTHCHECK_LD	Sets whether line drivers will perform authorization checking for START or STOP commands.	Anytime.	
AUTHCHECK_MONITOR	Sets whether the MONITOR service will perform authorization checking for its commands.	Anytime.	
AUTHCHECK_SERVER	Sets whether the SERVER service will perform authorization checking for its commands.	Anytime.	
AUTHCHECK_SGP	Sets whether the SGP service will perform authorization checking for its commands.	Anytime.	

Table 31 (Page 2 of 3). Configuration Variables

Variable	Function	When?	Notes
AUTHCHECK_TRIE	Sets whether the TRIE service will perform authorization checking for its commands.	Anytime.	
AUTHCHECK_USERID	Sets whether the USERID service will perform authorization checking for its commands.	Anytime.	
AUTHCHECK_WORKER	Sets whether the WORKER service will perform authorization checking for its commands.	Anytime.	
MEM_MAXFREE	Sets the maximum number of pages that should be kept preallocated by the reusable server kernel storage manager for any one subpool.	Anytime.	Specify *pages* as a positive integer.
MON_PRODUCT_ID	Sets the 16-byte product identifier the reusable server kernel will use when it invokes DIAG X'00DC' to identify the server's APPLDATA monitor buffer.	Pre-RUNSERV	
MON_USER_SIZE	Sets the size of the application monitor buffer.	Pre-RUNSERV	The address of the application monitor buffer is returned by ssAnchorGet.
MON_KERNEL_ROWS	Sets the number of rows the kernel monitor buffer will contain.	Pre-RUNSERV	
MSG_NOHDR	Sets whether the MSG/SMSG line driver will use CP's MSGNOH command to issue replies.	Anytime.	
NOMAP_APPC	Sets whether the APPC line driver will pass an unmappable user ID to an instance.	Anytime.	
NOMAP_IUCV	Sets whether the IUCV line driver will pass an unmappable user ID to an instance.	Anytime.	
NOMAP_MSG	Sets whether the MSG/SMSG line driver will pass an unmappable user ID to an instance.	Anytime.	
NOMAP_TCP	Sets whether the TCP line driver will pass an unmappable user ID to an instance.	Anytime.	
NOMAP_UDP	Sets whether the UDP line driver will pass an unmappable user ID to an instance.	Anytime.	
NOMAP_SPOOL	Sets whether the SPOOL line driver will pass an unmappable user ID to an instance.	Anytime.	
RSCS_USERID	Sets the user ID of the RSCS machine the SPOOL driver should use.	Anytime.	

Table 31 (Page 3 of 3). Configuration Variables

Variable	Function	When?	Notes
SGP_FILE	Sets the name of the storage group definition file.	Pre-RUNSERV	
SPL_CATCHER	Sets the user ID to which the SPOOL line driver will CP TRANSFER spool files it is unable to decode.	Anytime.	
SPL_INPUT_FT	Sets the file type of reader files the SPOOL line driver will recognize as service input.	Anytime.	
SPL_OUTPUT_FT	Sets the file type of punch files the SPOOL line driver will generate in response to service output.	Anytime.	
SRV_THREADS	Sets the maximum number of threads of a service a parallelizing line driver will attempt to run simultaneously.	Anytime.	
UMAP_FILE	Sets the name of the user ID mapping file.	Anytime.	
VM_CONSOLE	Sets whether the console line driver will pass unrecognized command lines to CMS for execution.	Anytime.	
VM_MSG	Sets whether the MSG/SMSG line driver will pass unrecognized messages to CMS for execution.	Anytime.	
VM_SUBCOM	Sets whether the SUBCOM line driver will pass unrecognized messages to CMS for execution.	Anytime.	
VM_SPOOL	Sets whether the SPOOL line driver will pass unrecognized input to CMS for execution.	Anytime.	

Storage Group Definition File

The storage groups known to the reusable server kernel are recorded in the file whose name is given in configuration variable `SGP_FILE`. Each time an API call that changes the storage group configuration executes successfully, the reusable server kernel rewrites the file. Thus storage group definitions persist across invocations of the server program.

This file is not meant for manual manipulation. It should be manipulated only with the appropriate API calls or administration commands.

This file must be present when the reusable server kernel starts. If it is not present, the reusable server kernel will not start. To create the first-ever configuration file, just use XEDIT to make a one-record, V-format file whose only record contains an asterisk as its first character. The reusable server kernel will ignore this record and realize that no storage groups are defined.

User ID Mapping Facility

Frequently the reusable server kernel translates *(nodeid,userid)* pairs to single-token user IDs. This mapping is part of the scheme by which the reusable server kernel presents single-token user IDs to service instances. For example, the spool file line driver translates the origin node and origin user ID of a request file into a single-token user ID and passes that single-token user ID to a service instance. Similarly, the TCP/IP line driver translates the client's IP address into a single-token user ID.[24] Both these translations are done through a translation database called the *user ID mapping file*. The user ID mapping data is kept in a file whose name is given in configuration variable `UMAP_FILE`.

The reusable server kernel loads the mapping file into storage when the server starts and uses the in-storage copy for translations. The command `USERID RELOAD` is available for reloading the in-storage copy from disk. This lets the server operator change the mapping while the server is running.

Each time the reusable server kernel needs to translate a *(userid,nodeid)* pair to a single-token user ID, the translation is done according to the rules in the mapping file. The translation scan goes from top to bottom through the file, stopping at the first matching entry. The entries can contain wildcards to ease the handling of groups of users (nodes, and so forth). The rules for wildcard use are the same as the rules for wildcards in CMS Application Multitasking's IPC message keys and event keys.

The syntax rules for the user ID mapping file are illustrated in Appendix B, “Sample User ID Mapping File” on page 383 contains a sample user ID mapping file.

The mapping file must be present when the server starts; the server will not start without it.

[24] For TCP/IP, *nodeid* is the IP address, and *userid* is `*`.

Chapter 13. Monitor Data

While the server runs, the reusable server kernel uses CP's APPLDATA facility (Diagnose X'00DC') to accrue monitor data. The monitor data support is arranged so that both the reusable server kernel itself and the server application can generate monitor data concurrently.

The monitor data facility works like this:

- As part of setting up the server virtual machine's CP directory entry, the system administrator must insert `OPTION APPLMON` so that the server virtual machine will be permitted to produce monitor data.
- In `PROFILE RSK` prior to the `RUNSERV` command, the server author places `CONFIG` commands to set the values of the `MON_PRODUCT_ID`, `MON_KERNEL_ROWS`, and `MON_USER_SIZE` configuration variables. These variables control the following things:
  - The value of `MON_PRODUCT_ID` is the product ID the reusable server kernel uses when it invokes Diagnose X'00DC' to identify the monitor buffer.
  - The value of `MON_KERNEL_ROWS` is the number of monitor rows the server kernel should allocate for its own purposes. The minimum and default value is 36 rows.
  - The value of `MON_USER_SIZE` is the amount of space the reusable server kernel reserves in the monitor buffer for data the server application will generate. The default value for this is 256 bytes.
- Just after `RUNSERV`, the server kernel allocates the monitor buffer according to the configuration parameters specified and invokes Diagnose X'00DC' to identify the monitor buffer. The server administrator should note that CP requires the monitor buffer not to exceed 4024 bytes in size. If an error occurs in trying to identify the monitor buffer, the server kernel will write a message to the server console, specifying the Diagnose X'00DC' return code produced by CP. The server administrator will need to interpret the return code and take appropriate action.
- While the server runs, the server kernel employs rows of the monitor buffer to log information pertinent to the use of various resources (memory subpools, for example). Monitor data is produced for a resource for only as long as the resource exists; when the resource is deleted, the monitor row is marked free and might be reused later for some other resource.
- If the server application wants to produce its own monitor data, it can call entry point `ssAnchorGet` to retrieve the address and length of the portion of the monitor buffer reserved for application use.
- The application can store information into the application portion of the monitor buffer, and the values stored in the buffer will be picked up by CP as APPLDATA.
- As part of server shutdown, the server kernel invokes Diagnose X'00DC' again to retract the monitor buffer.

Monitor Buffer Organization

The first part of the monitor buffer is reserved for use by the server kernel. This reserved portion is organized into records called *monitor rows*. The first eight bytes of each row tell the kind of data accruing in that row, according to Table 32.

Table 32. Monitor Data Rows

Identifier	**Type of Row**
`KERNEL`	Kernel information
`SERVICE`	Service information
`LINEDRV`	Line driver information
`AUTH`	Authorization information
`SGP`	Storage group information
`MEM`	Memory information
`ENROLL`	Enrollment information
`CACHE`	File cache row
`TRIE`	Trie API row
`WORKER`	Worker API row
`$UNUSED`	Unused row

After the area used by the server kernel comes the application portion of the monitor buffer. The application can use `ssAnchorGet` to retrieve the address and length of this area.

The sections below describe the organizations of the server kernel's monitor buffer rows.

Kernel Row

The kernel row gives basic information about the organization of the monitor area. There is only one kernel row and it is always the first row of the monitor buffer.

Table 33. KERNEL Monitor Row

Offset	**Length**	**Data Type**	**Usage**
0	8	CHAR	String “KERNEL”
8	8	CHAR	Blanks (X'40')
16	4	INT	Number of rows
20	4	INT	Size of row (bytes)
24	4	INT	Size of application portion
28	4	INT	Reserved for IBM

Service Row

A service row accumulates information about the operation of a specific service.

Table 34. SERVICE Monitor Row

Offset	Length	Data Type	Usage
0	8	CHAR	String “SERVICE”
8	8	CHAR	Service name
16	4	INT	Reserved for IBM
20	4	INT	Number of completed transactions
24	8	INT	Total bytes from clients
32	8	INT	Total bytes to clients

Line Driver Row

A line driver row accumulates information about the operation of a specific line driver.

Table 35. LINEDRV Monitor Row

Offset	Length	Data Type	Usage
0	8	CHAR	String “LINEDRV”
8	8	CHAR	Service name
16	4	INT	Reserved for IBM
20	4	INT	Number of completed transactions
24	8	INT	Total bytes from clients
32	8	INT	Total bytes to clients

Authorization Row

The authorization row accumulates information about the operation of the authorization API.

Table 36. AUTH Monitor Row

Offset	Length	Data Type	Usage
0	8	CHAR	String “AUTH”
8	8	CHAR	Unused
16	4	INT	Number of permits
20	4	INT	Number of inquiries
24	4	INT	Number of rows retrieved
28	4	INT	Number of row cache hits

Storage Group Row

A storage group row accumulates information about the operation of a particular storage group.

Note that times are accrued only when I/O is performed through DIAG X'00A4'.

Table 37. SGP Monitor Row

Offset	Length	Data Type	Usage
0	8	CHAR	String “SGP”
8	8	CHAR	Storage group name
16	4	INT	Reserved for IBM
20	4	INT	I/O technique: **0** Diag X'A4' **1** Diag X'0250' **2** VM Data Spaces
24	4	INT	Number of reads
28	8	INT	Pages read
36	8	INT	Time spent reading (STCK)
44	4	INT	Number of writes
48	8	INT	Pages written
56	8	INT	Time spent writing (STCK)

Memory Row

A memory row accumulates information about the operation of a particular subpool.

Table 38. MEM Monitor Row

Offset	Length	Data Type	Usage
0	8	CHAR	String “MEM”
8	8	CHAR	Subpool name
16	4	INT	Free storage in server kernel cache
20	4	INT	Amount currently in use through ssMemoryAllocate
24	4	INT	Calls to ssMemoryAllocate
28	8	INT	Total taken through ssMemoryAllocate
36	4	INT	Calls to ssMemoryRelease
40	8	INT	Total returned through ssMemoryRelease
48	4	INT	Times extended through CMSSTOR
52	8	INT	Total taken through CMSSTOR
60	4	INT	Times depleted through CMSSTOR
64	8	INT	Total returned through CMSSTOR

Enrollment Row

An enrollment row accumulates information about the operation of a particular enrollment set.

Table 39. ENROLL Monitor Row

Offset	Length	Data Type	Usage
0	8	CHAR	String “ENROLL”
8	8	CHAR	Enrollment set name
16	4	INT	Number of records in set
20	4	INT	Bytes in use holding records
24	4	INT	Count of insertions
28	4	INT	Count of removals
32	4	INT	Count of retrievals

Cache Row

The cache row accumulates information about the operation of the file caching API.

Table 40. CACHE Monitor Row

Offset	Length	Data Type	Usage
0	8	CHAR	String “CACHE”
8	8	CHAR	Cache name
16	4	INT	Cache size in bytes
20	4	INT	Bytes in use
24	4	INT	Files in cache
28	4	INT	Number of opens
32	4	INT	Number of hits
36	4	INT	Number of discards

Trie Row

The trie row accumulates information about the operation of the trie API.

Table 41 (Page 1 of 2). TRIE Monitor Row

Offset	Length	Data Type	Usage
0	8	CHAR	String “TRIE”
8	8	CHAR	Trie name
16	4	INT	Last free trie byte
20	4	INT	Next free trie byte
24	4	INT	Records indexed
28	4	INT	Internal node count
32	4	INT	Number of lookups done

Table 41 (Page 2 of 2). TRIE Monitor Row

Offset	Length	Data Type	Usage
36	4	INT	Number of records returned

A trie's monitor data is maintained only in the virtual machine that owns the trie and is updated only when the owning virtual machine performs an operation against the trie.

Worker Row

The worker row accumulates information about the operation of the worker machine API.

The worker row is updated every 30 seconds as long as there is activity through the worker API (if no calls to the worker API happen, the row does not get updated). The worker row contains information about the three most active worker classes, as measured by total number of worker connections since the server started. The information in the worker row can be trusted if the STCK field of the row is nonzero. While the row is being recomputed, the STCK field is set to zero. There is no guarantee that the classes will be mentioned in the row in order of their activity - the most active class might appear in the "class 3" slot, for example.

Table 42. WORKER Monitor Row

Offset	Length	Data Type	Usage
0	8	CHAR	String “WORKER”
8	8	CHAR	Unused
16	8	DWORD	STCK of last monitor row update
24	8	CHAR	Class name 1
32	4	INT	Total connections to class 1
36	4	INT	Connections right now to class 1
40	8	CHAR	Class name 2
48	4	INT	Total connections to class 2
52	4	INT	Connections right now to class 2
56	8	CHAR	Class name 3
64	4	INT	Total connections to class 3
68	4	INT	Connections right now to class 3

Chapter 14. Command Descriptions

This chapter describes commands made available by the set of services shipped as part of the reusable server kernel:

Table 43. Programming Interfaces

Subset	Description
APPC	Provides a means of controlling the APPC/VM line driver.
AUTH	Provides a means of manipulating the authorization database.
CACHE	Provides a means of manipulating file caches.
CMS	Provides a means of issuing CMS commands.
CONFIG	Provides a means of manipulating configuration parameters.
CONSOLE	Provides a means of manipulating the console line driver.
CP	Provides a means of issuing CP commands.
ENROLL	Provides a means of manipulating enrollment data.
IUCV	Provides a means of manipulating the IUCV line driver.
MONITOR	Provides a means of displaying monitor rows.
MSG	Provides a means of manipulating the MSG/SMSG line driver.
SERVER	Provides a means of controlling the execution of the server.
SGP	Provides a means of manipulating storage groups.
SPOOL	Provides a means of manipulating the SPOOL line driver.
SUBCOM	Provides a means of manipulating the SUBCOM line driver.
TCP	Provides a means of manipulating the TCP/IP line driver.
TRIE	Provides a means of manipulating tries.
UDP	Provides a means of manipulating the UDP/IP line driver.
USERID	Provides a means of manipulating the user ID mapping file.
WORKER	Provides a means of manipulating worker machine pools.

In truth, each of these command sets is implemented as a reusable server kernel service of the same name. Said services all expect record-oriented input and they all produce record-oriented output. This means that they can be sourced by any of the reusable server kernel's record-oriented line drivers. In addition, these services can be sourced by the bulk data line drivers if the client program takes responsibility for managing the data stream in record-oriented fashion (see Table 8 on page 15).

To set up the particular sourcing arrangement you want, use `PROFILE RSK`. For an example of a `PROFILE RSK` that establishes several sourcing arrangements for each of these services, see Appendix A, "Sample PROFILE RSK" on page 379.

In addition to the specific messages listed in the command descriptions that follow, any of these commands might produce any of these messages:

BKW0000I Operation completed OK.
BKW0001E Not authorized.

BKW0002E Enter a command.
BKW0003E Syntax error.
BKW0004E Unrecognized command.

For more information about messages, see Appendix H, “Messages” on page 411.

APPC LIST

```
►►──APPC──LIST──────────────────────────────────────────────────────────────►◄
```

Purpose

Lists the subtasks associated with the APPC/VM line driver.

Operands

None

Options

None

Usage Note

The output form is:

```
Subtask ServName T ExitName Capacity InUse Threads Waiters
------- -------- - -------- -------- ----- ------- -------
0       ECHO     G BKWG0000 40       0     1       0
```

The columns have the following meanings:

Subtask	The numeric identifier of the subtask.
ServName	The name of the service involved.
T	The type of APPC/VM resource, as follows:
	G APPC/VM global resource
	L APPC/VM local resource
	P APPC/VM private resource
ExitName	The name of the CMSIUCV exit the server kernel opened. Also known as the *transaction program name*.
Capacity	The number of concurrent clients the subtask can handle.
InUse	The number of clients currently being handled.
Threads	The number of CMS threads working on behalf of this subtask.
Waiters	The number of clients whose conversations are waiting to be accepted (unhandled connection pending interrupts).

Messages and Return Codes

BKW0201E Subtask not found.

APPC QUERY

```
►►──APPC──QUERY──subtaskid─────────────────────────────────────────────────►◄
```

Purpose

Queries a specific APPC/VM subtask.

Operands

subtaskid
The identifier of the subtask to query.

Options

None

Usage Note

The output form is:

```
Instance C-Block  Userid   IPVMID   LUName           BytesIn    BytesOut
-------- -------  ------   ------   ------           -------    --------
1        01AFD1B8 BKW      WADEB    *USERID:WADEB    0          0
```

The columns have the following meanings:

Instance	The numeric identifier of the instance.
C-Block	The address of the instance's C-block.
Userid	The mapped user ID of the client.
IPVMID	The security user ID of the client.
LUName	The name of the LU at which the client resides.
BytesIn	The number of bytes the client has sent the instance.
BytesOut	The number of bytes the instance has sent the client.

Messages and Return Codes

BKW0201E Subtask not found.
BKW0208I Subtask is handling no clients.

APPC REPORT

```
►►──APPC──REPORT──┬─ON──┬──────────────────────────────────────────────────►◄
                  └─OFF─┘
```

Purpose

Toggles reporting state for the APPC line driver.

Operands

ON
Turns reporting on.

OFF
Turns reporting off.

Options

None

Usage Note

When reporting is on, the APPC line driver issues the following messages to describe client activity:

- BKW1704I
- BKW1705I
- BKW1706I
- BKW1707I

For more information, see "APPC Line Driver Messages" on page 434.

Messages and Return Codes

None

APPC START

```
                                ┌─GLOBAL──srv_threads──servicename─────┐
►►──APPC──START──servicename────┼──────────────────────────────────────┼──────────────────────►◄
                                └──┬─GLOBAL──┬──┬────────────────────┬─┘
                                   ├─LOCAL───┤  └─maxclients──┬─────┬─┘
                                   └─PRIVATE─┘                └─tpn─┘
```

Purpose

Starts a service, connecting it to the APPC/VM line driver.

Operands

servicename
The name of the service to start, as specified on a call to `ssServiceBind`.

GLOBAL
The transaction program should be registered as an APPC/VM global resource.

LOCAL
The transaction program should be registered as an APPC/VM local resource.

PRIVATE
The transaction program should be registered as an APPC/VM private resource.

maxclients
The maximum number of clients this subtask should be permitted to serve concurrently.

tpn
The transaction program name the APPC/VM line driver should use.

Options

GLOBAL
The transaction program should be registered as an APPC/VM global resource.

srv_threads
The current value of configuration parameter `SRV_THREADS`.

servicename
The name of the service being started.

Usage Notes

1. To register a global or local resource, the server virtual machine's CP directory entry must be appropriately configured.
2. To register a private resource, `$SERVER$ NAMES` must be set up correctly.
3. The started service is identified by a number called the *subtask ID*. Use this identifier to refer to the started service in future commands.

For more information, see *VM/ESA: Connectivity Planning, Administration, and Operation*.

Messages and Return Codes

BKW0005E Out of storage.
BKW0200E Service not found.
BKW0205E Prefix already in use.
BKW0206E Service INIT routine failed - RC=&1 RE=&2.
BKW0207E Start of self is prohibited.
BKW1607E Client count must be greater than zero.
BKW1608E Unable to HNDIUCV SET.
BKW1609E Unable to create controlling thread.
BKW1700E (Resource &1) CMSIUCV CONNECT to *IDENT RC=&2
BKW1702E Unable to identify APPC/VM resource.

APPC STOP

```
►►──APPC──STOP──subtaskid──┬─────┬──────────────────────────────────────────────►◄
                           └─NOW─┘
```

Purpose

Stops a specific APPC/VM subtask, optionally denying currently-connected clients the privilege of completing their operations.

Operands

subtaskid
The identifier of the subtask to stop.

Options

NOW
Stop the subtask without letting current clients complete normally.

Usage Notes

None

Messages and Return Codes

BKW0201E Subtask not found.
BKW1600I Instance STOP requested.
BKW1606E Wait expired for STOP.

AUTH CRECLASS

```
                          ┌──────────────┐
►►──AUTH──CRECLASS──class──▼──operation──┴──────────────────────────────────►◄
```

Purpose

Creates an object class in the authorization database.

Operands

class
The name of the class to be created.

operation
The name of an operation to be defined on objects of this class.

Options

None

Usage Note

For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.

Messages and Return Codes

BKW0005E Out of storage.
BKW0007E RC=&1 RE=&2 from routine &3
BKW0800E The class specified already exists
BKW0801E Unable to read the authorization files
BKW0802E Unable to write to the authorization files

AUTH CREOBJECT

```
►►──AUTH──CREOBJECT──object──class──────────────────────────────────────────►◄
```

Purpose

Creates an object class in the authorization database.

Operands

object
The name of the object to be created.

class
The name of the class to which the object is to belong.

Options

None

Usage Note

For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.

Messages and Return Codes

BKW0005E Out of storage.
BKW0007E RC=&1 RE=&2 from routine &3
BKW0800E The class specified already exists
BKW0801E Unable to read the authorization files
BKW0802E Unable to write to the authorization files
BKW0805E The class specified does not exist
BKW0806E The object specified already exists

AUTH DELCLASS

```
►►──AUTH──DELCLASS──class──┬──────────────────────┬──────────────────────────────────────►◄
                           └─(──┬──────────────┬──┘
                                └─OBJECTSONLY─┘
```

Purpose

Deletes the objects of a given class.

Operands

class
The class for which objects are to be deleted.

Options

OBJECTSONLY
Delete the objects for the class, but leave the class itself in the authorization database.

Usage Notes

1. For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.
2. If OBJECTSONLY is omitted, then the class itself is also deleted from the authorization database.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3
BKW0801E Unable to read the authorization files
BKW0802E Unable to write to the authorization files
BKW0805E The class specified does not exist
BKW0807E At least one of the options specified is unrecognized

AUTH DELOBJECT

```
►►──AUTH──DELOBJECT──object──┬─────────────────┬──────────────────────────────────────►◄
                             └─(──┬──────────┬─┘
                                  └─RULESONLY─┘
```

Purpose

Deletes the authorization rules for a given object.

Operands

object
The object for which rules are to be deleted.

Options

RULESONLY
Delete the rules for the object, but leave the object itself in the authorization database.

Usage Notes

1. For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.
2. If **RULESONLY** is omitted, then the object itself is also deleted from the authorization database.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3
BKW0801E Unable to read the authorization files
BKW0802E Unable to write to the authorization files
BKW0807E At least one of the options specified is unrecognized
BKW0808E The object specified does not exist

AUTH DELUSER

```
►►──AUTH──DELUSER──userid──┬───────┬──────────────────────────────────────────►◄
                           └─class─┘
```

Purpose

Deletes authorization rules for a user.

Operands

userid
The user ID for which authorization rules are to be deleted.

class
The class from which *userid*'s rules are to be deleted.

Options

None

Usage Notes

1. For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.
2. If *class* is not specified, then *userid*'s rules for all classes are deleted.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3
BKW0801E Unable to read the authorization files
BKW0802E Unable to write to the authorization files
BKW0807E At least one of the options specified is unrecognized
BKW0810E No rules exist for the userid specified

AUTH LISTCLASS

```
            ┌─*─────────┐
►►──AUTH──LISTCLASS──┼───────────┼──────────────────────────────────────────►◄
            └─match_key─┘
```

Purpose

Lists the classes defined in the authorization data.

Operands

match_key
The key a class ID must match in order for it to show up in the output.

Options

None

Usage Notes

1. *match_key* is expressed using the CMS Application Multitasking syntax for IPC and event keys.
2. For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.
3. Output from this command appears as follows:

```
For class: File
 R     W

For class: Dir
 R     W     NR    NW

For class: Service
 STRT  STOP  EXEC
```

   The output just cites each class and then follows the citation with a list of the operations defined on it.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3
BKW0801E Unable to read the authorization files
BKW0802E Unable to write to the authorization files
BKW0805E The class specified does not exist
BKW0807E At least one of the options specified is unrecognized
BKW0813E No classes exist for the match key specified

AUTH LISTOBJECT

```
                               ┌─*─────────┐
►►──AUTH──LISTOBJECT──class_id─┼───────────┼──────────────────────────────────────────►◄
                               └─match_key─┘
```

Purpose

Lists the objects belonging to a specified class.

Operands

match_key
The key an object name must match in order for it to show up in the output.

Options

None

Usage Notes

1. Operand *match_key* is expressed using the CMS Application Multitasking syntax for IPC and event keys.
2. For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.
3. Output from this command appears as follows:

```
For class: Service
ECHO
SGEXER
HTTP
AUTH
CACHE
CONFIG
ENROLL
MONITOR
SERVER
SGP
USERID
CP
CMS
```

The name of the class appears, followed by a list of the names of the objects in the class.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3
BKW0801E Unable to read the authorization files
BKW0802E Unable to write to the authorization files
BKW0805E The class specified does not exist
BKW0807E At least one of the options specified is unrecognized
BKW0814E No objects exist for the match key specified

AUTH MODCLASS

```
                          ┌───────────┐
                          ▼           │
►►──AUTH──MODCLASS──class────operation─┴──────────────────────────────────────►◄
```

Purpose

Adds operations to the definition of an existing object.

Operands

class
The name of the class to be modified.

operation
The name of an operation to be defined on objects of this class.

Options

None

Usage Note

For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.

Messages and Return Codes

BKW0005E Out of storage.
BKW0007E RC=&1 RE=&2 from routine &3
BKW0801E Unable to read the authorization files
BKW0802E Unable to write to the authorization files
BKW0805E The class specified does not exist
BKW0812E Operation limit for the class specified has been exceeded

AUTH PERMIT

```
                                  ┌──────────────┐   ┌─(──ADD──────────┐
►►──AUTH──PERMIT──userid──object──▼──operation──┴───┼─────────────────┼──────────────────►◄
                                                    │    ┌─ADD─────┐  │
                                                    └─(──┼─────────┼──┘
                                                         ├─REMOVE──┤
                                                         └─REPLACE─┘
```

Purpose

Controls the operations a user can perform on an object.

Operands

userid
The user ID to which this rule is to apply.

object
The object to which this rule is to apply.

operation
An operation defined on this object.

Options

ADD
This rule is to be added to *userid*'s permissions for *object*.

REMOVE
This rule is to be removed from *userid*'s permissions for *object*.

REPLACE
This rule is to replace *userid*'s permissions for *object*.

Usage Note

For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.

Messages and Return Codes

BKW0005E Out of storage.
BKW0007E RC=&1 RE=&2 from routine &3
BKW0801E Unable to read the authorization files
BKW0802E Unable to write to the authorization files
BKW0808E The object specified does not exist

AUTH QOBJECT

```
►►──AUTH──QOBJECT──object──┬────────┬──────────────────────────────────────────►◄
                           └─userid─┘
```

Purpose

Inquires about the permitted operations associated with a given object.

Operands

object
The object for which rules are to be displayed.

userid
The user ID for which rules are to be displayed.

Options

None

Usage Notes

1. For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.
2. If *userid* is supplied, then only *userid*'s rules for *object* are displayed.
3. If *userid* is omitted, then all rules for *object* are displayed.
4. Output from this command is as follows:

   ```
   For object: SGP
    For userid: RANDOPM
     STRT STOP

    For userid: BKW
     STRT STOP EXEC
   ```

   The output identifies the user IDs for whom there are rules in the data and for each such user ID the output lists the permitted operations.

Messages and Return Codes

BKW0005E Out of storage.
BKW0007E RC=&1 RE=&2 from routine &3
BKW0801E Unable to read the authorization files
BKW0803E Too many operations or options specified
BKW0808E The object specified does not exist
BKW0815E No userids exist for the object specified
BKW0816E No rules exist for the userid specified

AUTH RELOAD

```
►►──AUTH──RELOAD──────────────────────────────────────────────────────────►◄
```

Purpose

Causes the authorization API to reset its attempts to use the authorization database.

Operands

None

Options

None

Usage Note

For support information, see “ssAuthReload — Reload Authorization Data” on page 248.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3
BKW0801E Unable to read the authorization files
BKW0802E Unable to write to the authorization files
BKW0811E Unable to open the authorization files

BKWENRCP

```
            ┌─BKWENRDB──*───────┐
►►──BKWENRCP──fn──┼───────────────────┼──────────────────────────────────────►◄
            └─ft──┬─*───────┬─┘
                  ├─────────┤
                  ├─fm──────┤
                  └─dirid───┘
```

Purpose

Removes redundant information from the SFS file holding an enrollment set.

Operands

set_name
The name of the set to be interrogated.

fn The file name of the SFS enrollment file.

ft The file type of the SFS enrollment file.

fm The file mode of the SFS enrollment file.

dirid
The directory name of the SFS enrollment file.

Options

None

Usage Notes

1. BKWENRCP is an EXEC, not an *internal* command provided by the reusable server kernel (such as the ENROLL command set).
2. To be processed by BKWENRCP, the SFS file containing the enrollment set must not be active -- that is, the corresponding enrollment set must be dropped through ENROLL DROP before BKWENRCP can work.
3. The output is written to the A file mode in a file whose file name matches *fn* and whose file type is BKWENRCP.
4. If your enrollment set is very large, a large virtual machine might be required to process it.

Messages and Return Codes

The return codes produced by BKWENRCP all come from CMS Pipelines. For more information, see *z/VM: CMS Pipelines Reference*.

CACHE CREATE

```
►►──CACHE──CREATE──cname──┬──────┬─────────────────────────────────────►◄
                          └─size─┘
```

Purpose

Creates a file cache.

Operands

cname
The name of the file cache to be created.

size
The size of the file cache, in pages.

Options

None

Usage Notes

1. The name *cname* is used directly in a call to `ssMemoryCreateDS` and therefore must be unique among all storage subpool names.
2. The cache size *size* is given in pages. It must be greater than zero and less than or equal to 524288. The size you specify is rounded up to the next 16-page boundary. If you do not specify a size, a size of 16 MB is used.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

CACHE DELETE

```
►►──CACHE──DELETE──cname──────────────────────────────────────────────►◄
```

Purpose

Deletes a file cache.

Operands

cname
The name of the file cache to be deleted.

Options

None

Usage Notes

1. Once deletion starts, no more new files will be cached.
2. The deletion completes after the last file is closed.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

CACHE LIST

```
►►──CACHE──LIST──────────────────────────────────────────────────────────►◄
```

Purpose

Lists the set of file caches.

Operands

None

Options

None

Usage Note

The output form is:

```
Name     Size       InUse      FileCount  Opens     Hits
----     ----       -----      ---------  -----     ----
CACHE1   16384000   433567     421        1633      1185
CACHE2   32768000   2236541    28         4532      4158
```

The columns have the following meanings:

Column	Meaning
Name	Name of cache
Size	Cache size in bytes
InUse	Bytes in use in cache
FileCount	Number of files in cache
Opens	Number of file opens processed
Hits	Number of cache hits on opens

Messages and Return Codes

BKW1500E No file caches found.

CMS

```
►►──CMS──cms_command_string──────────────────────────────────────────────────►◄
```

Purpose

Provides a means of issuing CMS commands.

Operands

cms_command_string
The command string to pass to CMS.

Options

None

Usage Note

The command is issued by passing it to the CMS subcommand environment.

Messages and Return Codes

BKW1000I RC=&1 from CMS.

CONFIG AUT_CACHE

```
►►──CONFIG──AUT_CACHE──rows──────────────────────────────────────────────►◄
```

Purpose

Sets the number of authorization rows that will be cached.

Operands

rows
The number of rows to be cached.

Options

None

Usage Note

For *rows*, specify a positive integer.

Messages and Return Codes

None

CONFIG AUT_DATA_1

```
►►──CONFIG──AUT_DATA_1──filespec──────────────────────────────────────────────►◄
```

Purpose

Sets the name of copy 1 of the authorization data file.

Operands

filespec
The name of copy 1 of the authorization data file.

Options

None

Usage Notes

1. For *filespec*, any string acceptable to `DMSOPEN` is acceptable.
2. Changing this parameter has no effect after `PROFILE RSK` has issued `RUNSERV`.

Messages and Return Codes

None

CONFIG AUT_DATA_2

```
►►──CONFIG──AUT_DATA_2──filespec──────────────────────────────────────────────►◄
```

Purpose

Sets the name of copy 2 of the authorization data file.

Operands

filespec
The name of copy 2 of the authorization data file.

Options

None

Usage Notes

1. For *filespec*, any string acceptable to `DMSOPEN` is acceptable.
2. Changing this parameter has no effect after `PROFILE RSK` has issued `RUNSERV`.
3. This parameter is ignored when `AUT_LOCATION` is set to `SFS`.

Messages and Return Codes

None

CONFIG AUT_FREE

```
►►──CONFIG──AUT_FREE──rows──────────────────────────────────────────────────►◄
```

Purpose

Sets the maximum number of free buffers that will be retained for the purpose of caching authorization rows.

Operands

rows
The maximum number of row buffers to retain.

Options

None

Usage Note

For *rows*, specify a positive integer.

Messages and Return Codes

None

CONFIG AUT_INDEX_1

```
►►──CONFIG──AUT_INDEX_1──filespec──────────────────────────────────────►◄
```

Purpose

Sets the name of copy 1 of the authorization index file.

Operands

filespec
The name of copy 1 of the authorization index file.

Options

None

Usage Notes

1. For *filespec*, any string acceptable to `DMSOPEN` is acceptable.
2. Changing this parameter has no effect after `PROFILE RSK` has issued `RUNSERV`.

Messages and Return Codes

None

CONFIG AUT_INDEX_2

```
►►──CONFIG──AUT_INDEX_2──filespec──────────────────────────────────────────────►◄
```

Purpose

Sets the name of copy 2 of the authorization index file.

Operands

filespec
The name of copy 2 of the authorization index file.

Options

None

Usage Notes

1. For *filespec*, any string acceptable to `DMSOPEN` is acceptable.
2. Changing this parameter has no effect after `PROFILE RSK` has issued `RUNSERV`.
3. This parameter is ignored when `AUT_LOCATION` is set to `SFS`.

Messages and Return Codes

None

CONFIG AUT_LOCATION

```
►►──CONFIG──AUT_LOCATION──┬─MINIDISK─┬──────────────────────────────────────────────────►◄
                          └─SFS──────┘
```

Purpose

Sets the repository type of the authorization database.

Operands

MINIDISK
The authorization database is stored on CMS minidisks.

SFS
The authorization database is stored in the CMS Shared File System.

Options

None

Usage Note

Changing this parameter has no effect after `PROFILE RSK` has issued `RUNSERV`.

Messages and Return Codes

None

CONFIG AUT_LOG

```
►►──CONFIG──AUT_LOG──filespec──────────────────────────────────────────────────►◄
```

Purpose

Sets the name of the authorization logfile.

Operands

filespec
The name of the authorization logfile.

Options

None

Usage Notes

1. Changing this parameter has no effect after `PROFILE RSK` has issued `RUNSERV`.
2. For *filespec*, any syntax acceptable to `DMSOPEN` may be used.
3. This parameter is ignored when `AUT_LOCATION` is set to `SFS`.

Messages and Return Codes

None

CONFIG AUTHCHECK_AUTH

```
►►──CONFIG──AUTHCHECK_AUTH──┬─ON──┬──────────────────────────────────────────────────►◄
                            └─OFF─┘
```

Purpose

Controls whether the `AUTH` commands will be subject to authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG AUTHCHECK_CACHE

```
►►──CONFIG──AUTHCHECK_CACHE──┬─ON──┬──────────────────────────────────────────────────────►◄
                             └─OFF─┘
```

Purpose

Controls whether the `CACHE` commands will be subject to authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG AUTHCHECK_CMS

```
►►──CONFIG──AUTHCHECK_CMS──┬─ON──┬──────────────────────────────────────────────►◄
                           └─OFF─┘
```

Purpose

Controls whether the CMS service will perform authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG AUTHCHECK_CONFIG

```
►►──CONFIG──AUTHCHECK_CONFIG──┬─ON──┬──────────────────────────────────────────────►◄
                              └─OFF─┘
```

Purpose

Controls whether the `CONFIG` commands will be subject to authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG AUTHCHECK_CP

```
►►──CONFIG──AUTHCHECK_CP──┬─ON──┬──────────────────────────────────────────────────────►◄
                          └─OFF─┘
```

Purpose

Controls whether the `CP` service will perform authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG AUTHCHECK_ENROLL

```
►►──CONFIG──AUTHCHECK_ENROLL──┬─ON──┬──────────────────────────────────────────────────►◄
                              └─OFF─┘
```

Purpose

Controls whether the `ENROLL` service will perform authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG AUTHCHECK_LD

```
►►──CONFIG──AUTHCHECK_LD──┬─ON──┬────────────────────────────────────────────────►◄
                          └─OFF─┘
```

Purpose

Controls whether line driver commands will be subject to authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG AUTHCHECK_MONITOR

```
►►──CONFIG──AUTHCHECK_MONITOR──┬─ON──┬──────────────────────────────────────────────►◄
                               └─OFF─┘
```

Purpose

Controls whether the `MONITOR` service will perform authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG AUTHCHECK_SERVER

```
►►──CONFIG──AUTHCHECK_SERVER──┬─ON──┬──────────────────────────────────────────────►◄
                              └─OFF─┘
```

Purpose

Controls whether the SERVER commands will be subject to authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG AUTHCHECK_SGP

```
►►──CONFIG──AUTHCHECK_SGP──┬─ON──┬──────────────────────────────────────────────►◄
                           └─OFF─┘
```

Purpose

Controls whether the SGP commands will be subject to authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG AUTHCHECK_TRIE

```
►►──CONFIG──AUTHCHECK_TRIE──┬─ON──┬──────────────────────────────────────────────────►◄
                            └─OFF─┘
```

Purpose

Controls whether the `TRIE` service will perform authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG AUTHCHECK_USERID

```
►►──CONFIG──AUTHCHECK_USERID──┬─ON──┬──────────────────────────────────────────────►◄
                              └─OFF─┘
```

Purpose

Controls whether the USERID commands will be subject to authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG AUTHCHECK_WORKER

```
►►──CONFIG──AUTHCHECK_WORKER──┬─ON──┬────────────────────────────────────────────────────►◄
                              └─OFF─┘
```

Purpose

Controls whether the WORKER commands will be subject to authorization checking.

Operands

ON
Authorization checking will be performed.

OFF
Authorization checking will not be performed.

Options

None

Usage Note

For more information, see “Other Services' Use of Authorization” on page 46 and Table 31 on page 75.

Messages and Return Codes

None

CONFIG MEM_MAXFREE

```
►►──CONFIG──MEM_MAXFREE──pages──────────────────────────────────────────────────►◄
```

Purpose

Sets the maximum number of pages that the reusable server kernel storage manager will retain for a given subpool before returning storage from that subpool to CMS.

Operands

pages
The maximum number of pages to retain.

Options

None

Usage Note

For *pages*, specify a positive integer.

Messages and Return Codes

None

CONFIG MON_KERNEL_ROWS

```
►►──CONFIG──MON_KERNEL_ROWS──rows──────────────────────────────────────────►◄
```

Purpose

Sets the number of monitor data rows the reusable server kernel will permit in the Diagnose X'00DC' monitor buffer.

Operands

rows
The number of rows to permit.

Options

None

Usage Notes

1. A monitor row is 72 bytes wide, and CP lets CMS allocate a monitor buffer up to 4024 bytes in size.
2. You must choose *rows* in range [36..55].
3. At *r* kernel rows, there are 4024-72**r* bytes left over for user data.

Messages and Return Codes

None

CONFIG MON_PRODUCT_ID

```
►►──CONFIG──MON_PRODUCT_ID──identifier──────────────────────────────────────────►◄
```

Purpose

Sets the product identifier the reusable server kernel will use when it invokes Diagnose X'00DC' to start APPLDATA monitor data collection.

Operands

identifier
The 16-byte identifier to use.

Options

None

Usage Notes

None

Messages and Return Codes

None

CONFIG MON_USER_SIZE

```
►►──CONFIG──MON_USER_SIZE──bytes──────────────────────────────────────────►◄
```

Purpose

Sets the size of the monitor buffer the reusable server kernel will reserve for application use.

Operands

bytes
The number of bytes to reserve.

Options

None

Usage Note

The maximum number of bytes reservable is 1432 (4024 - 36*72).

Messages and Return Codes

None

CONFIG MSG_NOHDR

```
►►──CONFIG──MSG_NOHDR──┬─ON──┬──────────────────────────────────────────────────►◄
                       └─OFF─┘
```

Purpose

Controls whether the MSG/SMSG line driver will use the `MSGNOH` command to reply to a client.

Operands

ON
`MSGNOH` will be used.

OFF
`MSG` will be used.

Options

None

Usage Notes

None

Messages and Return Codes

None

CONFIG NOMAP_APPC

```
►►──CONFIG──NOMAP_APPC──┬─ON──┬──────────────────────────────────────────────────►◄
                        └─OFF─┘
```

Purpose

Controls whether the APPC line driver will pass unmappable user IDs to a service instance.

Operands

ON
Unmappable user IDs will be passed.

OFF
Unmappable user IDs will be rejected.

Options

None

Usage Notes

None

Messages and Return Codes

None

CONFIG NOMAP_IUCV

```
►►──CONFIG──NOMAP_IUCV──┬─ON──┬──────────────────────────────────────────────────►◄
                        └─OFF─┘
```

Purpose

Controls whether the IUCV line driver will pass unmappable user IDs to a service instance.

Operands

ON
Unmappable user IDs will be passed.

OFF
Unmappable user IDs will be rejected.

Options

None

Usage Note

If `NOMAP_IUCV` is **ON**, unmappable user IDs will be passed as user ID `$UNKNOWN`.

Messages and Return Codes

None

CONFIG NOMAP_MSG

```
►►──CONFIG──NOMAP_MSG──┬─ON──┬──────────────────────────────────────────────────────────►◄
                       └─OFF─┘
```

Purpose

Controls whether the MSG/SMSG line driver will pass unmappable user IDs to a service instance.

Operands

ON
Unmappable user IDs will be passed.

OFF
Unmappable user IDs will be rejected.

Options

None

Usage Note

If `NOMAP_MSG` is **ON**, unmappable user IDs will be passed as user ID `$UNKNOWN`.

Messages and Return Codes

None

CONFIG NOMAP_SPOOL

```
►►──CONFIG──NOMAP_SPOOL──┬─ON──┬──────────────────────────────────────────────────►◄
                         └─OFF─┘
```

Purpose

Controls whether the SPOOL line driver will pass unmappable user IDs to a service instance.

Operands

ON
Unmappable user IDs will be passed.

OFF
Unmappable user IDs will be rejected.

Options

None

Usage Notes

None

Messages and Return Codes

None

CONFIG NOMAP_TCP

```
►►──CONFIG──NOMAP_TCP──┬─ON──┬──────────────────────────────────────────────────────►◄
                       └─OFF─┘
```

Purpose

Controls whether the TCP line driver will pass unmappable user IDs to a service instance.

Operands

ON
Unmappable user IDs will be passed.

OFF
Unmappable user IDs will be rejected.

Options

None

Usage Note

If `NOMAP_TCP` is **ON**, unmappable user IDs will be passed as user ID `$UNKNOWN`.

Messages and Return Codes

None

CONFIG NOMAP_UDP

```
►►──CONFIG──NOMAP_UDP──┬─ON──┬──────────────────────────────────────────────────►◄
                       └─OFF─┘
```

Purpose

Controls whether the UDP line driver will pass unmappable user IDs to a service instance.

Operands

ON
Unmappable user IDs will be passed.

OFF
Unmappable user IDs will be rejected.

Options

None

Usage Note

If `NOMAP_UDP` is **ON**, unmappable user IDs will be passed as user ID `$UNKNOWN`.

Messages and Return Codes

None

CONFIG RSCS_USERID

```
►►──CONFIG──RSCS_USERID──userid─────────────────────────────────────────────►◄
```

Purpose

Sets the user ID of the virtual machine in which the SPOOL and MSG/SMSG line drivers will assume RSCS is running.

Operands

userid
The user ID of the RSCS machine.

Options

None

Usage Note

Most installations will tailor `PROFILE RSK` so that it issues CMS's `IDENTIFY` command, parses the response so as to obtain the user ID of the RSCS machine, and then issues an appropriate `CONFIG RSCS_USERID` command.

Messages and Return Codes

None

CONFIG SGP_FILE

```
►►──CONFIG──SGP_FILE──filespec──────────────────────────────────────────────►◄
```

Purpose

Sets the name of the storage group configuration file.

Operands

filespec
The string identifying the storage group configuration file.

Options

None

Usage Notes

1. For *filespec*, any string acceptable to `DMSOPEN` is acceptable.
2. Changing this parameter has no effect after `PROFILE RSK` has issued `RUNSERV`.

Messages and Return Codes

None

CONFIG SPL_CATCHER

```
►►──CONFIG──SPL_CATCHER──userid────────────────────────────────────────────►◄
```

Purpose

Controls the user ID to which the SPOOL driver will transfer spool files it is unable to decode.

Operands

userid
: The user ID to which the SPOOL driver will transfer files it is unable to decode.

Options

None

Usage Notes

1. The SPOOL line driver is able to decode files sent in NETDATA (aka SENDFILE NEW) or DISK DUMP (aka SENDFILE OLD) formats. All other formats are undecodable.
2. If *userid* is `*`, the reusable server kernel will leave such files in the server's reader in USER HOLD status.

Messages and Return Codes

None

CONFIG SPL_INPUT_FT

```
►►──CONFIG──SPL_INPUT_FT──filetype──────────────────────────────────────────►◄
```

Purpose

Controls the file type the SPOOL driver will recognize as input for a service.

Operands

filetype
The file type the SPOOL line driver will recognize.

Options

None

Usage Notes

None

Messages and Return Codes

None

CONFIG SPL_OUTPUT_FT

```
►►──CONFIG──SPL_OUTPUT_FT──filetype──────────────────────────────────────────►◄
```

Purpose

Controls the file type the SPOOL driver will produce as output from a service.

Operands

filetype
The file type the SPOOL line driver will produce.

Options

None

Usage Notes

None

Messages and Return Codes

None

CONFIG SRV_THREADS

```
►►──CONFIG──SRV_THREADS──threads──────────────────────────────────────────►◄
```

Purpose

Controls the number of threads on which a given line driver will attempt to run a given service.

Operands

threads
The maximum number of threads on which a given line driver will attempt to run a given service.

Options

None

Usage Notes

None

Messages and Return Codes

None

CONFIG UMAP_FILE

```
►►──CONFIG──UMAP_FILE──filespec──────────────────────────────────────────────►◄
```

Purpose

Sets the name of the user ID mapping file.

Operands

filespec
The string identifying the user ID mapping file.

Options

None

Usage Note

For *filespec*, any string acceptable to `DMSOPEN` is acceptable.

Messages and Return Codes

None

CONFIG VM_CONSOLE

```
►►──CONFIG──VM_CONSOLE──┬─ON──┬──────────────────────────────────────────────────────►◄
                        └─OFF─┘
```

Purpose

Controls whether the console line driver will pass unrecognized input to CMS for execution.

Operands

ON
The console driver will pass unrecognized input to CMS.

OFF
The console driver will not pass unrecognized input to CMS.

Options

None

Usage Notes

None

Messages and Return Codes

None

CONFIG VM_MSG

```
►►──CONFIG──VM_MSG──┬─ON──┬──────────────────────────────────────────────────────────►◄
                    └─OFF─┘
```

Purpose

Controls whether the MSG/SMSG line driver will pass unrecognized input to CMS for execution.

Operands

ON
The MSG/SMSG driver will pass unrecognized input to CMS.

OFF
The MSG/SMSG driver will not pass unrecognized input to CMS.

Options

None

Usage Notes

None

Messages and Return Codes

None

CONFIG VM_SPOOL

```
►►──CONFIG──VM_SPOOL──┬─ON──┬──────────────────────────────────────────────────────►◄
                      └─OFF─┘
```

Purpose

Controls whether the SPOOL line driver will pass unrecognized input to CMS for execution.

Operands

ON
The SPOOL driver will pass unrecognized input to CMS.

OFF
The SPOOL driver will not pass unrecognized input to CMS.

Options

None

Usage Notes

None

Messages and Return Codes

None

CONFIG VM_SUBCOM

```
►►──CONFIG──VM_SUBCOM──┬─ON──┬──────────────────────────────────────────────►◄
                       └─OFF─┘
```

Purpose

Controls whether the SUBCOM line driver will pass unrecognized input to CMS for execution.

Operands

ON
The SUBCOM driver will pass unrecognized input to CMS.

OFF
The SUBCOM driver will not pass unrecognized input to CMS.

Options

None

Usage Notes

None

Messages and Return Codes

None

CONSOLE LIST

```
►►──CONSOLE──LIST──────────────────────────────────────────────────────────►◄
```

Purpose

Lists the subtasks associated with the console line driver.

Operands

None

Options

None

Usage Note

This command displays information about the services started through the console line driver. The output form is:

```
Subtask  Service  Prefix   Instances
-------  -------  ------   ---------
0        CONSOLE  CONSOLE  1
1        SERVER   SERVER   1
```

The columns have the following meanings:

Subtask	The numeric identifier of the subtask.
Service	The name of the started service.
Prefix	The prefix used to send input to the service.
Instances	The number of instances of the service the line driver is controlling.

Messages and Return Codes

None

CONSOLE QUERY

```
►►──CONSOLE──QUERY──subtaskid──────────────────────────────────────────────────►◄
```

Purpose

Queries a specifis console subtask.

Operands

subtaskid
The identifier of the subtask to query.

Options

None

Usage Note

This command displays information about all of the instances of the requested subtask. The output form is:

```
Instance C-block  ThreadID Userid    BytesIn    BytesOut
-------- -------  -------- ------    -------    --------
1        01EE0F5C 16       *         175        446
```

In this output, the columns have the following meanings:

Instance	The numeric identifier of the instance.
C-block	The address of the instance's C-block.
ThreadID	The CMS thread ID of the thread on which the instance is running.
Userid	The user ID of the client affiliated with the instance.
BytesIn	The number of bytes the client has provided to the instance.
BytesOut	The number of bytes the instance has provided to the client.

Messages and Return Codes

BKW0201E Subtask not found.
BKW0208I Subtask is handling no clients.

CONSOLE START

```
►►──CONSOLE──START──servicename──┬────────┬──────────────────────────────────────────►◄
                                 └─prefix─┘
```

Purpose

Starts a service, connecting it to the console line driver.

Operands

servicename
The name of the service to start, as specified on a call to `ssServiceBind`.

prefix
The prefix that will identify commands that should be sent to this service.

Options

None

Usage Notes

1. If *prefix* is not specified, the value of *servicename* is used for the prefix.
2. The started service is identified by a number called the *subtask ID*. Use this identifier to refer to the started service in future commands.

Messages and Return Codes

BKW0005E Out of storage.
BKW0200E Service not found.
BKW0205E Prefix already in use.
BKW0206E Service INIT routine failed - RC=&1 RE=&2.
BKW0207E Start of self is prohibited.

CONSOLE STOP

```
►►──CONSOLE──STOP──subtaskid──┬─────┬──────────────────────────────────────────►◄
                              └─NOW─┘
```

Purpose

Stops a specific console subtask, optionally denying currently-connected clients the privilege of completing their operations.

Operands

subtaskid
The identifier of the subtask to stop.

Options

NOW
Stop the subtask without letting current clients complete normally.

Usage Notes

None

Messages and Return Codes

BKW0201E Subtask not found.
BKW0202E Stop of self is prohibited.
BKW0203I Subtask asked to STOP.
BKW0204I Subtask killed.

CP

```
►►──CP──cp_command_string──────────────────────────────────────────────────►◄
```

Purpose

Provides a means of issuing CP commands.

Operands

cp_command_string
The command string to pass to CP.

Options

None

Usage Note

The command is issued by passing it to CP through DIAG X`'08'`.

Messages and Return Codes

BKW0900I RC=&1 from CP.
BKW0901E CP response was truncated.
BKW0902E CP command was too long.

ENROLL COMMIT

```
►►──ENROLL──COMMIT──set_name──────────────────────────────────────────────────►◄
```

Purpose

Commits changes to the named enrollment set.

Operands

set_name
The name of the set to be committed.

Options

None

Usage Note

For more information, see "Usage Notes" on page 274.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

ENROLL DROP

```
                            ┌─COMMIT───┐
►►──ENROLL──DROP──set_name──┤          ├──────────────────────────────────────────►◄
                            └─ROLLBACK─┘
```

Purpose

Commits changes to the named enrollment set.

Operands

set_name
The name of the set to be committed.

COMMIT
The uncommitted changes should be committed.

ROLLBACK
The uncommitted changes should be rolled back.

Options

None

Usage Note

For more information, see “Usage Notes” on page 276.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

ENROLL GET

```
►►──ENROLL──GET──set_name──key──────────────────────────────────────────────►◄
```

Purpose

Retrieves a record from an enrollment set.

Operands

set_name
The name of the set to be interrogated.

key
The key of the record to be retrieved.

Options

None

Usage Notes

1. Due to parsing considerations, *key* must not contain a left parenthesis or a space.
2. For more information, see “Usage Notes” on page 284.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

ENROLL INSERT

```
►►──ENROLL──INSERT──set_name──key──data──────────────────────────────────────►◄
```

Purpose

Inserts or replaces a record in an enrollment set.

Operands

set_name
The name of the set to be updated.

key
The key of the record to be inserted.

data
The data to be inserted.

Options

None

Usage Notes

1. Due to parsing considerations, *key* must not contain a left parenthesis or a space.
2. The record is inserted with method *ss_enr_insert_replace*.
3. For more information, see “Usage Notes” on page 286.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

ENROLL LIST

```
►►──ENROLL──LIST──────────────────────────────────────────────────────►◄
```

Purpose

Generates a list of the loaded enrollment sets.

Operands

None

Options

None

Usage Note

For more information, see “ssEnrollList — List Enrollment Sets” on page 278.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

ENROLL LOAD

```
►►──ENROLL──LOAD──set_name──┬─DISK─┬──size──filename──────────────────────────────►◄
                            └─MEM──┘
```

Purpose

Loads an enrollment set from the Shared File System, or initializes a transient enrollment set.

Operands

set_name
The name of the set to be loaded.

DISK
This is a permanent enrollment set.

MEM
This is a transient enrollment set.

size
The data space size to use, in pages.

filename
The file specification of the Shared File System file to be used.

Options

None

Usage Note

For more information, see “ssEnrollLoad — Load Enrollment Set” on page 280.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

ENROLL RECLIST

```
►►──ENROLL──RECLIST──set_name──────────────────────────────────────────►◄
```

Purpose

Generates a list of the keys of the records stored in the named enrollment set.

Operands

set_name
The name of the set to be interrogated.

Options

None

Usage Note

For more information, see “Usage Notes” on page 287.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

ENROLL REMOVE

```
►►──ENROLL──REMOVE──set_name──key──────────────────────────────────────►◄
```

Purpose

Removes a record from an enrollment set.

Operands

set_name
The name of the set to be updated.

key
The key of the record to be removed.

Options

None

Usage Notes

1. Due to parsing considerations, *key* must not contain a left parenthesis or a space.
2. For more information, see "Usage Notes" on page 289.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

IUCV LIST

```
►►──IUCV──LIST──────────────────────────────────────────────────────────────►◄
```

Purpose

Lists the subtasks associated with the IUCV line driver.

Operands

None

Options

None

Usage Note

The output form is:

```
Subtask ServName ExitName Capacity InUse Threads Waiters
------- -------- -------- -------- ----- ------- -------
0       ECHO     ECHO     40       0     1       0
```

The columns have the following meanings:

Subtask	The numeric identifier of the subtask.
ServName	The name of the started service.
ExitName	The name of the IUCV exit for this subtask.
Capacity	The number of clients this subtask can handle concurrently.
InUse	The number of clients currently connected.
Threads	The number of threads available to service clients of this subtask.
Waiters	The number of clients waiting to be serviced.

Messages and Return Codes

BKW0201E Subtask not found.

IUCV QUERY

```
►►──IUCV──QUERY──subtaskid──────────────────────────────────────────────────►◄
```

Purpose

Queries a specific IUCV subtask.

Operands

subtaskid
The identifier of the subtask to query.

Options

None

Usage Note

The output form is:

```
Instance C-Block  Userid    BytesIn    BytesOut
-------- -------  ------    -------    --------
32       01D2E6DC RICHARD   22         22
```

The columns have the following meanings:

Instance	The numeric identifier of the instance.
C-Block	The address of the C-block for this client.
Userid	The mapped user ID of the client.
BytesIn	The number of bytes the IUCV line driver has queued for the instance.
BytesOut	The number of bytes the instance has queued for the IUCV line driver to transmit to the client.

Messages and Return Codes

BKW0201E Subtask not found.
BKW0208I Subtask is handling no clients.

IUCV REPORT

```
►►──IUCV──REPORT──┬─ON──┬──────────────────────────────────────────────────►◄
                  └─OFF─┘
```

Purpose

Toggles reporting state for the IUCV line driver.

Operands

ON
Turns reporting on.

OFF
Turns reporting off.

Options

None

Usage Note

When reporting is on, the IUCV line driver issues the following messages to describe client activity:

- BKW1602I
- BKW1603I
- BKW1604I
- BKW1605I

For more information, see “IUCV Line Driver Messages” on page 432.

Messages and Return Codes

None

IUCV START

```
►►──IUCV──START──servicename──┬─────────────────────────┬──────────────────────►◄
                              └─maxclients──┬─────────┬─┘
                                            └─exitname─┘
```

Purpose

Starts a service, connecting it to the IUCV line driver.

Operands

servicename
The name of the service to start, as specified on a call to `ssServiceBind`.

maxclients
The maximum number of concurrent clients permitted for the subtask.

exitname
The `HNDIUCV` exit name to be used for the subtask.

Options

None

Usage Notes

1. If *maxclients* is not specified, the current value of configuration parameter `SRV_THREADS` is used.
2. If *exitname* is not specified, the value of *servicename* is used.
3. The started service is identified by a number called the *subtask ID*. Use this identifier to refer to the started service in future commands.

Messages and Return Codes

BKW0200E Service not found.
BKW0207E Start of self is prohibited.
BKW1607E Client count must be greater than zero.
BKW1608E Unable to HNDIUCV SET.
BKW1609E Unable to create controlling thread.

IUCV STOP

```
►►──IUCV──STOP──subtaskid──┬──────────┬──────────────────────────────────────────►◄
                           ├─NOW──────┤
                           └─instance─┘
```

Purpose

Stops a specific IUCV subtask, optionally denying currently-connected clients the privilege of completing their operations, or stops a specific client and affiliated instance.

Operands

subtaskid
The identifier of the subtask to stop.

instance
The number of the instance to stop.

Options

NOW
Stop the subtask without letting current clients complete normally.

Usage Notes

1. If `NOW` is specified, the subtask is stopped immediately and clients are not given the opportunity to finish their work.
2. If *instance* is specified, only that specific connection is terminated.

Messages and Return Codes

BKW0201E Subtask not found.
BKW1600I Instance STOP requested.
BKW1606E Wait expired for STOP.

MONITOR DISPLAY

```
►►──MONITOR──DISPLAY──┬──────────────────┬──────────────────────────────────────────────►◄
                      └─type──┬────────┬─┘
                              └─name───┘
```

Purpose

Displays one or more rows of monitor data.

Operands

type
The type of monitor row to display.

size
The name of a specific monitor row of the given type.

Options

None

Usage Notes

1. If *type* is not specified, all monitor rows are displayed.
2. If only *type* is specified, all rows of the specified type are displayed.
3. If both *type* and *name* are specified, the specific row described is displayed.
4. For each qualifying monitor row, the display consists simply of the address and length of the row and the storage at those locations.

Messages and Return Codes

BKW1400E Matching monitor row not found.

MONITOR USER

```
►►──MONITOR──USER──────────────────────────────────────────────────────►◄
```

Purpose

Displays the user monitor buffer.

Operands

None

Options

None

Usage Note

The display consists simply of the address and length of the user monitor buffer and the storage at those locations.

Messages and Return Codes

None

MSG LIST

```
►►──MSG──LIST──────────────────────────────────────────────────────────────►◄
```

Purpose

Lists the subtasks associated with the MSG/SMSG line driver.

Operands

None

Options

None

Usage Note

This command displays information about the services started through the MSG/SMSG line driver. The output form is:

```
Subtask  Service  Prefix   Instances
-------  -------  ------   ---------
0        MSG      MSG      1
1        SERVER   SERVER   1
```

The columns have the following meanings:

Subtask	The numeric identifier of the subtask.
Service	The name of the started service.
Prefix	The prefix used to send input to the service.
Instances	The number of instances of the service the line driver is controlling.

Messages and Return Codes

None

MSG QUERY

```
►►──MSG──QUERY──subtaskid──────────────────────────────────────────────────►◄
```

Purpose

Queries a specific MSG/SMSG subtask.

Operands

subtaskid
The identifier of the subtask to query.

Options

None

Usage Note

This command displays information about all of the instances of the requested subtask. The output form is:

```
Instance C-block  ThreadID Userid    BytesIn    BytesOut
-------- -------  -------- ------    -------    --------
1        01EE0F5C 16       BKW       175        446
```

In this output, the columns have the following meanings:

Instance	The numeric identifier of the instance.
C-block	The address of the instance's C-block.
ThreadID	The CMS thread ID of the thread on which the instance is running.
Userid	The user ID of the client affiliated with the instance.
BytesIn	The number of bytes the client has provided to the instance.
BytesOut	The number of bytes the instance has provided to the client.

Messages and Return Codes

BKW0201E Subtask not found.
BKW0208I Subtask is handling no clients.

MSG START

```
►►──MSG──START──servicename──┬────────┬──────────────────────────────────────────►◄
                             └─prefix─┘
```

Purpose

Starts a service, connecting it to the MSG/SMSG line driver.

Operands

servicename
The name of the service to start, as specified on a call to `ssServiceBind`.

prefix
The prefix that will identify commands that should be sent to this service.

Options

None

Usage Notes

1. If *prefix* is not specified, then the value of *servicename* is used for the prefix.
2. The started service is identified by a number called the *subtask ID*. Use this identifier to refer to the started service in future commands.

Messages and Return Codes

BKW0005E Out of storage.
BKW0200E Service not found.
BKW0205E Prefix already in use.
BKW0206E Service INIT routine failed - RC=&1 RE=&2.
BKW0207E Start of self is prohibited.

MSG STOP

```
►►──MSG──STOP──subtaskid──┬─────┬──────────────────────────────────────────────►◄
                          └─NOW─┘
```

Purpose

Stops a specific MSG/SMSG subtask, optionally denying currently-connected clients the privilege of completing their operations.

Operands

subtaskid
The identifier of the subtask to stop.

Options

NOW
Stop the subtask without letting current clients complete normally.

Usage Notes

None

Messages and Return Codes

BKW0201E Subtask not found.
BKW0202E Stop of self is prohibited.
BKW0203I Subtask asked to STOP.
BKW0204I Subtask killed.

SERVER SERVICES

```
►►──SERVER──SERVICES──────────────────────────────────────────────────────────►◄
```

Purpose

Displays a summary of the bound services.

Operands

None

Options

None

Usage Note

This command causes the reusable server kernel to display a list of the bound services with some descriptive information about each service. The output form is:

```
Service  S-block  Type Init     Service  Term     Count
-------  -------  ---- ----     -------  ----     -----
USERID   01EFEF40 N    00000000 81E94530 81E94D18 0
SERVER   01EFEF70 N    00000000 81E94530 81E94D18 1
CONFIG   01EFEFA0 N    00000000 81E94530 81E94D18 1
CONSOLE  01EFEFD0 LDSS 81E93478 81E939C8 81E94408 1
```

The meanings of the columns are:

Service	The name of the bound service.
S-block	The address of the service's S-block.
Type	The type of the bound service. Types are: `N` Normal service; `LD` Line driver; `LDSS` Self-sourced line driver
Init	The address of the service's initialization routine.
Service	The address of the service's service routine.
Term	The address of the service's termination routine.
Count	The number of line drivers that have started this service.

Messages and Return Codes

None

SERVER MONITOR

```
►►──SERVER──MONITOR──────────────────────────────────────────────────────►◄
```

Purpose

Gives information about the Diagnose X'00DC' monitor buffer.

Operands

None

Options

None

Usage Note

This command tells the user the:

- Location of the monitor buffer
- Size of the monitor buffer
- Number of rows in the monitor buffer
- Number of free rows in the monitor buffer

Messages and Return Codes

BKW0301I Monitor buffer at &1.&2, &3 rows, &4 free

SERVER STOP

```
►►──SERVER──STOP──────────────────────────────────────────────────────────►◄
```

Purpose

Stops the server and the reusable server kernel.

Operands

None

Options

None

Usage Note

Issuing this command is equivalent to calling entry point `ssServerStop`. Both of these facilities cause `WAITSERV` to complete.

Messages and Return Codes

None

SGP CREATE

```
                     ┌────────┐
                     ▼        │
►►──SGP──CREATE──sgn───mdisk──┴──────────────────────────────────────────►◄
```

Purpose

Creates a storage group.

Operands

sgn
The number of the storage group to create.

mdisk
The device number of a minidisk to be used for the storage group.

Options

None

Usage Note

For more information, see “Usage Notes” on page 305.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

SGP DELETE

```
►►──SGP──DELETE──sgn──────────────────────────────────────────────────────────►◄
```

Purpose

Deletes a storage group.

Operands

sgn
The number of the storage group to delete.

Options

None

Usage Note

For more information, see “Usage Notes” on page 306.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

SGP LIST

```
►►──SGP──LIST──────────────────────────────────────────────────────────►◄
```

Purpose

Displays a list of the known storage groups.

Operands

None

Options

None

Usage Notes

1. This command causes the reusable server kernel to display a list of the known storage groups. The output format is:

   ```
   SGrp Name     Blocks     IOMode Status
   ---- ----     ------     ------ ------
   2    main     4000       blk-rw 40000000
   5    spare    82400      blk-ro 20000000
   ```

   The meanings of the columns are:

SGrp	The storage group number.	
Name	The name of the storage group.	
Blocks	The total number of 4 KB blocks in the storage group.	
IOMode	The mode in which the storage group was started.	
	off	not started
	blk-ro	block mode read-only
	blk-rw	block mode read-write
Status	Status bits	
	X'80000000'	Stop is in progress
	X'40000000'	I/O using VM Data Spaces
	X'20000000'	I/O using DIAG X'250'

2. For more information, see “Usage Notes” on page 310 and “Usage Notes” on page 313.

Messages and Return Codes

BKW0005E Out of storage.
BKW0007E RC=&1 RE=&2 from routine &3

SGP MDLIST

```
►►──SGP──MDLIST──sgn──────────────────────────────────────────────────────────►◄
```

Purpose

Displays specific information about the minidisks of a storage group.

Operands

sgn
The number of the storage group to interrogate.

Options

None

Usage Notes

1. This command causes the reusable server kernel to display a list of the minidisks associated with a given storage group. The output format is:

   ```
   VDev Blocks
   ---- ------
   1004 34006
   0FC2 14200
   ```

   The meanings of the columns are:

VDev	The device number of the minidisk.
Total	The number of 4 KB blocks on the minidisk.

2. For more information, see "Usage Notes" on page 313.

Messages and Return Codes

BKW0005E Out of storage.
BKW0007E RC=&1 RE=&2 from routine &3

SGP START

```
                                   ┌─BLOCKRW──────┐   ┌─DS──────────┐
►►──SGP──START──sgn──groupname─────┼──────────────┼───┼─────────────┼──────────────────────────►◄
                                   └──┬─BLOCKRO─┬─┘   └──┬─DS───┬───┘
                                      └─BLOCKRW─┘        └─NODS─┘
```

Purpose

Starts a specific storage group.

Operands

sgn
The number of the storage group to start.

groupname
The symbolic name to be assigned to the storage group.

BLOCKRO
The storage group should be started in block mode read-only.

BLOCKRW
The storage group should be started in block mode read-write.

DS
The reusable server kernel should attempt to use VM Data Spaces for I/O.

NODS
The reusable server kernel should not attempt to use VM Data Spaces for I/O.

Options

None

Usage Note

For more information, see “Usage Notes” on page 317.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

SGP STOP

```
►►──SGP──STOP──sgn──────────────────────────────────────────────────────►◄
```

Purpose

Stops a specific storage group.

Operands

sgn
The number of the storage group to stop.

Options

None

Usage Note

For more information, see “Usage Notes” on page 320.

Messages and Return Codes

BKW0007E RC=&1 RE=&2 from routine &3

SPOOL LIST

```
►►──SPOOL──LIST────────────────────────────────────────────────────────────►◄
```

Purpose

Lists the subtasks associated with the SPOOL line driver.

Operands

None

Options

None

Usage Note

This command displays information about the services started through the spool line driver. The output form is:

```
Subtask  Service  Prefix   Instances
-------  -------  ------   ---------
0        SPOOL    SPOOL    1
1        SERVER   SERVER   1
```

The columns have the following meanings:

Subtask	The numeric identifier of the subtask.
Service	The name of the started service.
Prefix	The file name used to send input to the service.
Instances	The number of instances of the service the line driver is controlling.

Messages and Return Codes

None

SPOOL QUERY

```
►►──SPOOL──QUERY──subtaskid──────────────────────────────────────────────►◄
```

Purpose

Queries a specific SPOOL subtask.

Operands

subtaskid
The identifier of the subtask to query.

Options

None

Usage Notes

This command displays information about all of the instances of the requested subtask. The output form is:

```
Instance C-block  ThreadID Userid    BytesIn    BytesOut
-------- -------  -------- ------    -------    --------
1        01EE0F5C 16       BKW       175        446
```

In this output, the columns have the following meanings:

Instance	The numeric identifier of the instance.
C-block	The address of the instance's C-block.
ThreadID	The CMS thread ID of the thread on which the instance is running.
Userid	The user ID of the client affiliated with the instance.
BytesIn	The number of bytes the client has provided to the instance.
BytesOut	The number of bytes the instance has provided to the client.

Messages and Return Codes

BKW0201E Subtask not found.
BKW0208I Subtask is handling no clients.

SPOOL START

```
►►──SPOOL──START──servicename──spoolfn──────────────────────────────────────►◄
```

Purpose

Starts a service, connecting it to the SPOOL line driver.

Operands

servicename
The name of the service to start, as specified on a call to `ssServiceBind`.

spoolfn
The file name of spool files that should be directed to this service.

Options

None

Usage Notes

1. If *prefix* is not specified, then the value of *servicename* is used for the prefix.
2. The started service is identified by a number called the *subtask ID*. Use this identifier to refer to the started service in future commands.

Messages and Return Codes

BKW0005E Out of storage.
BKW0200E Service not found.
BKW0205E Prefix already in use.
BKW0206E Service INIT routine failed - RC=&1 RE=&2.
BKW0207E Start of self is prohibited.

SPOOL STOP

```
►►──SPOOL──STOP──subtaskid──┬─────┬──────────────────────────────────────────────►◄
                            └─NOW─┘
```

Purpose

Stops a specific SPOOL subtask, optionally denying currently-connected clients the privilege of completing their operations.

Operands

subtaskid
The identifier of the subtask to stop.

Options

NOW
Stop the subtask without letting current clients complete normally.

Usage Notes

None

Messages and Return Codes

BKW0201E Subtask not found.
BKW0202E Stop of self is prohibited.
BKW0203I Subtask asked to STOP.
BKW0204I Subtask killed.

SUBCOM LIST

```
►►──SUBCOM──LIST──────────────────────────────────────────────────────────►◄
```

Purpose

Lists the subtasks associated with the SUBCOM line driver.

Operands

None

Options

None

Usage Note

This command displays information about the services started through the SUBCOM line driver. The output form is:

```
Subtask  Service  Prefix   Instances
-------  -------  ------   ---------
0        SUBCOM   SUBCOM   1
1        SERVER   SERVER   1
```

The columns have the following meanings:

Subtask	The numeric identifier of the subtask.
Service	The name of the started service.
Prefix	The prefix used to send input to the service.
Instances	The number of instances of the service the line driver is controlling.

Messages and Return Codes

None

SUBCOM QUERY

```
►►──SUBCOM──QUERY──subtaskid──────────────────────────────────────────────►◄
```

Purpose

Queries a specific SUBCOM subtask.

Operands

subtaskid
The identifier of the subtask to query.

Options

None

Usage Note

This command displays information about all of the instances of the requested subtask. The output form is:

```
Instance C-block  ThreadID Userid    BytesIn    BytesOut
-------- -------  -------- ------    -------    --------
1        01EE0F5C 16       *         175        446
```

In this output, the columns have the following meanings:

Instance	The numeric identifier of the instance.
C-block	The address of the instance's C-block.
ThreadID	The CMS thread ID of the thread on which the instance is running.
Userid	The user ID of the client affiliated with the instance.
BytesIn	The number of bytes the client has provided to the instance.
BytesOut	The number of bytes the instance has provided to the client.

Messages and Return Codes

BKW0201E Subtask not found.
BKW0208I Subtask is handling no clients.

SUBCOM START

```
►►──SUBCOM──START──servicename──┬────────┬──────────────────────────────────────────►◄
                                └─prefix─┘
```

Purpose

Starts a service, connecting it to the SUBCOM line driver.

Operands

servicename
The name of the service to start, as specified on a call to `ssServiceBind`.

prefix
The prefix that will identify commands that should be sent to this service.

Options

None

Usage Notes

1. If *prefix* is not specified, the value of *servicename* is used for the prefix.
2. The started service is identified by a number called the *subtask ID*. Use this identifier to refer to the started service in future commands.

Messages and Return Codes

BKW0005E Out of storage.
BKW0200E Service not found.
BKW0205E Prefix already in use.
BKW0206E Service INIT routine failed - RC=&1 RE=&2.
BKW0207E Start of self is prohibited.

SUBCOM STOP

```
►►──SUBCOM──STOP──subtaskid──┬─────┬──────────────────────────────────────────────────►◄
                             └─NOW─┘
```

Purpose

Stops a specific SUBCOM subtask, optionally denying currently-connected clients the privilege of completing their operations.

Operands

subtaskid
The identifier of the subtask to stop.

Options

NOW
Stop the subtask without letting current clients complete normally.

Usage Notes

None

Messages and Return Codes

BKW0201E Subtask not found.
BKW0202E Stop of self is prohibited.
BKW0203I Subtask asked to STOP.
BKW0204I Subtask killed.

TCP LIST

```
►►──TCP──LIST──────────────────────────────────────────────────────────────►◄
```

Purpose

Lists the subtasks associated with the TCP/IP line driver.

Operands

None

Options

None

Usage Note

This command displays information about the services started through the TCP/IP line driver. The output form is:

```
Subtask ServName BPort Adapter_Address TCPStack Sokts InUse Thrds
------- -------- ----- --------------- -------- ----- ----- -----
2       WEBSERV  80    0.0.0.0         TCPIP    100   17    31
4       WEBADMIN 90    9.117.32.29     TCPIP    50    4     13
```

The columns have the following meanings:

Subtask	The numeric identifier of the subtask.
ServName	The name of the started service.
BPort	The port number to which the service is bound.
Adapter_Address	The adapter address to which the port is bound.
TCPStack	The user ID of the TCP/IP virtual machine through which this subtask's TCP activity is taking place.
Sokts	The number of sockets available to the subtask.
InUse	The number of sockets currently in use.
Thrds	The number of CMS threads servicing this subtask.

Messages and Return Codes

BKW0201E Subtask not found.

TCP QUERY

```
►►──TCP──QUERY──subtaskid──────────────────────────────────────────────────►◄
```

Purpose

Queries a specific TCP/IP subtask.

Operands

subtaskid
The identifier of the subtask to query.

Options

None

Usage Note

The ouput form is:

```
Instance C-Block  Userid    RPort Remote_Host     BytesIn    BytesOut
-------- -------  ------    ----- -----------     -------    --------
2        030F0210 PAUL      1401  9.130.79.171    165        32436
5        030F0500 FRED      833   9.117.32.29     8223       11234385
```

The columns and their meanings are:

Instance	The numeric identifier of this instance.
C-Block	The address of the instance's C-block.
Userid	The mapped user ID of the client being served by this instance, as produced by the `ssUseridMap`.
RPort	The port number through which the client's connection is exiting the client computer.
Remote_Host	The IP address of the client computer.
BytesIn	The number of bytes received from the client so far.
BytesOut	The number of bytes sent to the client so far.

Messages and Return Codes

BKW0201E Subtask not found.
BKW0208I Subtask is handling no clients.

TCP REPORT

```
►►──TCP──REPORT──┬─ON──┬─────────────────────────────────────────────────►◄
                 └─OFF─┘
```

Purpose

Toggles reporting state for the TCP/IP line driver.

Operands

ON
Turns reporting on.

OFF
Turns reporting off.

Options

None

Usage Note

When reporting is on, the TCP/IP line driver issues the following messages to describe client activity:

- BKW0500I
- BKW0501I
- BKW0502I
- BKW0504I

For more information, see “TCP and UDP Line Driver Messages” on page 417.

Messages and Return Codes

None

TCP START

```
                                   ┌─50──0.0.0.0──TCPIP──────────────┐
►►──TCP──START──servicename──port──┼─────────────────────────────────┼──────────────────►◄
                                   └─sockets──┬─0.0.0.0──TCPIP────┐  │
                                              ├───────────────────┼──┘
                                              └─adapter──┬─TCPIP───┤
                                                         ├─────────┘
                                                         └─tcpname─┘
```

Purpose

Starts a service, connecting it to the TCP line driver.

Operands

servicename
The name of the service to start, as specified on a call to `ssServiceBind`.

port
The port number on which the reusable server kernel should make the service available.

sockets
The number of sockets the reusable server kernel should make available for this port.

adapter
The IP address of the adapter over which you want this service to accept requests (specify `0.0.0.0` to mean “any of this VM system's adapters”).

tcpname
The name of the TCP/IP service machine through which the reusable server kernel should access the TCP/IP network.

Options

None

Usage Notes

1. Operand *port* must be between 1 and 65535 inclusive.
2. Operand *sockets* must be between 50 and 2000 inclusive.
3. The started service is identified by a number called the *subtask ID*. Use this identifier to refer to the started service in future commands.

Messages and Return Codes

BKW0200E Service not found.
BKW0207E Start of self is prohibited.
BKW0513E Port number must be in range [0..65535].
BKW0514E Socket count must be in range [50..2000].
BKW0005E Out of storage.
BKW0516E Creation of subtask controller thread failed.
BKW0517E Creation of TCP/IP socket group failed.
BKW0518E Creation of listen socket failed.
BKW0519E Setting listen socket to SO_REUSEADDR failed.
BKW0520E Setting listen socket to nonblocking failed.
BKW0521E bind() for listen socket failed.
BKW0522E listen() for listen socket failed.

TCP STOP

```
►►──TCP──STOP──subtaskid──┬─────┬──────────────────────────────────────────────►◄
                          └─NOW─┘
```

Purpose

Stops a specific TCP/IP subtask, optionally denying currently-connected clients the privilege of completing their operations.

Operands

subtaskid
The identifier of the subtask to stop.

Options

NOW
Stop the subtask without letting current clients complete normally.

Usage Notes

None

Messages and Return Codes

BKW0201E Subtask not found.
BKW0523I Instance STOP requested.
BKW0524E Wait expired for STOP.

TRIE LIST

```
►►──TRIE──LIST──────────────────────────────────────────────────────────►◄
```

Purpose

Lists the tries created by this virtual machine.

Operands

None

Options

None

Usage Note

The output form is:

```
Name     ASIT             LastFree NextFree Nodes      Records
----     ---------------- -------- -------- -----      -------
D0000001 7690F9000000001E 7FFFFFFF 0F4585B8 3050166    421008
D0000002 7690F88000000008 3FFFFFFF 2B934EEC 8697007    421008
```

The columns have the following meanings:

Name	The trie name supplied by the creator.
ASIT	The ASIT of the data space containing the trie.
LastFree	The address of the last byte of the trie data space.
NextFree	The address of the next free byte in the trie data space.
Nodes	The number of nodes in the trie.
Records	The number of record numbers being held onto by the trie.

Messages and Return Codes

BKW1900E No tries found.

UDP LIST

```
►►──UDP──LIST──────────────────────────────────────────────────────────────►◄
```

Purpose

Lists the subtasks associated with the UDP/IP line driver.

Operands

None

Options

None

Usage Note

This command displays information about the services started through the UDP/IP line driver. The output form is:

```
Subtask ServName BPort Adapter_Address TCPStack InProg Thrds
------- -------- ----- --------------- -------- ------ -----
2       MYSERV   85    0.0.0.0         TCPIP    17     31
4       MYADMIN  95    9.117.32.29     TCPIP    4      13
```

The columns have the following meanings:

Subtask	The numeric identifier of the subtask.
ServName	The name of the started service.
BPort	The port number to which the service is bound.
Adapter_Address	The adapter address to which the port is bound.
TCPStack	The user ID of the TCP/IP virtual machine through which this subtask's UDP activity is taking place.
InProg	The number of transactions in progress at the moment.
Thrds	The number of CMS threads servicing this subtask.

Messages and Return Codes

BKW0201E Subtask not found.

UDP QUERY

```
►►──UDP──QUERY──subtaskid──────────────────────────────────────────────────────►◄
```

Purpose

Queries a specific UDP/IP subtask.

Operands

subtaskid
The identifier of the subtask to query.

Options

None

Usage Note

The output form is:

```
Instance C-Block  Userid    RPort Remote_Host     BytesIn    BytesOut
-------- -------  ------    ----- -----------     -------    --------
2        030F0210 PAUL      1401  9.130.79.171    165        0
5        030F0500 FRED      833   9.117.32.29     8223       0
```

The columns and their meanings are:

Instance	The numeric identifier of this instance.
C-Block	The address of the instance's C-block.
Userid	The mapped user ID of the client being served by this instance, as produced by the `ssUseridMap`.
RPort	The port number through which the client's connection is exiting the client computer.
Remote_Host	The IP address of the client computer.
BytesIn	The number of bytes received from the client so far.
BytesOut	The number of bytes sent to the client so far.

Messages and Return Codes

BKW0201E Subtask not found.
BKW0208I Subtask is handling no clients.

UDP REPORT

```
►►──UDP──REPORT──┬─ON──┬──────────────────────────────────────────────────────►◄
                 └─OFF─┘
```

Purpose

Toggles reporting state for the UDP/IP line driver.

Operands

ON
Turns reporting on.

OFF
Turns reporting off.

Options

None

Usage Note

When reporting is on, the UDP/IP line driver issues the following messages to describe client activity:

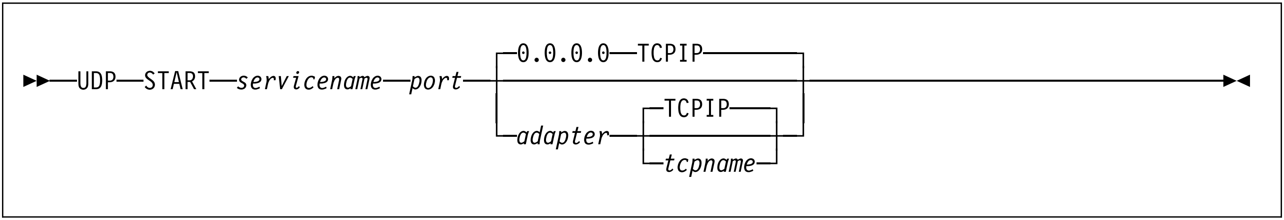
- BKW0500I
- BKW0501I
- BKW0502I
- BKW0504I

For more information, see “TCP and UDP Line Driver Messages” on page 417.

Messages and Return Codes

None

UDP START



Purpose

Starts a service, connecting it to the UDP line driver.

Operands

servicename
The name of the service to start, as specified on a call to `ssServiceBind`.

port
The port number on which the reusable server kernel should make the service available.

adapter
The IP address of the adapter over which you want this service to accept requests (specify `0.0.0.0` to mean “any of this VM system's adapters”).

tcpname
The name of the TCP/IP service machine through which the reusable server kernel should access the TCP/IP network.

Options

None

Usage Notes

1. Operand *port* must be between 1 and 65535 inclusive.
2. The started service is identified by a number called the *subtask ID*. Use this identifier to refer to the started service in future commands.

Messages and Return Codes

BKW0200E Service not found.
BKW0207E Start of self is prohibited.
BKW0513E Port number must be in range [0..65535].
BKW0514E Socket count must be in range [50..2000].
BKW0005E Out of storage.
BKW0516E Creation of subtask controller thread failed.
BKW0517E Creation of TCP/IP socket group failed.
BKW0518E Creation of listen socket failed.
BKW0519E Setting listen socket to SO_REUSEADDR failed.
BKW0520E Setting listen socket to nonblocking failed.

BKW0521E bind() for listen socket failed.
BKW0522E listen() for listen socket failed.

UDP STOP

```
►►──UDP──STOP──subtaskid──┬─────┬──────────────────────────────────────────►◄
                          └─NOW─┘
```

Purpose

Stops a specific UDP/IP subtask, optionally denying currently-connected clients the privilege of completing their operations.

Operands

subtaskid
The identifier of the subtask to stop.

Options

NOW
Stop the subtask without letting current clients complete normally.

Usage Notes

None

Messages and Return Codes

BKW0201E Subtask not found.
BKW0523I Instance STOP requested.
BKW0524E Wait expired for STOP.

USERID MAP

```
►►──USERID──MAP──line_driver_name──node──user──────────────────────────────────►◄
```

Purpose

Interrogates the user ID mapping file.

Operands

line_driver_name
The name of the line driver whose mapping is being interrogated.

node
The nodename as known to the specified line driver.

user
The user ID as known to the specified line driver.

Options

None

Usage Note

The mapping is interrogated and the result displayed.

Messages and Return Codes

BKW0401I &1 &2 &3 maps to &4
BKW0402E RC=&1 RE=&2 mapping &3 &4 &5

USERID RELOAD

```
►►──USERID──RELOAD───────────────────────────────────────────────────────►◄
```

Purpose

Reloads the user ID mapping file.

Operands

None

Options

None

Usage Note

The user ID mapping file is reloaded from whatever file is nominated by configuration parameter `UMAP_FILE`.

Messages and Return Codes

BKW0400E Reload failed - DMSOPEN or DMSREAD RC=&1 RE=&2.

WORKER ADD

```
                                  ┌─1────────┐
►►──WORKER──ADD──classname──userid──┼──────────┼──────────────────────────────────────────►◄
                                  └─capacity─┘
```

Purpose

Adds a worker machine to a worker class, creating the class if the class does not yet exist.

Operands

classname
The name of the worker class to which the worker machine should be added.

userid
The user ID of the worker virtual machine.

capacity
The number of IUCV connections the worker machine is capable of handling concurrently.

Options

1 The worker is capable of handling one connection at a time.

Usage Notes

1. Case is significant in class names.
2. Do not add a given worker virtual machine to more than one worker class. Unpredictable results will occur.

Messages and Return Codes

BKW1800E Worker machine is already in the specified class.

WORKER CLASSES

```
►►──WORKER──CLASSES──────────────────────────────────────────────────────►◄
```

Purpose

Displays summary information about the worker classes.

Operands

None

Options

None

Usage Note

The output format is:

```
Class    D Machines   C-Limit    C-InUse
-----    - --------   -------    -------
cgiserv  n 2          2          0
```

The columns have the following meanings:

Column	Meaning
Class	Name of class
D	Whether workers are being managed as if they might be distributed on other nodes y Managed as if distributed n Managed as if local
Machines	Number of worker machines
C-Limit	Total number of connections permitted
C-InUse	Number of connections at the moment

Messages and Return Codes

BKW1803E No worker classes defined.

WORKER DELCLASS

```
►►──WORKER──DELCLASS──classname──┬───────┬──────────────────────────────────────────►◄
                                 └─FORCE─┘
```

Purpose

Deletes a worker class, requesting instances to close their connections to the workers therein.

Operands

classname
The name of the worker class being deleted.

FORCE
The server kernel should forcibly sever the IUCV connections to the workers in the class.

Options

None

Usage Notes

1. Case is significant in class names.
2. If `FORCE` is not specified, the server kernel sends each instance a message asking it to end its connections with its workers in the affected class. Each instance is expected to finish up quickly and end its connection.
3. If `FORCE` is specified, the server kernel will `IUCV SEVER` all connections to workers in the class and inform each affected instance that its connections to those workers have been lost. After this, each worker machine found to be running disconnected will be forced off through `CP FORCE`.

Messages and Return Codes

BKW1802E Worker class not found.

WORKER DELETE

```
►►──WORKER──DELETE──userid──┬───────┬────────────────────────────────────────────►◄
                            └─FORCE─┘
```

Purpose

Deletes a single worker machine from its class.

Operands

userid
The user ID of the worker virtual machine.

FORCE
The server kernel should forcibly break any existing IUCV connections to the worker machine.

Options

None

Usage Notes

1. If `FORCE` is not specified, the server kernel sends each affected instance a message asking it to end its connections with the worker. The instances are expected to finish up quickly and end their connections to the worker.
2. If `FORCE` is specified, the server kernel will `IUCV SEVER` all connections to the worker and inform each affected instance that its connections to the worker have been lost. After this, if the worker is found to be running disconnected, it will be forced off through `CP FORCE`.

Messages and Return Codes

BKW1801E Worker machine not found.

WORKER DISTRIBUTE

```
►►──WORKER──DISTRIBUTE──classname──┬─ON──┬──────────────────────────────────────────►◄
                                   └─OFF─┘
```

Purpose

Controls whether the reusable server kernel will attempt to manage a worker class as if the worker machines were located on other systems.

Operands

classname
The name of the worker class to which the command applies.

ON
Manage as if distributed.

OFF
Manage as if local.

Options

None

Usage Notes

1. Case is significant in class names.
2. When you set **DISTRIBUTE OFF** for a class, the reusable server kernel manages the workers as if they were running on the same instance of CP as the server itself. More specifically, the reusable server kernel uses the `XAUTOLOG` and `FORCE` commands to control the workers in the class. For example, if the server kernel determines that another worker needs to be logged on, it will issue `XAUTOLOG` to log on the new worker.
3. When you set **DISTRIBUTE ON** for a class, the reusable server kernel manages the workers as if they might be running on other systems. In particular, the reusable server kernel suppresses any attempts it might make to use the `XAUTOLOG` or `FORCE` commands to manage the worker machines in the class. Instead, responsibility for managing the machines is left to the server operator or system programmer.

Messages and Return Codes

BKW1802E Worker class not found.

WORKER MACHINES

```
►►──WORKER──MACHINES──classname──────────────────────────────────────►◄
```

Purpose

Displays a table of status information about worker machines in a given class.

Operands

classname
The name of the class for which worker status should be displayed.

Options

None

Usage Notes

1. Case is significant in class names.
2. The output form is:

```
Machine  State    S Capacity   InUse
-------  -----    - --------   -----
MPT002   -        0 1          0
```

The columns have the following meanings:

Column	**Meaning**	
Machine	The user ID of the worker machine	
State	What CP QUERY USER reports about the worker machine, or - if the worker is not logged on	
S	The status of the worker machine, as follows:	
	0	Seems usable
	1	Repeated FORCE-XAUTOLOG cycles did not bring this worker to life
	2	Tried to XAUTOLOG this worker but could not do so - possible insufficient privilege to use XAUTOLOG command
	3	Unrecoverable error trying to IUCV CONNECT
	4	Tried to reset worker through CP FORCE but command failed - possible insufficient privilege to use FORCE
	5	CP FORCE succeeded but virtual machine did not log off - worker machine appears hung
Capacity	The number of IUCV connections the worker can handle concurrently	
InUse	The number of IUCV connections to the worker right now	

Messages and Return Codes

BKW1802E Worker class not found.
BKW1805E No worker machines found.

WORKER RESET

```
►►──WORKER──RESET──classname──┬────────┬──────────────────────────────────────────►◄
                              └─userid─┘
```

Purpose

Resets the status information the server kernel retains about a worker machine.

Operands

classname
The name of the class to be reset.

userid
The specific worker machine whose status is to be reset.

Options

None

Usage Notes

1. Case is significant in class names.
2. This command is meant to be used after manual intervention has supposedly resolved the problems the server kernel has detected in trying to use a worker machine or a class of worker machines. For example, the system administrator might have omitted the `IUCV ALLOW` statements in the workers' CP directory entries, and when the server attempted to use those workers, it found it could not connect to them. Once the CP directory has been repaired, `WORKER RESET` can be used to wipe out the server kernel's memory of the difficulty.
3. If *userid* is omitted, the status for all machines in the class is reset.

Messages and Return Codes

BKW1801E Worker machine not found.
BKW1802E Worker class not found.

WORKER STATUS

```
►►──WORKER──STATUS──┬───────────┬──────────────────────────────────────────────►◄
                    └─classname─┘
```

Purpose

Displays information about the current set of connections to worker machines.

Operands

classname
The name of the worker class for which status information should be displayed.

Options

None

Usage Notes

1. Case is significant in class names.
2. The output form is:

```
Class    Machine  W-CBlock  I-CBlock  I-Service
-----    -------  --------  --------  ---------
cgiserv  MPT001   03FF3048  03FE21F8  HTTP
```

The columns and their meanings are:

Column	**Meaning**
Class	The worker class involved
Machine	The worker machine to which the connection leads
W-CBlock	The address of the worker C-block
I-CBlock	The address of the instance C-block
I-Service	The service with which the instance is affiliated

Messages and Return Codes

BKW1802E Worker class not found.
BKW1804E No worker connections found.

Chapter 15. Function Descriptions

This chapter describes application programming interfaces (APIs) provided as part of the reusable server kernel. To review, the APIs can be partitioned into a number of subsets:

Table 44. Programming Interfaces

Subset	Description
Anchor	Provides a means for manipulating an anchor word.
Authorization	Provides a means for manipulating an authorization database.
Cache	Provides a means for manipulating cached files.
Client	Provides a means for manipulating buffers of client data.
Enroll	Provides a means for manipulating enrollment data.
Memory	Provides a means for manipulating memory.
Server	Provides a means for starting and stopping the server.
Service	Provides a means for identifying services.
Storage group	Provides a means for manipulating storage groups.
Tries	Provides a means for manipulating tries.
User ID	Provides a means for mapping user IDs.
Worker	Provides a means for connecting to a worker machine.

Programmers should be aware of the these restrictions regarding the use of these APIs:

- `RSKMAIN` can call only `ssServiceBind` and `ssServerRun`.
- `ssServiceBind` can be called only by `RSKMAIN` and only before `ssServerRun`.
- `ssServerRun` can be called only by `RSKMAIN` and only once.

Note: Failure to adhere to these restrictions could cause unpredictable results.

ssAnchorGet — Get Anchor Value

```
ssAnchorGet
                    retcode
                    reascode
                    anchor
                    monbufptr
                    monbufsize
```

Purpose

Retrieves the value of the application-wide anchor word and the address and size of the application monitor data area.

Operands

ssAnchorGet
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAnchorGet`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAnchorGet`.

anchor
(output,INT,4) is a signed four-byte binary output variable to hold the returned anchor value.

monbufptr
(output,POINTER,4) is a signed four-byte binary output variable to hold the address of the application monitor buffer.

monbufsize
(output,INT,4) is a signed four-byte binary output variable to hold the size of the application monitor buffer.

Usage Notes

1. If the application-wide anchor word has not yet been set, this routine returns zero as the value of the anchor word.
2. The value returned in *monbufsize* is the value of the `MON_USER_SIZE` configuration variable.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_anc_rc_success	*ss_anc_re_success*	`ssAnchorGet` completed successfully

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMANC MACRO
PL/X	SSPLXANC COPY

ssAnchorSet — Set Anchor Value

```
ssAnchorSet
                    retcode
                    reascode
                    anchor
```

Purpose

Sets the value of the application-wide anchor word.

Operands

ssAnchorSet
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAnchorSet`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAnchorSet`.

anchor
(input,INT,4) is a signed four-byte binary input variable holding the new anchor value.

Usage Notes

None

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_anc_rc_success	*ss_anc_re_success*	`ssAnchorSet` completed successfully

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMANC MACRO
PL/X	SSPLXANC COPY

ssAuthCreateClass — Create an Object Class

```
ssAuthCreateClass
                    retcode
                    reascode
                    class_id
                    operation_count
                    operation_array
```

Purpose

Creates a class in the authorization rule base.

Operands

ssAuthCreateClass
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAuthCreateClass`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAuthCreateClass`.

class_id
(input,CHAR,8) is a character string holding the identifier of the new class.

operation_count
(input,INT,4) is a signed four-byte binary input variable holding the number of operations defined on the class.

operation_array
(input,CHAR,4**operation_count*) is an array of character strings holding the operations defined on the class.

Usage Note

For more information on the naming conventions and other limits for the authorization API, see "Naming Conventions and Other Limits" on page 42.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_aut_rc_success	*ss_aut_re_success*	`ssAuthCreateClass` completed successfully
ss_aut_rc_error	*ss_aut_re_bad_count*	*operation_count* out of range
ss_aut_rc_error	*ss_aut_re_out_of_storage*	Not enough storage available
ss_aut_rc_error	*ss_aut_re_exists*	Class already exists
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed
ss_aut_rc_error	*ss_aut_re_cvw_fail*	Condition variable wait failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed

Return Code	Reason Code	Meaning
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_write_fail*	Unable to write authorization files
ss_aut_rc_error	*ss_aut_re_prev_io_error*	API disabled due to I/O error on previous call
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssAuthCreateObject — Create an Object

```
ssAuthCreateObject
                    retcode
                    reascode
                    object_name
                    object_name_length
                    class_id
```

Purpose

Creates an object in the authorization rule base, assigning the object to the specified class.

Operands

ssAuthCreateObject
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAuthCreateObject`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAuthCreateObject`.

object_name
(input,CHAR,*object_name_length*) is a character string holding the name of the object.

object_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *object_name*.

class_id
(input,INT,4) is a signed four-byte binary input variable holding the identifier of the class to which the object belongs.

Usage Note

For more information on the naming conventions and other limits for the authorization API, see“Naming Conventions and Other Limits” on page 42 .

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_aut_rc_success	*ss_aut_re_success*	`ssAuthCreateObject` completed successfully
ss_aut_rc_error	*ss_aut_re_bad_obj_length*	*object_name_length* out of range
ss_aut_rc_error	*ss_aut_re_out_of_storage*	Not enough storage available
ss_aut_rc_error	*ss_aut_re_no_class*	Class does not exist
ss_aut_rc_error	*ss_aut_re_exists*	Object already exists
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed

Return Code	**Reason Code**	**Meaning**
ss_aut_rc_error	*ss_aut_re_cvw_fail*	Condition variable wait failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_write_fail*	Unable to write authorization files
ss_aut_rc_error	*ss_aut_re_prev_io_error*	API disabled due to I/O error on previous call
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssAuthDeleteClass — Delete a Class

```
ssAuthDeleteClass
                        retcode
                        reascode
                        class_id
                        option_count
                        option_array
```

Purpose

Deletes the objects in a class, and optionally deletes the class.

Operands

ssAuthDeleteClass
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAuthDeleteClass`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAuthDeleteClass`.

class_id
(input,CHAR,8) is a character string holding the identifier of the class to be deleted.

option_count
(input,INT,4) is a signed four-byte binary input variable holding the number of options in *option_array*.

option_array
(input,INT,4**option_count*) is an array of signed four-byte binary input variables holding the deletion options.

Usage Notes

1. These options are recognized:

ss_aut_objects_only	Delete only the class's objects
ss_aut_objects_and_class	Delete the class and the class's objects (default)

2. For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_aut_rc_success	*ss_aut_re_success*	`ssAuthDeleteClass` completed successfully
ss_aut_rc_error	*ss_aut_re_bad_count*	*option_count* is out of range
ss_aut_rc_error	*ss_aut_re_bad_option*	At least one element of *option_array* is unrecognized
ss_aut_rc_error	*ss_aut_re_no_class*	Class does not exist
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed
ss_aut_rc_error	*ss_aut_re_cvw_fail*	Condition variable wait failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_write_fail*	Unable to write authorization files
ss_aut_rc_error	*ss_aut_re_prev_io_error*	API disabled due to I/O error on previous call
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssAuthDeleteObject — Delete an Object

ssAuthDeleteObject
retcode
reascode
object_name
object_name_length
option_count
option_array

Purpose

Deletes the rules associated with an object, and optionally deletes the object.

Operands

ssAuthDeleteObject
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAuthDeleteObject`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAuthDeleteObject`.

object_name
(input,CHAR,*object_name_length*) is a character string holding the name of the object.

object_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *object_name*

option_count
(input,INT,4) is a signed four-byte binary input variable holding the number of options in *option_array*.

option_array
(input,INT,4**option_count*) is an array of signed four-byte binary input variables holding the options to be applied to the deletion.

Usage Notes

1. These deletion options are recognized:

ss_aut_rules_only	Delete only the object's rules
ss_aut_rules_and_object	Delete the object and all its rules (default)

2. For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_aut_rc_success	*ss_aut_re_success*	`ssAuthDeleteObject` completed successfully
ss_aut_rc_error	*ss_aut_re_bad_obj_length*	*object_name_length* out of range
ss_aut_rc_error	*ss_aut_re_bad_count*	*option_count* is out of range
ss_aut_rc_error	*ss_aut_re_bad_option*	Unrecognized option in *option_array*
ss_aut_rc_error	*ss_aut_re_no_object*	Object does not exist
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed
ss_aut_rc_error	*ss_aut_re_cvw_fail*	Condition variable wait failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_write_fail*	Unable to write authorization files
ss_aut_rc_error	*ss_aut_re_prev_io_error*	API disabled due to I/O error on previous call
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssAuthDeleteUser — Delete a User

```
ssAuthDeleteUser
                         retcode
                         reascode
                         user_name
                         user_name_length
                         class_name
                         option_count
                         option_array
```

Purpose

Deletes rules associated with a given user.

Operands

ssAuthDeleteUser
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAuthDeleteUser`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAuthDeleteUser`.

user_name
(input,CHAR,*user_name_length*) is a character string holding the name of the user.

user_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *user_name*

class_name
(input,CHAR,8) is the name of the class from which rules should be deleted.

option_count
(input,INT,4) is a signed four-byte binary input variable holding the number of deletion options specified.

option_array
(input,INT,4**option_count*) is an array of signed four-byte binary input variables holding the deletion options.

Usage Notes

1. If no deletion options are specified, or if option *ss_aut_all_classes* is specified, then every rule applicable to the named user is deleted.
2. If *ss_aut_specific_class* is specified in the options array, then the only rules deleted are those that both apply to objects belonging to class *class_name* and mention the named user.
3. To adjust a given user's rules for a specific object, use routine *ssAuthPermitUser*.
4. For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_aut_rc_success	*ss_aut_re_success*	`ssAuthDeleteUser` completed successfully
ss_aut_rc_error	*ss_aut_re_bad_user_length*	*user_name_length* out of range
ss_aut_rc_error	*ss_aut_re_bad_count*	*option_count* out of range
ss_aut_rc_error	*ss_aut_re_bad_option*	Unrecognized option in *option_array*
ss_aut_rc_error	*ss_aut_re_no_user*	No rules exist for *user_name*
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed
ss_aut_rc_error	*ss_aut_re_cvw_fail*	Condition variable wait failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_write_fail*	Unable to write authorization files
ss_aut_rc_error	*ss_aut_re_prev_io_error*	API disabled due to I/O error on previous call
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssAuthListClasses — List Classes

```
ssAuthListClasses
                        retcode
                        reascode
                        match_key
                        match_key_length
                        classes_expected
                        class_buffer
                        classes_returned
```

Purpose

Returns a list of classes.

Operands

ssAuthListClasses
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAuthListClasses`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAuthListClasses`.

match_key
(input,CHAR,*match_key_length*) is an input character string holding the match key.

match_key_length
(input,INT,4) is a signed four-byte binary input variable holding the length of the match key.

classes_expected
(input,INT,4) is a signed four-byte binary input variable holding the number of eight-byte class names that will fit in *class_buffer*.

class_buffer
(output,CHAR,140**classes_expected*) is an output buffer into which the list of classes and their defined operations is to be placed.

classes_returned
(output,INT,4) is a signed four-byte binary output variable to hold the number of classes defined.

Usage Notes

1. `ssAuthListClasses` returns a list of the classes whose names match the match key specified by the caller. The operations defined on those classes are also returned.
2. The key expressed in *match_key* is expressed according to the CMS Application Multitasking syntax for IPC and event match keys.
3. Each class returned consumes 140 bytes in the output buffer, as follows:

Offset.Length	**Usage**
0.8	Class name
8.4	Number of operations
12.128	Operations (4 bytes each)

4. If the actual number of classes defined is greater than *classes_expected*, then the actual number of classes defined is returned in *classes_returned*, as many class names as will fit are filled into the output buffer, and a warning return and reason code are produced.
5. For more information on the naming conventions and other limits for the authorization API, see "Naming Conventions and Other Limits" on page 42.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_aut_rc_success	*ss_aut_re_success*	`ssAuthListClasses` completed successfully
ss_aut_rc_error	*ss_aut_re_bad_count*	*classes_expected* is out of range
ss_aut_rc_warning	*ss_aut_re_too_many*	Some class names did not fit into the output buffer
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_prev_io_error*	API disabled due to I/O error on previous call
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssAuthListObjects — List Objects in Class

ssAuthListObjects
retcode
reascode
class_id
match_key
match_key_length
object_names_expected
object_name_buffer_pointers
object_name_buffer_sizes
object_name_lengths
object_names_returned

Purpose

Generates a list of the names of the objects belonging to a given class.

Operands

ssAuthListObjects
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAuthListObjects`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAuthListObjects`.

class_id
(input,CHAR,8) is a character string holding the class to be interrogated.

match_key
(input,CHAR,*match_key_length*) is an input character string holding the match key.

match_key_length
(input,INT,4) is a signed four-byte binary input variable holding the length of the match key.

object_names_expected
(input,INT,4) is a signed four-byte binary input variable holding the number of elements in the *object_name_buffer_pointers*, *object_name_buffer_sizes*, and *object_name_lengths* arrays.

object_name_buffer_pointers
(input,POINTER,4**object_names_expected*) is an array of pointers to buffers to hold the returned object names.

object_name_buffer_sizes
(input,INT,4**object_names_expected*) is an array of signed four-byte binary input variables holding the sizes of the buffers pointed to by the elements of *object_name_buffer_pointers*.

object_name_lengths
(output,INT,4**object_names_expected*) is an array of signed four-byte binary output variables to hold the lengths of the returned object names.

object_names_returned
(output,INT,4) is a signed four-byte binary output variable to hold the actual number of object names matching the supplied key.

Usage Notes

1. This function returns the names of the objects belonging to class *class_id* and matching key *match_key*.
2. The key expressed in *match_key* is expressed according to the CMS Application Multitasking syntax for IPC and event match keys.
3. If the actual number of objects selected by *match_key* is greater than *object_names_expected*, then the actual number of objects selected is returned in *object_names_returned*, as many object names as will fit are filled into the output arrays, and a warning return and reason code are produced.
4. If an object name does not fit into the buffer described by its pair of elements from the *object_name_buffer_pointers* and *object_name_buffer_sizes* arrays, then the actual length of the object name is returned in the corresponding element of the *object_name_lengths*, as much of the object name as will fit is returned in the object name buffer, and a warning return and reason code are produced.
5. If both of the above-mentioned warning conditions are encountered, the reason code will indicate that more object names were available than would fit in the output arrays (in other words, the truncated object name condition will not be visible through reason code).
6. For more information on the naming conventions and other limits for the authorization API, see "Naming Conventions and Other Limits" on page 42.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_aut_rc_success	*ss_aut_re_success*	`ssAuthListObjects` completed successfully
ss_aut_rc_error	*ss_aut_re_bad_count*	*object_names_expected* out of range
ss_aut_rc_error	*ss_aut_re_no_class*	Class does not exist
ss_aut_rc_warning	*ss_aut_re_too_many*	More object names were available than caller expected
ss_aut_rc_warning	*ss_aut_re_trunc*	One or more returned object names was truncated
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_prev_io_error*	API disabled due to I/O error on previous call
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssAuthModifyClass — Modify an Object Class

```
ssAuthModifyClass
                     retcode
                     reascode
                     class_id
                     operation_count
                     operation_array
```

Purpose

Adds operations to an existing object class.

Operands

ssAuthModifyClass
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAuthModifyClass`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAuthModifyClass`.

class_id
(input,CHAR,8) is a character string holding the identifier of the class being modified.

operation_count
(input,INT,4) is a signed four-byte binary input variable holding the number of operations to be added to the class.

operation_array
(input,CHAR,4**operation_count*) is an array of character strings holding the operations to be added to the class.

Usage Notes

1. Use this function when it becomes necessary to define one or more new operations on a class (and therefore on all objects belonging to it).
2. For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_aut_rc_success	*ss_aut_re_success*	`ssAuthModifyClass` completed successfully
ss_aut_rc_error	*ss_aut_re_bad_count*	*operation_count* out of range
ss_aut_rc_error	*ss_aut_re_no_class*	Class does not exist
ss_aut_rc_error	*ss_aut_re_too_many*	Operation limit on class would be exceeded

Return Code	Reason Code	Meaning
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed
ss_aut_rc_error	*ss_aut_re_cvw_fail*	Condition variable wait failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_write_fail*	Unable to write authorization files
ss_aut_rc_error	*ss_aut_re_prev_io_error*	API disabled due to I/O error on previous call
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssAuthPermitUser — Permit a User

```
ssAuthPermitUser
                        retcode
                        reascode
                        user_name
                        user_name_length
                        object_name
                        object_name_length
                        use_arrays
                        operation_count
                        operation_array
                        operation_qualifiers
                        update_results
```

Purpose

Installs, modifies, or deletes a rule in the rule base.

Operands

ssAuthPermitUser
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAuthPermitUser`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAuthPermitUser`.

user_name
(input,CHAR,*user_name_length*) is a character string holding the name of the user.

user_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *user_name*.

object_name
(input,CHAR,*object_name_length*) is a character string holding the name of the object.

object_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *object_name*.

use_arrays
(input,INT,4) is a signed four-byte binary input variable holding a flag indicating how the operation arrays should be applied to the rule.

operation_count
(input,INT,4) is a signed four-byte binary input variable holding the length of the *operation_array*, *operation_qualifiers* and *update_results* arrays.

operation_array
(input,CHAR,4**operation_count*) is an array of character strings holding the operations being edited.

operation_qualifiers
(input,INT,4**operation_count*) is an array of signed four-byte binary input variables holding the interpretation rules for the corresponding elements of *operation_array*.

update_results
(output,INT,4**operation_count*) is an array of signed four-byte binary output variables to hold the results of applying the changes requested in the corresponding elements of the *operation_array* and *operation_qualifier* arrays.

Usage Notes

1. These values are recognized in *use_arrays*:

ss_aut_add_all	First add all operations defined on the object to the user's rule for the object, then use the operation arrays to further update the user's rule
ss_aut_delete_all	First completely delete the current rule, then use the operation arrays to construct a new rule
ss_aut_use_arrays	Just update the current rule, using the operation arrays

2. These items are recognized in *operation_qualifiers*:

ss_aut_add_operation	Add the corresponding operation in *operation_array*
ss_aut_remove_operation	Remove the corresponding operation in *operation_array*

3. These items are filled into *update_results*:

ss_aut_op_not_defined	Operation is not defined on class to which object belongs
ss_aut_op_permitted	Operation is now permitted
ss_aut_op_not_permitted	Operation is now not permitted
ss_aut_no_change	Requested update did not change user's rule for object

4. To completely remove a rule, use *ss_aut_delete_all* and *operation_count*=0.
5. To grant “blanket” access to an object, use *ss_aut_add_all* and *operation_count*=0.
6. To grant all authorities except ones you explicitly wish to exclude, use *ss_aut_add_all* followed by an operation array naming the authorities you wish to exclude, each entry being qualified by *ss_aut_remove_operation*.
7. To “edit” an existing rule, use *ss_aut_use_arrays* and operation arrays containing the changes you wish to apply.
8. For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_aut_rc_success	*ss_aut_re_success*	`ssAuthPermitUser` completed successfully
ss_aut_rc_warning	*ss_aut_re_bad_op*	One or more of the elements of *operation_array* is not defined on this object's class
ss_aut_rc_error	*ss_aut_re_bad_user_length*	*user_name_length* out of range
ss_aut_rc_error	*ss_aut_re_bad_obj_length*	*object_name_length* out of range
ss_aut_rc_error	*ss_aut_re_bad_use*	*use_arrays* contains an unrecognized value
ss_aut_rc_error	*ss_aut_re_bad_count*	*operation_count* out of range
ss_aut_rc_error	*ss_aut_re_bad_qual*	One or more of the elements of *operation_qualifiers* is unrecognized
ss_aut_rc_error	*ss_aut_re_out_of_storage*	Not enough storage available
ss_aut_rc_error	*ss_aut_re_no_object*	Object does not exist
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed
ss_aut_rc_error	*ss_aut_re_cvw_fail*	Condition variable wait failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_write_fail*	Unable to write authorization files
ss_aut_rc_error	*ss_aut_re_prev_io_error*	API disabled due to I/O error on previous call
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssAuthQueryObject — Query an Object

ssAuthQueryObject
retcode
reascode
object_name
object_name_length
class_id
userids_expected
userid_buffer_pointers
userid_buffer_sizes
userid_lengths
userids_returned

Purpose

Queries an object, returning the class to which it belongs and a list of the user IDs for which a rule exists for the object.

Operands

ssAuthQueryObject
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAuthQueryObject`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAuthQueryObject`.

object_name
(input,CHAR,*object_name_length*) is a character string holding the name of the object.

object_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *object_name*.

class_id
(output,CHAR,8) is a character string to hold the class to which the object belongs.

userids_expected
(input,INT,4) is a signed four-byte binary input variable holding the number of elements in the *userid_buffer_pointers*, *userid_buffer_sizes*, and *userid_lengths* arrays.

userid_buffer_pointers
(input,POINTER,4**userids_expected*) is an array of pointers to buffers to hold the returned user IDs.

userid_buffer_sizes
(input,INT,4**userids_expected*) is an array of signed four-byte binary input variables holding the sizes of the buffers pointed to by the elements of *userid_buffer_pointers*.

userid_lengths
(output,INT,4**userids_expected*) is an array of signed four-byte binary output variables to hold the lengths of the returned user IDs.

userids_returned
(output,INT,4) is a signed four-byte binary output variable to hold the actual number of user IDs for which a rule exists for the object.

Usage Notes

1. If the actual number of user IDs for which a rule exists is greater than *userids_expected*, then the actual number of user IDs is returned in *userids_returned*, as many user IDs as will fit are filled into the output arrays, and a warning return and reason code are produced.
2. If a user ID does not fit into the buffer described by the pair of elements from the *userid_buffer_pointers* and *userid_buffer_sizes* arrays, then the actual length of the user ID is returned in the corresponding element of the *userid_lengths* arrays, as much of the user ID as will fit is returned in the buffer, and a warning return and reason code are produced.
3. If both of the above-mentioned warning conditions are encountered, the reason code will indicate that more user IDs were available than would fit in the output arrays (in other words, the truncated user ID condition will not be visible through reason code).
4. To determine the specific access rights afforded to one of the returned user IDs, use `ssAuthQueryRule`.
5. For more information on the naming conventions and other limits for the authorization API, see “Naming Conventions and Other Limits” on page 42.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_aut_rc_success	*ss_aut_re_success*	`ssAuthQueryObject` completed successfully
ss_aut_rc_error	*ss_aut_re_bad_obj_length*	*object_name_length* out of range
ss_aut_rc_error	*ss_aut_re_bad_count*	*userids_expected* out of range
ss_aut_rc_error	*ss_aut_re_no_object*	Object does not exist
ss_aut_rc_warning	*ss_aut_re_too_many*	Some user IDs did not fit into the output arrays
ss_aut_rc_warning	*ss_aut_re_trunc*	One or more returned user IDs was truncated
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_prev_io_error*	API disabled due to I/O error on previous call
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssAuthQueryRule — Query a Rule

```
ssAuthQueryRule
                    retcode
                    reascode
                    user_name
                    user_name_length
                    object_name
                    object_name_length
                    operations_expected
                    operation_array
                    operations_returned
```

Purpose

Queries the operations a user can perform against an object.

Operands

ssAuthQueryRule
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAuthQueryRule`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAuthQueryRule`.

user_name
(input,CHAR,*user_name_length*) is a character string holding the name of the user.

user_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *user_name*.

object_name
(input,CHAR,*object_name_length*) is a character string holding the name of the object.

object_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *object_name*.

operations_expected
(input,INT,4) is a signed four-byte binary input variable holding the size of *operation_array*.

operation_array
(output,CHAR,4**operations_expected*) is an array of character strings to hold the operations the user is permitted to perform.

operations_returned
(output,INT,4) is a signed four-byte binary output variable to hold the number of operations filled into *operation_array*.

Usage Notes

1. If the actual number of operations permitted is greater than *operations_expected*, then the actual number of operations permitted is returned in *operations_returned*, as many operations as will fit are filled into *operation_array*, and a warning return and reason code are produced.
2. If the named user is not permitted any operations against the named object, then a successful return and reason code are generated and *operations_returned* is set to zero.
3. For more information on the naming conventions and other limits for the authorization API, see "Naming Conventions and Other Limits" on page 42.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_aut_rc_success	*ss_aut_re_success*	`ssAuthQueryRule` completed successfully
ss_aut_rc_error	*ss_aut_re_bad_user_length*	*user_name_length* out of range
ss_aut_rc_error	*ss_aut_re_bad_obj_length*	*object_name_length* out of range
ss_aut_rc_error	*ss_aut_re_bad_count*	*operations_expected* out of range
ss_aut_rc_error	*ss_aut_re_no_object*	Object does not exist
ss_aut_rc_warning	*ss_aut_re_too_many*	Some operations did not fit into *operation_array*
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_prev_io_error*	API disabled due to I/O error on previous call
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssAuthReload — Reload Authorization Data

```
ssAuthReload
                        retcode
                        reascode
```

Purpose

Resets the internal authorization engine.

Operands

ssAuthReload
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from ssAuthReload.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from ssAuthReload.

Usage Note

This function is intended for use when an I/O error of some kind shuts off the authorization API (causes *ss_aut_re_prev_io_error* to be returned). It performs these functions:

- Closes all authorization data files, ignoring close errors.

  Note: For the SFS, the work unit was rolled back at the time the error was detected. For other repositories, the log file and update algorithms provide appropriate recovery mechanisms.

- Returns its CMS work unit ID, if applicable.
- Flushes all caches.
- Gets a new CMS work unit ID, if applicable.
- Reopens the data files.
- If applicable, attempts to recover the authorization database (processes log file and realigns the two copies).
- Reloads the authorization index into storage.

If all these operations were successful, the authorization API is again available for use.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_aut_rc_success	*ss_aut_re_success*	ssAuthReload completed successfully
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed
ss_aut_rc_error	*ss_aut_re_cvw_fail*	Condition variable wait failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed
ss_aut_rc_error	*ss_aut_re_gwu_fail*	DMSGETWU (Get Work Unit ID) failed
ss_aut_rc_error	*ss_aut_re_open_fail*	Unable to open authorization files
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_write_fail*	Unable to write authorization files
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssAuthTestOperations — Test Operations

```
ssAuthTestOperations
                         retcode
                         reascode
                         user_name
                         user_name_length
                         object_name
                         object_name_length
                         operation_count
                         desired_operations
                         test_results
```

Purpose

Tests a given user's rights to perform a set of actions against a given object.

Operands

ssAuthTestOperations
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssAuthTestOperations`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssAuthTestOperations`.

user_name
(input,CHAR,*user_name_length*) is a character string holding the name of the user.

user_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *us/r_name*.

object_name
(input,CHAR,*object_name_length*) is a character string holding the name of the object.

object_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *object_name*.

operation_count
(input,INT,4) is a signed four-byte binary input variable holding the length of the *desired_operations* and *test_results* arrays.

desired_operations
(input,CHAR,4**operation_count*) is an array of character strings holding the operations to be tested.

test_results
(output,INT,4**operation_count*) is an array of signed four-byte binary output variables to hold the results of the tests.

Usage Notes

1. On successful completion, each element of *test_results* will contain one of these values:

ss_aut_op_permitted	Operation is permitted
ss_aut_op_not_permitted	Operation is not permitted
ss_aut_op_not_defined	Operation is not defined

2. For more information on the naming conventions and other limits for the authorization API, see "Naming Conventions and Other Limits" on page 42.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_aut_rc_success	*ss_aut_re_success*	`ssAuthTestOperations` completed successfully
ss_aut_rc_error	*ss_aut_re_bad_user_length*	*user_name_length* out of range
ss_aut_rc_error	*ss_aut_re_bad_obj_length*	*object_name_length* out of range
ss_aut_rc_error	*ss_aut_re_bad_count*	*operation_count* out of range
ss_aut_rc_error	*ss_aut_re_no_object*	Object does not exist
ss_aut_rc_error	*ss_aut_re_maq_fail*	Mutex acquisition failed
ss_aut_rc_error	*ss_aut_re_cvs_fail*	Condition variable signal failed
ss_aut_rc_error	*ss_aut_re_mr_fail*	Mutex release failed
ss_aut_rc_error	*ss_aut_re_read_fail*	Unable to read authorization files
ss_aut_rc_error	*ss_aut_re_prev_io_error*	API disabled due to I/O error on previous call
ss_aut_rc_error	*ss_aut_re_prev_sync_error*	API disabled due to synchronization error on previous call

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMAUT MACRO
PL/X	SSPLXAUT COPY

ssCacheCreate — Create Cache

```
ssCacheCreate
                    retcode
                    reascode
                    cache_name
                    cache_size
                    cache_alet
```

Purpose

Creates a file cache, using a VM Data Space.

Operands

ssCacheCreate
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssCacheCreate`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssCacheCreate`.

cache_name
(input,CHAR,8) is a character string holding the name of the new file cache.

cache_size
(input,INT,4) is a signed four-byte binary input variable holding the size of the new file cache.

cache_ALET
(output,INT,4) is a signed four-byte binary output variable to hold the returned ALET.

Usage Notes

1. The cache name is used directly in a call to `ssMemoryCreateDS` and therefore must not conflict with any other subpool names.
2. The cache size is to be given in pages. It must be greater than 0 and less than or equal to 524288. The actual size of the created cache is rounded up to the next 16-page boundary.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_fil_rc_success	*ss_fil_re_success*	`ssCacheCreate` completed successfully
ss_fil_rc_error	*ss_fil_re_bad_size*	*cache_size* is out of range
ss_fil_rc_error	*ss_fil_re_cache_exists*	Cache already exists
ss_fil_rc_error	*ss_fil_re_out_of_storage*	Out of storage
ss_fil_rc_error	*ss_fil_re_dscr_fail*	Creation of data space failed

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMCAC MACRO
PL/X	SSPLXCAC COPY

ssCacheDelete — Delete Cache

```
ssCacheDelete
                    retcode
                    reascode
                    cache_name
```

Purpose

Deletes a file cache.

Operands

ssCacheDelete
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssCacheDelete`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssCacheDelete`.

cache_name
(input,CHAR,8) is a character string holding the name of the file cache to be deleted.

Usage Notes

1. Once deletion starts, the server kernel will not honor any more calls to `ssCacheFileOpen` for this cache.
2. The deletion does not complete until the last open file in this cache is closed.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_fil_rc_success	*ss_fil_re_success*	`ssCacheDelete` completed successfully
ss_fil_rc_error	*ss_fil_re_cache_not_found*	Cache not found

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMCAC MACRO
PL/X	SSPLXCAC COPY

ssCacheFileClose — Close Cached File

```
ssCacheFileClose
                         retcode
                         reascode
                         cache_name
                         file_token
```

Purpose

Close a cached file.

Operands

ssCacheFileClose
: is the name of the function being invoked.

retcode
: (output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssCacheFileClose`.

reascode
: (output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssCacheFileClose`.

cache_name
: (input,CHAR,8) is a character string holding the name of the cache in which the file being closed is located.

file_token
: (input,CHAR,8) is a character string holding the token of the file being closed.

Usage Note

If the file being closed was previously marked as stale, it is dropped from the cache.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_fil_rc_success	*ss_fil_re_success*	`ssCacheFileClose` completed successfully
ss_fil_rc_error	*ss_fil_re_cache_not_found*	Cache does not exist
ss_fil_rc_error	*ss_fil_re_bad_token*	File token is bad

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMCAC MACRO
PL/X	SSPLXCAC COPY

ssCacheFileOpen — Open Cached File

```
ssCacheFileOpen
                    retcode
                    reascode
                    cache_name
                    file_name
                    file_name_length
                    ESM_data
                    ESM_data_length
                    flag_count
                    flag_names
                    flag_values
                    file_token
                    cache_ALET
                    file_address
                    file_size
                    file_stamp
```

Purpose

Makes a file ready for reading from a cache, loading it from minidisk, SFS, or BFS if necessary.

Operands

ssCacheFileOpen
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssCacheFileOpen`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssCacheFileOpen`.

cache_name
(input,CHAR,8) is a character string holding the name of the cache in which the file is to be placed.

file_name
(input,CHAR,*file_name_length*) is a character string holding the name of the file to be cached.

file_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *file_name*.

ESM_data
(input,CHAR,*ESM_data_length*) is a character string holding ESM data to be passed to `DMSOPEN`.

ESM_data_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *ESM_data*.

flag_count
(input,INT,4) is a signed four-byte binary input variable holding the number of elements in each of the the *flag_names* and *flag_values* arrays.

flag_names
(input,INT,4**flag_count*) is an array of signed four-byte binary input variables holding flag names.

flag_values
(input,INT,4**flag_count*) is an array of signed four-byte binary input variables holding flag values.

file_token
(output,CHAR,8) is a character string to hold the returned file token.

cache_ALET
(output,INT,4) is a signed four-byte binary output variable to hold the ALET of the cache data space.

file_address
(output,POINTER,4) is a signed four-byte binary output variable to hold the address of the file in the data space.

file_size
(output,INT,4) is a signed four-byte binary output variable to hold the size of the cached file in bytes.

file_stamp
(output,CHAR,32) is a character string to hold the returned last update date and time of the file.

Usage Notes

1. Parameters *file_name* and *file_name_length* together describe a string which will be passed unchanged to either CSL routine `DMSOPEN` or CSL routine `BPX1OPN` as the name of the file to be opened. The CSL routine the server kernel chooses depends on the values you specify in the flag arrays. Be aware that case is significant in file names.
2. The server kernel will pass parameters *ESM_data* and *ESM_data_length* unchanged to `DMSOPEN` if it ends up calling `DMSOPEN` to find the file. The server kernel will ignore the ESM data if it ends up calling `BPX1OPN`.
3. Parameter arrays *flag_names* and *flag_values* together contain integers specifying various controls on how the file is to be cached. These integers and their meanings are described in Table 45 on page 258.

Table 45 (Page 1 of 2). Flags for ssCacheFileOpen

Flag Name	Function	Acceptable Values	Default Value
ss_cac_ofn_bfs	Corresponding value tells the server kernel whether to use BPX1OPN to open the file.	Specify *ss_cac_ofv_yes* for BPX1OPN or *ss_cac_ofv_no* for DMSOPEN.	If you do not mention this flag in your flag arrays, the server kernel will try to guess whether to use DMSOPEN or BPX1OPN based on the composition of the filename string you supply. If the filename you supply contains a blank (X'40'), the server kernel will try DMSOPEN. If it contains no blanks, the server kernel will try BPX1OPN.
ss_cac_ofn_xlate	Corresponding value nominates a translation table previously identified through ssCacheXlTabSet.	Any table ID, or zero to bypass translations.	Zero
ss_cac_ofn_preserve_dolr	Corresponding value specifies whether the file's date of last reference should be preserved (that is, not updated). *Ignored if the server kernel ends up calling BPX1OPN.*	Specify *ss_cac_ofv_yes* or *ss_cac_ofv_no*.	*ss_cac_ofv_no*
ss_cac_ofn_recmethod_fs	Corresponding value describes how the server kernel should expect the records to be delimited in the file it is reading from disk.	• **X'00xxxxxx'** - The file's records are delimited according to the structure recorded by the CMS file system (F1 for BFS files). • **X'01nnssss'** - The file's records are delimited by an *nn*-byte suffix appearing in the file's data after each record. Set *nn* equal to X'00', X'01', or X'02'. The suffix bytes to be used are *ssss*. If *nn* is X'01' the second suffix byte is ignored. • **X'02nnxxxx'** - The file's records are delimited by an *nn*-byte length prefix appearing in the file's data before each record. The length prefix does not include the length of the prefix itself. Set *nn* equal to X'02' or X'04'.	X'00000000'

Table 45 (Page 2 of 2). Flags for ssCacheFileOpen

Flag Name	Function	Acceptable Values	Default Value
ss_cac_ofn_recmethod_cache	Corresponding value describes how the server kernel should delimit records in the cached file.	• **X'01nnssss'** - Put an *nn*-byte suffix on each record. Set *nn* equal to X'00', X'01', or X'02'. The suffix bytes to be used are *ssss*. If *nn* is X'01' the second suffix byte is ignored. • **X'02nnxxxx'** - Prefix each record with a *nn*-byte length field. The length prefix does not include the length of the prefix itself. Set *nn* equal to X'02' or X'04'.	X'01000000'

4. Use the value supplied in output *file_token* in calls to `ssCacheFileRead` and `ssCacheFileClose`.
5. If the server kernel was able to load the file contiguously in data space storage, then it returns the cache's ALET in *cache_ALET* and the address of the file buffer in *file_address*. This lets the server know that it can use AR mode to access the file data directly if it chooses. If the file was not loaded contiguously, *cache_ALET* and *file_address* are returned as zero.
6. The number of bytes cached -- that is, the size of the transformed file, in bytes -- is returned in *file_size*.
7. If the data space is too full to contain the file, the server kernel throws away cached files in LRU fashion, skipping those files that are still open, until enough storage is freed to hold the new file. If the server kernel removes all files eligible for removal but the new file still will not fit, an error is returned.
8. If there are stale versions of the new file still in the cache, and those stale versions are no longer open, they are discarded prior to loading the new file. Stale, still-open versions are marked as stale and thrown out when they are finally closed.
9. A file's date of last reference is never updated on a cache hit, no matter what the caller requested.
10. Cache contents are indexed by file name as passed by the caller. Depending on accessed file modes, default filepools, SFS aliasing, and default filespaces, several different file names might actually refer to the same physical file; the server kernel cannot discern that these names all refer to the same file. Callers need to be aware of this phenomenon and might need to perform some file name resolution prior to calling `ssCacheFileOpen` in order to keep unnecessary duplicates out of a file cache.

    Similarly, if the server is referring to files using file mode letters and is switching the accessed file mode set through the ACCESS and RELEASE commands, the same name might refer to two different files at two different moments in time. The cache will be unharmed by this as long as those two different files have different update timestamps, but if two such files have the same update timestamp the cache will fail to reload when a reload truly is required. The server author is responsible for avoiding this situation.

11. Files with record formats other than V or F (as returned by `DMSEXIST`) cannot be cached.
12. Files with names longer than 256 bytes cannot be cached.
13. If you requested suffixing or prefixing for *ss_cac_ofn_recmethod_fs*, the records encountered in the file must all be less than or equal to 65,535 bytes in length.
14. On VM/ESA 2.3.0 and later, *file_stamp* is always returned in ISO format. On earlier VM/ESA releases, if the cached file was loaded from SFS or minidisk the stamp is returned in ISO format, but if the cached file was loaded from BFS the first four bytes of the returned stamp are Posix time and the remainder of the stamp is blank (`X'40'`).

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_fil_rc_success	*ss_fil_re_success*	`ssCacheFileOpen` completed successfully
ss_fil_rc_error	*ss_fil_re_cache_not_found*	Cache does not exist
ss_fil_rc_error	*ss_fil_re_bad_length*	Bad value in *file_name_length*
ss_fil_rc_error	*ss_fil_re_bad_count*	Bad value in *flag_count*
ss_fil_rc_error	*ss_fil_re_bad_esmdl*	Bad value in *ESM_data_length*
ss_fil_rc_error	*ss_fil_re_bad_fname*	Bad value in *flag_names*
ss_fil_rc_error	*ss_fil_re_bad_fval*	Bad value in *flag_values*
ss_fil_rc_error	*ss_fil_re_exist_fail*	Call to `DMSEXIST` failed
ss_fil_rc_error	*ss_fil_re_file_not_found*	`DMSOPEN` could not find file
ss_fil_rc_error	*ss_fil_re_bad_recfm*	Record format is neither F nor V

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMCAC MACRO
PL/X	SSPLXCAC COPY

ssCacheFileRead — Read Cached File

```
ssCacheFileRead
                    retcode
                    reascode
                    cache_name
                    file_token
                    byte_offset
                    byte_count
                    buffer
                    bytes_read
```

Purpose

Reads data from a cached file.

Operands

ssCacheFileRead
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssCacheFileRead`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssCacheFileRead`.

cache_name
(input,CHAR,8) is a character string holding the name of the cache in which the file is located.

file_token
(input,CHAR,8) is a character string holding the token of the file to be read.

byte_offset
(input,INT,4) is the zero-origin offset to the first byte of the file to be read.

byte_count
(input,INT,4) is the number of bytes to be read.

buffer
(output,CHAR,*byte_count*) is a character string to hold the bytes read from the file.

bytes_returned
(output,INT,4) is a signed four-byte binary output variable to hold the number of bytes read from the file.

Usage Notes

1. The server kernel supports multiple simultaneous read operations against a given file.
2. If not enough bytes are available to satisfy the call, as many bytes as are available are returned in the output buffer and success is returned.
3. If the supplied offset is less than zero or is past the end of the file, an error is returned.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_fil_rc_success	*ss_fil_re_success*	`ssCacheFileRead` completed successfully
ss_fil_rc_error	*ss_fil_re_cache_not_found*	Cache does not exist
ss_fil_rc_error	*ss_fil_re_bad_token*	Bad file token
ss_fil_rc_error	*ss_fil_re_bad_offset*	Bad file offset
ss_fil_rc_error	*ss_fil_re_bad_length*	Bad byte count

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMCAC MACRO
PL/X	SSPLXCAC COPY

ssCacheQuery — Query Cache

```
ssCacheQuery
                  retcode
                  reascode
                  cache_name
                  files_cached
                  cache_size
                  in_use
                  open_count
                  hit_count
```

Purpose

Returns basic statistics about a cache's operation.

Operands

ssCacheQuery
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssCacheQuery`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssCacheQuery`.

cache_name
(input,CHAR,8) is a character string holding the name of the file cache to be queried.

files_cached
(output,INT,4) is a signed four-byte binary output variable to hold the number of files currently resident in the cache.

cache_size
(output,INT,4) is a signed four-byte binary output variable to hold the size of the cache.

in_use
(output,INT,4) is a signed four-byte binary output variable to hold the amount of cache space currently in use.

open_count
(output,INT,4) is a signed four-byte binary output variable to hold the number of file opens processed through this cache.

hit_count
(output,INT,4) is a signed four-byte binary output variable to hold the number of times a file open was satisfied without having to call CMS to read the file from disk.

Usage Note

Parameters *cache_size* and *in_use* are returned in bytes.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_fil_rc_success	*ss_fil_re_success*	`ssCacheQuery` completed successfully
ss_fil_rc_error	*ss_fil_re_cache_not_found*	Cache not found

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMCAC MACRO
PL/X	SSPLXCAC COPY

ssCacheXlTabSet — Set Translation Table

```
ssCacheXlTabSet
                    retcode
                    reascode
                    table_id
                    table
```

Purpose

Sets translation table for use when reading files.

Operands

ssCacheXlTabSet
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssCacheXlTabSet`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssCacheXlTabSet`.

table_id
(input,INT,4) is a signed four-byte binary input variable holding the identifier of the new translation table.

table
(input,CHAR,256) is a character string holding the translation table itself.

Usage Notes

1. Parameter *table_id* can be any four-byte integer except zero.
2. If *table_id* was previously in use, the previous table is replaced and a warning is returned.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_fil_rc_success	*ss_fil_re_success*	`ssCacheXlTabSet` completed successfully
ss_fil_rc_warning	*ss_fil_re_table_replaced*	Table was replaced
ss_fil_rc_error	*ss_fil_re_bad_table_id*	Table ID cannot be zero
ss_fil_rc_error	*ss_fil_re_out_of_storage*	Out of storage

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMCAC MACRO
PL/X	SSPLXCAC COPY

ssClientDataGet — Get Client Data

```
ssClientDataGet
                              retcode
                              reascode
                              caller_type
                              C-block_address
                              get_method
                              buffer_alet
                              data_buffer
                              amount_wanted
                              amount_given
                              amount_remaining
```

Purpose

Obtains or discards data from client data buffers.

Operands

ssClientDataGet
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssClientDataGet`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssClientDataGet`.

caller_type
(input,INT,4) is a signed four-byte binary input variable holding an indicator of the kind of caller (instance or line driver).

C-block_address
(input,POINTER,4) is a signed four-byte binary input variable holding the address of the C-block for the client in question.

get_method
(input,INT,4) is a signed four-byte binary input variable holding an indicator of the kind of retrieval operation to be performed.

buffer_alet
(input,INT,4) is a signed four-byte binary input variable holding the ALET to be used when accessing *data_buffer*.

data_buffer
(input,CHAR,*amount_wanted*) is a character string into which the retrieved data is to be placed.

amount_wanted
(input,INT,4) is a signed four-byte binary input variable holding the number of bytes of data to be retrieved or discarded.

amount_given
(output,INT,4) is a signed four-byte binary output variable to hold the number of bytes actually returned or discarded.

amount_remaining
(output,INT,4) is a signed four-byte binary output variable to hold the number of bytes remaining in the client's buffers after the caller's operation completed.

Usage Notes

1. The *caller_type* should be set to one of these values:

ss_cli_iam_instance	The caller is an instance thread.
ss_cli_iam_linedriver	The caller is a line driver.

2. The *get_method* should be set to one of these values:

ss_cli_method_peek	Fill the caller's buffer but do not dequeue and discard it just yet from the reusable server kernel's internal buffers.
ss_cli_method_read	Fill the caller's buffer and dequeue and discard it from the reusable server kernel's internal buffers.
ss_cli_method_discard	Dequeue and discard the data from the reusable server kernel's internal buffers but do not fill it into the caller's buffer.

3. Setting *amount_wanted* to -1 means “perform this operation on all of the data currently buffered.”
4. If the caller asks for more data than is currently buffered, all of the currently available data is returned, *amount_given* is filled in appropriately, and no error is returned.
5. If the line driver you are using is record-oriented, then the data stream you read from the client will be organized into records, each record prefixed by a four-byte length. For more information on the description of record-oriented line drivers, see Table 8 on page 15. “Connectivity and Line Drivers.”

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_cli_rc_success	*ss_cli_re_success*	`ssClientDataGet` completed successfully
ss_cli_rc_error	*ss_cli_re_bad_iam*	*caller_type* contains unrecognized value
ss_cli_rc_error	*ss_cli_re_bad_method*	*get_method* contains unrecognized value
ss_cli_rc_error	*ss_cli_re_out_of_range*	*amount_wanted* contains illegal value

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMCLI MACRO
PL/X	SSPLXCLI COPY

ssClientDataInit — Initialize Client Data Buffers

```
ssClientDataInit
                              retcode
                              reascode
                              C-block_address
                              subpool_name
```

Purpose

Initializes client data buffer structures.

Operands

ssClientDataInit
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssClientDataInit`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssClientDataInit`.

C-block_address
(input,POINTER,4) is a signed four-byte binary input variable holding the address of the C-block for the client in question.

subpool_name
(input,CHARACTER,8) is a character string holding the name of the subpool from which these client buffers should be allocated.

Usage Notes

1. This routine is meant for use by a line driver that is preparing to handle a new client. As part of initializing the C-block that describes the new client, the line driver should call `ssClientDataInit` to ensure that the structures relating to buffering the client's data are initialized.
2. Subpool *subpool_name* must **not** be a subpool that refers to a VM Data Space.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_cli_rc_success	*ss_cli_re_success*	`ssClientDataInit` completed successfully

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMCLI MACRO
PL/X	SSPLXCLI COPY

ssClientDataPut — Put Client Data

```
ssClientDataPut
                          retcode
                          reascode
                          caller_type
                          C-block_address
                          buffer_alet
                          data_buffer
                          amount_of_data
                          new_amount_buffered
```

Purpose

Writes data to client data buffers.

Operands

ssClientDataPut
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssClientDataPut`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssClientDataPut`.

caller_type
(input,INT,4) is a signed four-byte binary input variable holding an indicator of the kind of caller (instance or line driver).

C-block_address
(input,POINTER,4) is a signed four-byte binary input variable holding the address of the C-block for the client in question.

buffer_alet
(input,INT,4) is a signed four-byte binary input variable holding the ALET to be used when accessing *data_buffer*.

data_buffer
(input,CHAR,*amount_of_data*) is a character string containing the data to be written.

amount_of_data
(input,INT,4) is a signed four-byte binary input variable holding the length of *data_buffer*.

new_amount_buffered
(output,INT,4) is a signed four-byte binary output variable to hold the new amount of data in the client buffer.

Usage Notes

1. *caller_type* should be set to one of these values:

ss_cli_iam_instance	The caller is an instance thread.
ss_cli_iam_linedriver	The caller is a line driver.

2. `ssClientDataPut` maintains the *bytes in* and *bytes out* fields of the C-block. A line driver should not attempt to maintain these itself.
3. `ssClientDataPut` exerts flow control on its caller. When the caller's operation results in either more than 16 MB being queued for the client or more than 128 distinct buffers being queued for the client, `ssClientDataPut` waits until the corresponding line driver empties the buffers before returning to the caller. The buffer will be emptied only if the server has sent the appropriate IPC message to its line driver; `ssClientDataPut` does not send any IPC messages on behalf of its caller.
4. If the line driver you are using is record-oriented, then the data stream you build for the client must be organized into records, each record prefixed by a four-byte length. For more information on the description of record-oriented line drivers, see Table 8 on page 15. “Connectivity and Line Drivers.”

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_cli_rc_success	*ss_cli_re_success*	`ssClientDataPut` completed successfully
ss_cli_rc_error	*ss_cli_re_bad_iam*	*caller_type* contains unrecognized value
ss_cli_rc_error	*ss_cli_re_out_of_range*	*amount_of_data* contains illegal value
ss_cli_rc_error	*ss_cli_re_out_of_storage*	Not enough free storage to buffer this data

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMCLI MACRO
PL/X	SSPLXCLI COPY

ssClientDataTerm — Terminate Client Data Buffers

```
ssClientDataTerm
                    retcode
                    reascode
                    C-block_address
```

Purpose

Terminates client data buffer structures.

Operands

ssClientDataTerm
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssClientDataTerm`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssClientDataTerm`.

C-block_address
(input,POINTER,4) is a signed four-byte binary input variable holding the address of the C-block for the client in question.

Usage Note

This routine is meant for use by a line driver that is ending its handling of a client. As part of its termination processing, the line driver should call `ssClientDataTerm` so that the reusable server kernel can clean up its handling of buffered client data.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_cli_rc_success	*ss_cli_re_success*	`ssClientDataTerm` completed successfully

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMCLI MACRO
PL/X	SSPLXCLI COPY

ssEnrollCommit — Commit Enrollment Set

```
ssEnrollCommit
                        retcode
                        reascode
                        set_name
```

Purpose

Commits changes to an open enrollment set.

Operands

ssEnrollCommit
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssEnrollCommit`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssEnrollCommit`.

set_name
(input,CHAR,8) is a character string holding the name of the enrollment set to be committed.

Usage Notes

1. This entry point commits the SFS file holding the named enrollment set. The enrollment set remains loaded and available for other transactions.
2. If the commit fails, the appropriate action is to call `ssEnrollDrop` to drop the set, using drop type *ss_enr_drop_rollback*.
3. An attempt to commit a transient enrollment set will return a warning. No other action is taken.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_enr_rc_success	*ss_enr_re_success*	`ssEnrollCommit` completed successfully
ss_enr_rc_error	*ss_enr_re_db_not_found*	Named enrollment set not found
ss_enr_rc_warning	*ss_enr_re_not_disk*	Named enrollment set is transient
ss_enr_rc_error	*ss_enr_re_comm_fail*	Call to `DMSCOMM` failed

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMENR MACRO
PL/X	SSPLXENR COPY

ssEnrollDrop — Drop Enrollment Set

```
ssEnrollDrop
                    retcode
                    reascode
                    set_name
                    drop_type
```

Purpose

Drops (closes, unloads) an enrollment set.

Operands

ssEnrollDrop
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssEnrollDrop`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssEnrollDrop`.

set_name
(input,CHAR,8) is a character string holding the name of the enrollment set to be dropped.

drop_type
(input,INT,4) is a signed four-byte binary input variable holding a value indicative of the kind of drop to be performed:

ss_enr_drop_commit	Commit changes
ss_enr_drop_rollback	Roll back changes

Usage Notes

1. This entry point closes the SFS file holding the named enrollment set, either rolling back or committing the changes, according to the value of parameter *drop_type*. It also deletes the data space and performs other cleanup operations.
2. If *ss_enr_drop_commit* is requested and the commit fails, an error will be returned and no other action will be taken. The appropriate recovery action is to attempt a rollback drop.
3. An attempt to commit a transient enrollment set will return a warning and the drop will proceed.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_enr_rc_success	*ss_enr_re_success*	`ssEnrollDrop` completed successfully
ss_enr_rc_error	*ss_enr_re_bad_drop_type*	Unrecognized drop type
ss_enr_rc_error	*ss_enr_re_db_not_found*	Named enrollment set not found
ss_enr_rc_warning	*ss_enr_re_not_disk*	Named enrollment set is transient
ss_enr_rc_error	*ss_enr_re_close_fail*	Call to `DMSCLOSE` failed

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMENR MACRO
PL/X	SSPLXENR COPY

ssEnrollList — List Enrollment Sets

```
ssEnrollList
                    retcode
                    reascode
                    C-block_pointer
```

Purpose

Produces a summary list of the loaded enrollment sets.

Operands

ssEnrollList
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssEnrollList`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssEnrollList`.

C-block_pointer
(input,POINTER,4) is a signed four-byte binary input variable holding the address of the C-block representing the client to whom the summary list should be sent.

Usage Notes

1. The reusable server kernel writes the summary list to the client represented by *C-block_pointer*, using routine `ssClientDataPut`.
2. If the programmer wishes to capture the output of `ssEnrollList` for his own purposes, he can allocate storage to represent a C-block, initialize the C-block using routine `ssClientDataInit`, and then call routine `ssEnrollList`. When `ssEnrollList` returns, the programmer can call `ssClientDataGet` to retrieve the response. After the response is decoded, he should deallocate the C-block. Note that the response is record-oriented.
3. The form of the output is:

```
Name     Pages  Entries    InUse D K
----     -----  -------    ----- - -
test     256    1          1     0 d
```

The columns are:

Name	The name of the enrollment set
Pages	The size of the data space, in pages
Entries	The number of records in the enrollment set

InUse	The number of pages of data space storage being used to hold records
D	“Dirty” bit - if 1, set needs to be committed
K	Kind of set

d	On-disk (permanent)
m	In-memory (transient)

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_enr_rc_success	*ss_enr_re_success*	`ssEnrollList` completed successfully

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMENR MACRO
PL/X	SSPLXENR COPY

ssEnrollLoad — Load Enrollment Set

```
ssEnrollLoad
                    retcode
                    reascode
                    set_name
                    set_kind
                    dataspace_size
                    file_name
                    file_name_length
```

Purpose

Loads an enrollment set from the Shared File System, or initializes an empty transient enrollment set.

Operands

ssEnrollLoad
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssEnrollLoad`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssEnrollLoad`.

set_name
(input,CHAR,8) is a character string holding the name of the enrollment set to be loaded.

set_kind
(input,INT,4) is a signed four-byte binary input variable holding a value that indicates whether the enrollment set is permanent or transient, as follows:

ss_enr_kind_memory	transient set
ss_enr_kind_disk	permanent set

dataspace_size
(input,INT,4) is a signed four-byte binary input variable holding the size of the dataspace.

file_name
(input,CHAR,*file_name_length*) is a character string holding the name of the SFS file containing the enrollment set.

file_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *file_name*.

Usage Notes

1. The name supplied in parameter *set_name* is used unchanged as a subpool name in a call to `ssMemoryCreateDS`. The server author must ensure that this name does not collide with any subpool names he might be using for other purposes.
2. The caller can use parameter *dataspace_size* to influence the size of the created data space. Express the size in pages. The reusable server kernel rounds the suggested size up to the next 16-page boundary before using it further. To refrain from influencing the data space size, specify a size of zero.
3. When it creates the data space, the reusable server kernel uses the larger of the following two parameters as the size of the space:
   - The number of records in the SFS file multiplied by the LRECL of the SFS file, multiplied by 1.5
   - The size requested by the caller in the *dataspace_size* parameter

   If the larger of these two sizes is less than 1 MB, then the reusable server kernel uses 1 MB (256 pages) instead.
4. Parameter *file_name* accepts any syntax acceptable to CSL routine `DMSOPEN`. This includes `NAMEDEF`s.
5. The file nominated by *file_name* must reside in the Shared File System. If the file does not (or would not) reside in the Shared File System, an error is returned and the enrollment set is not loaded.
6. The virtual machine in which the server program is running must have write authority to the file nominated by *file_name*.
7. If the file nominated by *file_name* does not exist, it is created and a warning is returned.
8. The file nominated by *file_name* is opened on its own work unit.
9. If a transient enrollment set is being loaded, no CMS file I/O takes place and no work unit is gotten. The data space is created, initialized as empty, and made ready to hold records.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_enr_rc_success	*ss_enr_re_success*	`ssEnrollLoad` completed successfully
ss_enr_rc_error	*ss_enr_re_bad_kind*	Parameter *set_kind* contains an unrecognized value
ss_enr_rc_error	*ss_enr_re_bad_length*	Parameter *file_name_length* contains an unrecognized value
ss_enr_rc_error	*ss_enr_re_no_storage*	Insufficient storage is available
ss_enr_rc_error	*ss_enr_re_db_exists*	Set *set_name* already exists
ss_enr_rc_error	*ss_enr_re_dscr_fail*	Attempt to create data space failed
ss_enr_rc_error	*ss_enr_re_gwu_fail*	Attempt to get work unit failed
ss_enr_rc_error	*ss_enr_re_open_fail*	Attempt to open file failed
ss_enr_rc_error	*ss_enr_re_not_sfs*	File is not SFS-resident
ss_enr_rc_error	*ss_enr_re_not_v*	File is not V-format
ss_enr_rc_error	*ss_enr_re_point_fail*	Attempt to move file pointers failed
ss_enr_rc_error	*ss_enr_re_read_fail*	Attempt to read SFS file failed
ss_enr_rc_warning	*ss_enr_re_new_file*	SFS file not found - new permanent enrollment set created

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMENR MACRO
PL/X	SSPLXENR COPY

ssEnrollRecordGet — Get Enrollment Record

```
ssEnrollRecordGet
                          retcode
                          reascode
                          set_name
                          key
                          buffer
                          buffer_size
                          data_length
```

Purpose

Retrieves a record from an enrollment set.

Operands

ssEnrollRecordGet
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssEnrollRecordGet`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssEnrollRecordGet`.

set_name
(input,CHAR,8) is a character string holding the name of the enrollment set to be interrogated.

key
(input,CHAR,64) is a character string holding the key of the record to be retrieved.

buffer
(output,CHAR,*buffer_size*) is a character string buffer to hold the data of the retrieved record.

buffer_size
(input,INT,4) is a signed four-byte binary input variable holding the size of *buffer*.

data_length
(output,INT,4) is a signed four-byte binary output variable to hold the amount of data stored under key *key*.

Usage Notes

1. Every byte of the key is significant. If your application's keys are, say, text strings, be sure to pad your keys on the right to fill out the entire key field.
2. Case is significant in keys.
3. If the amount of data stored under key *key* will not fit in *buffer*, as much as will fit is returned, output *data_length* is set to the actual size of the data, and a warning is returned. This lets the caller retry the operation with a buffer large enough to hold all of the data.
4. If the record does not exist in set *set_name*, an error is returned.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_enr_rc_success	*ss_enr_re_success*	`ssEnrollRecordGet` completed successfully
ss_enr_rc_error	*ss_enr_re_db_not_found*	Set *set_name* does not exist
ss_enr_rc_error	*ss_enr_re_rec_not_found*	No record matches key *key*
ss_enr_rc_warning	*ss_enr_re_truncated*	Record was found but truncated because *buffer* could not contain all of it

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMENR MACRO
PL/X	SSPLXENR COPY

ssEnrollRecordInsert — Insert Enrollment Record

```
ssEnrollRecordInsert
                                  retcode
                                  reascode
                                  set_name
                                  key
                                  buffer
                                  data_length
                                  insert_type
```

Purpose

Inserts or replaces a record in an enrollment set.

Operands

ssEnrollRecordInsert
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssEnrollRecordInsert`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssEnrollRecordInsert`.

set_name
(input,CHAR,8) is a character string holding the name of the enrollment set to be modified.

key
(input,CHAR,64) is a character string holding the key of the record to be inserted or replaced.

buffer
(output,CHAR,*data_length*) is a character string buffer holding the data to be associated with *key*.

buffer_size
(input,INT,4) is a signed four-byte binary input variable holding the size of *buffer*.

data_length
(output,INT,4) is a signed four-byte binary output variable to hold the amount of data stored under key *key*.

insert_type
(input,INT,4) is a signed four-byte binary input variable to hold the kind of insertion being done:

ss_enr_insert_new	New record
ss_enr_insert_replace	Replacement record

Usage Notes

1. Every byte of the key is significant. If your application's keys are, say, text strings, be sure to pad your keys on the right to fill out the entire key field.
2. Case is significant in keys.
3. The differences between *ss_enr_insert_new* and *ss_enr_insert_replace* are:
   - For *_new*, the reusable server kernel will fail the API call if the enrollment set already holds a record bearing key *key*. Thus the programmer can use *_new* to guard against inadvertent replacements.
   - For *_replace*, if the record bearing key *key* already exists, it is replaced and a warning is returned.
4. The change is not permanent until it is committed.
5. For permanent enrollment sets, the data cannot be more than 65,500 bytes long.
6. For transient enrollment sets, the data cannot be more than 16 MB long.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_enr_rc_success	*ss_enr_re_success*	`ssEnrollRecordInsert` completed successfully
ss_enr_rc_error	*ss_enr_re_bad_method*	Parameter *insert_type* contains an unrecognized value
ss_enr_rc_error	*ss_enr_re_bad_length*	Parameter *data_length* contains an invalid value
ss_enr_rc_error	*ss_enr_re_db_not_found*	Set *set_name* does not exist
ss_enr_rc_error	*ss_enr_re_no_storage*	Insufficient storage to satisfy request
ss_enr_rc_error	*ss_enr_re_write_storage*	Write to SFS file failed
ss_enr_rc_warning	*ss_enr_re_rec_exists*	Record exists and was replaced
ss_enr_rc_error	*ss_enr_re_rec_exists*	Record exists and was not replaced

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMENR MACRO
PL/X	SSPLXENR COPY

ssEnrollRecordList — List Records In Enrollment Set

```
ssEnrollRecordList
                    retcode
                    reascode
                    set_name
                    C-block_pointer
```

Purpose

Produces a summary list of the records in an enrollment set.

Operands

ssEnrollRecordList
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssEnrollRecordList`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssEnrollRecordList`.

set_name
(input,CHAR,8) is a character string holding the name of the enrollment set.

C-block_pointer
(input,POINTER,4) is a signed four-byte binary input variable holding the address of the C-block representing the client to whom the summary list should be sent.

Usage Notes

1. The reusable server kernel writes the summary list to the client represented by *C-block_pointer*, using routine `ssClientDataPut`.
2. If the programmer wishes to capture the output of `ssEnrollRecordList` for his own purposes, he can allocate storage to represent a C-block, initialize the C-block using routine `ssClientDataInit`, and then call routine `ssEnrollRecordList`. When `ssEnrollRecordList` returns, the programmer can call `ssClientDataGet` to retrieve the response. After the response is decoded, he should deallocate the C-block. Note that the response is record-oriented.
3. The output of `ssEnrollRecordList` is simply one enrollment record per output record. Each output record contains only the key of the corresponding enrollment record.
4. To retrieve the data associated with a given key, use `ssEnrollRecordGet`.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_enr_rc_success	*ss_enr_re_success*	`ssEnrollRecordList` completed successfully
ss_enr_rc_error	*ss_enr_re_db_not_found*	Set *set_name* is not loaded

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMENR MACRO
PL/X	SSPLXENR COPY

ssEnrollRecordRemove — Remove Enrollment Record

```
ssEnrollRecordRemove
                      retcode
                      reascode
                      set_name
                      key
```

Purpose

Removes a record from an enrollment set.

Operands

ssEnrollRecordRemove
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssEnrollRecordRemove`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssEnrollRecordRemove`.

set_name
(input,CHAR,8) is a character string holding the name of the enrollment set to be modified.

key
(input,CHAR,64) is a character string holding the key of the record to be removed.

Usage Notes

1. Every byte of the key is significant. If your application's keys are, say, text strings, be sure to pad your keys on the right to fill out the entire key field.
2. Case is significant in keys.
3. If the record bearing key *key* is not found, an error is returned.
4. The change is not permanent until it is committed.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_enr_rc_success	*ss_enr_re_success*	`ssEnrollRecordRemove` completed successfully
ss_enr_rc_error	*ss_enr_re_db_not_found*	Set *set_name* does not exist
ss_enr_rc_error	*ss_enr_re_rec_not_found*	Record bearing key *key* does not exist
ss_enr_rc_error	*ss_enr_re_write_storage*	Write to SFS file failed

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMENR MACRO
PL/X	SSPLXENR COPY

ssMemoryAllocate — Allocate Memory

```
ssMemoryAllocate
                    return_code
                    reason_code
                    min_bytes_needed
                    max_bytes_needed
                    subpool_name
                    align_type
                    memory_pointer
                    bytes_obtained
```

Purpose

Allocates a block of primary storage (memory).

Operands

ssMemoryAllocate
is the name of the function being invoked.

return_code
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssMemoryAllocate`.

reason_code
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssMemoryAllocate`.

min_bytes_needed
(input,INT,4) is a signed four-byte binary input variable holding the minimum number of bytes needed.

max_bytes_needed
(input,INT,4) is a signed four-byte binary input variable holding the maximum number of bytes needed.

subpool_name
(input,CHAR,8) is a character string holding the name of the subpool from which the storage should be allocated.

align_type
(input,INT,4) is a signed four-byte binary input variable holding the type of alignment the new buffer will require.

memory_pointer
(output,INT,4) is a signed four-byte binary output variable to hold the returned memory address.

bytes_obtained
(output,INT,4) is a signed four-byte binary output variable to hold the returned number of bytes actually allocated.

Usage Notes

1. To issue a request for a block of storage of variable size, set *min_bytes_needed* equal to the minimum amount of storage needed and set *max_bytes_needed* equal to the maximum amount of storage desired.
2. To issue a request for a block of storage of fixed size, set *min_bytes_needed=max_bytes_needed*.
3. Parameter *subpool_name* is used unchanged in calls to CMSSTOR and therefore must adhere to CMSSTOR's rules for subpool names.
4. Parameter *align_type* must have one of these values:

ss_mem_align_norm	Align allocated storage on doubleword boundary
ss_mem_align_page	Align allocated storage on page boundary

5. The reusable server kernel allocates and releases memory in multiples of doublewords. The amount of storage requested by the caller will be rounded up to the next doubleword boundary before the allocation request is processed.
6. If the requested storage could not be obtained, *memory_pointer* and *bytes_obtained* are set to zero and appropriate return and reason codes are returned.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_mem_rc_success	*ss_mem_re_success*	`ssMemoryAllocate` completed successfully
ss_mem_rc_error	*ss_mem_re_bad_align*	*align_type* is not recognized
ss_mem_rc_error	*ss_mem_re_bad_amount*	Error in amount specification
ss_mem_rc_error	*ss_mem_re_out_of_storage*	Storage could not be obtained
ss_mem_rc_error	*ss_mem_re_subpool_deleted*	Subpool deleted while call was in progress

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMMEM MACRO
PL/X	SSPLXMEM COPY

ssMemoryCreateDS — Create Data Space

```
ssMemoryCreateDS
                    return_code
                    reason_code
                    subpool_name
                    number_of_pages
                    storage_key
                    option_count
                    option_array
                    asit
                    alet
```

Purpose

Creates a data space and prepares the reusable server kernel to manage the storage therein.

Operands

ssMemoryCreateDS
is the name of the function being invoked.

return_code
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssMemoryCreateDS`.

reason_code
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssMemoryCreateDS`.

subpool_name
(input,CHAR,8) is a character string holding the subpool name to be assigned to the new data space.

number_of_pages
(input,INT,4) is a signed four-byte binary input variable specifying the size to be passed to `DMSSPCC`.

storage_key
(input,INT,4) is a signed four-byte binary input variable specifying the storage key to be passed to `DMSSPCC`.

option_count
(input,INT,4) is a signed four-byte binary input variable specifying the option count to be passed to `DMSSPCC`.

option_array
(input,INT,4**option_count*) is an array of signed four-byte binary input variables specifying the option array to be passed to `DMSSPCC`.

asit
(output,CHAR,8) is an output character buffer to hold the returned ASIT.

alet
(output,INT,4) is an signed four-byte binary output variable to hold the returned ALET.

Usage Notes

1. Review the usage notes for CSL routines `DMSSPCC` and `DMSSPLA` before using `ssMemoryCreateDS`. For more information, see *z/VM: CMS Callable Services Reference*.
2. The value of *subpool_name* is used in constructing the name of the data space and therefore must adhere to the character set composition rules for data space names. For more information, see the description of CSL routine `DMSSPCC` in the book *z/VM: CMS Callable Services Reference*.
3. The reusable server kernel uses storage in the primary address space to keep track of free and used pieces of storage in the data space. The primary address space storage used for this purpose is taken from CMS through `CMSSTOR OBTAIN` under subpool name *subpool_name*.
4. Parameters *number_of_pages* and *storage_key* are passed directly to `DMSSPCC`.
5. If *option_count* is zero, `ssMemoryCreateDS` uses `DMSSPCC`'s defaults, except that it asks for the data space to be created SHARE. The virtual machine's `XCONFIG ADDRSPACE` directory entry must be set up accordingly.
6. `ssMemoryCreateDS` asks `DMSSPLA` to create the ALET using the WRITE and SYNCH options. The reusable server kernel does not keep track of the generated ALET; the application is free to use `DMSSPLR` and `DMSSPLA` to manipulate ALETs.
7. After calling `ssMemoryCreateDS` successfully, allocate and release storage in the data space using routines `ssMemoryAllocate` and `ssMemoryRelease`.
8. To delete the data space, use `ssMemoryDelete`.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_mem_rc_success	*ss_mem_re_success*	`ssMemoryCreateDS` completed successfully
ss_mem_rc_error	*ss_mem_re_bad_amount*	*number_of_pages* is invalid
ss_mem_rc_error	*ss_mem_re_bad_key*	*storage_key* is invalid
ss_mem_rc_error	*ss_mem_re_spcc_fail*	`DMSSPCC` failed
ss_mem_rc_error	*ss_mem_re_spla_fail*	`DMSSPLA` failed
ss_mem_rc_error	*ss_mem_re_out_of_storage*	Storage could not be obtained
ss_mem_rc_error	*ss_mem_re_subpool_exists*	Subpool already exists

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMMEM MACRO
PL/X	SSPLXMEM COPY

ssMemoryDelete — Delete Subpool

```
ssMemoryDelete
                                   return_code
                                   reason_code
                                   subpool_name
```

Purpose

Deletes a memory subpool, and the corresponding data space if there is one.

Operands

ssMemoryDelete
is the name of the function being invoked.

return_code
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssMemoryDelete`.

reason_code
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssMemoryDelete`.

subpool_name
(input,CHAR,8) is a character string holding the name of the subpool to be deleted.

Usage Notes

1. The reusable server kernel deletes its record of the subpool and issues a corresponding `SUBPOOL DELETE` call to CMS.
2. If the subpool is a data space, the corresponding data space is also deleted.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_mem_rc_success	*ss_mem_re_success*	`ssMemoryDelete` completed successfully
ss_mem_rc_error	*ss_mem_re_no_subpool*	Unrecognized subpool name
ss_mem_rc_error	*ss_mem_re_spd_fail*	`SUBPOOL DELETE` call failed

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMMEM MACRO
PL/X	SSPLXMEM COPY

ssMemoryRelease — Release Memory

```
ssMemoryRelease
                    return_code
                    reason_code
                    bytes_released
                    subpool_name
                    memory_pointer
```

Purpose

Releases a block of primary storage (memory).

Operands

ssMemoryRelease
is the name of the function being invoked.

return_code
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssMemoryRelease`.

reason_code
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssMemoryRelease`.

bytes_released
(input,INT,4) is a signed four-byte binary input variable holding the number of bytes being released.

subpool_name
(input,CHAR,8) is a character string holding the name of the subpool from which the storage was allocated.

memory_pointer
(input,INT,4) is a signed four-byte binary input variable holding the address of the storage being released.

Usage Notes

1. The buffer being released must reside on a doubleword boundary.
2. If it does not represent an integral number of doublewords, parameter *bytes_released* is rounded up to the next doubleword boundary before being used.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_mem_rc_success	*ss_mem_re_success*	`ssMemoryRelease` completed successfully
ss_mem_rc_error	*ss_mem_re_bad_align*	Buffer is not aligned on doubleword boundary
ss_mem_rc_error	*ss_mem_re_bad_amount*	Error in amount specification
ss_mem_rc_error	*ss_mem_re_no_subpool*	Unrecognized subpool name

Return Code	Reason Code	Meaning
ss_mem_rc_error	*ss_mem_re_not_alloc*	Some or all of buffer is already free
ss_mem_rc_error	*ss_mem_re_subpool_deleted*	Subpool deleted while call in progress
ss_mem_rc_error	*ss_mem_re_out_of_storage*	Not enough storage available

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMMEM MACRO
PL/X	SSPLXMEM COPY

ssServerRun — Run the Server

```
ssServerRun
                    retcode
                    reascode
```

Purpose

Runs the server program.

Operands

ssServerRun
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssServerRun`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssServerRun`.

Usage Note

Call this routine only from `RSKMAIN` and only after you have called `ssServiceBind` sufficiently to set up your server.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_srv_rc_success	*ss_srv_re_success*	`ssServerRun` completed successfully
ss_srv_rc_error	anything else	Nonzero return code from `PROFILE RSK`.

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMSRV MACRO
PL/X	SSPLXSRV COPY

ssServerStop — Stop the Server

```
ssServerStop
                              retcode
                              reascode
```

Purpose

Stops the server program.

Operands

ssServerStop
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssServerStop`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssServerStop`.

Usage Note

Calling this function will cause the `WAITSERV` command in `PROFILE RSK` to complete.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_srv_rc_success	*ss_srv_re_success*	`ssServerStop` completed successfully

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMSRV MACRO
PL/X	SSPLXSRV COPY

ssServiceBind — Bind A Service

```
ssServiceBind
                    retcode
                    reascode
                    service_name
                    service_name_length
                    init_addr
                    service_addr
                    term_addr
```

Purpose

Informs the reusable server kernel of the existence of a new service.

Operands

ssServiceBind
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssServiceBind`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssServiceBind`.

service_name
(input,CHAR,*service_name_length*) is the name of the new service.

service_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of the service name.

init_addr
(input,INT,4) is a signed four-byte binary input variable holding the address of the service's initialization entry point.

service_addr
(input,INT,4) is a signed four-byte binary input variable holding the address of the service's service entry point.

term_addr
(input,INT,4) is a signed four-byte binary input variable holding the address of the service's termination entry point.

service_type
(input,INT,4) is a signed four-byte binary input variable holding the kind of service being bound.

Usage Notes

1. Case is not significant in service names.
2. The parameter list array passed to the initialization entry point (pointed to by R1) is organized as shown inTable 3 on page 7 .
3. To signal successful initialization, the initialization entry point should return with the return and reason code words set to zero. A nonzero return code will cause the start of the service to fail.
4. The parameter list array passed to the service entry point (pointed to by R1) is organized as shown inTable 4 on page 7 .
5. The parameter list array passed to the termination entry point (pointed to by R1) is organized as shown inTable 5 on page 8 .
6. The values that can be supplied for *service_type* are:

ss_srv_srvtype_normal	Plain old service.
ss_srv_srvtype_ld	Plain old line driver.
ss_srv_srvtype_ldss	Self-sourced line driver.

7. To activate the service, use one of the line drivers' `START` commands.
8. `ssServiceBind` will produce correct results only when it is called by `RSKMAIN` prior to `ssServerRun`. `ssServiceBind` should never be called under any other conditions. Unpredicable results could occur.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_srv_rc_success	*ss_srv_re_success*	`ssServiceBind` completed successfully
ss_srv_rc_error	*ss_srv_re_out_of_range*	*service_name_length*<0 or >8
ss_srv_rc_error	*ss_srv_re_bad_type*	*service_type* contains unrecognized value.
ss_srv_rc_error	*ss_srv_re_exists*	Service already exists
ss_srv_rc_error	*ss_srv_re_out_of_storage*	Out of storage

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMSRV MACRO
PL/X	SSPLXSRV COPY

ssServiceFind — Find A Service

```
ssServiceFind
                retcode
                reascode
                service_name
                service_name_length
                S-block_address
```

Purpose

Obtains descriptive information about a service.

Operands

ssServiceFind
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssServiceFind`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssServiceFind`.

service_name
(input,CHAR,*service_name_length*) is the name of the new service.

service_name_length
(input,INT,4) is a signed four-byte binary input variable holding the length of the service name.

S-block_address
(output,POINTER,4) is a signed four-byte binary output variable to hold the address of the found service's S-block.

Usage Notes

1. Case is not significant in service names.
2. The returned S-block is organized according toTable 2 on page 6 .
3. If the service could not be found, a return and reason code are generated and *sblock_address* is returned as 0.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_srv_rc_success	*ss_srv_re_success*	`ssServiceFind` completed successfully
ss_srv_rc_error	*ss_srv_re_out_of_range*	*service_name_length*<0 or >8
ss_srv_rc_error	*ss_srv_re_not_found*	The named service could not be found.

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMSRV MACRO
PL/X	SSPLXSRV COPY

ssSgpCreate — Create a Storage Group

```
ssSgpCreate
                    retcode
                    reascode
                    storage_group_number
                    minidisk_count
                    minidisk_array
                    attribute_count
                    attribute_array
```

Purpose

Identifies a set of minidisks to be managed as a storage group.

Operands

ssSgpCreate
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssSgpCreate`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssSgpCreate`.

storage_group_number
(input,INT,4) is a signed four-byte binary input variable holding the number of the new storage group.

minidisk_count
(input,INT,4) is a signed four-byte binary input variable holding the number of minidisks in the new storage group.

minidisk_array
(input,INT,4**minidisk_count*) is an array of signed four-byte binary input variables holding the device addresses of the minidisks to be included in the new storage group.

attribute_count
(input,INT,4) is a signed four-byte binary input variable holding the number of attributes in the *attribute_array* array.

attribute_array
(input,INT,4**attribute_count*) is an array of signed four-byte binary input variables holding the attributes to be associated with the new storage group.

Usage Notes

1. Parameter *storage_group_number* must be in the range 0 to 1023, inclusive.
2. Each minidisk to be included in the storage group must have already been formatted at 4 KB by the `FORMAT` command and reserved by the `RESERVE` command. The reusable server kernel requires that its minidisks exhibit this format.
3. There is a limit of 13,000 minidisks per storage group, and the sum of the sizes of the data areas on the minidisks must not exceed `X'FFFFFFFF'` 4 KB blocks.
4. The storage group's existence is recorded in the storage group definition file and persists across instances of the server program. For more information on the description of the storage group definition file, see Chapter 12, “Initialization and Profiles” on page 71.
5. No attributes are currently recognized in the *attribute_array* (in other words, if *attribute_count* is nonzero, *ss_sgp_re_bad_attrib* is returned).

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_sgp_rc_success	*ss_sgp_re_success*	`ssSgpCreate` completed successfully
ss_sgp_rc_error	*ss_sgp_re_out_of_range*	*storage_group_number*, *minidisk_count* or *attribute_count* is out of range
ss_sgp_rc_error	*ss_sgp_re_bad_attrib*	*attribute_array* contains an unrecognized attribute
ss_sgp_rc_error	*ss_sgp_re_mx_fail*	Mutex creation or acquisition failed
ss_sgp_rc_error	*ss_sgp_re_exists*	Storage group already exists
ss_sgp_rc_error	*ss_sgp_re_out_of_storage*	Out of storage
ss_sgp_rc_error	*ss_sgp_re_cv_fail*	Condition variable creation failed
ss_sgp_rc_warning	*ss_sgp_re_rewrite_fail*	Rewrite of storage group definitions failed

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMSGP MACRO
PL/X	SSPLXSGP COPY

ssSgpDelete — Delete a Storage Group

```
ssSgpDelete
                    retcode
                    reascode
                    storage_group_number
```

Purpose

Removes a set of minidisks from the control of the reusable server kernel.

Operands

ssSgpDelete
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssSgpDelete`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssSgpDelete`.

storage_group_number
(input,INT,4) is a signed four-byte binary input variable holding the number of the storage group to be deleted.

Usage Notes

1. To be deleted, the storage group must not be started.
2. The storage group definition file is updated to reflect the fact that the storage group no longer exists.
3. No I/O is done to the storage group as part of deletion; the minidisks remain as they were. To recreate the storage group, just issue an appropriate call to `ssSgpCreate`.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_sgp_rc_success	*ss_sgp_re_success*	`ssSgpDelete` completed successfully
ss_sgp_rc_error	*ss_sgp_re_mx_fail*	Mutex acquisition failed
ss_sgp_rc_error	*ss_sgp_re_not_found*	Storage group not found
ss_sgp_rc_error	*ss_sgp_re_online*	Storage group is online
ss_sgp_rc_error	*ss_sgp_re_maint*	Maintenance in progress
ss_sgp_rc_warning	*ss_sgp_re_rewrite_fail*	Rewrite of storage group definitions failed

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMSGP MACRO
PL/X	SSPLXSGP COPY

ssSgpFind — Find a Storage Group

```
ssSgpFind
            retcode
            reascode
            storage_group_name
            storage_group_number
            io_mode
            total_blocks
```

Purpose

Returns information about the storage group whose name is supplied.

Operands

ssSgpFind
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssSgpFind`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssSgpFind`.

storage_group_name
(input,CHAR,8) is an input character string holding the name of the storage group to find.

storage_group_number
(output,INT,4) is a signed four-byte binary output variable to hold the number of the found storage group.

io_mode
(output,INT,4) is a signed four-byte binary output variable to hold the I/O mode of the found storage group.

total_blocks
(output,INT,4) is a signed four-byte binary output variable to hold the number of blocks in the storage group.

Usage Notes

1. Because the lookup is by name, only started storage groups can be found.
2. Right-pad the name with spaces.
3. The value returned in *io_mode* is one of:

ss_sgp_attrib_block_rw	Started read-write
ss_sgp_attrib_block_ro	Started read-only

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_sgp_rc_success	*ss_sgp_re_success*	`ssSgpFind` completed successfully
ss_sgp_rc_error	*ss_sgp_re_not_found*	Storage group is not found

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMSGP MACRO
PL/X	SSPLXSGP COPY

ssSgpList — List Storage Groups

```
ssSgpList
                        retcode
                        reascode
                        number_expected
                        number_returned
                        storage_group_list
```

Purpose

Returns a list of the known storage groups.

Operands

ssSgpList
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssSgpList`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssSgpList`.

number_expected
(input,INT,4) is a signed four-byte binary input variable holding the number of storage groups whose identifiers can fit into the *storage_group_list* array.

number_returned
(output,INT,4) is a signed four-byte binary output variable to hold the number of storage group identifiers placed into the *storage_group_list* array.

storage_group_list
(output,INT,4**number_expected*) is an array of signed four-byte binary output variables to hold the identifiers of the existing storage groups.

Usage Notes

1. If the actual number of existing storage groups is greater than *number_expected*, then the actual number of storage groups is filled into *number_returned*, the identifiers of the first *number_expected* storage groups are returned in *storage_group_list*, and a warning is given.
2. To determine information about a particular storage group, use `ssSgpQuery`.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_sgp_rc_success	*ss_sgp_re_success*	`ssSgpList` completed successfully
ss_sgp_rc_error	*ss_sgp_re_mx_fail*	Mutex acquisition failed
ss_sgp_rc_warning	*ss_sgp_re_too_many*	More storage groups than *number_expected*

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMSGP MACRO
PL/X	SSPLXSGP COPY

ssSgpQuery — Query a Storage Group

```
ssSgpQuery
                    retcode
                    reascode
                    storage_group_number
                    io_mode
                    total_blocks
                    status_word
                    attributes_expected
                    attributes_returned
                    attribute_array
                    minidisks_expected
                    minidisks_returned
                    minidisk_address_array
                    minidisk_blocks_array
```

Purpose

Returns information about a specific storage group.

Operands

ssSgpQuery
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssSgpQuery`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssSgpQuery`.

storage_group_number
(input,INT,4) is a signed four-byte binary input variable holding the number of the storage group about which information is desired.

io_mode
(output,INT,4) is a signed four-byte binary output variable to hold the storage group I/O mode.

total_blocks
(output,INT,4) is a signed four-byte binary output variable to hold the total number of 4 KB blocks in the storage group.

status_word
(output,INT,4) is a signed four-byte binary output variable to hold the storage group status word.

attributes_expected
(input,INT,4) is a signed four-byte binary input variable holding the number of attribute identifiers that will fit in the *attribute_array* array.

attributes_returned
(input,INT,4) is a signed four-byte binary output variable to hold the number of entries filled into the *attribute_array* array.

attribute_array
(output,INT,4**attribute_count*) is an array of signed four-byte binary output variables to hold the returned storage group attribute indicators.

minidisks_expected
(input,INT,4) is a signed four-byte binary input variable holding the number of minidisks for which descriptive information will fit in the *minidisk_address_array*, *minidisk_total_array*, and *minidisk_free_array* arrays.

minidisks_returned
(output,INT,4) is a signed four-byte binary output variable to hold the number of minidisks for which descriptive information was deposited in the *minidisk_address_array*, *minidisk_total_array*, and *minidisk_free_array* arrays.

minidisk_address_array
(output,INT,4**minidisks_expected*) is an array of signed four-byte binary output variables to hold the returned minidisk addresses.

minidisk_total_array
(output,INT,4**minidisks_expected*) is an array of signed four-byte binary output variables to hold the returned sizes of each of the minidisks in the storage group.

minidisk_free_array
(output,INT,4**minidisks_expected*) is an array of signed four-byte binary output variables to hold the returned free block counts for each of the minidisks in the storage group.

Usage Notes

1. The possible values returned for *io_mode* are:

ss_sgp_attrib_offline	Not started (not online)
ss_sgp_attrib_block_ro	Started for read-only block I/O
ss_sgp_attrib_block_rw	Started for read-write block I/O

2. The size information (total blocks, blocks per minidisk) and status word returned by this function are meaningful only if the storage group is started.
3. The integer returned in *status_word* is to be interpreted bit-by-bit according to the following key. In this key, the bits are numbered from 0 to 31, most significant to least significant. If the named bit is set, the condition is true. The bits that are not mentioned are meaningless.

Bit	Description
0	Stop in progress
1	VM Data Spaces in use
2	DIAG X'250' in use

4. No attributes are currently returned in *attribute_array*.
5. If the actual number of minidisks is greater than *minidisks_expected*, then the actual number of minidisks is returned in parameter *minidisks_returned*, the

descriptive information for the first *minidisks_expected* minidisks is filled into the arrays, and a warning is given.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_sgp_rc_success	*ss_sgp_re_success*	`ssSgpQuery` completed successfully
ss_sgp_rc_error	*ss_sgp_re_out_of_range*	Bad value for *attributes_expected* or *minidisks_expected*
ss_sgp_rc_error	*ss_sgp_re_mx_fail*	Mutex acquisition failed
ss_sgp_rc_error	*ss_sgp_re_not_found*	Storage group not found
ss_sgp_rc_warning	*ss_sgp_re_too_many*	More attributes than *attributes_expected* or more minidisks than *minidisks_expected*

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMSGP MACRO
PL/X	SSPLXSGP COPY

ssSgpRead — Read a Storage Group

```
ssSgpRead
                    retcode
                    reascode
                    storage_group_number
                    starting_block
                    block_count
                    buffer_alet
                    buffer
```

Purpose

Reads one or more blocks from a storage group.

Operands

ssSgpRead
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssSgpRead`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssSgpRead`.

storage_group_number
(input,INT,4) is a signed four-byte binary input variable holding the number of the storage group from which blocks should be read.

starting_block
(input,INT,4) is a signed four-byte binary input variable holding the starting block number of the block extent to be read.

block_count
(input,INT,4) is a signed four-byte binary input variable holding the number of blocks to be read.

buffer_alet
(input,INT,4) is a signed four-byte binary input variable holding the ALET to be used when referring to *buffer*.

buffer
(output,CHAR,4096**block_count*) is a character string to hold the data read from the storage group.

Usage Notes

1. The first block of the storage group is block 0.
2. This entry point can be used only if the storage group is online.
3. This entry point does not serialize access to storage groups. If your application performs storage group I/O on multiple threads, it is possible that the I/O might happen in parallel, *especially in MP situations*. It is the application developer's responsibility to implement any serialization paradigms required.
4. When VM Data Spaces are used, the transfer from the storage group's data space to the target space is done with PSW key 0.
5. When a CP DIAGNOSE is used, CP is instructed to use key 0 in the channel programs it builds.
6. If DIAG `X'A4'` is being used for storage group I/O, *buffer_alet* must be 0.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_sgp_rc_success	*ss_sgp_re_success*	`ssSgpRead` completed successfully
ss_sgp_rc_error	*ss_sgp_re_mx_fail*	Mutex acquisition failed
ss_sgp_rc_error	*ss_sgp_re_not_found*	Storage group not found
ss_sgp_rc_error	*ss_sgp_re_out_of_range*	Extent is not within storage group size
ss_sgp_rc_error	*ss_sgp_re_io_fail*	Requested read failed

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMSGP MACRO
PL/X	SSPLXSGP COPY

ssSgpStart — Start a Storage Group

```
ssSgpStart
                        retcode
                        reascode
                        storage_group_number
                        storage_group_name
                        attribute_count
                        attribute_array
```

Purpose

Makes a storage group ready for use.

Operands

ssSgpStart
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssSgpStart`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssSgpStart`.

storage_group_number
(input,INT,4) is a signed four-byte binary input variable holding the number of the storage group to be brought online.

storage_group_name
(input,CHAR,8) is a character string holding the name to be assigned to the storage group while it is online.

attribute_count
(input,INT,4) is a signed four-byte binary input variable holding the number of attributes present in the *attribute_array* array.

attribute_array
(input,INT,4**attribute_count*) is an array of signed four-byte binary input variables holding the attributes to be used in bringing the storage group online.

Usage Notes

1. Each minidisk to be included in the storage group must have already been formatted at 4 KB by the `FORMAT` command and reserved by the `RESERVE` command. The reusable server kernel requires that its minidisks exhibit this format.
2. There is a limit of 13,000 minidisks per storage group, and the sum of the sizes of the data areas on the minidisks must not exceed 16 TB (`X'FFFFFFFF'` 4 KB blocks).

3. To be eligible for starting, the storage group must be completely stopped.
4. These attributes are recognized in the *attribute_array* (defaults are labeled as such):

ss_sgp_attrib_ds	Use VM Data Spaces MAPMDISK facility (default)
ss_sgp_attrib_no_ds	Do not use VM Data Spaces MAPMDISK facility
ss_sgp_attrib_block_rw	Online read-write for block I/O (default)
ss_sgp_attrib_block_ro	Online read-only for block I/O

5. To use *ss_sgp_attrib_ds* successfully, the real hardware and the server virtual machine's CP directory entry must be set up appropriately. This includes:
   - The z/VM system must be running on an ESA/390(™) processor.
   - In the CP directory, `MACHINE XC` must be specified.
   - In the CP directory, `XCONFIG ADDRSPACE` must allow enough data spaces to span the storage groups. Each 2 GB or fraction thereof in a storage group requires one data space.
   - In the CP directory, `XCONFIG ADDRSPACE` must allow an aggregate data space size at least as large as the sum of the sizes of the storage groups to be brought online with this attribute.
6. If *ss_sgp_attrib_ds* is specified and the reusable server kernel could not activate VM Data Spaces support for it, then the reusable server kernel:
   a. Sets a warning return code indicating why VM Data Spaces failed, and
   b. Attempts to bring the storage group online as if *ss_sgp_attrib_no_ds* had been specified.
7. If *ss_sgp_attrib_no_ds* is specified, then the reusable server kernel makes use of DIAGNOSE X'250' or DIAGNOSE X'A4' for I/O to the storage group, as follows:
   a. The reusable server kernel attempts to initialize the DIAGNOSE X'250' environment for each minidisk in the storage group, using the diagnose in asynchronous mode and with minidisk caching (MDC) enabled.
   b. If DIAGNOSE X'250' initialization is successful for all minidisks in the storage group, then DIAGNOSE X'250' is used for I/O to the storage group.
   c. If DIAGNOSE X'250' initialization fails for at least one minidisk in the storage group, then DIAGNOSE X'A4' is used for I/O to the storage group and a warning return code and reason code are returned.
8. Reason codes related to VM Data Spaces are produced with a warning return code. These reason codes indicate that the use of VM Data Spaces failed and that DIAGNOSE X'250' is being used instead.
9. Reason codes related to DIAGNOSE X'250' are produced with a warning return code. These reason codes indicate that the use of DIAGNOSE X'250' failed and that DIAGNOSE X'A4' is being used instead.
10. If reason code *ss_sgp_re_read_only* is produced and it really is desired to bring the storage group online read-write, follow these steps:

Step	Task
1	Determine which minidisk(s) are linked read-only.

Step	Task
2	Detach the read-only minidisks and link them read-write.
3	Try again to start the storage group.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_sgp_rc_success	*ss_sgp_re_success*	`ssSgpStart` completed successfully
ss_sgp_rc_error	*ss_sgp_re_bad_attrib*	Unrecognized item in attribute array
ss_sgp_rc_error	*ss_sgp_re_mx_fail*	Mutex acquisition failed
ss_sgp_rc_error	*ss_sgp_re_not_found*	Storage group not found
ss_sgp_rc_error	*ss_sgp_re_name_in_use*	Storage group name already in use
ss_sgp_rc_warning	*ss_sgp_re_online*	Storage group is already online
ss_sgp_rc_error	*ss_sgp_re_vdq_fail*	Minidisk format incorrect or query of format failed
ss_sgp_rc_error	*ss_sgp_re_read_only*	At least one minidisk is linked read-only
ss_sgp_rc_warning	*ss_sgp_re_ds_fail*	Data space creation failed
ss_sgp_rc_warning	*ss_sgp_re_pool_fail*	MAPMDISK minidisk pool definition failed
ss_sgp_rc_warning	*ss_sgp_re_map_fail*	MAPMDISK minidisk pool mapping failed
ss_sgp_rc_warning	*ss_sgp_re_diag_250_fail*	Use of DIAGNOSE X`'250'` failed

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMSGP MACRO
PL/X	SSPLXSGP COPY

ssSgpStop — Stop a Storage Group

```
ssSgpStop
                          retcode
                          reascode
                          storage_group_number
                          attribute_count
                          attribute_array
```

Purpose

Makes a storage group unready.

Operands

ssSgpStop
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssSgpStop`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssSgpStop`.

storage_group_number
(input,INT,4) is a signed four-byte binary input variable holding the number of the storage group to be taken offline.

attribute_count
(input,INT,4) is a signed four-byte binary input variable holding the number of attributes present in the *attribute_array* array.

attribute_array
(input,INT,4**attribute_count*) is an array of signed four-byte binary input variables holding the attributes to be used in taking the storage group offline.

Usage Notes

1. To stop all defined storage groups, set *storage_group_number* to -1.
2. Once the stop of the storage group begins, no more block I/O may be started, and the stop completes only after all block I/O to the storage group is completed.
3. No elements are currently recognized in *attribute_array*.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_sgp_rc_success	*ss_sgp_re_success*	`ssSgpStop` completed successfully
ss_sgp_rc_error	*ss_sgp_re_out_of_range*	Bad value for *attribute_count*
ss_sgp_rc_error	*ss_sgp_re_mx_fail*	Mutex acquisition failed
ss_sgp_rc_error	*ss_sgp_re_not_found*	Storage group not found
ss_sgp_rc_warning	*ss_sgp_re_offline*	Already stopped or stop in progress
ss_sgp_rc_error	*ss_sgp_re_cv_fail*	Condition variable wait failed

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMSGP MACRO
PL/X	SSPLXSGP COPY

ssSgpWrite — Write a Storage Group

```
ssSgpWrite
                  retcode
                  reascode
                  storage_group_number
                  starting_block
                  block_count
                  buffer_alet
                  buffer
```

Purpose

Writes one or more blocks to a storage group.

Operands

ssSgpWrite
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssSgpWrite`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssSgpWrite`.

storage_group_number
(input,INT,4) is a signed four-byte binary input variable holding the number of the storage group to which blocks should be written.

starting_block
(input,INT,4) is a signed four-byte binary input variable holding the starting block number of the block extent to be written.

block_count
(input,INT,4) is a signed four-byte binary input variable holding the number of blocks to be written.

buffer_alet
(input,INT,4) is a signed four-byte binary input variable holding the ALET to be used when referring to *buffer*.

buffer
(input,CHAR,4096**block_count*) is a character string holding the data to be written to the storage group.

Usage Notes

1. The first block of the storage group is block 0.
2. This entry point can be used only if the storage group is online with attribute *ss_sgp_attrib_block_rw*.
3. This entry point does not serialize access to storage groups. If your application performs storage group I/O on multiple threads, it is possible that the I/O might happen in parallel, *especially in MP situations*. It is the application developer's responsibility to implement any serialization paradigms required.
4. When VM Data Spaces are used, the transfer from the source space to the storage group's data space is done with PSW key 0.
5. When a CP DIAGNOSE is used, CP is instructed to use key 0 in the channel programs it builds.
6. If DIAG `X'A4'` is being used for storage group I/O, *buffer_alet* must be 0.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_sgp_rc_success	*ss_sgp_re_success*	`ssSgpWrite` completed successfully
ss_sgp_rc_error	*ss_sgp_re_mx_fail*	Mutex acquisition failed
ss_sgp_rc_error	*ss_sgp_re_not_found*	Storage group not found
ss_sgp_rc_error	*ss_sgp_re_out_of_range*	Extent is not within storage group size
ss_sgp_rc_error	*ss_sgp_re_wrong_mode*	Storage group is not started for read-write block I/O
ss_sgp_rc_error	*ss_sgp_re_io_fail*	Requested write failed

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMSGP MACRO
PL/X	SSPLXSGP COPY

ssTrieCreate — Create a Trie

```
ssTrieCreate
                    retcode
                    reascode
                    triename
                    triesize
                    trieasit
                    triealet
```

Purpose

Creates a trie.

Operands

ssTrieCreate
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssTrieCreate`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssTrieCreate`.

triename
(input,CHAR,8) is a character string holding the name of the new trie.

triesize
(input,INT,4) is a signed four-byte binary input variable holding the size of the new trie's data space, in pages.

trieasit
(output,CHAR,8) is a character string to hold the ASIT of the data space for the new trie.

triealet
(output,INT,4) is a signed four-byte binary output variable to hold the ALET associated with the new trie's data space.

Usage Notes

1. The name supplied in parameter *triename* is used unchanged as a subpool name in a call to `ssMemoryCreateDS`. The server author must ensure that this name does not collide with any subpool names he might be using for other purposes.
2. The caller should specify parameter *triesize* in pages. The reusable server kernel passes *triesize* directly to `ssMemoryCreateDS`.
3. The reusable server kernel creates the new trie in a data space and returns the data space's ASIT and ALET to the caller.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_tri_rc_success	*ss_tri_re_success*	`ssTrieCreate` completed successfully
ss_tri_rc_error	*ss_tri_re_bad_size*	*triesize* <0 or >524288
ss_tri_rc_error	*ss_tri_re_trie_exists*	Trie *triename* already exists
ss_tri_rc_error	*ss_tri_re_out_of_storage*	Out of storage
ss_tri_rc_error	*ss_tri_re_dscr_fail*	Call to `ssMemoryCreateDS` failed

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMTRI MACRO
PL/X	SSPLXTRI COPY

ssTrieDelete — Delete a Trie

```
ssTrieDelete
                  retcode
                  reascode
                  triename
```

Purpose

Deletes a trie.

Operands

ssTrieDelete
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssTrieDelete`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssTrieDelete`.

triename
(input,CHAR,8) is a character string holding the name of the trie to be deleted.

Usage Notes

1. This call results in the data space being deleted via call to `ssMemoryDelete`.
2. If your application has shared the trie's ASIT with other virtual machines, your application is responsible for telling those other virtual machines about the upcoming deletion prior to calling `ssTrieDelete`.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_tri_rc_success	*ss_tri_re_success*	`ssTrieDelete` completed successfully
ss_tri_rc_error	*ss_tri_re_trie_not_found*	Trie *triename* was not found
ss_tri_rc_error	*ss_tri_re_trie_busy*	Unable to acquire lock necessary to delete trie

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMTRI MACRO
PL/X	SSPLXTRI COPY

ssTrieRecordInsert — Insert Record Into Trie

ssTrieRecordInsert
retcode
reascode
triename
triealet
recnum
index_buffer
index_length

Purpose

Inserts the record number into the trie, using the specified key.

Operands

ssTrieRecordInsert
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssTrieRecordInsert`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssTrieRecordInsert`.

triename
(input,CHAR,8) is a character string holding the name of the trie into which the record is to be inserted.

triealet
(input,INT,4) is a signed four-byte binary input variable holding the ALET of the data space in which the trie resides.

recnum
(input,INT,4) is a signed four-byte binary input variable holding the record number to be inserted into the trie.

index_buffer
(input,CHAR,*index_length*) is a character string holding the index of the record being inserted.

index_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *index_buffer*.

Usage Notes

1. If your virtual machine created the trie, you may use either the trie name or the trie ALET value to identify the trie. If *triealet* is nonzero the reusable server kernel will use your ALET directly. To refer to your trie by name, set *triealet* to zero and use input *triename* to specify the name of your trie.
2. If your virtual machine did not create the trie (that is, if the creator passed you the trie ASIT and you generated the ALET yourself), you must use parameter *triealet* to pass the reusable server kernel the ALET you generated for the trie. In this case, what you pass via *triename* is irrelevant.
3. The index string must not be longer than 256 bytes.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_tri_rc_success	*ss_tri_re_success*	`ssTrieRecordInsert` completed successfully
ss_tri_rc_error	*ss_tri_re_bad_index_len*	Index string has improper length
ss_tri_rc_error	*ss_tri_re_trie_not_found*	Trie *triename* was not found
ss_tri_rc_error	*ss_tri_re_trie_busy*	Unable to acquire lock necessary to update trie
ss_tri_rc_error	*ss_tri_re_out_of_ds_storage*	The data space is full

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMTRI MACRO
PL/X	SSPLXTRI COPY

ssTrieRecordList — List Matching Records

ssTrieRecordList
retcode
reascode
triename
triealet
index_buffer
index_length
recnum_array
recnum_array_capacity
records_found

Purpose

Generates a list of all the record numbers whose keys match the specified prefix.

Operands

ssTrieRecordList
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssTrieRecordList`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssTrieRecordList`.

triename
(input,CHAR,8) is a character string holding the name of the trie to be interrogated.

triealet
(input,INT,4) is a signed four-byte binary input variable holding the ALET of the data space in which the trie resides.

index_buffer
(input,CHAR,*index_length*) is a character string holding the key prefix to be used in the lookup.

index_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *index_buffer*.

recnum_array
(output,INT,4**recnum_array_capacity*) is an array of signed four-byte binary output variables to hold the record numbers whose keys match the supplied prefix.

recnum_array_capacity
(input,INT,4) is a signed four-byte binary input variable holding the size of *recnum_array*.

records_found
(output,INT,4) is a signed four-byte binary output variable to hold the number of record numbers found.

Usage Notes

1. If your virtual machine created the trie, you may use either the trie name or the trie ALET value to identify the trie. If *triealet* is nonzero the reusable server kernel will use your ALET directly. To refer to your trie by name, set *triealet* to zero and use input *triename* to specify the name of your trie.
2. If your virtual machine did not create the trie (that is, if the creator passed you the trie ASIT and you generated the ALET yourself), you must use parameter *triealet* to pass the reusable server kernel the ALET you generated for the trie. In this case, what you pass via *triename* is irrelevant.
3. The index string must not be longer than 256 bytes.
4. The reusable server kernel examines the trie and determines the set of record numbers whose keys' prefixes match the prefix you specified in *index_buffer*. It then writes the record numbers to the *recnum_array* array.
5. If there are more matching records than *recnum_array* can hold, the reusable server kernel fills *recnum_array* to capacity, writes the actual number of matching records to *records_found*, and returns success. You must always examine *records_found* to determine whether your array was large enough.

Messages and Return Codes

Return Code	Reason Code	Meaning
ss_tri_rc_success	*ss_tri_re_success*	`ssTrieRecordList` completed successfully
ss_tri_rc_error	*ss_tri_re_bad_index_len*	Index string has improper length
ss_tri_rc_error	*ss_tri_re_bad_capacity_len*	*recnum_array_capacity* must be >= 0
ss_tri_rc_error	*ss_tri_re_trie_not_found*	Trie *triename* was not found
ss_tri_rc_error	*ss_tri_re_trie_busy*	Unable to acquire lock necessary to update trie

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMTRI MACRO
PL/X	SSPLXTRI COPY

ssUseridMap — Produce Mapped User ID

```
ssUseridMap
                    retcode
                    reascode
                    linedriver
                    linedriver_length
                    input_node
                    input_node_length
                    input_userid
                    input_userid_length
                    output_userid
                    output_userid_length
```

Purpose

Maps line-driver-specific information through the user ID mapping file.

Operands

ssUseridMap
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssUseridMap`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssUseridMap`.

linedriver
(input,CHAR,*linedriver_length*) is a character string holding the name of the line driver.

linedriver_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *linedriver*.

input_node
(input,CHAR,*input_node_length*) is a character string holding the input node for the mapping function.

input_node_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *input_node*.

input_userid
(input,CHAR,*input_userid_length*) is a character string holding the input user ID for the mapping function.

input_userid_length
(input,INT,4) is a signed four-byte binary input variable holding the length of *input_userid*.

output_userid
(output,CHAR,64) is a character string to hold the output of the mapping function.

output_userid_length
(output,INT,4) is a signed four-byte binary output variable to hold the length of the retrieved user ID.

Usage Notes

1. The reusable server kernel maps the triplet (*linedriver*,*input_node*,*input_userid*) through the user ID mapping file and returns the resultant user identifier.
2. For more information about the organization and use of the user ID mapping file, see “User ID Mapping Facility” on page 78.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_uid_rc_success	*ss_uid_re_success*	`ssUseridMap` completed successfully
ss_uid_rc_error	*ss_uid_re_not_found*	No matching entry in user ID mapping file

Programming Language Bindings

Language	**Language Binding File**
Assembler	SSASMUID MACRO
PL/X	SSPLXUID COPY

ssWorkerAllocate — Allocate Connection to Worker Machine

ssWorkerAllocate
retcode
reascode
instance_C-block
class_name
option_count
option_names
option_values
worker_C-block
connection_ID

Purpose

Allocates a connection to a worker machine, autologging a worker if necessary.

Operands

ssWorkerAllocate
is the name of the function being invoked.

retcode
(output,INT,4) is a signed four-byte binary output variable to hold the return code from `ssWorkerAllocate`.

reascode
(output,INT,4) is a signed four-byte binary output variable to hold the reason code from `ssWorkerAllocate`.

instance_C-block
(input,POINTER,4) is a pointer holding the address of the C-block previously created for the calling instance by its own line driver.

class_name
(input,CHAR,8) is a character string holding the name of the class from which a worker machine should be selected.

option_count
(input,INT,4) is a signed four-byte binary input variable holding the number of elements in the *option_names* and *option_values* arrays.

option_names
(input,INT,4**option_count*) is an array of signed four-byte binary input variables holding option names.

option_values
(input,INT,4**option_count*) is an array of signed four-byte binary input variables holding option values.

worker_C-block
(output,POINTER,4) is a pointer to hold the address of the returned worker C-block, constructed by the server kernel to represent the connection between the instance and the selected worker.

connection_ID
(output,INT,4) is a signed four-byte binary output variable to hold the returned connection ID.

Usage Notes

1. Input *instance_C-block* is the address of the C-block assigned to the instance by its line driver. This value was passed to the instance in its own parameter list when the instance was started.
2. The worker class *class_name* should correspond to a class defined through the `WORKER ADD` command. If the class has not yet been created through `WORKER ADD`, an error is returned.
3. Case is significant in class names.
4. The *option_names* array can contain any of these values:

   ss_wrk_ofn_prefer_empty The corresponding entry in the *option_values* array controls how the server kernel will search for an available worker, as follows:

ss_wrk_ofv_yes	The server kernel will search for empty or not-yet-logged-on worker machines first and direct the connection to one of those. If no such worker is found the server kernel will determine the least burdened worker and direct the connection to it.
ss_wrk_ofv_no	The server kernel will search the already-logged-on workers, determine the least burdened one, and direct the connection to it. If no workers are logged on yet, or if all logged-on workers are full, the server kernel will autolog another worker and direct the connection to it.

ss_wrk_ofn_retry_count	The corresponding value in the *option_values* array is the number of worker machines the server kernel should try before it gives up. Specifying a count of zero means that the server kernel should try until it runs out of worker machine candidates.
ss_wrk_ofn_alt_userid	The corresponding value in the *option_values* array is a pointer to an 8-byte character string which is the alternate user ID to use.
ss_wrk_ofn_alt_seclabel	The corresponding value in the *option_values* array is a pointer to an 8-byte character string which is the alternate seclabel to use.

5. The server kernel maintains status information about the workers in each class and uses that status information when considering whether to try to connect to a worker. The status information, an integer, indicates either that the worker machine appears healthy or tells the reason why the last attempt to connect to

the worker machine failed. For more information, see "WORKER MACHINES" on page 214.

6. To be able to set a worker's alternate user ID and seclabel, the controlling virtual machine must have permission to issue Diagnose `X'D4'`. See *z/VM: CP Programming Services* for more information. If you attempt to use the reusable server kernel's alternate user ID machinery and your virtual machine does not have the privilege necessary to issue Diagnose `X'D4'`, your virtual machine will take a program check. It is your responsibility to recover from this.
7. The reusable server kernel always uses the subcode `X'04'` form of Diagnose `X'D4'`.
8. If you specify an alternate seclabel, you must also specify an alternate user ID. The reusable server kernel does not check this.
9. Output *worker_C-block* will contain the address of the C-block that describes the connection from the instance to the worker. The instance should consult this C-block for:
   - The queue handle it should use when sending IPC messages to the server kernel about this worker connnection
   - The line driver key it should use when sending IPC messages to the server kernel about this worker connection
10. The returned connection ID will appear in IPC messages arriving on the instance's line driver queue. These messages, keyed with the instance's key, are indicative of activity on the worker connection.

Messages and Return Codes

Return Code	**Reason Code**	**Meaning**
ss_wrk_rc_success	*ss_wrk_re_success*	`ssWorkerAllocate` completed successfully
ss_wrk_rc_error	*ss_wrk_re_out_of_storage*	Insufficient storage to connect to worker
ss_wrk_rc_error	*ss_wrk_re_bad_count*	Input *option_count* contains a negative value
ss_wrk_rc_error	*ss_wrk_re_bad_flag_name*	Input *option_names* contains an unrecognized name
ss_wrk_rc_error	*ss_wrk_re_bad_flag_value*	Input *option_values* contains an unrecognized value
ss_wrk_rc_error	*ss_wrk_re_no_class*	The class you requested does not exist
ss_wrk_rc_error	*ss_wrk_re_no_subordinates*	No worker machine could be found
ss_wrk_rc_error	*ss_wrk_re_algtries_exceeded*	The last worker machine tried was autologged several times but the IUCV connection never succeeded
ss_wrk_rc_error	*ss_wrk_re_autolog_fail*	The server kernel was unable to autolog the last virtual machine it tried
ss_wrk_rc_error	*ss_wrk_re_timer_fail*	The server kernel tried to use the CMS Timer API to set a timer but the Timer API failed
ss_wrk_rc_error	*ss_wrk_re_iucvcon_fail*	The server kernel encountered an unrecoverable `IUCV CONNECT` error on the last worker virtual machine it tried
ss_wrk_rc_error	*ss_wrk_re_force_fail*	The server kernel tried to `CP FORCE` a worker (to reset it) but was unable to issue the `FORCE` command
ss_wrk_rc_error	*ss_wrk_re_force_timeout*	The server kernel `FORCE`d a worker (to reset it) but did not see the worker become logged off - possible hung user

Return Code	Reason Code	Meaning
ss_wrk_rc_error	*ss_wrk_re_oper_delete*	While the server kernel was trying to bring up the worker connection, the operator issued `WORKER DELETE` or `WORKER DELCLASS`, thus nullifying the connection attempt

Programming Language Bindings

Language	Language Binding File
Assembler	SSASMWRK MACRO
PL/X	SSPLXWRK COPY

Chapter 16. RSK Sockets

The RSK socket library is a PL/X application programming interface for socket programming. The library is a *very thin layer* over the IUCV socket interface and can be used only within an RSK program.[25] While the RSK socket library does not provide a correspondent for every IUCV socket function, it provides many of the basic operations necessary to communicate with other socket programs. The RSK socket library also provides some RSK-specific functions.

The RSK socket library is aware of multitasking CMS and integrates well with it. For example, when a socket operation blocks, only the calling thread blocks. Further, the library offers extensions to traditional socket semantics, making available asynchronous versions of often-used socket calls (such as *write()*). When the caller performs an asynchronous socket operation, the completion notice arrives as a message on a CMS queue.

Prerequisite Knowledge

This chapter assumes you have a working knowledge of the Reusable Server Kernel. You will also need to be experienced in socket programming, such as from having used IUCV sockets, C sockets, or Rexx/Sockets. To use the asynchronous features of the RSK socket library, you will need to understand CMS interprocess communication (IPC) as implemented by multitasking CMS's “queue” functions (e.g., `QueueReceiveBlock`). Finally, you will need to know how to program in PL/X.

To use the RSK socket documentation effectively, you will need a copy of the “IUCV Sockets” section of *IBM z/VM: TCP/IP FL 3.2.0 Programmer’s Reference*. That material gives complete usage information for the IUCV socket API. The best way to use this RSK socket library documentation is to refer to the RSK socket documentation and the IUCV socket documentation side-by-side.

Available Functions

The following IUCV socket functions have correspondents in the RSK socket interface:

Table 46 (Page 1 of 2). Socket Functions Available in RSK Library

IUCV socket function name	**RSK entry point name**
accept()	*PS_accept()*
bind()	*PS_bind()*
close()	*PS_close()*
connect()	*PS_connect()*
gethostid()	*PS_gethostid()*
getpeername()	*PS_getpeername()*
getsockname()	*PS_getsockname()*

[25] That is, the callers of the RSK socket library entry points must adhere to the RSK linkage and automatic storage conventions. See Chapter 11, “Run-Time Environment” on page 65 for more information.

Table 46 (Page 2 of 2). Socket Functions Available in RSK Library

IUCV socket function name	RSK entry point name
getsockopt()	*PS_getsockopt()*
ioctl()	*PS_ioctl()*
listen()	*PS_listen()*
read()	*PS_read()*
recvfrom()	*PS_recvfrom()*
select()	*PS_select()*
sendto()	*PS_sendto()*
setsockopt()	*PS_setsockopt()*
shutdown()	*PS_shutdown()*
socket()	*PS_socket()*
write()	*PS_write()*

The following additional functions are specific to the RSK socket library:

Table 47. Additional RSK-Specific Functions in Library

Function	RSK entry point name
Library initialization	*PS_libinit()*
Library termination	*PS_libterm()*
Application initialization	*PS_applinit()*
Application termination	*PS_applterm()*
Asynchronous *read()*	*PS_async_read()*
Asynchronous *recvfrom()*	*PS_async_recv()*
Asynchronous *sendto()*	*PS_async_sendto()*
Asynchronous *write()*	*PS_async_write()*
Cancel asynchronous operation	*PS_cancel()*

Programming with RSK Sockets

Programming with the RSK socket library involves the following steps:

1. In each of your PL/X compilation units that will use the RSK socket library, you must *include the RSK socket library language binding macro*. To do so, put the following statement into each compilation unit:

   ```
   %include syslib(plxsock);
   ```

   `PLXSOCK COPY` is in `DMSRP MACLIB`, which is part of the z/VM PL/X Restricted Source Feature, which you can order as a feature of z/VM.

2. At run-time, your first step must be to initialize the RSK socket library. This prepares the library to receive socket calls. To initialize the library, you must either call *PS_libinit()* yourself or arrange for the RSK to call it. See “PS_libinit” on page 364 for more information.

3. To perform socket operations, you must create a *socket set*.[26] We call each RSK socket set an *application* and hence the entry point you use for this is *PS_applinit()*.

   You supply *PS_applinit()* with the name (VM user ID) of the TCP/IP stack machine, a unique name for your new set of sockets, and the number of sockets you want in the set.

   PS_applinit() establishes the IUCV connection to the TCP/IP stack machine and prepares the socket set for your use.
4. You perform operations on the sockets in your set. You use the RSK socket library entry points to do so. For example, to allocate a new socket, you call *PS_socket()*, or to write data to a socket, you call *PS_write()*.
5. When you are done with your set of sockets, you dispose of it by calling *PS_applterm()*, identifying the socket set by the unique name you chose for it at its creation.
6. Prior to your server ending, either you should call *PS_libterm()* or you should arrange for the RSK to call it. See “PS_libterm” on page 366 for more information.

Restrictions and Limitations

Be aware of the following restrictions and limitations when you use the RSK socket library:

- The RSK socket library uses storage subpool name `DMSSBPSO`. You should refrain from using this subpool name.
- The RSK socket library creates an HNDIUCV exit named `DMSPLXSK`. You should refrain from using this HNDIUCV exit name.
- The RSK socket library creates CMS semaphores whose names are of the form `DMSPLXSKxxxx`, where `xxxx` is a hexadecimal number. You should refrain from using semaphore names of these forms.
- Each socket set may contain 50 to 2000 sockets, inclusive.
- The RSK itself uses socket set names of the form `Uxxxxxxx` and `Txxxxxxx`, where `xxxxxxx` is a hexadecimal number. You should refrain from using socket set names of these forms.
- You may create more than one named socket set concurrently. The absolute limit on the number of socket sets the library can manage is set by call to *PS_libinit()*.[27] This limit counts both socket sets you create yourself and RSK UDP or TCP subtasks you have running in your server. Each such subtask uses one socket set.
- You may overlap operations on a socket set, but you should not overlap operations on a single socket. For example, if you use *PS_async_write()* to write data to a socket, you should not start another write to that socket until the current write to that socket finishes.

[26] In IUCV sockets, this step corresponds to establishing a connection to the TCP/IP stack machine and sending the initial message. In Rexx/Sockets, this step corresponds to invoking `Socket('Initialize')`.

[27] When the RSK calls *PS_libinit()*, it sets the limit to 100.

- When you call a synchronous socket operation (such as *PS_write()*), the calling thread blocks until the operation completes. Other CMS threads might run while the calling thread waits for the operation to complete. While the synchronous operation is in progress, other threads are permitted to perform operations on other sockets in that socket set and on other socket sets.

Data Structures

Certain data structures are important in socket programming. For example, the 16-byte structure containing the address of a new client (known to C programmers as *sockaddr_in*) is used throughout the API. Here are some hypothetical PL/X representations of those data structures. These representations are referred to in the routines' descriptions below, *but they are not provided in* `PLXSOCK COPY` and are here just for illustrative purposes.

Address Structure

```
/* sockaddr_in */
declare
 1  sockaddr_in       based boundary(word),
    5  si_family      fixed(15),           /* address family */
    5  si_port        fixed(16),           /* port number    */
    5  si_address     fixed(32),           /* IP address     */
    5  si_zero        char(8);             /* must be zero   */
```

Timeout Structure

```
/* timeout structure for select() */
declare
 1  timeval           based boundary(word),
    5  tv_sec         fixed(31),           /* seconds       */
    5  tv_usec        fixed(31);           /* microseconds  */
```

Notes on PLXSOCK COPY

The language binding file `PLXSOCK COPY` contains constant definitions, structure definitions, and function prototypes. Some notes on each:

Constants

Certain (but certainly not all) constants relevant to socket programming appear in `PLXSOCK COPY`. When the library requires you to supply a constant (such as `AF_INET`), check the binding to see if a symbolic name is available. If there is no symbolic name, you will have to make up your own.

Structures

PLXSOCK COPY contains definitions for certain structures commonly used in socket programming. Feel free to use these structures if you find them helpful.

Function Prototypes

PLXSOCK COPY contains function prototypes for each RSK socket library entry point.

Return Codes and ERRNO Values

By and large, the return code values and *errno* values returned by the RSK socket library correspond exactly to the values returned by the IUCV socket API. The following exceptions apply:

- Some entry points unique to the RSK socket library (such as *PS_applinit()*) supply a return and reason code. The descriptions below list the return and reason codes that might be produced.
- The RSK socket library defines additional *errno* values not found in the IUCV socket API. These *errno* values come from the additional complexity in the RSK socket library. Their symbolic names and meanings are:

Name	Meaning
EIBMIUCVERR	Some kind of IUCV error occurred
EIBMLIBERR	The RSK socket library is not initialized
EIBMNOAPPL	The socket set you named does not exist
EIBMNOSOCKAVAIL	No sockets available in socket set
EIBMBADKEYLEN	Notify key length is invalid
EIBMNOSTORAGE	No storage available
EIBMBADBUFLEN	A supplied buffer length is invalid
EIBMBADPARM	Timeout buffer length is invalid

Any of the RSK socket library routines having *errno* as an output might produce some of these *errno* values.

RSK Socket Calls

This section provides the PL/X language syntax, parameters, and other appropriate information for each socket call the RSK supports.

The parameter lists and syntax for each routine are illustrated with PL/X snippets. *These snippets are not verbatim examples you can compile and run.* They just show the data type of each parameter list entry, whether the item is input (**I**) or output (**O**), and how to code the CALL statement to invoke the function.

Usage notes here are confined to explaining particulars of the RSK socket API. As a result, the information here is intentionally terse. Again, refer to "IUCV Sockets" in *IBM z/VM: TCP/IP FL 3.2.0 Programmer's Reference*.

PS_accept

Purpose

Performs socket *accept()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname     char(8),
 lsocket      fixed(31),
 addrbufptr   pointer(31),
 addrbufsize  fixed(31),
 addrlen      fixed(31),
 socket       fixed(31),
 errno        fixed(31);

/* how to call */
call PS_accept
(
 applname,              /* I:  application name       */
 lsocket,               /* I:  listen socket          */
 addrbufptr,            /* I:  address buffer pointer  */
 addrbufsize,           /* I:  address buffer size     */
 addrlen,               /* O:  address length          */
 socket,                /* O:  new socket number       */
 errno                  /* O:  ERRNO                   */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
lsocket	Socket you listened on
addrbufptr	Pointer to buffer into which API should place a completed sockaddr_in structure
addrbufsize	Size of said buffer
addrlen	Returned length of sockaddr_in structure
socket	Socket number for new connection
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

PS_applinit

Purpose

Creates a socket set.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 rc          fixed(31),
 re          fixed(31),
 tcpname     char(8),
 applname    char(8),
 numwanted   fixed(31),
 numgotten   fixed(31);

/* how to call */
call PS_applinit
(
 rc,                    /* O:  return code            */
 re,                    /* O:  reason code            */
 tcpname,               /* I:  name of TCP/IP stack   */
 applname,              /* I:  appl name to use       */
 numwanted,             /* I:  num of sockets wanted  */
 numgotten              /* O:  num of sockets gotten  */
);
```

Parameters

Parameter	**Definition**
rc	Return code
re	Reason code
tcpname	User ID of TCP/IP stack machine
applname	Name for new socket set
numwanted	Number of sockets wanted (50 to 2000)
numgotten	Number of sockets gotten

Reason Codes

Reason Code	**Meaning**
sok_re_bad_ns	numwanted is out of range
sok_re_dup_appl	applname already in use
sok_re_ic_fail	IUCV CONNECT to stack failed
sok_re_bad_inttype	Stack responded improperly to CONNECT
sok_re_is_fail	IUCV SEND to stack failed
sok_re_diff_ns	numgotten ¬= numwanted

Usage Notes

1. If you get a warning return code and you get reason code sok_re_diff_ns, you may proceed to use the socket set, recognizing you did not get as many sockets as you requested.

| 2. If you get an error return code and you get reason code sok_re_diff_ns, the
| socket set was not created because the TCP/IP stack tried to give you more
| sockets than you requested.

PS_applterm

Purpose

Terminates a socket set.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 rc          fixed(31),
 re          fixed(31),
 applname    char(8);

/* how to call */
call PS_applterm
(
 rc,                     /* O:  return code            */
 re,                     /* O:  reason code            */
 applname                /* I:  set to terminate       */
);
```

Parameters

Parameter	**Definition**
rc	Return code
re	Reason code
applname	Name of socket set to terminate

Reason Codes

Reason Code	**Meaning**
sok_re_no_appl	Application not found

Usage Notes

None.

PS_async_read

Purpose

Starts a read of a socket. The library sends an IPC message when the read completes.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname     char(8),
 socket       fixed(31),
 bufpointer   pointer(31),
 bufsize      fixed(31),
 nqhandle     fixed(31),
 nkpointer    pointer(31),
 nklength     fixed(31),
 xid          fixed(31),
 rc           fixed(31),
 errno        fixed(31);

/* how to call */
call PS_async_read
(
 applname,              /* I:  application name       */
 socket,                /* I:  socket to read         */
 bufpointer,            /* I:  pointer to read buffer  */
 bufsize,               /* I:  size of read buffer     */
 nqhandle,              /* I:  handle of notify queue  */
 nkpointer,             /* I:  pointer to notify key   */
 nklength,              /* I:  length of notify key    */
 xid,                   /* O:  transaction ID          */
 rc,                    /* O:  return code             */
 errno                  /* O:  ERRNO                   */
);
```

Parameters

Parameter	Definition
applname	Name of socket set
socket	Socket to read
bufpointer	Pointer to buffer to be filled
bufsize	Amount of data wanted
nqhandle	Handle of notify queue
nkpointer	Pointer to key for notify message
nklength	Length of notify message
xid	Transaction ID
rc	Return code
errno	Returned ERRNO

Reason Codes

Not applicable.

Usage Notes

1. The handle for the notify queue must be a service ID. In other words, the queue in which the notification is to be placed must be a service queue. You must have already arranged for this by calling QueueIdentifyService.
2. The notification message you see in the service queue will be the concatenation of your notify key and the following extra data:

Offset.Length	Usage
0.4	Return code
4.4	Errno
8.16	Unused

3. The message will be sent with your notify key as its key.
4. If you need to cancel the operation before it completes, use the returned transaction ID in a call to *PS_cancel()*.

PS_async_recv

Purpose

Starts a receive of a datagram. The library sends an IPC message when the receive completes.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname     char(8),
 socket       fixed(31),
 bufpointer   pointer(31),
 bufsize      fixed(31),
 flagword     fixed(31),
 nqhandle     fixed(31),
 nkpointer    pointer(31),
 nklength     fixed(31),
 xid          fixed(31),
 rc           fixed(31),
 errno        fixed(31);

/* how to call */
call PS_async_recv
(
 applname,              /* I:  application name       */
 socket,                /* I:  socket to receive on    */
 bufpointer,            /* I:  pointer to recv buffer  */
 bufsize,               /* I:  size of recv buffer     */
 flagword,              /* I:  flag word               */
 nqhandle,              /* I:  handle of notify queue  */
 nkpointer,             /* I:  pointer to notify key   */
 nklength,              /* I:  length of notify key    */
 xid,                   /* O:  transaction ID          */
 rc,                    /* O:  return code             */
 errno                  /* O:  ERRNO                   */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket to receive on
bufpointer	Pointer to buffer to be filled
bufsize	Amount of data wanted
flagword	Flag word
nqhandle	Handle of notify queue
nkpointer	Pointer to key for notify message
nklength	Length of notify message
xid	Transaction ID
rc	Return code
errno	Returned ERRNO

Reason Codes

Not applicable.

Usage Notes

1. See the IUCV socket library documentation for definition of the flag word.
2. The handle for the notify queue must be a service ID. In other words, the queue in which the notification is to be placed must be a service queue. You must have already arranged for this by calling QueueIdentifyService.
3. The notification message you see in the service queue will be the concatenation of your notify key and the following extra data:

Offset.Length	**Usage**
0.4	Return code
4.4	Errno
8.16	sockaddr_in describing message source

4. The message will be sent with your notify key as its key.
5. If you need to cancel the operation before it completes, use the returned transaction ID in a call to *PS_cancel()*.

PS_async_sendto

Purpose

Starts a send of a datagram. The library sends an IPC message when the send completes.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname     char(8),
 socket       fixed(31),
 bufpointer   pointer(31),
 bufsize      fixed(31),
 flagword     fixed(31),
 addrbufptr   pointer(31),
 addrbufsize  fixed(31),
 nqhandle     fixed(31),
 nkpointer    pointer(31),
 nklength     fixed(31),
 xid          fixed(31),
 rc           fixed(31),
 errno        fixed(31);

/* how to call */
call PS_async_sendto
(
 applname,                /* I:  application name       */
 socket,                  /* I:  socket to send on      */
 bufpointer,              /* I:  pointer to data buffer  */
 bufsize,                 /* I:  size of data buffer    */
 flagword,                /* I:  flag word              */
 addrbufptr,              /* I:  pointer to addr buffer  */
 addrbufsize,             /* I:  size of addr buffer    */
 nqhandle,                /* I:  handle of notify queue  */
 nkpointer,               /* I:  pointer to notify key   */
 nklength,                /* I:  length of notify key    */
 xid,                     /* O:  transaction ID         */
 rc,                      /* O:  return code            */
 errno                    /* O:  ERRNO                  */
);
```

Parameters

Parameter	Definition
applname	Name of socket set
socket	Socket to send on
bufpointer	Pointer to data buffer
bufsize	Length of data buffer
flagword	Flag word
addrbufptr	Pointer to sockaddr_in structure
addrbufsize	Length of sockaddr_in structure
nqhandle	Handle of notify queue

nkpointer	Pointer to key for notify message
nklength	Length of notify message
xid	Transaction ID
rc	Return code
errno	Returned ERRNO

Reason Codes

Not applicable.

Usage Notes

1. See the IUCV socket library documentation for definition of the flag word.
2. The handle for the notify queue must be a service ID. In other words, the queue in which the notification is to be placed must be a service queue. You must have already arranged for this by calling QueueIdentifyService.
3. The notification message you see in the service queue will be the concatenation of your notify key and the following extra data:

Offset.Length	**Usage**
0.4	Return code
4.4	Errno
8.16	Unused

4. The message will be sent with your notify key as its key.
5. If you need to cancel the operation before it completes, use the returned transaction ID in a call to *PS_cancel()*.

PS_async_write

Purpose

Starts a write to a socket. The library sends an IPC message when the write completes.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname     char(8),
 socket       fixed(31),
 bufpointer   pointer(31),
 bufsize      fixed(31),
 nqhandle     fixed(31),
 nkpointer    pointer(31),
 nklength     fixed(31),
 xid          fixed(31),
 rc           fixed(31),
 errno        fixed(31);

/* how to call */
call PS_async_write
(
 applname,              /* I:  application name       */
 socket,                /* I:  socket to write to     */
 bufpointer,            /* I:  pointer to data buffer */
 bufsize,               /* I:  size of data buffer    */
 nqhandle,              /* I:  handle of notify queue */
 nkpointer,             /* I:  pointer to notify key  */
 nklength,              /* I:  length of notify key   */
 xid,                   /* O:  transaction ID         */
 rc,                    /* O:  return code            */
 errno                  /* O:  ERRNO                  */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket to write to
bufpointer	Pointer to data buffer
bufsize	Length of data buffer
nqhandle	Handle of notify queue
nkpointer	Pointer to key for notify message
nklength	Length of notify message
xid	Transaction ID
rc	Return code
errno	Returned ERRNO

Reason Codes

Not applicable.

Usage Notes

1. The handle for the notify queue must be a service ID. In other words, the queue in which the notification is to be placed must be a service queue. You must have already arranged for this by calling QueueIdentifyService.
2. The notification message you see in the service queue will be the concatenation of your notify key and the following extra data:

Offset.Length	**Usage**
0.4	Return code
4.4	Errno
8.16	Unused

3. The message will be sent with your notify key as its key.
4. If you need to cancel the operation before it completes, use the returned transaction ID in a call to *PS_cancel()*.

PS_bind

Purpose

Performs *bind()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname     char(8),
 socket       fixed(31),
 addrbufptr   pointer(31),
 addrbufsize  fixed(31),
 rc           fixed(31),
 errno        fixed(31);

/* how to call */
call PS_bind
(
 applname,               /* I:  application name        */
 socket,                 /* I:  socket for bind         */
 addrbufptr,             /* I:  address buffer pointer  */
 addrbufsize,            /* I:  address buffer size     */
 rc,                     /* O:  return code             */
 errno                   /* O:  ERRNO                   */
);
```

Parameters

Parameter	Definition
applname	Name of socket set
socket	Socket for bind
addrbufptr	Pointer to your built sockaddr_in structure
addrbufsize	Length of your sockaddr_in structure
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

PS_cancel

Purpose

Cancels an asynchronous RSK socket function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname     char(8),
 xid          fixed(31),
 rc           fixed(31),
 errno        fixed(31);

/* how to call */
call PS_cancel
(
 applname,              /* I:  application name       */
 xid,                   /* I:  transaction to cancel  */
 rc,                    /* O:  return code            */
 errno                  /* O:  ERRNO                  */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
xid	Transaction to cancel
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

PS_close

Purpose

Performs *close()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname     char(8),
 socket       fixed(31),
 rc           fixed(31),
 errno        fixed(31);

/* how to call */
call PS_close
(
 applname,              /* I:  application name        */
 socket,                /* I:  socket to close         */
 rc,                    /* O:  return code             */
 errno                  /* O:  ERRNO                   */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket to close
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

PS_connect

Purpose

Performs *connect()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname     char(8),
 socket       fixed(31),
 addrbufptr   pointer(31),
 addrbufsize  fixed(31),
 rc           fixed(31),
 errno        fixed(31);

/* how to call */
call PS_connect
(
 applname,                /* I:  application name       */
 socket,                  /* I:  socket to use          */
 addrbufptr,              /* I:  pointer to sockaddr_in  */
 addrbufsize,             /* I:  length of sockaddr_in   */
 rc,                      /* O:  return code            */
 errno                    /* O:  ERRNO                  */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket to close
addrbufptr	Pointer to sockaddr_in describing target
addrbufsize	Length of sockaddr_in
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

PS_gethostid

Purpose

Performs *gethostid()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname     char(8),
 hostid       fixed(31),
 errno        fixed(31);

/* how to call */
call PS_gethostid
(
 applname,               /* I:  application name        */
 hostid,                 /* O:  host ID                 */
 errno                   /* O:  ERRNO                   */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
hostid	Returned host ID
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

PS_getpeername

Purpose

Performs *getpeername()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname     char(8),
 socket       fixed(31),
 addrbufptr   pointer(31),
 addrbufsize  fixed(31),
 rc           fixed(31),
 errno        fixed(31);

/* how to call */
call PS_getpeername
(
 applname,              /* I:  application name       */
 socket,                /* I:  socket number          */
 addrbufptr,            /* I:  pointer to sockaddr_in  */
 addrbufsize,           /* I:  length of sockaddr_in   */
 rc,                    /* O:  return code            */
 errno                  /* O:  ERRNO                  */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket number
addrbufptr	Pointer to buffer to contain sockaddr_in
addrbufsize	Length of sockaddr_in
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

PS_getsockname

Purpose

Performs *getsockname()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname     char(8),
 socket       fixed(31),
 addrbufptr   pointer(31),
 addrbufsize  fixed(31),
 rc           fixed(31),
 errno        fixed(31);

/* how to call */
call PS_getsockname
(
 applname,              /* I:  application name       */
 socket,                /* I:  socket number          */
 addrbufptr,            /* I:  pointer to sockaddr_in  */
 addrbufsize,           /* I:  length of sockaddr_in   */
 rc,                    /* O:  return code            */
 errno                  /* O:  ERRNO                  */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket number
addrbufptr	Pointer to buffer to contain sockaddr_in
addrbufsize	Length of sockaddr_in
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

PS_getsockopt

Purpose

Performs *getsockopt()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname         char(8),
 socket           fixed(31),
 level            fixed(31),
 optname          fixed(31),
 optvalptr        pointer(31),
 optvalbufsize    fixed(31),
 rc               fixed(31),
 errno            fixed(31);

/* how to call */
call PS_getsockopt
(
 applname,              /* I:  application name        */
 socket,                /* I:  socket number           */
 level,                 /* I:  level setting           */
 optname,               /* I:  option name             */
 optvalptr,             /* I:  pointer to value buffer */
 optvalbufsize,         /* I:  length of value buffer  */
 rc,                    /* O:  return code             */
 errno                  /* O:  ERRNO                   */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket number
level	Option level
optname	Name of option being interrogated
optvalptr	Pointer to buffer for option value
optvalbufsize	Size of buffer for option value
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

PS_ioctl

Purpose

Performs *ioctl()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname         char(8),
 socket           fixed(31),
 command          fixed(31),
 argstrptr        pointer(31),
 argstrlen        fixed(31),
 respbufptr       pointer(31),
 respbufsize      fixed(31),
 rc               fixed(31),
 errno            fixed(31);

/* how to call */
call PS_ioctl
(
 applname,               /* I:  application name        */
 socket,                 /* I:  socket number           */
 command,                /* I:  ioctl command           */
 argstrptr,              /* I:  pointer to arg string   */
 argstrlen,              /* I:  length of arg string    */
 respbufptr,             /* I:  pointer to resp buffer  */
 respbufsize,            /* I:  size of resp buffer     */
 rc,                     /* O:  return code             */
 errno                   /* O:  ERRNO                   */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket number
command	*ioctl()* command
argstrptr	Pointer to argument string
argstrlen	Length of argument string
respbufptr	Pointer to response buffer
respbufsize	Size of response buffer
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

| ## Usage Notes
| None.

PS_libinit

Purpose

Initializes the RSK socket library.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 rc                fixed(31),
 re                fixed(31),
 numofapps         fixed(31);

/* how to call */
call PS_libinit
(
 rc,                      /* O:  return code            */
 re,                      /* O:  reason code            */
 numofapps                /* I:  number of applications  */
);
```

Parameters

Parameter	**Definition**
rc	Return code
re	Reason code
numofapps	Number of concurrent applications

Reason Codes

Reason Code	**Meaning**
sok_re_success	Function worked correctly
sok_re_already	Socket library already initialized
sok_re_bad_appl_count	numofapps is out of range
sok_re_out_of_storage	Insufficient storage
sok_re_hs_fail	HNDIUCV SET failed
sok_re_sc_fail	SemCreate failed

Usage Notes

1. You need to coordinate your use of *PS_libinit()* with the RSK's TCP and UDP line drivers.

   The objective in such coordination is to make sure that if the RSK decides to call *PS_libinit()*, its call will work. (Most service levels of the RSK cannot tolerate failure of a call to *PS_libinit()*.)

   If you plan **never ever** to use any of the IP functions in the RSK, you will definitely need to call *PS_libinit()* exactly once to initialize the RSK socket library, so you should go ahead and issue the call before you issue any other RSK socket calls.

   However, if your server starts the TCP or UDP line drivers (for example, `SUBCOM START UDP` appears in your `PROFILE RSK`), then you should refrain from calling *PS_libinit()* because the RSK will do so as part of initializing those line drivers.

| If the latter is your situation, you can assume that the RSK has initialized the
| socket library as soon as control returns from the first `START` of the TCP or UDP
| line driver (e.g., `SUBCOM START TCP` in `PROFILE RSK`).

PS_libterm

Purpose

Terminates the RSK socket library.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 rc              fixed(31),
 re              fixed(31),

/* how to call */
call PS_libterm
(
 rc,                      /* O:  return code            */
 re                       /* O:  reason code            */
);
```

Parameters

Parameter	Definition
rc	Return code
re	Reason code

Reason Codes

Reason Code	Meaning
sok_re_success	Function worked correctly

Usage Notes

1. You need to coordinate your use of *PS_libterm()* with the RSK's TCP and UDP line drivers.

   The objective in such coordination is to make sure that you do not terminate the socket library prior to the RSK's being ready for it to be terminated.

   If you plan **never ever** to use any of the IP functions in the RSK, you will definitely need to call *PS_libinit()* exactly once to terminate the RSK socket library, so you should go ahead and issue the call after you are all done issuing other RSK socket calls.

   However, if your server starts the TCP or UDP line drivers (for example, `SUBCOM START UDP` appears in your `PROFILE RSK`), then you should refrain from calling *PS_libterm()* because the RSK will do so as part of terminating those line drivers.

   The RSK will terminate the TCP and UDP line drivers only after all of your instance threads have terminated.

PS_listen

Purpose

Performs *listen()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname        char(8),
 socket          fixed(31),
 queuesize       fixed(31),
 rc              fixed(31),
 errno           fixed(31);

/* how to call */
call PS_listen
(
 applname,              /* I:  application name        */
 socket,                /* I:  socket number           */
 queuesize,             /* I:  backlog queue size      */
 rc,                    /* O:  return code             */
 errno                  /* O:  ERRNO                   */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket number
queuesize	Backlog queue size
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

PS_read

Purpose

Performs *read()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname          char(8),
 socket            fixed(31),
 bufpointer        pointer(31),
 bufsize           fixed(31),
 rc                fixed(31),
 errno             fixed(31);

/* how to call */
call PS_read
(
 applname,               /* I:  application name        */
 socket,                 /* I:  socket number           */
 bufpointer,             /* I:  pointer to read buffer  */
 bufsize,                /* I:  size of read buffer     */
 rc,                     /* O:  return code             */
 errno                   /* O:  ERRNO                   */
);
```

Parameters

Parameter	Definition
applname	Name of socket set
socket	Socket number
bufpointer	Pointer to read buffer
bufsize	Size of read buffer
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

PS_recvfrom

Purpose

Performs *recvfrom()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname        char(8),
 socket          fixed(31),
 bufpointer      pointer(31),
 bufsize         fixed(31),
 flagword        fixed(31),
 addrbufptr      pointer(31),
 addrbufsize     fixed(31),
 rc              fixed(31),
 errno           fixed(31);

/* how to call */
call PS_recvfrom
(
 applname,              /* I:  application name       */
 socket,                /* I:  socket number          */
 bufpointer,            /* I:  pointer to recv buffer  */
 bufsize,               /* I:  size of recv buffer     */
 flagword,              /* I:  flag word              */
 addrbufptr,            /* I:  pointer to sockaddr_in  */
 addrbufsize,           /* I:  size of sockaddr_in     */
 rc,                    /* O:  return code            */
 errno                  /* O:  ERRNO                  */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket number
bufpointer	Pointer to recv buffer
bufsize	Size of recv buffer
flagword	Flag word
addrbufptr	Pointer to buffer to receive sockaddr_in
addrbufsize	Size of buffer to receive sockaddr_in
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

| ## Usage Notes
| 1. See the IUCV socket library documentation for definition of the flag word.

PS_select

Purpose

Performs *select()* function. Completion notification arrives as an IPC message in a CMS queue.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname        char(8),
 numinuse        fixed(31),
 rdptr           pointer(31),
 wrptr           pointer(31),
 exptr           pointer(31),
 toptr           pointer(31),
 nqhandle        fixed(31),
 nkpointer       pointer(31),
 nklength        fixed(31),
 xid             fixed(31),
 rc              fixed(31),
 errno           fixed(31);

/* how to call */
call PS_select
(
 applname,              /* I:  application name              */
 numinuse,              /* I:  sockets in use                */
 rdptr,                 /* I:  pointer to read descriptor    */
 wrptr,                 /* I:  pointer to write descriptor   */
 exptr,                 /* I:  pointer to exception descriptor */
 toptr,                 /* I:  pointer to timeval structure  */
 nqhandle,              /* I:  handle of notify queue        */
 nkpointer,             /* I:  pointer to notify key         */
 nklength,              /* I:  length of notify key          */
 xid,                   /* O:  transaction ID                */
 rc,                    /* O:  return code                   */
 errno                  /* O:  ERRNO                         */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
numinuse	Number of sockets named in descriptors
rdptr	Pointer to read-interrogation descriptor
wrptr	Pointer to write-interrogation descriptor
exptr	Pointer to exception-interrogation descriptor
toptr	Pointer to timeval structure
nqhandle	Handle of notify queue
nkpointer	Pointer to notify key
nklength	Length of notify key
xid	Returned transaction ID

rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

1. The handle for the notify queue must be a service ID. In other words, the queue in which the notification is to be placed must be a service queue. You must have already arranged for this by calling QueueIdentifyService.
2. The size of each descriptor in bytes, *fdsize*, is given by the formula 4 * ((numinuse+31)/32).
3. The notification message you see in the service queue will be the concatenation of your notify key and the following extra data:

Offset.Length	Usage
0.4	Return code
4.4	Errno
8.8	Unused
16.*fdsize*	Read-readiness descriptor
16+*fdsize***.***fdsize*	Write-readiness descriptor
16+2**fdsize***.***fdsize*	Exception-readiness descriptor

4. The message will be sent with your notify key as its key.
5. If you need to cancel the operation before it completes, use the returned transaction ID in a call to *PS_cancel()*.

PS_sendto

Purpose

Performs *sendto()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname         char(8),
 socket           fixed(31),
 bufpointer       pointer(31),
 bufsize          fixed(31),
 flagword         fixed(31),
 addrbufptr       pointer(31),
 addrbufsize      fixed(31),
 rc               fixed(31),
 errno            fixed(31);

/* how to call */
call PS_sendto
(
 applname,               /* I:  application name       */
 socket,                 /* I:  socket number          */
 bufpointer,             /* I:  pointer to send buffer */
 bufsize,                /* I:  size of send buffer    */
 flagword,               /* I:  flag word              */
 addrbufptr,             /* I:  pointer to sockaddr_in */
 addrbufsize,            /* I:  size of sockaddr_in    */
 rc,                     /* O:  return code            */
 errno                   /* O:  ERRNO                  */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket number
bufpointer	Pointer to send buffer
bufsize	Size of send buffer
flagword	Flag word
addrbufptr	Pointer to sockaddr_in describing recipient
addrbufsize	Size of buffer to receive sockaddr_in
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

1. See the IUCV socket library documentation for definition of the flag word.

PS_setsockopt

Purpose

Performs *setsockopt()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname        char(8),
 socket          fixed(31),
 level           fixed(31),
 optname         fixed(31),
 optvalptr       pointer(31),
 optvalbufsize   fixed(31),
 rc              fixed(31),
 errno           fixed(31);

/* how to call */
call PS_setsockopt
(
 applname,              /* I:  application name        */
 socket,                /* I:  socket number           */
 level,                 /* I:  level setting           */
 optname,               /* I:  option name             */
 optvalptr,             /* I:  pointer to value buffer */
 optvalbufsize,         /* I:  length of value buffer  */
 rc,                    /* O:  return code             */
 errno                  /* O:  ERRNO                   */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket number
level	Option level
optname	Name of option being set
optvalptr	Pointer to option value
optvalbufsize	Size of option value
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

PS_shutdown

Purpose

Performs *shutdown()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname         char(8),
 socket           fixed(31),
 method           fixed(31),
 rc               fixed(31),
 errno            fixed(31);

/* how to call */
call PS_shutdown
(
 applname,               /* I:  application name        */
 socket,                 /* I:  socket number           */
 method,                 /* I:  shutdown method         */
 rc,                     /* O:  return code             */
 errno                   /* O:  ERRNO                   */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket number
method	Shutdown method
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

| ## PS_socket

| ### Purpose
| Performs *socket()* function.

| ### PL/X Illustration

```
| %include syslib(plxsock);

| /* parameter data types */
| declare
|  applname        char(8),
|  domain          fixed(31),
|  type            fixed(31),
|  protocol        fixed(31),
|  socket          fixed(31),
|  errno           fixed(31);

| /* how to call */
| call PS_socket
| (
|  applname,             /* I:  application name        */
|  domain,               /* I:  domain                  */
|  type,                 /* I:  type                    */
|  protocol,             /* I:  protocol                */
|  socket,               /* O:  socket number           */
|  errno                 /* O:  ERRNO                   */
| );
```

| ### Parameters

Parameter	**Definition**
applname	Name of socket set
domain	Socket domain
type	Socket type
protocol	Protocol to use
socket	Socket number
errno	Returned ERRNO value

| ### Reason Codes
| Not applicable.

| ### Usage Notes
| 1. Only domain AF_INET is supported.

PS_write

Purpose

Performs *write()* function.

PL/X Illustration

```
%include syslib(plxsock);

/* parameter data types */
declare
 applname         char(8),
 socket           fixed(31),
 bufpointer       pointer(31),
 bufsize          fixed(31),
 rc               fixed(31),
 errno            fixed(31);

/* how to call */
call PS_write
(
 applname,               /* I:  application name        */
 socket,                 /* I:  socket number           */
 bufpointer,             /* I:  pointer to write buffer */
 bufsize,                /* I:  size of write buffer    */
 rc,                     /* O:  return code             */
 errno                   /* O:  ERRNO                   */
);
```

Parameters

Parameter	**Definition**
applname	Name of socket set
socket	Socket number
bufpointer	Pointer to write buffer
bufsize	Size of write buffer
rc	Return code
errno	Returned ERRNO value

Reason Codes

Not applicable.

Usage Notes

None.

Appendix A. Sample PROFILE RSK

```
/*  */

/*******************************************************/
/*                                                     */
/* Sample Reusable Server Kernel profile file          */
/*                                                     */
/*******************************************************/

parse arg stuff
say 'Args were' stuff

/***************************/
/* first, config the server */
/***************************/

/***************************/
/* set names of data files  */
/***************************/

/* configure key data files */
'CONFIG SGP_FILE       MYSERV RSKSGP  A'
'CONFIG UMAP_FILE      MYSERV RSKUMAP A'

/* config auth data */
'CONFIG AUT_LOCATION   MINIDISK'
'CONFIG AUT_LOG        MYSERV  RSKAUL  B'
'CONFIG AUT_DATA_1     MYSERV1 RSKAUD  B'
'CONFIG AUT_INDEX_1    MYSERV1 RSKAUX  B'
'CONFIG AUT_DATA_2     MYSERV2 RSKAUD  B'
'CONFIG AUT_INDEX_2    MYSERV2 RSKAUX  B'

/***************************/
/* set other config vars    */
/***************************/

/* configure RSCS userid */
address command 'IDENTIFY ( LIFO'
parse pull . . . . rscsid .
'CONFIG RSCS_USERID' rscsid

/* configure monitor data */
'CONFIG MON_PRODUCT_ID MYSERVER'
'CONFIG MON_KERNEL_ROWS 50'

/* configure authorization database */
'CONFIG AUT_CACHE 100'
'CONFIG AUT_FREE 100'

/* configure AUTHCHECK family */
'CONFIG AUTHCHECK_AUTH ON'
'CONFIG AUTHCHECK_CACHE ON'
'CONFIG AUTHCHECK_CMS ON'
'CONFIG AUTHCHECK_CONFIG ON'
'CONFIG AUTHCHECK_CP ON'
```

```
'CONFIG AUTHCHECK_ENROLL ON'
'CONFIG AUTHCHECK_LD ON'
'CONFIG AUTHCHECK_SERVER ON'
'CONFIG AUTHCHECK_SGP ON'
'CONFIG AUTHCHECK_USERID ON'
'CONFIG AUTHCHECK_WORKER ON'

/* configure memory API */
'CONFIG MEM_MAXFREE 100'

/* set NOMAP actions */
'CONFIG NOMAP_TCP   OFF'
'CONFIG NOMAP_UDP   OFF'
'CONFIG NOMAP_MSG   OFF'
'CONFIG NOMAP_APPC  OFF'
'CONFIG NOMAP_IUCV  OFF'
'CONFIG NOMAP_SPOOL OFF'

/* configure MSG driver */
'CONFIG MSG_NOHDR OFF'

/* configure SPOOL driver */
'CONFIG SPL_INPUT_FT RSKRQST'
'CONFIG SPL_OUTPUT_FT RSKRESP'

/* configure implicit routing */
'CONFIG VM_CONSOLE ON'
'CONFIG VM_MSG ON'
'CONFIG VM_SPOOL ON'
'CONFIG VM_SUBCOM ON'

/**************************/
/* and start it           */
/**************************/

'RUNSERV'
if (rc<>0) then
 return 100

/*******************************************/
/* attach certain services to subcom driver */
/*******************************************/

'SUBCOM START WORKER'
'SUBCOM START USERID'
'SUBCOM START SERVER'
'SUBCOM START AUTH'
'SUBCOM START ENROLL'
'SUBCOM START SGP'
'SUBCOM START CMS'
'SUBCOM START CP'

'SUBCOM START TCP'
'SUBCOM START IUCV'
'SUBCOM START APPC'
'SUBCOM START SPOOL'
'SUBCOM START MSG'
'SUBCOM START CONSOLE'
```

```
/********************************************/
/* attach certain services to console too   */
/********************************************/

'CONSOLE START CACHE'
'CONSOLE START CONFIG'
'CONSOLE START USERID'
'CONSOLE START WORKER'
'CONSOLE START SERVER'
'CONSOLE START AUTH'
'CONSOLE START SGP'
'CONSOLE START CMS'
'CONSOLE START CP'
'CONSOLE START ENROLL'

'CONSOLE START TCP'
'CONSOLE START IUCV'
'CONSOLE START APPC'
'CONSOLE START SPOOL'
'CONSOLE START MSG'
'CONSOLE START SUBCOM'

/********************************************/
/* and attach some to the MSG driver        */
/********************************************/

'MSG START CACHE'
'MSG START CONFIG'
'MSG START USERID'
'MSG START SERVER'
'MSG START AUTH'
'MSG START SGP'
'MSG START CMS'
'MSG START CP'
'MSG START ENROLL'
'MSG START WORKER'

'MSG START TCP'
'MSG START SPOOL'
'MSG START MSG'
'MSG START SUBCOM'

/********************************************/
/* start author-supplied services           */
/********************************************/

/* for example... */
'TCP START MYSERV 500 10 0.0.0.0 TCPIP1'
'TCP START MYSERV 500 10 0.0.0.0 TCPIP2'
'TCP START MYSERV 500 10 0.0.0.0 TCPIP3'

'SUBCOM  START MYOP'
'CONSOLE START MYOP'
'MSG     START MYOP'
```

```
/*******************************************/
/* wait for server to end                  */
/*******************************************/

'WAITSERV'

/*******************************************/
/* perform server-specific termination here */
/*******************************************/

/*******************************************/
/* ... and return to caller                */
/*******************************************/

return 0
```

Appendix B. Sample User ID Mapping File

```
************************************************************************
*                                                                      *
*  Sample Reusable Server Kernel userid mapping file                   *
*                                                                      *
*  This file contains the mapping table that translates                *
*  a two-token userid identifier to a single-token userid.             *
*                                                                      *
*                                                                      *
*  USAGE NOTES:                                                        *
*                                                                      *
*  1. File can be V-format or F-format, it doesn't matter.             *
*     LRECL doesn't matter, either.                                    *
*                                                                      *
*  2. Blank lines and lines starting with "*" are ignored.             *
*                                                                      *
*  3. If a ";" appears in the line, the ";" and everything             *
*     after the ";" are ignored.                                       *
*                                                                      *
*  4. Each clause must fit completely in one file record.              *
*                                                                      *
*  5. Case IS significant in this file.                                *
*                                                                      *
*  6. The keyword in each clause must be in UPPER CASE.                *
*                                                                      *
*  7. Unrecognized clauses are skipped without mention.                *
*                                                                      *
*  8. The server kernel requires a userid mapping file to              *
*     be present.                                                      *
*                                                                      *
*                                                                      *
*  CLAUSE DEFINITION:                                                  *
*                                                                      *
*  Each clause is a record as follows:                                 *
*                                                                      *
*   MAP input_conn input_nodeid input_userid output_userid ; comment   *
*                                                                      *
*   where:                                                             *
*                                                                      *
*    MAP               is a literal identifying a mapping record       *
*    input_conn        is the input connectivity technology name       *
*    input_nodeid      is the input node ID                            *
*    input_userid      is the input user ID                            *
*    output_userid     is the output of translation                    *
*    comment           is an optional comment                          *
*                                                                      *
*   input_conn is one of:                                              *
*                                                                      *
*    TCP               describes a TCP/IP mapping                      *
*    UDP               describes a UDP/IP mapping                      *
*    IUCV              describes an IUCV mapping                       *
*    APPC              describes an APPC/VM mapping                    *
*    SPOOL             describes a SPOOL mapping                       *
*    MSG               describes a MSG mapping                         *
*    *                 applies to all technologies                     *
*                                                                    *
*  Notes:                                                            *
*                                                                    *
*  1.  The input fields are expressed in the same notation as queue  *
*      and event keys in CMS Application Multitasking, namely:       *
*                                                                    *
*      a. Case is significant,                                       *
*      b. "*" is a wildcard of 0 or more characters,                 *
*      c. "%" is a wildcard of exactly one character,                *
*      d. "'" is an escape character.                                *
*                                                                    *
*      For example, "GDLVM%" matches GDLVM1, GDLVM2, etc. but not    *
*      GDLVMV50, and "GDL*" matches GDLVM1, GDLVMV50, GDLAIX, etc.   *
*      WARNING: if you want "*", "%", or "'" to be a literal in      *
*      the field, precede it by the escape character '.              *
*                                                                    *
*  2.  The output_userid field can be any literal or "=" to mean     *
*      "use the value of input_userid".                              *
*                                                                    *
*  3.  The input fields can each be up to 64 bytes long.             *
*                                                                    *
*  4.  The output_userid field can be up to 64 bytes long.           *
*                                                                    *
*  Examples:                                                         *
*                                                                    *
*  MAP APPC     '*USERID:*       BKW  BKW                            *
*  MAP IUCV     GDLVM7           BKW  BKW                            *
*  MAP TCP      9.130.57.10      *    BKW                            *
*  MAP UDP      9.130.57.10      *    BKW                            *
*  MAP SPOOL    GDLVM7           BKW  BKW                            *
*  MAP MSG      GDLVMWEB         BKW  BKW                            *
*                                                                    *
*  In these examples, all of the following clients appear to be     *
*  userid BKW:                                                       *
*                                                                    *
*  - an IUCV-connected client coming from a virtual machine          *
*    whose userid is BKW                                             *
*                                                                    *
*  - an APPC/VM-connected client whose LU starts with "*USERID"      *
*    and whose security userid is BKW                                *
*                                                                    *
*  - a TCP/IP-connected client residing on machine 9.130.57.10       *
*                                                                    *
*  - a UDP/IP-connected client residing on machine 9.130.57.10       *
*                                                                    *
*  - a spool-connected client sending from BKW at GDLVM7             *
*                                                                    *
*  - a MSG-connected client sending from BKW at GDLVMWEB             *
*                                                                    *
*                                                                    *
*  SEARCH TECHNIQUE:                                                 *
*                                                                    *
*  The file is searched top to bottom, the first matching clause     *
*  being the one that takes effect.                                  *
*                                                                    *
**********************************************************************
```

Appendix C. Authorization Data File Formats

This appendix describes the internals of the files used to hold authorization data managed by the reusable server kernel. The information is provided so that vendors and toolsmiths might have a way to write management tools for these data files.

Overview

First, it's important to note that an *authorization data set* consists of a *data file* together with its corresponding *index file*. The data file contains records that define object classes, objects, users, and rules. The index file contains hash tables that let the reusable server kernel quickly locate specific objects' and specific users' information in the corresponding data file.

If the authorization data is being kept on minidisk, the reusable server kernel will keep twin copies of the authorization data set and will also keep a third kind of file, a *log file*, that lets it ensure consistency between an index file and its corresponding data file.[28] The reusable server kernel uses the log file to keep track of whether related changes are successfully applied to both an index file and its corresponding data file. The log file lets the reusable server kernel recover an authorization data set from its twin if a system failure should introduce some kind of integrity problem.

The authorization data files make heavy use of linked lists within the files themselves to relate records to one another. For example, all of the authorization rules applying to a given user are linked to one another, so that they may all be removed together by `ssAuthDeleteUser`. In all such linked lists, the linking is accomplished by file record number.

The Data File

The data file's role is to contain specific definitions of objects, users, classes, and rules. The data file is an F 300 file. Each record (or *row*) of a data file contains:

- A definition of an object class and a doubly-linked-list listhead that anchors all of the rows defining objects in this class, OR
- A definition of an object and a doubly-linked-list listhead that anchors all of the rows defining rules applying to this object, OR
- A definition of a user and a doubly-linked-list listhead that anchors all of the rules mentioning this user, OR
- A definition of a specific rule, that is, a correlation between an object, a user, and some subset of the actions defined on the class to which the object belongs, OR
- A stamp indicating that the row is free (unused) so that it might be allocated for another purpose at some time in the future.

[28] The log file is unnecessary for SFS situations because the reusable server kernel just dedicates a work unit to the authorization data set.

One can see, then, that the relationship between object classes, objects, users, and actions is recorded by maintaining linkages among the records in the data file.

The following tables give the specific formats of each of the kinds of records found in the data file.

Table 48. Free Row

Offset	Length	Usage
0	4	X'00000000'
4	8	Unused
12	4	Row number of next free row

Table 49. Class Row

Offset	Length	Usage
0	4	X'00000001'
4	4	Row number of next class row
8	4	Row number of previous class row
12	4	Row number of first object in class
16	4	Row number of last object in class
20	4	Class identifier
24	8	Class name
32	4	Number of operations defined on class
36	128	Operation names (four bytes each)

Table 50. Object Row

Offset	Length	Usage
0	4	X'00000002'
4	4	Row number of first rule for object
8	4	Row number of last rule for object
12	4	Row number of next object in class
16	4	Row number of previous object in class
20	4	Row number of next object in object hash
24	4	Row number of previous object in object hash
28	4	Object ID
32	4	Class ID of class to which object belongs
36	4	Row number of said class's row
40	4	Length of object name
44	256	Object name

Table 51 (Page 1 of 2). User Row

Offset	Length	Usage
0	4	X'00000003'

Table 51 (Page 2 of 2). User Row

Offset	**Length**	**Usage**
4	4	Length of user ID
8	4	Unused
12	4	Row number of first rule for user
16	4	Row number of last rule for user
20	4	Row number of next user in user hash
24	4	Row number of previous user in user hash
28	64	User ID

Table 52. Rule Row

Offset	**Length**	**Usage**
0	4	X'00000004'
4	4	Row number of next rule for object
8	4	Row number of previous rule for object
12	4	Row number of next rule for user
16	4	Row number of previous rule for user
20	4	Row number of user row
24	4	Row number of object row
28	4	Length of user ID
32	64	User ID
96	4	Object ID
100	4	Operation count
104	128	Permitted operations (four bytes each)

The Index File

The index file, an F 4096 file, contains these three things:

- An *anchor row* that gives certain critical information about the authorization data set
- An *object hash* that lets the reusable server kernel find a given object's row quickly
- A *user hash* that lets the reusable server kernel find a given user's row quickly

The anchor row -- record 1 of the index file -- is described in Table 53.

Table 53 (Page 1 of 2). Anchor Row

Offset	**Length**	**Usage**
0	4	Number of rows in data file
4	4	Row number of first class row in data file
8	4	Row number of last class row in data file
12	4	Row number of first free row in data file

Table 53 (Page 2 of 2). Anchor Row		
Offset	**Length**	**Usage**
16	4	Next class ID to use
20	4	Next object ID to use
24	4	Status bits (all zero when server down)

The object hash and user hash are each the same size. Each hash consists of 4096 buckets, numbered 1 to 4096. Each bucket consists of an eight-byte listhead - a *first row in hash* record number and a *last row in hash* record number. Thus each hash is 8 4096-byte records long. Records 2-9 are the object hash, and records 10-17 are the user hash.

To locate the row for a given object, the reusable server kernel hashes the object name to produce an integer *i* in the range [1,4096]. It then searches object hash bucket *i* for the object row nominating the object of interest. A similar hash-and-search procedure is used to find the row for a given user.

The Log File

When the authorization data sets reside on minidisk, the reusable server kernel maintains an F 256 *log file* that records updates that are in progress against an authorization data set's pair of files. The records in the log file are these:

- The *log stamp* row records which twin is known to be good and which twin has an update in progress. There is only one log stamp row in the log file and it is always record 1.
- A *log update* row lists a set of records in either an index file or a data file. Said list of records is in the process of being updated (rewritten).

The following tables give the organizations of these records.

Table 54. Log Stamp Row		
Offset	**Length**	**Usage**
0	4	Last known good authorization set (1 or 2)
4	4	Set against which an update is in progress
8	4	Number of update records following in log file

Table 55. Log Update Row		
Offset	**Length**	**Usage**
0	4	Data file (1) or index file (2) changes
4	4	Number of records being changed
8	248	Record numbers of records being changed (four bytes each)

The reusable server kernel performs log file updates, index file updates, data file updates, and file closes in a specific order which exploits the safety properties of the minidisk file system. The order of updates to these files is carefully controlled so that the files are always maintained on disk in a state from which the authorization database can be recovered even if there is an I/O failure.

The recovery algorithm is simple. When the reusable server kernel starts, it reads the first record of the log file to determine whether one of the twins was in the process of being updated when the files were last committed to disk. If one of the twins was being updated, the log update records tell which records were being rewritten. The reusable server kernel uses that list to restore the in-progress twin to a consistent state, merely copying the named records from the known-good twin to the in-progress twin. If the failing writes reflected a transaction that had already been performed against the known-good twin, the transaction will be propagated to the in-progress twin; if the failing writes reflected a transaction that had not yet been performed against the known-good twin, the transaction will be backed out. In this manner the in-progress twin is restored to a consistent state.

Appendix D. Enrollment Data File Format

An enrollment file is just a V-format CMS file, one file record per enrolled entity.

Columns	**Usage**
1	`A` for add, `D` for delete
2-65	Record's key
66-end	Record's data, if column 1 is `A`

When it loads the file into the data space, the reusable server kernel reads the file one record at a time, performing the operation specified in column 1. As API calls change the database, records are written to the end of the enrollment file, describing the API calls that took place. When the enrollment set is dropped, the file is closed with commit. If commit could not take place, the changes are backed out.

Appendix E. Storage Group File

The file containing storage group definitions is very simple. Each storage group is represented by one record. The first token of the record is the storage group number in decimal. The remaining tokens of the record are the hexadecimal virtual device numbers of the minidisks making up the storage group.

Appendix F. Reserved Names

The reusable server kernel uses several named CMS objects, such as storage subpools, mutexes, and the like. Further, in some cases the reusable server kernel uses named objects managed by its own entry points (for example, services registered through call to `ssServiceBind`).

The names of all CMS-managed objects used by the reusable server kernel start with the prefix `BKW` (case is not significant). Server authors should avoid this prefix.

Of course, CMS itself names objects with the prefixes `DMS` and `VM`, so these prefixes should be avoided as well.

Service Names

Specifically, the following service names are used:

Name	**Object**
`APPC`	APPC/VM line driver service name
`AUTH`	Authorization data manipulation service
`CACHE`	File cache manipulation service
`CMS`	CMS command execution service name
`CONFIG`	Configuration manipulation service
`CONSOLE`	Console line driver service name
`CP`	CP command execution service name
`ENROLL`	Enrollment service name
`IUCV`	IUCV line driver service name
`MSG`	MSG/SMSG line driver service name
`SERVER`	Server management service name
`SPOOL`	Spool line driver service name
`SUBCOM`	Subcom line driver service name
`TCP`	TCP/IP line driver service name
`TRIE`	Trie manipulation service
`UDP`	TCP/IP line driver service name
`USERID`	Userid mapping service name
`WORKER`	Userid mapping service name

Data Spaces

The reusable server kernel creates data spaces whose names are of the form `BKW@n`, where *n* is the storage group number. It also creates data spaces whose names begin with `BKW_`.

TCP/IP Subtask Names

The TCP/IP line driver uses the IUCV interface to TCP/IP. When it connects to the TCP/IP service machine, it uses subtask names that are uppercase seven-digit hexadecimal numbers prefixed by `T` (that is, anything from `T0000000` to `TFFFFFFF`).

UDP/IP Subtask Names

The UDP/IP line driver uses the IUCV interface to TCP/IP. When it connects to the TCP/IP service machine, it uses subtask names that are uppercase seven-digit hexadecimal numbers prefixed by `U` (that is, anything from `U0000000` to `UFFFFFFF`).

Appendix G. More Detail On Reason Codes

Table 56 on page 398 gives the correspondence between numeric values of nonzero reason codes and their symbolic names. When an entry point (for example, `ssSgpStart`) gives you a nonzero reason code, use the table to interpret the reason code and devise a recovery strategy.

Table 56 (Page 1 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
101	ss_uid_re_not_found	all	Add the appropriate mapping information to the user ID mapping file.
301	ss_aut_re_bad_count	all	Supply a valid option count or array length count.
302	ss_aut_re_bad_user_length	all	Supply a user ID length between 1 and 64 inclusive.
303	ss_aut_re_bad_obj_length	all	Supply an object length between 1 and 256 inclusive.
304	ss_aut_re_bad_option	all	Review the options array you supplied. One of the entries contains an unrecognized option code.
305	ss_aut_re_bad_qual	all	Review the qualifiers array you supplied. One of the entries contains a bad qualifier.
307	ss_aut_re_exists	all	The class or object you are trying to create already exists. Supply a different class name or object name.
308	ss_aut_re_no_class	all	The class to which you are referring does not exist. Supply a different class name.
309	ss_aut_re_no_object	all	The object to which you are referring does not exist. Supply a different object name.
310	ss_aut_re_maq_fail	all	A call by the server kernel to CSL routine `MutexAcquire` has failed. Contact IBM support.
311	ss_aut_re_cvw_fail	all	A call by the server kernel to CSL routine `CondVarWait` has failed. Contact IBM support.
312	ss_aut_re_cvs_fail	all	A call by the server kernel to CSL routine `CondVarSignal` has failed. Contact IBM support.
313	ss_aut_re_mr_fail	all	A call by the server kernel to CSL routine `MutexRelease` has failed. Contact IBM support.
314	ss_aut_re_too_many	ssAuthListClasses	There were more classes defined than your output array expected. Use a larger array.
314	ss_aut_re_too_many	ssAuthListObjects	There were more objects defined than your output array expected. Use a larger array.
314	ss_aut_re_too_many	ssAuthModifyClass	Your call would result in exceeding the limit of 32 operations defined per object class. Use fewer operations.
314	ss_aut_re_too_many	ssAuthQueryObject	There were more user IDs defined than your output array expected. Use a larger array.

Table 56 (Page 2 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
314	ss_aut_re_too_many	ssAuthQueryRule	There were more rules defined than your output array expected. Use a larger array.
316	ss_aut_re_no_user	all	The user ID you are attempting to locate does not exist in the authorization data. Try a different user ID.
317	ss_aut_re_prev_io_error	all	A previous I/O error to the authorization data base has taken it offline. Try `ssAuthReload`.
318	ss_aut_re_prev_sync_error	all	A previous error in calling one of CMS's synchronization routines (for example, `CondVarSignal`) has taken the authorization data base offline. Try `ssAuthReload`.
319	ss_aut_re_read_fail	all	An attempt to retrieve one or more records from one of the authorization data files has failed. This could mean either that an I/O error to one of the files has occurred or that there is insufficient storage to hold the records retrieved. Check for both conditions and respond accordingly.
320	ss_aut_re_write_fail	all	An attempt to write one or more records to one of the authorization data files has failed. This means an I/O error to one of the files has occurred. Check the file system and respond accordingly.
321	ss_aut_re_trunc	ssAuthListObjects	One or more returned object names was truncated. Use larger buffers.
321	ss_aut_re_trunc	ssAuthQueryObject	One or more returned user IDs was truncated. Use larger buffers.
322	ss_aut_re_gwu_fail	all	An attempt to get a CMS work unit has failed. Contact IBM support.
323	ss_aut_re_open_fail	all	An attempt to open one of the authorization data files has failed. Check the `AUT_` configuration parameters and the file system and respond accordingly.
601	ss_sgp_re_too_many	ssSgpList	There were more storage groups defined than your output array could hold. Use a larger array.
601	ss_sgp_re_too_many	ssSgpQuery	There were more minidisks defined than your output array could hold. Use a larger array.
602	ss_sgp_re_not_found	all	The storage group to which you are referring does not exist. Check the storage group identifier you are using (name or ID, as appropriate) and retry the operation.
603	ss_sgp_re_out_of_storage	all	There is insufficient storage to hold the control blocks necessary to represent the storage group. Use a larger virtual machine and try again.

Table 56 (Page 3 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
604	ss_sgp_re_mx_fail	all	One of the server kernel's calls to the CSL mutex routines has failed. Contact IBM support.
607	ss_sgp_re_exists	all	The storage group you are attempting to create already exists. Use a different storage group number or delete the storage group first.
608	ss_sgp_re_vdq_fail	all	The server kernel's attempt to determine the attributes of one or more of the minidisks defined in your storage group has failed. You might have an incorrect device number or perhaps the minidisk is not linked. It is also possible that the minidisk is not formatted at 4 KB or that it has not been reserved. Check all of these conditions and try again.
609	ss_sgp_re_online	ssSgpDelete	You cannot delete this storage group because it is online right now. Take it offline (use `ssSgpStop`) and then retry the operation.
609	ss_sgp_re_online	ssSgpStart	The storage group is already started. Stop it first.
610	ss_sgp_re_offline	ssSgpStop	The storage group is already offline.
610	ss_sgp_re_offline	ssSgpWrite	The storage group is offline and therefore writes cannot happen. Bring the storage group online first.
612	ss_sgp_re_cv_fail	all	One of the server kernel's calls to the CSL condition variable routines has failed. Contact IBM support.
615	ss_sgp_re_ds_fail	all	The server kernel's attempt to create data spaces to map a storage group's minidisks has failed. Check your virtual machine's `XCONFIG ADDRSPACE` CP directory statement to ensure that you have not exceeded either the number of dataspaces limit or the aggregate storage size limit. Adjust the directory statement as appropriate. If you cannot adjust the directory statement, consider starting the storage group using DIAG `X'0250'` I/O instead.
616	ss_sgp_re_pool_fail	all	The server kernel's attempt to define the minidisk pool (MAPMDISK IDENTIFY) might have failed. If this happened, there should be a return and reason code on the virtual machine console. Research the return and reason code and act appropriately. This error can also be caused by insufficient storage. If this appears to be the cause, try increasing your virtual machine size.
617	ss_sgp_re_map_fail	all	The server kernel's attempt to map data space pages to minidisk blocks failed. There should be a MAPMDISK DEFINE return code on the virtual machine console. Contact IBM support.

Table 56 (Page 4 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
618	ss_sgp_re_bad_attrib	all	The attribute array you supplied contains an unrecognized value. Repair the attribute array and try again.
619	ss_sgp_re_rewrite_fail	all	The server kernel's attempt to rewrite the file pointed to by configuration parameter SGP_FILE failed. Check to make sure the configuration value is correct and check to make sure the server virtual machine has the permissions necessary to write to the file.
620	ss_sgp_re_read_only	all	You asked to start the storage group read-write but one or more of the minidisks in the storage group is linked read-only. Change the link and try again, or start the storage group read-only.
622	ss_sgp_re_out_of_range	all	Some scalar parameter you supplied, such as a storage group number or the count of elements in an array, is out of range. Check your inputs and try again.
623	ss_sgp_re_wrong_mode	all	You attempted to write to the storage group but the storage group is started read-only. Stop the storage group and restart it in read-write mode or refrain from writing to the storage group.
624	ss_sgp_re_io_fail	all	If you started the storage group using DIAG X'00A4', you cannot specify an nonzero ALET value. If this is your situation, use zero for the value of your ALET. It is possible your virtual machine is out of storage. Try using a larger virtual storage size. Finally, it is possible that the real I/O failed. Check with your system programmer about whether the devices on which your minidisks reside have incurred some kind of failure. Be sure to tell the system programmer how you had started the storage group -- DIAG X'0250', DIAG X'00A4', or VM Data Spaces.
625	ss_sgp_re_diag_250_fail	all	You asked to use DIAG X'0250' as the I/O method for your storage group but the server kernel was unable to initialize the DIAG X'0250' environment. A return code of other than 0 or 4 was returned by DIAG X'0250' Initialize. Check the appropriate CP documentation and recover as necessary.
626	ss_sgp_re_too_big	all	The storage group you are attempting to start is too large - there are more than X'FFFFFFFF' 4 KB blocks in it. Use a smaller storage group.

Table 56 (Page 5 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
628	ss_sgp_re_bad_name	all	You are attempting to start the storage group with an all-blank name. Supply a non-blank name for the name of the storage group. IBM recommends a printable EBCDIC name for storage groups.
629	ss_sgp_re_name_in_use	all	The storage group name you are trying to assign is already in use. Try a different storage group name.
701	ss_srv_re_bad_type	all	The service type you are supplying is unrecognized. Check your parameter list and try again.
702	ss_srv_re_not_found	all	The service you are trying to locate has not been bound. Check your `RSKMAIN` to be sure you called `ssServiceBind` and make sure you supplied the correct name in your call to `ssServiceFind`.
703	ss_srv_re_out_of_range	all	The service name length you supplied is out of range. Change the value to be within limits and try the API call again.
706	ss_srv_re_out_of_storage	all	There is not enough storage to hold the control blocks necessary to keep a record of the service. Increase your virtual storage size and try the server again.
709	ss_srv_re_exists	all	The service you are trying to bind already exists. Check your program to see whether you are calling `ssServiceBind` more than once, and check to see that you are supplying a unique service name each time. Check also to see whether you are trying to use one of the names IBM uses.
801	ss_mem_re_out_of_storage	all	There is not enough memory in the virtual machine or data space to satisfy your storage request. Use a larger virtual machine or a larger data space or be more economical in your use of storage.
802	ss_mem_re_bad_amount	ssMemoryAllocate	The storage size you supplied is out of range. Adjust the size and try again.
802	ss_mem_re_bad_amount	ssMemoryCreateDS	The size of the data space you are attempting to create is out of range. Adjust the data space size and try again.
802	ss_mem_re_bad_amount	ssMemoryRelease	The storage size you supplied is out of range. Adjust the size and try again.
803	ss_mem_re_bad_align	all	The alignment request you made in your call to `ssMemoryAllocate` is unrecognized. Specify one of the supported alignment types and try the API call again.
804	ss_mem_re_no_subpool	all	The subpool you named does not exist. Check the subpool name and try your API call again.

Table 56 (Page 6 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
805	ss_mem_re_not_alloc	all	The storage you are attempting to release does not seem to be allocated. Check the storage pointer you are supplying and try the API call again.
807	ss_mem_re_spd_fail	all	The server kernel's call to `SUBPOOL DELETE` failed. Contact IBM support.
808	ss_mem_re_bad_key	all	The storage key you provide must be in the range [0,15]. Correct the error and try the API call again.
809	ss_mem_re_subpool_exists	all	The server kernel is already managing a subpool of this name. Change the subpool name to one that will be unique and try your API call again.
810	ss_mem_re_spcc_fail	all	The server kernel attempted to create a VM Data Space for you but could not do so. The virtual machine console should be displaying the return and reason code from CSL routine `DMSSPCC`. Interpret the return and reason code, correct the situation, and try again. The most likely reason for failure is that you have exceeded some limit imposed by the virtual machine's `XCONFIG ADDRSPACE` CP directory statement.
811	ss_mem_re_spla_fail	all	The server kernel attempted to establish addressability to a VM Data Space for you but could not do so. The virtual machine console should be displaying the return and reason code from CSL routine `DMSSPLA`. Interpret the return and reason code, correct the situation, and try again. The most likely reason for failure is that you have exceeded the limit imposed by the virtual machine's `XCONFIG ACCESSLIST` CP directory statement.
901	ss_cli_re_out_of_range	all	The amount of data you are attempting to put or get is out of range. Check your parameter list and try your API call again.
902	ss_cli_re_out_of_storage	all	There is insufficient storage to process your request to put data. Increase your virtual machine size and try your call again.
903	ss_cli_re_bad_iam	all	The caller type you specified is not one of the recognized caller types. Review your parameter list and try again.
904	ss_cli_re_bad_method	all	The byte retrieval method you specified is not one of the recognized retrieval methods. Review your parameter list and try again.
905	ss_cli_re_semc_fail	all	The server kernel performed a call to CSL routine `SemCreate` and the call failed. Contact IBM support.
1001	ss_enr_re_db_not_found	all	The enrollment data base you specified in your call does not exist. Check your parameter list and try your call again.

Table 56 (Page 7 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
1002	ss_enr_re_rec_not_found	all	The enrollment record you requested does not exist. You might have specified the wrong record key, or you might be looking in the wrong enrollment data base. Check your parameter list and try again.
1003	ss_enr_re_truncated	all	The enrollment data you retrieved was truncated because your output buffer was not large enough. Change your program to specify a larger output buffer and try your call again.
1005	ss_enr_re_rec_exists	all	The record you tried to insert already exists. The enrollment record you specified on your call was replaced if you used method *ss_enr_insert_replace*, otherwise it was not replaced. Depending on your intentions, you may need to change your API call and try your call again.
1006	ss_enr_re_bad_length	ssEnrollLoad	The file name length you specified contains an invalid value. Change your parameter list and try your call again.
1006	ss_enr_re_bad_length	ssEnrollRecordGet	You specified an unacceptable length for the buffer in which the server kernel is to place the retrieved enrollment data. Change your parameter list and try your call again.
1006	ss_enr_re_bad_length	ssEnrollRecordInsert	You specified an unacceptable length for the data portion of the enrollment record you are attempting to insert. Change your parameter list and try your call again.
1007	ss_enr_re_bad_droptype	all	The parameter list you specified contains an unrecognized value for the drop type. Change your parameter list and try your API call again.
1008	ss_enr_re_no_storage	ssEnrollLoad	There is not enough storage available to load the enrollment set. The data space containing the records is full. Unload the data base and reload it using a larger data space size.
1008	ss_enr_re_no_storage	ssEnrollRecordInsert	There is not enough storage available to insert the record. The data space containing the records is full. Unload the data base and reload it using a larger data space size.
1009	ss_enr_re_close_fail	all	The file backing the VM Data Space could not be closed. The changes made to the enrollment data base were backed out. Check into your SFS server to see whether it went down or the communication connection to it was severed (for example, VTAM(™) outage).
1010	ss_enr_re_write_fail	all	The server kernel's attempt to write to the enrollment file failed. Because the file is opened at load time and kept open, this write failure probably means some error has happened in the SFS server. Check with your system administrator.

Table 56 (Page 8 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
1011	ss_enr_re_bad_method	all	The insertion method you specified in your parameter list was unrecognized. Check your parameter list and try your call again.
1012	ss_enr_re_open_fail	all	The server kernel's attempt to open the enrollment file failed. The name you specified might be incorrect, or the server might not have the permissions necessary to open the enrollment file for write, or the SFS server might not be operating. Check these things and try your call again.
1013	ss_enr_re_gwu_fail	all	The server kernel was not able to get a work unit on which to open the enrollment file. The return and reason code from `DMSGETWU` should have appeared on the virtual machine console. Investigate the return and reason code and take appropriate action.
1014	ss_enr_re_point_fail	all	The server kernel was not able to move the file pointers for the enrollment file. The return and reason code from `DMSPOINT` should have appeared on the virtual machine console. Investigate the return and reason code and take appropriate action.
1015	ss_enr_re_exist_fail	all	The server kernel attempted to retrieve the attributes of the enrollment file but was not able to do so. The return and reason code from `DMSEXIST` should have appeared on the virtual machine console. Investigate the return and reason code and take appropriate action.
1016	ss_enr_re_not_sfs	all	The server kernel determined that the enrollment file does not reside in the Shared File System. Move the file to an SFS directory and try your call again.
1017	ss_enr_re_not_v	all	The server kernel determined that the enrollment file does not use V records. Change the file to V-format (use XEDIT, perhaps, or write a pipeline) and try your call again.
1018	ss_enr_re_dscr_fail	all	The server kernel was not able to create the data space needed to hold the enrollment records. It is possible that some limit associated with `XCONFIG ADDRSPACE` was violated; check these limits and retry. It's also possible that the enrollment set name you used is already in use as a subpool for some other purpose. If this is the case, choose a different enrollment set name.

Table 56 (Page 9 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
1019	ss_enr_re_read_fail	all	The server kernel was unable to read the enrollment file. Because the server kernel's call to `DMSOPEN` worked, this probably indicates an SFS error of some kind. Check the health of the SFS server and try your call again.
1020	ss_enr_re_db_exists	all	The enrollment set you are attempting to load already exists. Choose a different name and try your call again. If you meant to reload the enrollment set, drop the set first and then load it again.
1021	ss_enr_re_comm_fail	all	The server kernel's attempt to commit the changes to the enrollment set has failed. The most likely cause is that the enrollment set has grown so large that the filespace limit has been exceeded - your SFS administrator might have to issue `MODIFY USER` before your commit will work. The return and reason code from `DMSCOMM` are displayed on the virtual machine console. Investigate the return and reason code and take appropriate corrective action.
1022	ss_enr_re_not_disk	all	You tried to commit changes to a transient enrollment set. Because a transient enrollment set has no backing file in the Shared File System, you cannot commit its changes. Use a permanent enrollment set instead of a transient one.
1023	ss_enr_re_bad_kind	all	The *set_kind* parameter you specified contains an unrecognized value. Change your parameter list and try your call again.
1024	ss_enr_re_new_file	all	The file you nominated doesn't exist, so the server kernel created it and initialized the enrollment set as empty. If you did not expect this result, check the file name you supplied and try your call again.
1025	ss_enr_re_no_sets	all	There are no enrollment sets loaded. If you didn't expect this, check your program to see whether you forgot to load your enrollment set or whether you dropped the enrollment set unknowingly.
1026	ss_enr_re_set_empty	all	The enrollment set you interrogated contains no records. If you didn't expect this, check to make sure you loaded the correct SFS file.
1501	ss_cac_re_out_of_storage	all	There is insufficient storage available to process your cache request. Increase your virtual machine's storage size.
1502	ss_cac_re_table_replaced	all	You submitted a translation table *n* when there was already a table known by that number. If you did not expect this result, check your parameter list and the other `ssCacheXlTabSet` calls your server has performed.

Table 56 (Page 10 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
1503	ss_cac_re_cache_not_found	all	The cache you are attempting to use does not exist. Check to be sure the cache was created.
1504	ss_cac_re_dscr_fail	all	The server kernel attempted to create a VM Data Space to hold the cached files but was not able to create it. The most likely cause here is that you have exceeded some limit set by `XCONFIG ADDRSPACE`. Check your CP directory entry, issue `CP QUERY SPACES`, compare the two, and make a configuration change if necessary.
1505	ss_cac_re_cache_exists	all	The cache you are trying to create already exists. Delete the cache before recreating it, or change your parameter list to specify a different cache name.
1506	ss_cac_re_bad_size	all	The cache size you specified is out of range. Check your parameter list against the documentation to see whether your cache size is in range. The cache size is specified in pages.
1511	ss_cac_re_bad_token	all	The file token you supplied is not recognized. Check your parameter list to be sure that the token you are providing is one that was given to you by `ssCacheFileOpen`.
1512	ss_cac_re_bad_length	ssCacheFileOpen	The file name length you supplied is unacceptable. Check to be sure the length is in range. Correct your parameter list and try your call again.
1512	ss_cac_re_bad_length	ssCacheFileRead	The byte count you supplied is out of range. Check your parameter list and try your call again.
1513	ss_cac_re_bad_count	all	The *flag_count* value you supplied is out of range. Correct your parameter list and try your call again.
1514	ss_cac_re_bad_esmdl	all	The ESM data length you supplied is unacceptable. Check your parameter list and make the appropriate correction.
1515	ss_cac_re_bad_fname	all	One of the flag names you specified in your flag name array is unrecognized. Check your flag name array and try your call again.
1516	ss_cac_re_bad_fval	all	One of the flag values you specified in your flag value array is unrecognized. Check your flag value array and try your call again.
1517	ss_cac_re_exist_fail	all	The server kernel's call to `DMSEXIST` failed. The return and reason code from `DMSEXIST` can be found on the virtual machine console. Investigate the return and reason code and try your call again.

Table 56 (Page 11 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
1518	ss_cac_re_file_not_found	all	The server kernel was not able to find the file you are trying to cache. Check the file name to be sure it is what you intended, and then try your call again.
1519	ss_cac_re_delete_in_progress	all	The server kernel was not able to cache the file you specified because the cache you specified is in the process of being deleted. Use a different cache to cache the file.
1520	ss_cac_re_bad_offset	all	The byte offset you specified is negative or goes beyond the last byte of the file. Correct your parameter list.
1521	ss_cac_re_bad_table_id	all	The table ID you specified was zero. Zero is a reserved table identifier. Specify any non-zero table identifier.
1522	ss_cac_re_table_not_found	all	The translation table you requested in your call to `ssCacheFileOpen` does not exist. Check your parameter list to see if you used the table ID you intended, or check to see that you did not omit a call to `ssCacheXlTabSet`.
1523	ss_cac_re_open_fail	all	The server kernel was not able to open the file you wanted to cache. The return and reason code from `DMSOPEN` are displayed on the virtual machine console. Investigate the return and reason code and take appropriate action.
1524	ss_cac_re_bad_recfm	all	The file you wanted to cache has a record format other than `F` or `V`. The server kernel cannot cache it. Change the file's record format and try the call again.
1526	ss_cac_re_out_of_storage_ds	all	There is not enough free storage in the data space to cache your file. Create a larger file cache and try your operation again.
1527	ss_cac_re_read_fail	all	The server kernel was able to open the file being cached but could not read it. The return code and reason code from `DMSREAD` appear on the virtual machine console. Investigate the return and reason code and try the call again.
1528	ss_cac_re_bad_data_stream	all	The server kernel was looking for record delimiters in the data of a CMS file (SFS, minidisk, or BFS) but did not find them. The probable cause is that there is a run of more than 65,535 bytes without a delimiter - in other words, some record in the file is too long. Change the file and try again.
1601	ss_wrk_re_out_of_storage	all	The server kernel was unable to allocate storage to hold information related to your connection to a worker. Increase your virtual storage size.

Table 56 (Page 12 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
1602	ss_wrk_re_bad_count	all	You supplied a less-than-zero option count. Fix your API call and try again.
1603	ss_wrk_re_bad_flag_name	all	One of the flag names you supplied in your parameter list is incorrect. Inspect the parameter list you built and try again.
1604	ss_wrk_re_bad_flag_value	all	One of the flag values you supplied in your parameter list is incorrect. Inspect the parameter list you built and try again.
1605	ss_wrk_re_no_class	all	The worker class you specified in your call is not defined. Inspect your parameter list and try your call again, or inspect `PROFILE RSK` to see whether you misspelled or omitted the WORKER commands necessary to create your worker machine class.
1606	ss_wrk_re_no_subordinates	all	The server kernel tried to allocate a connection for you to a worker machine but could not do so. Either all of the workers are full or the non-full ones didn't answer (autologging failed, IUCV connections failed, or some other indeterminate failure happened).
1607	ss_wrk_re_algtries_exceeded	all	The server kernel tried repeatedly to autolog a worker machine but the worker did not answer IUCV connection requests. Check your workers' configurations and try the server again.
1608	ss_wrk_re_autolog_fail	all	The server kernel tried to autolog a worker machine but the `XAUTOLOG` command failed. The server virtual machine probably has insufficient CP privilege to use the `XAUTOLOG` command. Check the configuration and try again.
1609	ss_wrk_re_timer_fail	all	The server kernel tried to use CMS's Timer API to set a timer but was not able to do so. Contact IBM support.
1610	ss_wrk_re_iucvcon_fail	all	The server kernel tried to `IUCV CONNECT` to a worker machine but encountered some kind of permanent error, such as the worker not having `IUCV ALLOW` in its CP directory entry. Check your worker machine configurations and try again.
1611	ss_wrk_re_force_fail	all	The server kernel tried to issue the `CP FORCE` command to force a worker machine but was unable to do so. The most likely cause is that the server virtual machine has insufficient CP privilege to use the `FORCE` command. Check the server virtual machine's CP directory entry and try again.

Table 56 (Page 13 of 13). Reason Codes and Recommended Actions

Numeric	Symbolic	Routine	Action
1612	ss_wrk_re_force_timeout	all	The server kernel issued the `CP FORCE` command to force off a worker and began waiting for the worker machine to be logged off, but after a timeout period the `CP QUERY` command showed that the worker was still logged on. The most likely cause is that the worker machine is a hung user.
1613	ss_wrk_re_oper_delete	all	Your program attempted to allocate a connection to a worker machine, but while the connection was being established an operator used the `WORKER DELETE` or `WORKER DELCLASS` command to delete the worker machine. Your connection attempt failed.
1701	ss_tri_re_bad_size	all	The trie size you specified is out of range. Check your parameter list against the documentation to see whether your size is in range. The trie size is specified in pages.
1702	ss_tri_re_trie_exists	all	You are trying to create a trie but it already exists. Choose a different trie name or delete the previous instance of the trie.
1703	ss_tri_re_out_of_storage	all	There is not enough primary storage (memory) to create your trie. Run your server in a larger virtual machine.
1704	ss_tri_re_dscr_fail	all	Creation of the trie's data space failed. You probably have created too many data spaces or the total size of your data spaces would be too large. Check your server and its `XCONFIG ADDRSPACE` CP directory entry and make any needed corrections.
1705	ss_tri_re_trie_not_found	all	The trie you are attempting to manipulate does not exist. Check the name your are using and try again.
1706	ss_tri_re_trie_busy	all	The server kernel was unable to acquire your trie's lock in a reasonable period of time. Perhaps the trie is shared among many virtual machines and the lock holder has abended or logged off unexpectedly. Re-IPL your set of servers.
1707	ss_tri_re_bad_index_len	all	The index you supplied has an incorrect length. Correct the index length and try the API call again.
1708	ss_tri_re_bad_capacity	all	The array capacity you supplied is incorrect. Correct the value and try the API call again.
1709	ss_tri_re_out_of_ds_storage	all	There is no room left in the trie's data space. No more indices can be added. Create the trie with a larger size.

Appendix H. Messages

Here is a summary of messages and recommended recovery actions.

Generally Applicable Messages

BKW0000I Operation completed OK.

Explanation: The command you issued completed normally.

System Action: The system performed the action you requested.

System Programmer Response: Nothing.

BKW0001E Not authorized.

Explanation: You are not authorized to issue the command you attempted.

System Action: The system declined to execute the command you supplied, responding with this error message instead.

System Programmer Response: The system programmer can use the `AUTH` command set to grant you permission to perform the requested operation.

BKW0002E Enter a command.

Explanation: You entered a null command.

System Action: The system did nothing.

System Programmer Response: Enter a non-null command.

BKW0003E Syntax error.

Explanation: There is a syntax error in the command you issued.

System Action: The system did nothing.

System Programmer Response: Refer to the syntax diagram for the command you issued, repair its syntax, and reissue the command.

BKW0004E Unrecognized command.

Explanation: The command you entered is not recognized.

System Action: The system did nothing.

System Programmer Response: Refer to the command documentation and submit a recognized command.

BKW0005E Out of storage.

Explanation: Not enough virtual storage was available to perform the operation you requested.

System Action: The system backed out any partial results and returned to the state it had just prior to your issuing the failing command.

System Programmer Response: Define a larger virtual machine.

BKW0007E RC=&1 RE=&2 from routine &3

Explanation: The displayed routine produced the given return and reason code.

System Action: The system did not complete the operation you requested.

System Programmer Response: Locate the documentation for the displayed routine and research the return and reason code. Take appropriate corrective action.

BKW0010E DMSQEFL returns CP_product &1 CP_level &1

Explanation: CSL routine `DMSQEFL` returned the displayed CP product code and CP level code.

System Action: The server kernel refuses to start because CP is too far back-level.

System Programmer Response: Upgrade to a newer release of z/VM.

BKW0011E DMSQEFL returns CMS_level &1

Explanation: CSL routine `DMSQEFL` returned the displayed CMS level.

System Action: The server kernel refuses to start because CMS is too far back-level.

System Programmer Response: Upgrade to a newer release of z/VM.

BKW0012E Insufficient VM/ESA functional level to run RSK - returning

Explanation: The level of VM/ESA is insufficient to support execution of the reusable server kernel.

System Action: The server kernel refuses to start.

System Programmer Response: Upgrade to a newer release of z/VM.

BKW0013I CMS 13 detected - ensure VM61422 is applied

Explanation: The reusable server kernel detected CMS 13. For best results, CMS 13 must have the displayed APAR applied. The server kernel will work if the APAR is not applied but it might not work well.

System Action: The server kernel starts anyway.

System Programmer Response: Install the named APAR for best results (the message will still appear even after the APAR is applied).

CONFIG Service Messages

BKW0100E Operation now irrelevant.

Explanation: The configuration variable whose value you changed is relevant only before `PROFILE RSK` issues `RUNSERV`. After `RUNSERV`, the server kernel no longer pays attention to the value of this variable.

System Action: The system did nothing.

System Programmer Response: Change this configuration variable before `RUNSERV`.

Line Driver Messages

BKW0200E Service not found.

Explanation: The service you are attempting to manipulate does not exist.

System Action: The system did nothing.

System Programmer Response: Correct the name of the service, or use the `SERVER SERVICES` command to determine whether the service is known to the server kernel.

BKW0201E Subtask not found.

Explanation: The subtask you attempted to manipulate does not exist.

System Action: The system did nothing.

System Programmer Response: Use the line driver's `LIST` command to confirm the existence of the subtask you are attempting to manipulate. Also, confirm that you have supplied the correct line driver name in your command. Make appropriate corrections and resubmit the command.

BKW0202E Stop of self is prohibited.

Explanation: You asked a self-sourced line driver to stop itself. A self-sourced driver cannot stop itself.

System Action: The system did nothing.

System Programmer Response: You probably meant to stop some other subtask. Correct the subtask number and try again.

BKW0203I Subtask asked to STOP.

Explanation: The line driver has sent STOP messages to the threads running this subtask.

System Action: The subtask will stop when all such threads respond with stop acknowledgements.

System Programmer Response: Wait for the subtask to stop.

BKW0204I Subtask killed.

Explanation: The line driver has deleted the threads of the subtask.

System Action: The server kernel has stopped a subtask in a forceful way. Threads running the service were not given an opportunity to complete their work normally.

System Programmer Response: Nothing.

BKW0205E Prefix already in use.

Explanation: The prefix you requested is already in use by this line driver.

System Action: The system did nothing.

System Programmer Response: Select a different prefix and reissue the command.

BKW0206E Service INIT routine failed - RC=&1 RE=&2.

Explanation: During handling of a `START` command, the server kernel drove the service's INIT routine but the INIT routine produced a nonzero return and reason code.

System Action: The system refused to start the service.

System Programmer Response: Use the documentation of the service itself to interpret the return and reason code. Take appropriate corrective actions and try the `START` again.

BKW0207E Start of self is prohibited.

Explanation: You asked a self-sourced line driver to start itself.

System Action: The system refused to do this. The server kernel starts self-sourced line drivers automatically as part of server initialization.

System Programmer Response: You probably submitted the `START` command to the wrong service or attempted to start the wrong service. Make the appropriate corrections in your command and issue it again.

BKW0208I Subtask is handling no clients.

Explanation: The subtask you attempted to interrogate through `QUERY` is not handling any clients right now.

System Action: The system did nothing.

System Programmer Response: None needed.

SERVER Service Messages

BKW0300I Shutdown initiated.

Explanation: You issued `SERVER STOP` and the server kernel is attempting to stop the server.

System Action: The line drivers are attempting to stop all services normally. When all services are stopped shutdown of the server will complete.

System Programmer Response: None needed.

BKW0301I Monitor buffer at &1.&2, &3 rows, &4 free

Explanation: The message indicates the location in storage of the server kernel's monitor buffer.

System Action: None, other than having issued the message.

System Programmer Response: None needed. The `CP DISPLAY` command can be used to display the monitor buffer. The `MONITOR DISPLAY` command can be used to display specific monitor rows without knowing their addresses in memory.

USERID Service Messages

BKW0400E Reload failed - DMSOPEN or DMSREAD RC=&1 RE=&2.

Explanation: The server kernel was not able to reload the user ID mapping file because either `DMSOPEN` or `DMSREAD` failed with the displayed return and reason code.

System Action: The previous user ID mapping remains in effect.

System Programmer Response: Research the return and reason code and take the appropriate action. Also, issue `SERVER CONFIG` and look at the value of the `UMAP_FILE` variable and see if it references the file you expected.

BKW0401I &1 &2 &3 maps to &4

Explanation: The user ID mapping facility maps your inputs to this output.

System Action: None, other than displaying the mapping.

System Programmer Response: If the mapping needs to be corrected, use XEDIT to change the mapping file, then issue `USERID RELOAD`.

BKW0402E RC=&1 RE=&2 mapping &3 &4 &5

Explanation: `ssUseridMap` produced the displayed return and reason code when interrogating the user ID map with the inputs you provided.

System Action: None, other than displaying the error message.

System Programmer Response: Research the return and reason code and take appropriate corrective action. If you need to update the user ID map, edit the mapping file and issue `USERID RELOAD`.

BKW0403E Open of UMAP_FILE failed - server will not start.

Explanation: The server kernel attempted to read the user ID mapping file as part of its startup processing, but was not able to read the file.

System Action: Startup fails and the `RUNSERV` command will complete with a nonzero return code.

System Programmer Response: The configuration variable `UMAP_FILE` is probably not set correctly. Make sure it points to the user ID mapping file and then try again to start the server.

BKW0404E Reload ignored some records due to syntax errors

Explanation: The server kernel attempted to reload the user ID mapping file, but while reading the file it found some records having invalid syntax.

System Action: The load finished, ignoring the bad records. Message BKW0405E was issued for each bad record.

System Programmer Response: Use the record numbers named in message BKW0405E to locate to locate the bad records. Repair each one.

BKW0405E Record &1 in UMAP_FILE has bad syntax

Explanation: The server kernel found a bad record in the user ID mapping file. This message announces the record number of the bad record.

System Action: The server kernel skipped the bad record and continued to load the user ID mapping file.

System Programmer Response: Repair the bad record.

TCP and UDP Line Driver Messages

BKW0500I A-block &1 Client &2 &3 done, lifetime &4 msec

Explanation: A TCP or UDP subtask has finished handling the client at the displayed port and IP address. The transaction lasted for the displayed number of milliseconds.

System Action: The system handled the client.

System Programmer Response: None.

BKW0501I A-block &1 Client &2 &3 done, inbytes &4, inrate &5 KB/s

Explanation: A TCP or UDP subtask has finished handling the client at the displayed port and IP address. The data rate from the client was as displayed.

System Action: The system handled the client.

System Programmer Response: None.

BKW0502I A-block &1 Client &2 &3 done, outbytes &4, outrate &5 KB/s

Explanation: A TCP or UDP subtask has finished handling the client at the displayed port and IP address. The data rate to the client was as displayed.

System Action: The system handled the client.

System Programmer Response: None.

BKW0504I A-block &1 Client &2 &3 started, C-block &4

Explanation: A TCP or UDP subtask has begun handling the client at the displayed port and IP address.

System Action: The system is beginning to handle the client.

System Programmer Response: None.

BKW0505E A-block &1 errno &2 accept failed

Explanation: The TCP line driver received the displayed *errno* value when it attempted to accept a connection from a client.

System Action: The line driver did not accept the connection but continues handling work for other clients.

System Programmer Response: Research the *errno* and determine whether a configuration change is necessary.

BKW0506E A-block &1 C-block &2 errno &3 ioctl(FIONBIO) failed

Explanation: The TCP line driver received the displayed *errno* value when it attempted to set a socket to blocking I/O.

System Action: The line driver closed the connection to the client but continues handling work for other clients.

System Programmer Response: Research the *errno* and determine whether a configuration change is necessary.

BKW0508E A-block &1 C-block &2 ThreadCreate RC=&3 RE=&4 failed (major)

Explanation: The TCP or UDP line driver was not able to create a CMS thread when one was absolutely required.

System Action: The line driver ended the subtask.

System Programmer Response: Research the return and reason code and take corrective action.

BKW0509E A-block &1 C-block &2 ThreadCreate RC=&3 RE=&4 failed (minor)

Explanation: The TCP or UDP line driver was not able to create a CMS thread when it felt one would be helpful, but there appear to be enough suitable threads to take up the slack.

System Action: The line driver uses the threads it's already created to handle the new client.

System Programmer Response: Research the return and reason code and take corrective action.

BKW0510E A-block &1 errno &2 select()-start failed

Explanation: The TCP line driver was not able to start a socket *select()* function.

System Action: The line driver stops the affected subtask. Clients already connected are permitted to complete their transactions, but no new clients are served.

System Programmer Response: Research the *errno* and take corrective action.

BKW0511E A-block &1 rsn &2 QueueReceiveBlock RC=&3 RE=&4 failed

Explanation: The TCP or UDP line driver was not able to receive a message from a CMS queue.

System Action: The line driver stops the affected subtask immediately.

System Programmer Response: Re-IPL CMS. If the problem persists, contact IBM support.

BKW0512E A-block &1 errno &2 select() failed

Explanation: The TCP line driver started a socket *select()* function but the function completed with error.

System Action: The line driver stops the affected subtask. Clients already connected are permitted to complete their transactions, but no new clients are served.

System Programmer Response: Research the *errno* and take corrective action.

BKW0513E Port number must be in range [0..65535].

Explanation: Your `START` command specified an out-of-range port value.

System Action: None, other than issuing an error message.

System Programmer Response: Correct your `START` command and try again.

BKW0514E Socket count must be in range [50..2000].

Explanation: Your `START` command specified an out-of-range value for the number of sockets permitted.

System Action: None, other than issuing an error message.

System Programmer Response: Correct your `START` command and try again.

BKW0515E Maximum subtask number would be exceeded.

Explanation: The TCP or UDP line driver was not able to start a new subtask because it has run out of subtask numbers.

System Action: The subtask was not started.

System Programmer Response: Restart the server.

BKW0516E Creation of subtask controller thread failed.

Explanation: The TCP or UDP line driver attempted to create a thread to control the new subtask but was not able to do so.

System Action: The subtask was not started.

System Programmer Response: Re-IPL CMS. If the problem persists, contact IBM support.

BKW0517E Creation of TCP/IP socket group failed.

Explanation: The TCP or UDP line driver was not able to connect to the TCP/IP service machine.

System Action: The subtask was not started.

System Programmer Response: The usual cause here is that the name of the TCP/IP machine was specified incorrectly. Another cause might be that the TCP/IP machine you are attempting to use is configured with `PermittedUsersOnly` but your server is not in the permitted users list. Check your `START` command and your TCP/IP configuration carefully and try your command again.

BKW0518E Creation of listen socket failed.

Explanation: The TCP or UDP line driver was not able to create the socket on which it will listen for connections from clients.

System Action: The subtask was not started.

System Programmer Response: Check your TCP/IP configuration.

BKW0519E Setting listen socket to SO_REUSEADDR failed.

Explanation: The TCP or UDP line driver was not able to set the listen socket to enable option `SO_REUSEADDR`.

System Action: The subtask was not started.

System Programmer Response: Check your TCP/IP configuration.

BKW0520E Setting listen socket to nonblocking failed.

Explanation: The TCP line driver was not able to set the listen socket to non-blocking I/O.

System Action: The subtask was not started.

System Programmer Response: Check your TCP/IP configuration.

BKW0521E bind() for listen socket failed.

Explanation: The TCP or UDP line driver was not able to bind the port number you specified in your `START` command to the IP address you specified in your `START` command.

System Action: The subtask was not started.

System Programmer Response: The most likely cause is that the port number is in the reserved port number list in your TCP/IP configuration but the user ID in which your server is running is not listed as one of the user IDs that can bind the reserved port. Check your TCP/IP configuration and try again if this was the situation. Another possible cause is that some other server on your system has already bound that port but did not set its listen socket to `SO_REUSEADDR`. If this is the case, contact your TCP/IP support programmer for help in locating the offending server, or use another port number in your own `START` command.

BKW0522E listen() for listen socket failed.

Explanation: The TCP line driver was not able to set the backlog queue size for its listen socket.

System Action: The subtask was not started.

System Programmer Response: Check your TCP/IP configuration.

BKW0523I Instance STOP requested.

Explanation: In response to your `STOP` command, the TCP or UDP line driver has asked an instance thread to stop.

System Action: The line driver will close the connection to the client after the instance acknowledges the STOP request.

System Programmer Response: None.

BKW0524E Wait expired for STOP.

Explanation: You asked the TCP or UDP line driver to stop a subtask, so it initiated the stop and waited for the subtask to quiesce, but the quiesce wait time ran out.

System Action: The stop did not complete.

System Programmer Response: The stop remains pending and will complete eventually if all of the instance threads cooperate. If you require the subtask to stop immediately, reissue the command using the `NOW` option.

BKW0525E A-block &1 C-block &2 read start failed - errno &3

Explanation: The TCP line driver was not able to start a socket *read()* for the displayed client, or the UDP line driver was not able to start a socket *recvfrom()*.

System Action: The TCP line driver closes the connection to the client; the UDP line driver ends the subtask.

System Programmer Response: Check your TCP/IP configuration.

BKW0526E A-block &1 C-block &2 write start failed - errno &3

Explanation: The TCP line driver was not able to start a socket *write()* for the displayed client, or the UDP line driver was not able to start a socket *sendto()*.

System Action: The TCP line driver closes the connection to the client; the UDP line driver ends the subtask.

System Programmer Response: Check your TCP/IP configuration.

BKW0527I A-block &1 stopped.

Explanation: You asked the TCP or UDP line driver to stop a subtask.

System Action: The subtask has stopped.

System Programmer Response: None.

BKW0528I A-block &1 C-block &2 stopped.

Explanation: You asked the TCP or UDP line driver to end its relationship with a specific client.

System Action: The relationship is ended.

System Programmer Response: None.

BKW0529I Subtask identifier is out of range.

Explanation: You asked the TCP or UDP line driver to stop a subtask whose identifier is zero.

System Action: None, other than to issue an error message.

System Programmer Response: Specify a nonzero subtask identifier.

BKW0530E A-block &1 C-block &2 recv failed - errno &3

Explanation: The UDP line driver attempted to receive a datagram using *recvfrom()*, but the call failed.

System Action: The UDP line driver stops the subtask and displays the *errno* value it encountered.

System Programmer Response: Research the *errno* value and restart the subtask.

BKW0531E A-block &1 C-block &2 sendto failed - errno &3

Explanation: The UDP line driver attempted to send a datagram using *sendto()*, but the call failed.

System Action: The UDP line driver stops the subtask and displays the *errno* value it encountered.

System Programmer Response: Research the *errno* value and restart the subtask.

BKW0532E No userid mapping for IP address &1 - ignored

Explanation: The TCP or UDP line driver attempted to map an IP address to a user ID but was not able to do so.

System Action: Because the line driver's NOMAP configuration parameter was OFF, the line driver ignored the client.

System Programmer Response: Update the user ID mapping file or set the line driver's NOMAP parameter ON.

SGP Service Messages

BKW0600I No storage groups found.

Explanation: Your LIST command found no storage groups.

System Action: None, other than issuing the error message.

System Programmer Response: None. If you expected to find storage groups, use the SERVER CONFIG command to check the value of configuration variable SGP_FILE. You might have specified the wrong file name.

BKW0601E Open of SGP_FILE failed - server will not start.

Explanation: The server kernel could not find the storage group configuration file.

System Action: The server kernel will not start and the RUNSERV command will see a nonzero return code.

System Programmer Response: Check your PROFILE RSK to make sure you set configuration variable SGP_FILE correctly.

RSK SUBCOM Messages

BKW0700E Commands cannot be issued - server not started yet

Explanation: Your PROFILE RSK contains commands other than CONFIG before RUNSERV.

System Action: The non-CONFIG commands are ignored.

System Programmer Response: Reorganize your PROFILE RSK.

BKW0701E The server has already been started

Explanation: You attempted RUNSERV more than once in your PROFILE RSK.

System Action: The extraneous RUNSERV commands are ignored.

System Programmer Response: Reorganize your PROFILE RSK.

BKW0702E RUNSERV failed

Explanation: The server kernel was unable to start.

System Action: The server did not start. Other error messages were issued to explain the reason. PROFILE RSK will see a nonzero return code from RUNSERV.

System Programmer Response: Investigate the reason for the failure and take corrective action.

AUTH Service Messages

BKW0800E The class specified already exists

Explanation: You tried to create an object class but the object class already exists.

System Action: None.

System Programmer Response: Choose a different name for your new object class.

BKW0801E Unable to read the authorization files

Explanation: The server kernel could not read the authorization database.

System Action: The server kernel has disabled all calls to the authorization API.

System Programmer Response: Perhaps an SFS failure or DASD failure has occurred. Contact your system programmer.

BKW0802E Unable to write to the authorization files

Explanation: The server kernel could not write the authorization database.

System Action: The server kernel has disabled all calls to the authorization API.

System Programmer Response: Perhaps an SFS failure or DASD failure has occurred. Contact your system programmer. When access to the files is repaired, issue `AUTH RELOAD`.

BKW0803E Too many operations or options specified

Explanation: You have exceeded the limit on options or operations for this particular command.

System Action: The command was not processed.

System Programmer Response: The most likely cause is that you exceeded the limit of 32 operations per object class. Reduce the number of operations and try again.

BKW0804E The length of the object name is out of range

Explanation: The object name you specified is too long.

System Action: The command was not processed.

System Programmer Response: The object name must be 256 characters or less. Reduce its length and try again.

BKW0805E The class specified does not exist

Explanation: Your command refers to an object class which does not exist.

System Action: The command was not processed.

System Programmer Response: Change the class name. You might also have inadvertently loaded the wrong authorization set. Use `SERVER CONFIG` to examine the names of the authorization files.

BKW0806E The object specified already exists

Explanation: You tried to create an object but the object already exists.

System Action: The command was not processed.

System Programmer Response: Choose a different name for your object. You might also have inadvertently loaded the wrong authorization set. Use `SERVER CONFIG` to examine the names of the authorization files.

BKW0807E At least one of the options specified is unrecognized

Explanation: You supplied a command containing options that are unrecognized.

System Action: The command was not processed.

System Programmer Response: Check the syntax diagram for the command you entered, make any necessary corrections, and try again.

BKW0808E The object specified does not exist

Explanation: The object you attempted to manipulate does not exist.

System Action: The command was not processed.

System Programmer Response: Check the command to be sure you are referring to the correct object name. You might also have inadvertently loaded the wrong authorization set. Use `SERVER CONFIG` to examine the names of the authorization files.

BKW0809E The length of the userid specifed is out of range

Explanation: You specified a user ID that is too long.

System Action: The command was not processed.

System Programmer Response: The user ID must be 64 characters or less in length. Change your command and try again.

BKW0810E No rules exist for the userid specified

Explanation: You asked for a display of the rules for a given user and object, but there were no such rules in the authorization database.

System Action: None.

System Programmer Response: None.

BKW0811E Unable to open the authorization files

Explanation: The server kernel was not able to open the authorization data files.

System Action: The authorization API is disabled.

System Programmer Response: Perhaps an SFS failure or DASD failure has occurred. Contact your system programmer. When access to the files is repaired, issue `AUTH RELOAD`.

BKW0812E Operation limit for the class specified has been exceeded

Explanation: You attempted to add a new operation to a class, but it would result in exceeding the limit of 32 operations per object class.

System Action: The command was not processed.

System Programmer Response: Depending on your situation, perhaps a new object class would solve your problem.

BKW0813E No classes exist for the match key specified

Explanation: You asked for a list of the object classes that match your key, but no such object classes exist.

System Action: No object classes were displayed.

System Programmer Response: Try a different match key. You might also have inadvertently loaded the wrong authorization set. Use `SERVER CONFIG` to examine the names of the authorization files.

BKW0814E No objects exist for the match key specified

Explanation: You asked for a list of the objects that match your key, but no such objects exist.

System Action: No object names were displayed.

System Programmer Response: Try a different match key. You might also have inadvertently loaded the wrong authorization set. Use `SERVER CONFIG` to examine the names of the authorization files.

BKW0815E No userids exist for the object specified

Explanation: You asked for a list of the user IDs for which there exist rules for the specified object, but there are no rules for the specified object.

System Action: No user IDs were displayed.

System Programmer Response: You might have inadvertently loaded the wrong authorization set. Use `SERVER CONFIG` to examine the names of the authorization files.

BKW0816E No rules exist for the userid specified

Explanation: You asked for the rule for the specified user ID and object, but there is no such rule.

System Action: No rule is displayed.

System Programmer Response: You might have inadvertently loaded the wrong authorization set. Use `SERVER CONFIG` to examine the names of the authorization files.

BKW0817E Open of authorization data failed - server will not start.

Explanation: The server kernel attempted to open the authorization files as part of server startup, but the open failed.

System Action: The server will not start and `RUNSERV` will be given a nonzero return code.

System Programmer Response: Correct `PROFILE RSK` and try again.

CP Service Messages

BKW0900I RC=&1 from CP.

Explanation: CP produced the displayed return code when it processed your command.

System Action: The command was executed.

System Programmer Response: Investigate the return code and take appropriate action.

BKW0901E CP response was truncated.

Explanation: The server kernel passed your command to CP, and CP executed the command, but the response was too long for the server kernel to capture.

System Action: The command was executed, but some of its response was not displayed.

System Programmer Response: Use the displayed portion of the response to determine whether correct results were obtained.

BKW0902E CP command was too long.

Explanation: The CP command you attemped to execute was too long.

System Action: The command was not executed.

System Programmer Response: The length limit is 240 characters. Shorten the command and try again.

CMS Service Messages

BKW1000I RC=&1 from CMS.

Explanation: CMS produced the displayed return code when it processed your command.

System Action: The command was executed.

System Programmer Response: Investigate the return code and take appropriate action.

BKW1001E RC=&1 RE=&2 acquiring CMS mutex.

Explanation: The server kernel was not able to acquire the mutex it needs to pass commands to CMS.

System Action: The CMS command was not executed.

System Programmer Response: Contact IBM support.

MSG Line Driver Messages

BKW1100E No userid mapping for user &1 at &2 - message ignored

Explanation: The MSG line driver used `ssUseridMap` to map the message's origin user ID and node into a local user ID, but `ssUseridMap` was not able to perform a mapping because no applicable entry was found in the user ID mapping file.

System Action: The MSG line driver ignored the message.

System Programmer Response: Adjust the user ID mapping file if necessary, or set configuration parameter `MSG_NOMAP` to `ON` so as to let the MSG driver accept the message anyway.

SPOOL Line Driver Messages

BKW1200E (file &1) DIAG 14 (order) failed - RC=&2 - file held

Explanation: The SPOOL line driver attempted to use DIAG X'0014' to move the displayed spool file to the front of the reader queue, but it was unable to do so.

System Action: The SPOOL driver placed the file in USER HOLD state.

System Programmer Response: The DIAG X'0014' return code appears in the message text. Investigate the return code and take appropriate action.

BKW1201E (file &1) DIAG 14 (select next) failed - RC=&2 - file held

Explanation: The SPOOL line driver attempted to use DIAG X'0014' to select the next file in the reader queue, but it was unable to do so.

System Action: The SPOOL driver placed the file in USER HOLD state.

System Programmer Response: The DIAG X'0014' return code appears in the message text. Investigate the return code and take appropriate action.

BKW1202E (file &1) Unrecognized spool file format - file held

Explanation: The SPOOL line driver did not recognize the format of the displayed spool file.

System Action: The SPOOL driver placed the file in USER HOLD state.

System Programmer Response: The file is probably not one that the server kernel is prepared to handle. Transfer it out of the server's reader queue, locate the sender, and find out what his intention was.

BKW1203E (file &1) DIAG 14 (read SPLINK) failed - RC=&2 - file held

Explanation: The SPOOL line driver attempted to use DIAG X'0014' to read the next buffer of spool file data, but it was unable to do so.

System Action: The SPOOL driver placed the file in USER HOLD state.

System Programmer Response: The DIAG X'0014' return code appears in the message text. Investigate the return code and take appropriate action.

BKW1204E (file &1) No userid mapping for user &1 at &2 - file held

Explanation: The SPOOL line driver used `ssUseridMap` to map the spool file's origin user ID and node into a local userid, but `ssUseridMap` was not able to perform a mapping because no applicable entry was found in the user ID mapping file.

System Action: The SPOOL driver placed the file in USER HOLD status.

System Programmer Response: Adjust the user ID mapping file if necessary, or set configuration parameter `SPL_NOMAP` to `ON` so as to let the SPOOL driver accept the file anyway.

BKW1205E Punch via DIAG A8 failed - RC=&1

Explanation: The SPOOL driver attempted to punch a response through DIAG X'00A8' but was not able to do so.

System Action: The response was not sent.

System Programmer Response: The return code from DIAG X'00A8' is displayed in the message. Investigate the return code and take appropriate action. The most likely cause is that spool space is full.

BKW1206E Could not encode instance data stream

Explanation: The service in which the response originated used the correct encoding procedure to generate a record-oriented response for its client, but the response contains a record longer than 65,535 bytes.

System Action: The response was not sent to the client.

System Programmer Response: This is a server defect, not an IBM defect. Contact the server author.

BKW1207E (file &1) Unrecognized spool file format - file transferred to &2

Explanation: The SPOOL line driver did not recognize the format of the displayed spool file.

System Action: The SPOOL driver transferred the file to the named user ID.

System Programmer Response: The file is probably not one that the server kernel is prepared to handle. Locate the sender and find out what his intention was.

Enrollment API Messages

BKW1300E Enrollment set &1, record &2 skipped

Explanation: The server kernel encountered an unrecognizable record in the enrollment data file as it was loading the file into the data space. It skipped the record.

System Action: The record was skipped, but loading of subsequent records continued.

System Programmer Response: Unload the enrollment set and examine the enrollment file with XEDIT. Repair the record so that it conforms to the format specified in the enrollment file appendix of this book.

MONITOR Service Messages

BKW1400E Matching monitor row not found.

Explanation: You asked the MONITOR service to display the monitor rows matching the tokens you specified, but no such monitor row exists.

System Action: None.

System Programmer Response: None.

BKW1401E DIAG DC RC &1 starting APPLDATA monitoring

Explanation: The server kernel tried to establish a CP APPLDATA buffer but was not able to do so. DIAG `X'00DC'` returned the displayed return code.

System Action: CP will not collect the server virtual machine's APPLDATA. The server virtual machine will run normally.

System Programmer Response: If you want CP to collect the server virtual machine's APPLDATA, make sure `OPTION APPLMON` is enabled in the server virtual machine's CP directory entry.

BKW1402E Monitor adjusted to &1 kernel rows and &2 bytes user data

Explanation: The server kernel tried to set up the monitor buffer according to the configuration you specified, but the resulting buffer ended up exceeding CP's limit on the size of a monitor buffer.

System Action: The server kernel resized the monitor buffer and displayed the actual buffer configuration in the message text.

System Programmer Response: None.

BKW1403I No free monitor row for &1

Explanation: Some operator command or API call caused the server kernel to attempt to allocate another monitor row, but the monitor buffer cannot accommodate any more monitor rows.

System Action: The server kernel will not accumulate monitor data for the displayed component, but operation of the server continues.

System Programmer Response: If possible, increase the number of monitor rows.

CACHE Service Messages

BKW1500E No file caches found.

Explanation: You asked the CACHE service to display a list of the file caches it is managing, but it is managing no file caches.

System Action: None.

System Programmer Response: None.

IUCV Line Driver Messages

BKW1600I Instance STOP requested.

Explanation: The IUCV line driver has asked an instance thread to STOP.

System Action: The server kernel will sever the path to the client after the instance thread acknowledges the STOP request.

System Programmer Response: None.

BKW1601E A-block &1 rsn &2 QueueReceiveBlock RC=&3 RE=&4 failed

Explanation: The thread controlling an IUCV subtask detected the displayed return and reason code when it attempted to receive a message from its CMS queue.

System Action: The server kernel terminates the subtask.

System Programmer Response: Research the displayed return and reason code and take appropriate corrective action.

BKW1602I A-block &1 Client &2 started, C-block &3

Explanation: The IUCV line driver has accepted a connection from a client.

System Action: The server kernel handles the client.

System Programmer Response: None.

BKW1603I A-block &1 Client &2 done, lifetime &3 msec

Explanation: The IUCV line driver was handling a client, and the connection to the client has ended. The connection lasted for the displayed number of milliseconds.

System Action: The server kernel cleans up and prepares to handle another client.

System Programmer Response: None.

BKW1604I A-block &1 Client &2 done, inbytes &3, inrate &4 KB/s

Explanation: The IUCV line driver was handling a client, and the connection to the client has ended. The server experienced the displayed input byte count and input data rate.

System Action: Nothing.

System Programmer Response: None.

BKW1605I A-block &1 Client &2 done, outbytes &3, outrate &4 KB/s

Explanation: The IUCV line driver was handling a client, and the connection to the client has ended. The server experienced the displayed output byte count and output data rate.

System Action: Nothing.

System Programmer Response: None.

BKW1606E Wait expired for STOP.

Explanation: You issued a STOP command to the IUCV line driver, and it attempted to stop the subtask gracefully, but the wait expired before the graceful stop completed.

System Action: The IUCV line driver continues to wait for the subtask to stop normally.

System Programmer Response: To finish the stop at a later time, reissue the STOP command.

BKW1607E Client count must be greater than zero.

Explanation: You issued an `IUCV START` command but the client count was zero.

System Action: Nothing, except to issue this message.

System Programmer Response: Specify a nonzero client count.

BKW1608E Unable to HNDIUCV SET.

Explanation: You issued an `IUCV START` command but the IUCV line driver was not able to identify the needed HNDIUCV exit.

System Action: The subtask was not started.

System Programmer Response: You probably inadvertently duplicated an exit name. Try another exit name.

BKW1609E Unable to create controlling thread.

Explanation: You issued an `IUCV START` command but the IUCV line driver was not able to create a CMS thread to control the subtask.

System Action: The subtask was not started.

System Programmer Response: Contact IBM support.

BKW1610E A-block &1 C-block &2 ThreadCreate RC=&3 RE=&4 failed (major)

Explanation: A client connected to the server through the IUCV line driver but the line driver was not able to create a thread to run on behalf of the client.

System Action: The subtask is terminated.

System Programmer Response: Contact IBM support.

BKW1611E A-block &1 C-block &2 ThreadCreate RC=&3 RE=&4 failed (minor)

Explanation: A client connected to the server through the IUCV line driver but the line driver was not able to create a thread to run on behalf of the client.

System Action: The client will be served by another thread, as soon as said other thread becomes available.

System Programmer Response: None.

BKW1612E A-block &1 C-block &2 IUCV SEND IPRCODE &3 - severing

Explanation: The IUCV line driver encountered the displayed IPRCODE when it attempted to send data to a client using IUCV SEND.

System Action: The IUCV line driver severs the connection to the client.

System Programmer Response: Research the IPRCODE and take appropriate corrective action.

BKW1613E No userid mapping for userid &1 - severing

Explanation: The IUCV line driver was unable to map the client's VM user ID.

System Action: Because `NOMAP_IUCV` was set OFF, the server kernel severed the connection.

System Programmer Response: Update the user ID mapping file or set `NOMAP_IUCV` to ON.

APPC Line Driver Messages

BKW1700E (Resource &1) CMSIUCV CONNECT to *IDENT RC=&2

Explanation: The APPC line driver encountered the displayed return code when attempting to connect to *IDENT to begin managing the displayed APPC/VM resource.

System Action: The `APPC START` command failed.

System Programmer Response: Using the `CP QUERY RESOURCE` command to determine whether some other virtual machine is already managing the resource. If so, resolve the conflict. If not, contact your system programmer.

BKW1701E (Resource &1) Unexpected IUCV interrupt, IPTYPE=&2

Explanation: The server kernel encountered the displayed external interrupt type while managing an APPC/VM conversation and was not expecting such an external interrupt.

System Action: The conversation was severed.

System Programmer Response: Contact IBM support.

BKW1702E Unable to identify APPC/VM resource.

Explanation: The server kernel was not able to begin managing an APPC/VM resource.

System Action: The `APPC START` command failed.

System Programmer Response: This message is issued in conjunction with some other message that tells what kind of failure was encountered. Refer to the other message for more information.

BKW1703E No userid mapping for LU &1, userid &2 - severing

Explanation: The attempt to pass the displayed user ID and LU name through the user ID mapping file failed, and `NOMAP_APPC` was OFF.

System Action: The conversation was severed.

System Programmer Response: Update the user ID mapping file or set `NOMAP_APPC` ON.

BKW1704I A-block &1 Client &2 &3 started, C-block &4

Explanation: The APPC line driver has accepted a connection from a client.

System Action: The server kernel handles the client.

System Programmer Response: None.

BKW1705I A-block &1 Client &2 &3 done, lifetime &4 msec

Explanation: The APPC line driver was handling a client, and the connection to the client has ended. The connection lasted for the displayed number of milliseconds.

System Action: The server kernel cleans up and prepares to handle another client.

System Programmer Response: None.

BKW1706I A-block &1 Client &2 &3 done, inbytes &4, inrate &5 KB/s

Explanation: The APPC line driver was handling a client, and the connection to the client has ended. The server experienced the displayed input byte count and input data rate.

System Action: Nothing.

System Programmer Response: None.

BKW1707I A-block &1 Client &2 &3 done, outbytes &4, outrate &5 KB/s

Explanation: The APPC line driver was handling a client, and the connection to the client has ended. The server experienced the displayed output byte count and output data rate.

System Action: Nothing.

System Programmer Response: None.

Worker API Messages

BKW1800E Worker machine is already in the specified class.

Explanation: You attempted to add a worker machine to a given worker class, but the worker already belongs to that class.

System Action: Nothing.

System Programmer Response: Probably nothing. If you are attempting to increase the worker's capacity, delete it first and then add it again.

BKW1801E Worker machine not found.

Explanation: You attempted to delete a worker machine but it does not seem to belong to any class.

System Action: None.

System Programmer Response: Check the command and try again.

BKW1802E Worker class not found.

Explanation: You attempted to operate on a specific worker class, but the class doesn't seem to exist.

System Action: None.

System Programmer Response: Check the command and try again.

BKW1803E No worker classes defined.

Explanation: You attempted to display information about the worker machine configuration, but there are no worker classes defined.

System Action: None.

System Programmer Response: Confirm that you did in fact issue the `WORKER ADD` commands necessary to create your worker pools.

BKW1804E No worker connections found.

Explanation: You attempted to use the `STATUS` command to see information about active connections to worker machines, but there currently are no such connections.

System Action: None.

System Programmer Response: None.

BKW1805E No worker machines found.

Explanation: You attempted to display information about a set of worker machines, but there are no such worker machines defined.

System Action: None.

System Programmer Response: None.

BKW1806E P-block &1 IUCV SEND IPRCODE &3 - severing

Explanation: The server kernel encountered the displayed IPRCODE when attempting to use IUCV to send information to a worker machine.

System Action: The server kernel severs the IUCV connection and informs the instance accordingly.

System Programmer Response: Investigate the IPRCODE and determine whether a configuration change is appropriate.

Trie Messages

BKW1900E No tries found.

Explanation: You asked to see a list of existing tries, but no tries exist.

System Action: Nothing.

System Programmer Response: If you were expecting tries, check to see whether their creation was attempted, and if so, whether it succeeded or failed.

Appendix I. Language Bindings

This appendix documents the language bindings used for PL/X and assembler.

Assembler Language Bindings

All of these binding macros invoke the VMASMMAX macro to ease the allocation of storage for parameter lists. For more information on VMASMMAX, see *z/VM: CMS Application Multitasking*.

Anchor Bindings (SSASMANC MACRO)

```
         MACRO
         SSASMANC  &WEAK=
         AGO   .@ASMAN1
.*  Branch around prolog so it is not included in listings         *
.*******************************************************************
.*                                                                 *
.*  NAME      -  Reusable Server Kernel   anchor bindings          *
.*                                                                 *
.*  FUNCTION  -  Defines the anchor constants and dsects           *
.*                                                                 *
.*  COPYRIGHT -                                              @VR2OZOZ
.*                                                           @VR2OZOZ
.*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992           @VR2OZOZ
.*      LICENSED MATERIALS - PROPERTY OF IBM                 @VR2OZOZ
.*      SEE COPYRIGHT INSTRUCTIONS, G120-2083                @VR2OZOZ
.*      ALL RIGHTS RESERVED                                  @VR2OZOZ
.*                                                                 *
.*  STATUS - VM/ESA Version 2 Release 4                      @VR2OZOZ
.*                                                                 *
.*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4          *
.*******************************************************************
.* A000000-999999   New for VM/ESA Version 2 Release 4       @VR74PVM
.*******************************************************************
.@ASMAN1 ANOP
         PUSH  PRINT
         AIF   ('&SYSPARM' NE 'SUP').ASMAN2
         PRINT OFF,NOGEN
.ASMAN2  ANOP
         LCLC  &$XXTRN
&$XXTRN  SETC  'EXTRN'
         AIF   ('&WEAK' NE 'YES').ASMAN3
&$XXTRN  SETC  'WXTRN'
.ASMAN3  ANOP
*-----------------------------------------------------------------*
*     Return and reason codes for anchor functions                *
*-----------------------------------------------------------------*
         SPACE 1
*
* return codes
SS_ANC_RC_SUCCESS                EQU      0
SS_ANC_RC_WARNING                EQU      4
SS_ANC_RC_ERROR                  EQU      8
SS_ANC_RC_ABEND                  EQU      12
```

```
*                                                                       00044000
* reason codes                                                          00045000
SS_ANC_RE_SUCCESS                EQU      0                             00046000
*------------------------------------------------------------------*    00047000
*     Constants for anchor functions                               *    00048000
*------------------------------------------------------------------*    00049000
         SPACE 1                                                        00050000
*------------------------------------------------------------------*    00051000
*     Definitions for anchor functions                             *    00052000
*------------------------------------------------------------------*    00053000
         SPACE 1                                                        00054000
*------------------------------------------------------------------*    00055000
*     Declaration for ssAnchorSet                                  *    00056000
*------------------------------------------------------------------*    00057000
         SPACE 1                                                        00058000
         &$XXTRN  BKWAST                                                00059000
SSANCHORSET                     EQU      BKWAST                         00060000
         SPACE 1                                                        00061000
BKWAST_PLIST                    DSECT                                   00062000
BKWAST_PLIST_RC                 DS       A   * return code              00063000
BKWAST_PLIST_RE                 DS       A   * reason code              00064000
BKWAST_PLIST_AV                 DS       A   * anchor value             00065000
BKWAST_PLIST_LENGTH             EQU      *-BKWAST_PLIST                 00066000
                                VMASMMAX                                00067000
         SPACE 1                                                        00068000
*------------------------------------------------------------------*    00069000
*     Declaration for ssAnchorGet                                  *    00070000
*------------------------------------------------------------------*    00071000
         SPACE 1                                                        00072000
         &$XXTRN  BKWAGT                                                00073000
SSANCHORGET                     EQU      BKWAGT                         00074000
         SPACE 1                                                        00075000
BKWAGT_PLIST                    DSECT                                   00076000
BKWAGT_PLIST_RC                 DS       A   * return code              00077000
BKWAGT_PLIST_RE                 DS       A   * reason code              00078000
BKWAGT_PLIST_AV                 DS       A   * anchor value             00079000
BKWAGT_PLIST_MB                 DS       A   * monitor buffer           00080000
BKWAGT_PLIST_MBL                DS       A   * monitor buffer length    00081000
BKWAGT_PLIST_LENGTH             EQU      *-BKWAGT_PLIST                 00082000
                                VMASMMAX                                00083000
*------------------------------------------------------------------*    00084000
*     End of declarations                                          *    00085000
*------------------------------------------------------------------*    00086000
         EJECT                                                          00087000
         POP   PRINT                                                    00088000
         MEND                                                           00089000
```

Authorization Bindings (SSASMAUT MACRO)

```
         MACRO
         SSASMAUT &WEAK=
         AGO   .@ASMAU1
.*  Branch around prolog so it is not included in listings          *
.********************************************************************
.*                                                                  *
.*  NAME      -  Reusable Server Kernel   authorization bindings    *
.*                                                                  *
.*  FUNCTION  -  Defines the authorization constants and dsects     *
.*                                                                  *
.*  COPYRIGHT -                                                @VR2OZOZ
.*                                                             @VR2OZOZ
.*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992             @VR2OZOZ
.*      LICENSED MATERIALS - PROPERTY OF IBM                   @VR2OZOZ
.*      SEE COPYRIGHT INSTRUCTIONS, G120-2083                  @VR2OZOZ
.*      ALL RIGHTS RESERVED                                    @VR2OZOZ
.*                                                                  *
.*  STATUS - VM/ESA Version 2 Release 4                        @VR2OZOZ
.*                                                                  *
.*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4           *
.********************************************************************
.* A000000-999999   New for VM/ESA Version 2 Release 4         @VR74PVM
.********************************************************************
.@ASMAU1 ANOP
         PUSH  PRINT
         AIF   ('&SYSPARM' NE 'SUP').ASMAU2
         PRINT OFF,NOGEN
.ASMAU2  ANOP
         LCLC  &$XXTRN
&$XXTRN  SETC  'EXTRN'
         AIF   ('&WEAK' NE 'YES').ASMAU3
&$XXTRN  SETC  'WXTRN'
.ASMAU3  ANOP
*------------------------------------------------------------------*
*     Return and reason codes for authorization functions          *
*------------------------------------------------------------------*
         SPACE 1
*
* return codes
SS_AUT_RC_SUCCESS                EQU      0
SS_AUT_RC_WARNING                EQU      4
SS_AUT_RC_ERROR                  EQU      8
SS_AUT_RC_ABEND                  EQU      12
*
* reason codes
SS_AUT_RE_SUCCESS                EQU      0
SS_AUT_RE_BAD_COUNT              EQU      301
SS_AUT_RE_BAD_USER_LENGTH        EQU      302
SS_AUT_RE_BAD_OBJ_LENGTH         EQU      303
SS_AUT_RE_BAD_OPTION             EQU      304
SS_AUT_RE_BAD_QUAL               EQU      305
SS_AUT_RE_BAD_USE                EQU      306
SS_AUT_RE_EXISTS                 EQU      307
SS_AUT_RE_NO_CLASS               EQU      308
SS_AUT_RE_NO_OBJECT              EQU      309
SS_AUT_RE_MAQ_FAIL               EQU      310
SS_AUT_RE_CVW_FAIL               EQU      311
SS_AUT_RE_CVS_FAIL               EQU      312
```

```
SS_AUT_RE_MR_FAIL                 EQU      313                              00059000
SS_AUT_RE_TOO_MANY                EQU      314                              00060000
SS_AUT_RE_OUT_OF_STORAGE          EQU      315                              00061000
SS_AUT_RE_NO_USER                 EQU      316                              00062000
SS_AUT_RE_PREV_IO_ERROR           EQU      317                              00063000
SS_AUT_RE_PREV_SYNC_ERROR         EQU      318                              00064000
SS_AUT_RE_READ_FAIL               EQU      319                              00065000
SS_AUT_RE_WRITE_FAIL              EQU      320                              00066000
SS_AUT_RE_TRUNC                   EQU      321                              00067000
SS_AUT_RE_GWU_FAIL                EQU      322                              00068000
SS_AUT_RE_OPEN_FAIL               EQU      323                              00069000
SS_AUT_RE_BAD_CACHE               EQU      324                              00070000
SS_AUT_RE_BAD_FREE                EQU      325                              00071000
SS_AUT_RE_BAD_OP                  EQU      326                              00072000
*                                                                           00073000
*-------------------------------------------------------------------*       00074000
*     Constants for authorization functions                         *       00075000
*-------------------------------------------------------------------*       00076000
         SPACE 1                                                            00077000
*-------------------------------------------*                               00078000
* Return values from ssAuthTestOperations  *                                00079000
* and ssAuthPermitUser                      *                               00080000
*-------------------------------------------*                               00081000
SS_AUT_OP_PERMITTED               EQU      0                                00082000
SS_AUT_OP_NOT_PERMITTED           EQU      1                                00083000
SS_AUT_OP_NOT_DEFINED             EQU      2                                00084000
SS_AUT_OP_NO_CHANGE               EQU      3                                00085000
*                                                                           00086000
*-------------------------------------------*                               00087000
* Qualifiers for ssAuthPermitUser           *                               00088000
*-------------------------------------------*                               00089000
SS_AUT_ADD_OPERATION              EQU      0                                00090000
SS_AUT_REMOVE_OPERATION           EQU      1                                00091000
*                                                                           00092000
*-------------------------------------------*                               00093000
* Use arrays in ssAuthPermitUser            *                               00094000
*-------------------------------------------*                               00095000
SS_AUT_USE_ARRAYS                 EQU      0                                00096000
SS_AUT_DELETE_ALL                 EQU      1                                00097000
SS_AUT_ADD_ALL                    EQU      2                                00098000
*                                                                           00099000
*-------------------------------------------*                               00100000
* Qualifiers for ssAuthDeleteObject         *                               00101000
*-------------------------------------------*                               00102000
SS_AUT_RULES_ONLY                 EQU      0                                00103000
SS_AUT_RULES_AND_OBJECT           EQU      1                                00104000
*                                                                           00105000
*-------------------------------------------*                               00106000
* Qualifiers for ssAuthDeleteUser           *                               00107000
*-------------------------------------------*                               00108000
SS_AUT_SPECIFIC_CLASS             EQU      0                                00109000
SS_AUT_ALL_CLASSES                EQU      1                                00110000
*                                                                           00111000
*-------------------------------------------*                               00112000
* Qualifiers for ssAuthDeleteClass          *                               00113000
*-------------------------------------------*                               00114000
SS_AUT_OBJECTS_ONLY               EQU      0                                00115000
SS_AUT_OBJECTS_AND_CLASS          EQU      1                                00116000
```

```
*
*------------------------------------------------------------------*
*     Definitions for authorization functions                      *
*------------------------------------------------------------------*
         SPACE 1
*------------------------------------------------------------------*
*     Operations on classes                                        *
*------------------------------------------------------------------*
*
*     create class
*
         SPACE 1
         &$XXTRN  BKWUCC
SSAUTHCREATECLASS               EQU      BKWUCC
         SPACE 1
BKWUCC_PLIST                    DSECT
BKWUCC_PLIST_RC                 DS       A   * return code
BKWUCC_PLIST_RE                 DS       A   * reason code
BKWUCC_PLIST_CID                DS       A   * class identifier
BKWUCC_PLIST_OC                 DS       A   * operation count
BKWUCC_PLIST_OA                 DS       A   * operation array
BKWUCC_PLIST_LENGTH             EQU      *-BKWUCC_PLIST
                                VMASMMAX
         SPACE 1
*
*     modify class
*
         SPACE 1
         &$XXTRN  BKWUMC
SSAUTHMODIFYCLASS               EQU      BKWUMC
         SPACE 1
BKWUMC_PLIST                    DSECT
BKWUMC_PLIST_RC                 DS       A   * return code
BKWUMC_PLIST_RE                 DS       A   * reason code
BKWUMC_PLIST_CID                DS       A   * class identifier
BKWUMC_PLIST_OC                 DS       A   * operation count
BKWUMC_PLIST_OA                 DS       A   * operation array
BKWUMC_PLIST_LENGTH             EQU      *-BKWUMC_PLIST
                                VMASMMAX
         SPACE 1
*
*     list classes
*
         SPACE 1
         &$XXTRN  BKWULC
SSAUTHLISTCLASSES               EQU      BKWULC
         SPACE 1
BKWULC_PLIST                    DSECT
BKWULC_PLIST_RC                 DS       A   * return code
BKWULC_PLIST_RE                 DS       A   * reason code
BKWULC_PLIST_MK                 DS       A   * match key
BKWULC_PLIST_MKL                DS       A   * match key length
BKWULC_PLIST_NE                 DS       A   * number expected
BKWULC_PLIST_OB                 DS       A   * output buffer
BKWULC_PLIST_NR                 DS       A   * number returned
BKWULC_PLIST_LENGTH             EQU      *-BKWULC_PLIST
                                VMASMMAX
         SPACE 1
*
*     delete class
*
         SPACE 1
         &$XXTRN  BKWUDC
SSAUTHDELETECLASS               EQU      BKWUDC
         SPACE 1
BKWUDC_PLIST                    DSECT
BKWUDC_PLIST_RC                 DS       A   * return code
BKWUDC_PLIST_RE                 DS       A   * reason code
BKWUDC_PLIST_CID                DS       A   * class identifier
BKWUDC_PLIST_OC                 DS       A   * option count
BKWUDC_PLIST_OA                 DS       A   * option array
BKWUDC_PLIST_LENGTH             EQU      *-BKWUDC_PLIST
                                VMASMMAX
*------------------------------------------------------------------*
*     Operations on objects                                        *
*------------------------------------------------------------------*
*
*     create object
*
         SPACE 1
         &$XXTRN  BKWUCO
SSAUTHCREATEOBJECT              EQU      BKWUCO
         SPACE 1
BKWUCO_PLIST                    DSECT
BKWUCO_PLIST_RC                 DS       A   * return code
BKWUCO_PLIST_RE                 DS       A   * reason code
BKWUCO_PLIST_ON                 DS       A   * object name
BKWUCO_PLIST_ONL                DS       A   * object name length
BKWUCO_PLIST_CID                DS       A   * object class
BKWUCO_PLIST_LENGTH             EQU      *-BKWUCO_PLIST
                                VMASMMAX
         SPACE 1
*
*     list objects in class
*
         SPACE 1
         &$XXTRN  BKWULO
SSAUTHLISTOBJECTS               EQU      BKWULO
         SPACE 1
BKWULO_PLIST                    DSECT
BKWULO_PLIST_RC                 DS       A   * return code
BKWULO_PLIST_RE                 DS       A   * reason code
BKWULO_PLIST_CID                DS       A   * class identifier
BKWULO_PLIST_MK                 DS       A   * match key
BKWULO_PLIST_MKL                DS       A   * match key length
BKWULO_PLIST_NE                 DS       A   * number expected
BKWULO_PLIST_BP                 DS       A   * buffer pointers
BKWULO_PLIST_BS                 DS       A   * buffer sizes
BKWULO_PLIST_RL                 DS       A   * returned lengths
BKWULO_PLIST_NR                 DS       A   * number returned
BKWULO_PLIST_LENGTH             EQU      *-BKWULO_PLIST
                                VMASMMAX
         SPACE 1
*
```

```
*     query an object
*
         SPACE 1
         &$XXTRN  BKWUQO
SSAUTHQUERYOBJECT               EQU      BKWUQO
         SPACE 1
BKWUQO_PLIST                    DSECT
BKWUQO_PLIST_RC                 DS       A   * return code
BKWUQO_PLIST_RE                 DS       A   * reason code
BKWUQO_PLIST_ON                 DS       A   * object name
BKWUQO_PLIST_ONL                DS       A   * object name length
BKWUQO_PLIST_CID                DS       A   * class identifier
BKWUQO_PLIST_UX                 DS       A   * userids expected
BKWUQO_PLIST_UBP                DS       A   * userid buf pointers
BKWUQO_PLIST_UBS                DS       A   * userid buf sizes
BKWUQO_PLIST_UL                 DS       A   * userid lengths
BKWUQO_PLIST_UR                 DS       A   * userids returned
BKWUQO_PLIST_LENGTH             EQU      *-BKWUQO_PLIST
                                VMASMMAX
         SPACE 1
*
*     delete an object
*
         SPACE 1
         &$XXTRN  BKWUDO
SSAUTHDELETEOBJECT              EQU      BKWUDO
         SPACE 1
BKWUDO_PLIST                    DSECT
BKWUDO_PLIST_RC                 DS       A   * return code
BKWUDO_PLIST_RE                 DS       A   * reason code
BKWUDO_PLIST_ON                 DS       A   * object name
BKWUDO_PLIST_ONL                DS       A   * its length
BKWUDO_PLIST_OC                 DS       A   * option count
BKWUDO_PLIST_OA                 DS       A   * option array
BKWUDO_PLIST_LENGTH             EQU      *-BKWUDO_PLIST
                                VMASMMAX
         SPACE 1
*------------------------------------------------------------------*
*     Operations on users                                          *
*------------------------------------------------------------------*
*
*     permit user
*
         SPACE 1
         &$XXTRN  BKWUPU
SSAUTHPERMITUSER                EQU      BKWUPU
         SPACE 1
BKWUPU_PLIST                    DSECT
BKWUPU_PLIST_RC                 DS       A   * return code
BKWUPU_PLIST_RE                 DS       A   * reason code
BKWUPU_PLIST_UN                 DS       A   * user name
BKWUPU_PLIST_UNL                DS       A   * its length
BKWUPU_PLIST_ON                 DS       A   * object name
BKWUPU_PLIST_ONL                DS       A   * its length
BKWUPU_PLIST_UA                 DS       A   * use arrays?
BKWUPU_PLIST_OC                 DS       A   * operation count
BKWUPU_PLIST_OA                 DS       A   * operation array
BKWUPU_PLIST_OQ                 DS       A   * operation qualifiers
```

```
BKWUPU_PLIST_OR                 DS       A   * operation results
BKWUPU_PLIST_LENGTH             EQU      *-BKWUPU_PLIST
                                VMASMMAX
         SPACE 1
*
*     query specific rule
*
         &$XXTRN  BKWUQR
SSAUTHQUERYRULE                 EQU      BKWUQR
         SPACE 1
BKWUQR_PLIST                    DSECT
BKWUQR_PLIST_RC                 DS       A   * return code
BKWUQR_PLIST_RE                 DS       A   * reason code
BKWUQR_PLIST_UN                 DS       A   * user name
BKWUQR_PLIST_UNL                DS       A   * its length
BKWUQR_PLIST_ON                 DS       A   * object name
BKWUQR_PLIST_ONL                DS       A   * its length
BKWUQR_PLIST_OE                 DS       A   * ops expected
BKWUQR_PLIST_OA                 DS       A   * operation array
BKWUQR_PLIST_OR                 DS       A   * ops returned
BKWUQR_PLIST_LENGTH             EQU      *-BKWUQR_PLIST
                                VMASMMAX
         SPACE 1
*
*     test operations
*
         SPACE 1
         &$XXTRN  BKWUTO
SSAUTHTESTOPERATIONS            EQU      BKWUTO
         SPACE 1
BKWUTO_PLIST                    DSECT
BKWUTO_PLIST_RC                 DS       A   * return code
BKWUTO_PLIST_RE                 DS       A   * reason code
BKWUTO_PLIST_UN                 DS       A   * user name
BKWUTO_PLIST_UNL                DS       A   * its length
BKWUTO_PLIST_ON                 DS       A   * object name
BKWUTO_PLIST_ONL                DS       A   * its length
BKWUTO_PLIST_OC                 DS       A   * operation count
BKWUTO_PLIST_OA                 DS       A   * operation array
BKWUTO_PLIST_TR                 DS       A   * test results
BKWUTO_PLIST_LENGTH             EQU      *-BKWUTO_PLIST
                                VMASMMAX
         SPACE 1
*
*     delete user
*
         SPACE 1
         &$XXTRN  BKWUDU
SSAUTHDELETEUSER                EQU      BKWUDU
         SPACE 1
BKWUDU_PLIST                    DSECT
BKWUDU_PLIST_RC                 DS       A   * return code
BKWUDU_PLIST_RE                 DS       A   * reason code
BKWUDU_PLIST_UN                 DS       A   * user name
BKWUDU_PLIST_UNL                DS       A   * its length
BKWUDU_PLIST_CID                DS       A   * class identifier
BKWUDU_PLIST_OC                 DS       A   * option count
```

```
BKWUDU_PLIST_OA                 DS       A   * option array
BKWUDU_PLIST_LENGTH             EQU      *-BKWUDU_PLIST
                                VMASMMAX
         SPACE 1
*------------------------------------------------------------------*
*     Utility functions                                            *
*------------------------------------------------------------------*
*
*  try to reset access to data files
*
         SPACE 1
         &$XXTRN  BKWURL
SSAUTHRELOAD                    EQU      BKWURL
         SPACE 1
BKWURL_PLIST                    DSECT
BKWURL_PLIST_RC                 DS       A   * return code
BKWURL_PLIST_RE                 DS       A   * reason code
BKWURL_PLIST_LENGTH             EQU      *-BKWURL_PLIST
                                VMASMMAX
         SPACE 1
*------------------------------------------------------------------*
*     End of declarations                                          *
*------------------------------------------------------------------*
         EJECT
         POP   PRINT
         MEND
```

Cache Bindings (SSASMCAC MACRO)

```
         MACRO
         SSASMCAC &WEAK=
         AGO   .@ASMOB1
.*  Branch around prolog so it is not included in listings          *
.********************************************************************
.*                                                                  *
.*  NAME      -  Reusable Server Kernel cache bindings              *
.*                                                                  *
.*  FUNCTION  -  Defines the file cache constants and dsects        *
.*                                                                  *
.*  COPYRIGHT -                                                @VR2OZOZ
.*                                                             @VR2OZOZ
.*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992             @VR2OZOZ
.*      LICENSED MATERIALS - PROPERTY OF IBM                   @VR2OZOZ
.*      SEE COPYRIGHT INSTRUCTIONS, G120-2083                  @VR2OZOZ
.*      ALL RIGHTS RESERVED                                    @VR2OZOZ
.*                                                                  *
.*  STATUS - Version 2 Release 4                               @VR2OZOZ
.*                                                                  *
.*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4           *
.********************************************************************
.* A000000-999999   New for VM/ESA Version 2 Release 4         @VR74PVM
.********************************************************************
.@ASMOB1 ANOP
         PUSH  PRINT
         AIF   ('&SYSPARM' NE 'SUP').ASMOB2
         PRINT OFF,NOGEN
.ASMOB2  ANOP
```

```
         LCLC  &$XXTRN
&$XXTRN  SETC  'EXTRN'
         AIF   ('&WEAK' NE 'YES').ASMOB3
&$XXTRN  SETC  'WXTRN'
.ASMOB3  ANOP
*------------------------------------------------------------------*
*     Return and reason codes for file functions                   *
*------------------------------------------------------------------*
         SPACE 1
* return codes
SS_CAC_RC_SUCCESS                EQU      0
SS_CAC_RC_WARNING                EQU      4
SS_CAC_RC_ERROR                  EQU      8
SS_CAC_RC_ABEND                  EQU      12
*
* reason codes
SS_CAC_RE_SUCCESS                EQU      0
SS_CAC_RE_OUT_OF_STORAGE         EQU      1501
SS_CAC_RE_TABLE_REPLACED         EQU      1502
SS_CAC_RE_CACHE_NOT_FOUND        EQU      1503
SS_CAC_RE_DSCR_FAIL              EQU      1504
SS_CAC_RE_CACHE_EXISTS           EQU      1505
SS_CAC_RE_BAD_SIZE               EQU      1506
SS_CAC_RE_BAD_TOKEN              EQU      1511
SS_CAC_RE_BAD_LENGTH             EQU      1512
SS_CAC_RE_BAD_COUNT              EQU      1513
SS_CAC_RE_BAD_ESMDL              EQU      1514
SS_CAC_RE_BAD_FNAME              EQU      1515
SS_CAC_RE_BAD_FVAL               EQU      1516
SS_CAC_RE_EXIST_FAIL             EQU      1517
SS_CAC_RE_FILE_NOT_FOUND         EQU      1518
SS_CAC_RE_DELETE_IN_PROGRESS     EQU      1519
SS_CAC_RE_BAD_OFFSET             EQU      1520
SS_CAC_RE_BAD_TABLE_ID           EQU      1521
SS_CAC_RE_TABLE_NOT_FOUND        EQU      1522
SS_CAC_RE_OPEN_FAIL              EQU      1523
SS_CAC_RE_BAD_RECFM              EQU      1524
SS_CAC_RE_BAD_LRECL              EQU      1525
SS_CAC_RE_OUT_OF_STORAGE_DS      EQU      1526
SS_CAC_RE_READ_FAIL              EQU      1527
SS_CAC_RE_BAD_DATA_STREAM        EQU      1528
         SPACE 1
*------------------------------------------------------------------*
*     Constants for file functions                                 *
*------------------------------------------------------------------*
         SPACE 1
* open flag names
SS_CAC_OFN_XLATE                EQU       0
SS_CAC_OFN_PRESERVE_DOLR        EQU       1
SS_CAC_OFN_BFS                  EQU       2
SS_CAC_OFN_RECMETHOD_FS         EQU       3
SS_CAC_OFN_RECMETHOD_CACHE      EQU       4
*
* open flag values
SS_CAC_OFV_NO                    EQU      0
SS_CAC_OFV_YES                   EQU      1
         SPACE 1
*------------------------------------------------------------------*
```

```
*     Definitions for file functions                               *
*------------------------------------------------------------------*
         SPACE 1
*
*     create cache
*
         SPACE 1
         &$XXTRN  BKWOCC
SSCACHECREATE                   EQU      BKWOCC
         SPACE 1
BKWOCC_PLIST                    DSECT
BKWOCC_PLIST_RC                 DS       A   * return code
BKWOCC_PLIST_RE                 DS       A   * reason code
BKWOCC_PLIST_CNAME              DS       A   * cache name
BKWOCC_PLIST_PAGES              DS       A   * file name length
BKWOCC_PLIST_ALET               DS       A   * storage group num
BKWOCC_PLIST_LENGTH             EQU      *-BKWOCC_PLIST
                                VMASMMAX
         SPACE 1
*
*     delete cache
*
         SPACE 1
         &$XXTRN  BKWOCD
SSCACHEDELETE                   EQU      BKWOCD
         SPACE 1
BKWOCD_PLIST                    DSECT
BKWOCD_PLIST_RC                 DS       A   * return code
BKWOCD_PLIST_RE                 DS       A   * reason code
BKWOCD_PLIST_CNAME              DS       A   * cache name
BKWOCD_PLIST_LENGTH             EQU      *-BKWOCD_PLIST
                                VMASMMAX
         SPACE 1
*
*     query cache utilization
*
         SPACE 1
         &$XXTRN  BKWOCQ
SSCACHEQUERY                    EQU      BKWOCQ
         SPACE 1
BKWOCQ_PLIST                    DSECT
BKWOCQ_PLIST_RC                 DS       A   * return code
BKWOCQ_PLIST_RE                 DS       A   * reason code
BKWOCQ_PLIST_CNAME              DS       A   * cache name
BKWOCQ_PLIST_FCOUNT             DS       A   * files cached
BKWOCQ_PLIST_CSIZE              DS       A   * cache size
BKWOCQ_PLIST_INUSE              DS       A   * amt in use
BKWOCQ_PLIST_OCOUNT             DS       A   * open count
BKWOCQ_PLIST_HCOUNT             DS       A   * hit count
BKWOCQ_PLIST_LENGTH             EQU      *-BKWOCQ_PLIST
                                VMASMMAX
         SPACE 1
*
*     set translation table
*
         SPACE 1
         &$XXTRN  BKWOTS
SSCACHEXLTABSET                 EQU      BKWOTS
```

```
         SPACE 1                                                        00145000
BKWOTS_PLIST                    DSECT                                   00146000
BKWOTS_PLIST_RC                 DS       A   * return code              00147000
BKWOTS_PLIST_RE                 DS       A   * reason code              00148000
BKWOTS_PLIST_XLTABID            DS       A   * xltab id                 00149000
BKWOTS_PLIST_XLTAB              DS       A   * xltab                    00150000
BKWOTS_PLIST_LENGTH             EQU      *-BKWOTS_PLIST                 00151000
                                VMASMMAX                                00152000
         SPACE 1                                                        00153000
*                                                                       00154000
*     open a cached file                                                00155000
*                                                                       00156000
         SPACE 1                                                        00157000
         &$XXTRN  BKWOFO                                                00158000
SSCACHEFILEOPEN                 EQU      BKWOFO                         00159000
         SPACE 1                                                        00160000
BKWOFO_PLIST                    DSECT                                   00161000
BKWOFO_PLIST_RC                 DS       A   * return code              00162000
BKWOFO_PLIST_RE                 DS       A   * reason code              00163000
BKWOFO_PLIST_CNAME              DS       A   * cache name               00164000
BKWOFO_PLIST_FSPEC              DS       A   * file spec                00165000
BKWOFO_PLIST_FSPECLEN           DS       A   * its length               00166000
BKWOFO_PLIST_ESMD               DS       A   * ESM data                 00167000
BKWOFO_PLIST_ESMDLEN            DS       A   * its length               00168000
BKWOFO_PLIST_FCOUNT             DS       A   * flag count               00169000
BKWOFO_PLIST_FNAMES             DS       A   * flag names               00170000
BKWOFO_PLIST_FVALS              DS       A   * flag values              00171000
BKWOFO_PLIST_FTOKEN             DS       A   * file token               00172000
BKWOFO_PLIST_ALET               DS       A   * file ALET                00173000
BKWOFO_PLIST_DSADDR             DS       A   * file DS address          00174000
BKWOFO_PLIST_DSLEN              DS       A   * file DS length           00175000
BKWOFO_PLIST_LASTUPD            DS       A   * last update date         00176000
BKWOFO_PLIST_LENGTH             EQU      *-BKWOFO_PLIST                 00177000
                                VMASMMAX                                00178000
         SPACE 1                                                        00179000
*                                                                       00180000
*     read cached file                                                  00181000
*                                                                       00182000
         SPACE 1                                                        00183000
         &$XXTRN  BKWOFR                                                00184000
SSCACHEFILEREAD                 EQU      BKWOFR                         00185000
         SPACE 1                                                        00186000
BKWOFR_PLIST                    DSECT                                   00187000
BKWOFR_PLIST_RC                 DS       A   * return code              00188000
BKWOFR_PLIST_RE                 DS       A   * reason code              00189000
BKWOFR_PLIST_CNAME              DS       A   * cache name               00190000
BKWOFR_PLIST_FTOKEN             DS       A   * file token               00191000
BKWOFR_PLIST_OFFSET             DS       A   * byte offset              00192000
BKWOFR_PLIST_COUNT              DS       A   * byte count               00193000
BKWOFR_PLIST_BUFFER             DS       A   * out buffer               00194000
BKWOFR_PLIST_RETURNED           DS       A   * bytes returned           00195000
BKWOFR_PLIST_LENGTH             EQU      *-BKWOFR_PLIST                 00196000
                                VMASMMAX                                00197000
         SPACE 1                                                        00198000
*                                                                       00199000
*     close cached file                                                 00200000
*                                                                       00201000
         SPACE 1                                                        00202000
         &$XXTRN  BKWOFC
SSCACHEFILECLOSE                EQU      BKWOFC
         SPACE 1
BKWOFC_PLIST                    DSECT
BKWOFC_PLIST_RC                 DS       A   * return code
BKWOFC_PLIST_RE                 DS       A   * reason code
BKWOFC_PLIST_CNAME              DS       A   * cache name
BKWOFC_PLIST_FTOKEN             DS       A   * file token
BKWOFC_PLIST_LENGTH             EQU      *-BKWOFC_PLIST
                                VMASMMAX
         SPACE 1
*------------------------------------------------------------------*
*     End of definitions                                           *
*------------------------------------------------------------------*
         EJECT
         POP   PRINT
         MEND
```

Client Bindings (SSASMCLI MACRO)

```
         MACRO
         SSASMCLI &WEAK=
         AGO   .@ASMSR1
.*  Branch around prolog so it is not included in listings          *
.********************************************************************
.*                                                                  *
.*  NAME      -  Reusable Server Kernel   services bindings         *
.*                                                                  *
.*  FUNCTION  -  LANGUAGE BINDINGS FOR THE CLIENT SERVICES          *
.*                                                                  *
.*  COPYRIGHT -                                                @VR2OZOZ
.*                                                             @VR2OZOZ
.*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992             @VR2OZOZ
.*      LICENSED MATERIALS - PROPERTY OF IBM                   @VR2OZOZ
.*      SEE COPYRIGHT INSTRUCTIONS, G120-2083                  @VR2OZOZ
.*      ALL RIGHTS RESERVED                                    @VR2OZOZ
.*                                                                  *
.*  STATUS - Version 2 Release 4                               @VR2OZOZ
.*                                                                  *
.*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4           *
.********************************************************************
.* A000000-999999   New for VM/ESA Version 2 Release 4         @VR24PVM
.********************************************************************
.@ASMSR1 ANOP
         PUSH  PRINT
         AIF   ('&SYSPARM' NE 'SUP').ASMSR2
         PRINT OFF,NOGEN
.ASMSR2  ANOP
         LCLC  &$XXTRN
&$XXTRN  SETC  'EXTRN'
         AIF   ('&WEAK' NE 'YES').ASMSR3
&$XXTRN  SETC  'WXTRN'
.ASMSR3  ANOP
*------------------------------------------------------------------*
*     Return and reason codes for services functions               *
*------------------------------------------------------------------*
         SPACE 1
*
```

```
* return codes
SS_CLI_RC_SUCCESS                 EQU      0
SS_CLI_RC_WARNING                 EQU      4
SS_CLI_RC_ERROR                   EQU      8
SS_CLI_RC_ABEND                   EQU      12
*
* reason codes
SS_CLI_RE_SUCCESS                 EQU      0
SS_CLI_RE_OUT_OF_RANGE            EQU      901
SS_CLI_RE_OUT_OF_STORAGE          EQU      902
SS_CLI_RE_BAD_IAM                 EQU      903
SS_CLI_RE_BAD_METHOD              EQU      904
SS_CLI_RE_SEMC_FAIL               EQU      905
*
* Who i am
         SPACE 1
SS_CLI_IAM_INSTANCE               EQU      0
SS_CLI_IAM_LINEDRIVER             EQU      1
*
* Ways to get data
         SPACE 1
SS_CLI_METHOD_READ                EQU      0
SS_CLI_METHOD_PEEK                EQU      1
SS_CLI_METHOD_DISCARD             EQU      2
*-------------------------------------------------------------------*
*     Definitions for services function                             *
*-------------------------------------------------------------------*
         SPACE 1
*
*     initialize client data queues
*
         SPACE 1
         &$XXTRN  BKWIIN
SSCLIENTDATAINIT                 EQU      BKWIIN
         SPACE 1
BKWIIN_PLIST                     DSECT
BKWIIN_PLIST_RC                  DS       A   * return code
BKWIIN_PLIST_RE                  DS       A   * reason code
BKWIIN_PLIST_CB                  DS       A   * C-block addr
BKWIIN_PLIST_SUBPOOL             DS       A   * subpool name
BKWIIN_PLIST_LENGTH              EQU      *-BKWIIN_PLIST
                                 VMASMMAX
         SPACE 1
*
*     terminate client data queues
*
         SPACE 1
         &$XXTRN  BKWITM
SSCLIENTDATATERM                 EQU      BKWITM
         SPACE 1
BKWITM_PLIST                     DSECT
BKWITM_PLIST_RC                  DS       A   * return code
BKWITM_PLIST_RE                  DS       A   * reason code
BKWITM_PLIST_CB                  DS       A   * C-block addr
BKWITM_PLIST_LENGTH              EQU      *-BKWITM_PLIST
                                 VMASMMAX
         SPACE 1
*
```

```
*     get input from client C-block
*
         SPACE 1
         &$XXTRN  BKWIDG
SSCLIENTDATAGET                EQU      BKWIDG
         SPACE 1
BKWIDG_PLIST                   DSECT
BKWIDG_PLIST_RC                DS       A   * return code
BKWIDG_PLIST_RE                DS       A   * reason code
BKWIDG_PLIST_INS               DS       A   * instance or ld?
BKWIDG_PLIST_CB                DS       A   * C-block addr
BKWIDG_PLIST_GM                DS       A   * get method
BKWIDG_PLIST_ALET              DS       A   * ALET
BKWIDG_PLIST_BUF               DS       A   * buffer
BKWIDG_PLIST_AM                DS       A   * amt wanted
BKWIDG_PLIST_AG                DS       A   * amt given
BKWIDG_PLIST_AL                DS       A   * amt left
BKWIDG_PLIST_LENGTH            EQU      *-BKWIDG_PLIST
                               VMASMMAX
         SPACE 1
*
*     put output onto client C-block
*
         SPACE 1
         &$XXTRN  BKWIDP
SSCLIENTDATAPUT                EQU      BKWIDP
         SPACE 1
BKWIDP_PLIST                   DSECT
BKWIDP_PLIST_RC                DS       A   * return code
BKWIDP_PLIST_RE                DS       A   * reason code
BKWIDP_PLIST_INS               DS       A   * instance or ld?
BKWIDP_PLIST_CB                DS       A   * C-block addr
BKWIDP_PLIST_ALET              DS       A   * ALET
BKWIDP_PLIST_BUF               DS       A   * buffer
BKWIDP_PLIST_AP                DS       A   * amt to put
BKWIDP_PLIST_NA                DS       A   * new amount
BKWIDP_PLIST_LENGTH            EQU      *-BKWIDP_PLIST
                               VMASMMAX
         SPACE 1
*-------------------------------------------------------------------*
*     End of declarations                                           *
*-------------------------------------------------------------------*
         EJECT
         POP   PRINT
         MEND
```

Enrollment Bindings (SSASMENR MACRO)

```
         MACRO
         SSASMENR &WEAK=
         AGO   .@ASMSR1
.*  Branch around prolog so it is not included in listings          *
.*******************************************************************
.*                                                                  *
.*  NAME      -  Reusable Server Kernel   services bindings         *
.*                                                                  *
.*  FUNCTION  -  Language bindings for enrollment services          *
.*                                                                  *
.*  COPYRIGHT -                                                 @VR2OZOZ 00011000
.*                                                              @VR2OZOZ 00012000
.*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992              @VR2OZOZ 00013000
.*      LICENSED MATERIALS - PROPERTY OF IBM                    @VR2OZOZ 00014000
.*      SEE COPYRIGHT INSTRUCTIONS, G120-2083                   @VR2OZOZ 00015000
.*      ALL RIGHTS RESERVED                                     @VR2OZOZ 00016000
.*                                                                  *   00017000
.*  STATUS - Version 2 Release 4                                @VR2OZOZ 00018000
.*                                                                  *   00019000
.*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4           *   00020000
.*******************************************************************   00021000
.* A000000-999999   New for VM/ESA Version 2 Release 4          @VR24PVM 00022000
.*******************************************************************   00023000
.@ASMSR1 ANOP                                                          00024000
         PUSH  PRINT                                                   00025000
         AIF   ('&SYSPARM' NE 'SUP').ASMSR2                            00026000
         PRINT OFF,NOGEN                                               00027000
.ASMSR2  ANOP                                                          00028000
         LCLC  &$XXTRN                                                 00029000
&$XXTRN  SETC  'EXTRN'                                                 00030000
         AIF   ('&WEAK' NE 'YES').ASMSR3                               00031000
&$XXTRN  SETC  'WXTRN'                                                 00032000
.ASMSR3  ANOP                                                          00033000
*-------------------------------------------------------------------*   00034000
*     Return and reason codes for services functions                *   00035000
*-------------------------------------------------------------------*   00036000
         SPACE 1                                                       00037000
*                                                                      00038000
* return codes                                                         00039000
SS_ENR_RC_SUCCESS                EQU      0                            00040000
SS_ENR_RC_WARNING                EQU      4                            00041000
SS_ENR_RC_ERROR                  EQU      8                            00042000
SS_ENR_RC_ABEND                  EQU      12                           00043000
*                                                                      00044000
* reason codes                                                         00045000
SS_ENR_RE_SUCCESS                EQU      0                            00046000
SS_ENR_RE_DB_NOT_FOUND           EQU      1001                         00047000
SS_ENR_RE_REC_NOT_FOUND          EQU      1002                         00048000
SS_ENR_RE_TRUNCATED              EQU      1003                         00049000
SS_ENR_RE_DIRTY                  EQU      1004                         00050000
SS_ENR_RE_REC_EXISTS             EQU      1005                         00051000
SS_ENR_RE_BAD_LENGTH             EQU      1006                         00052000
SS_ENR_RE_BAD_DROPTYPE           EQU      1007                         00053000
SS_ENR_RE_NO_STORAGE             EQU      1008                         00054000
SS_ENR_RE_CLOSE_FAIL             EQU      1009                         00055000
SS_ENR_RE_WRITE_FAIL             EQU      1010                         00056000
SS_ENR_RE_BAD_METHOD             EQU      1011                         00057000
SS_ENR_RE_OPEN_FAIL              EQU      1012                         00058000
SS_ENR_RE_GWU_FAIL               EQU      1013                         00059000
SS_ENR_RE_POINT_FAIL             EQU      1014                         00060000
SS_ENR_RE_EXIST_FAIL             EQU      1015                         00061000
SS_ENR_RE_NOT_SFS                EQU      1016                         00062000
SS_ENR_RE_NOT_V                  EQU      1017                         00063000
SS_ENR_RE_DSCR_FAIL              EQU      1018                         00064000
SS_ENR_RE_READ_FAIL              EQU      1019                         00065000
SS_ENR_RE_DB_EXISTS              EQU      1020                         00066000
SS_ENR_RE_COMM_FAIL              EQU      1021                         00067000
SS_ENR_RE_NOT_DISK               EQU      1022                         00068000
```

```
SS_ENR_RE_BAD_KIND               EQU      1023
SS_ENR_RE_NEW_FILE               EQU      1024
SS_ENR_RE_NO_SETS                EQU      1025
SS_ENR_RE_SET_EMPTY              EQU      1026
         SPACE 1
*
* API maxima
SS_ENR_INDEX_WIDTH               EQU      64
SS_ENR_MAX_DATA                  EQU      65450
         SPACE 1
*
* KIND types
SS_ENR_KIND_MEMORY               EQU      0
SS_ENR_KIND_DISK                 EQU      1
         SPACE 1
*
* INSERT types
SS_ENR_INSERT_NEW                EQU      0
SS_ENR_INSERT_REPLACE            EQU      1
         SPACE 1
*
* DROP types
SS_ENR_DROP_COMMIT               EQU      0
SS_ENR_DROP_ROLLBACK             EQU      1
         SPACE 1
*------------------------------------------------------------------*
*     Definitions for enrollment services                          *
*------------------------------------------------------------------*
         SPACE 1
*
*     load enrollment data base
*
         SPACE 1
         &$XXTRN  BKWJLO
SSENROLLLOAD                    EQU      BKWJLO
         SPACE 1
BKWJLO_PLIST                    DSECT
BKWJLO_PLIST_RC                 DS       A   * return code
BKWJLO_PLIST_RE                 DS       A   * reason code
BKWJLO_PLIST_DBASE              DS       A   * dbase name
BKWJLO_PLIST_DS_KIND            DS       A   * DS kind
BKWJLO_PLIST_DS_SIZE            DS       A   * DS size
BKWJLO_PLIST_FN                 DS       A   * filename
BKWJLO_PLIST_FNL                DS       A   * filename length
BKWJLO_PLIST_LENGTH             EQU      *-BKWJLO_PLIST
                                VMASMMAX
         SPACE 1
*
*     drop enrollment data base
*
         SPACE 1
         &$XXTRN  BKWJDP
SSENROLLDROP                    EQU      BKWJDP
         SPACE 1
BKWJDP_PLIST                    DSECT
BKWJDP_PLIST_RC                 DS       A   * return code
BKWJDP_PLIST_RE                 DS       A   * reason code
BKWJDP_PLIST_DBASE              DS       A   * dbase name
```

```
BKWJDP_PLIST_DT                 DS       A   * drop type
BKWJDP_PLIST_LENGTH             EQU      *-BKWJDP_PLIST
                                VMASMMAX
         SPACE 1
*
*     commit enrollment data base
*
         SPACE 1
         &$XXTRN  BKWJCM
SSENROLLCOMMIT                  EQU      BKWJCM
         SPACE 1
BKWJCM_PLIST                    DSECT
BKWJCM_PLIST_RC                 DS       A   * return code
BKWJCM_PLIST_RE                 DS       A   * reason code
BKWJCM_PLIST_DBASE              DS       A   * dbase name
BKWJCM_PLIST_LENGTH             EQU      *-BKWJCM_PLIST
                                VMASMMAX
         SPACE 1
*
*     list data bases
*
         SPACE 1
         &$XXTRN  BKWJDL
SSENROLLLIST                    EQU      BKWJDL
         SPACE 1
BKWJDL_PLIST                    DSECT
BKWJDL_PLIST_RC                 DS       A   * return code
BKWJDL_PLIST_RE                 DS       A   * reason code
BKWJDL_PLIST_CB                 DS       A   * C-block
BKWJDL_PLIST_LENGTH             EQU      *-BKWJDL_PLIST
                                VMASMMAX
         SPACE 1
*
*     insert record
*
         SPACE 1
         &$XXTRN  BKWJRI
SSENROLLRECORDINSERT            EQU      BKWJRI
         SPACE 1
BKWJRI_PLIST                    DSECT
BKWJRI_PLIST_RC                 DS       A    * return code
BKWJRI_PLIST_RE                 DS       A    * reason code
BKWJRI_PLIST_DBASE              DS       A    * dbase name
BKWJRI_PLIST_INDEX              DS       A    * index
BKWJRI_PLIST_DATA               DS       A    * data
BKWJRI_PLIST_DATAL              DS       A    * data length
BKWJRI_PLIST_REP                DS       A    * replace?
BKWJRI_PLIST_LENGTH             EQU      *-BKWJRI_PLIST
                                VMASMMAX
         SPACE 1
*
*     remove record
*
         SPACE 1
         &$XXTRN  BKWJRR
SSENROLLRECORDREMOVE            EQU      BKWJRR
         SPACE 1
BKWJRR_PLIST                    DSECT
```

```
BKWJRR_PLIST_RC                 DS       A    * return code
BKWJRR_PLIST_RE                 DS       A    * reason code
BKWJRR_PLIST_DBASE              DS       A    * dbase name
BKWJRR_PLIST_INDEX              DS       A    * index
BKWJRR_PLIST_LENGTH             EQU      *-BKWJRR_PLIST
                                VMASMMAX
         SPACE 1
*
*     list records
*
         SPACE 1
         &$XXTRN  BKWJRL
SSENROLLRECORDLIST              EQU      BKWJRL
         SPACE 1
BKWJRL_PLIST                    DSECT
BKWJRL_PLIST_RC                 DS       A    * return code
BKWJRL_PLIST_RE                 DS       A    * reason code
BKWJRL_PLIST_DBASE              DS       A    * dbase name
BKWJRL_PLIST_CB                 DS       A    * C-block
BKWJRL_PLIST_LENGTH             EQU      *-BKWJRL_PLIST
                                VMASMMAX
         SPACE 1
*
*     get record
*
         SPACE 1
         &$XXTRN  BKWJRG
SSENROLLRECORDGET               EQU      BKWJRG
         SPACE 1
BKWJRG_PLIST                    DSECT
BKWJRG_PLIST_RC                 DS       A    * return code
BKWJRG_PLIST_RE                 DS       A    * reason code
BKWJRG_PLIST_DBASE              DS       A    * dbase name
BKWJRG_PLIST_INDEX              DS       A    * index
BKWJRG_PLIST_BUF                DS       A    * buffer
BKWJRG_PLIST_BUFS               DS       A    * buffer size
BKWJRG_PLIST_AR                 DS       A    * amt returned
BKWJRG_PLIST_LENGTH             EQU      *-BKWJRG_PLIST
                                VMASMMAX
         SPACE 1
*-------------------------------------------------------------------*
*     End of declarations                                           *
*-------------------------------------------------------------------*
         EJECT
         POP   PRINT
         MEND
```

Memory Bindings (SSASMMEM MACRO)

```
         MACRO
         SSASMMEM &WEAK=
         AGO   .@ASMME1
.*  Branch around prolog so it is not included in listings          *
.*******************************************************************
.*                                                                  *
.*  NAME      -  Reusable Server Kernel   memory bindings           *
.*                                                                  *
.*  FUNCTION  -  Defines memory constants and dsects                *
.*                                                                  *
.*  COPYRIGHT -                                              @VR2OZOZ
.*                                                           @VR2OZOZ
.*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992           @VR2OZOZ
.*      LICENSED MATERIALS - PROPERTY OF IBM                 @VR2OZOZ
.*      SEE COPYRIGHT INSTRUCTIONS, G120-2083                @VR2OZOZ
.*      ALL RIGHTS RESERVED                                  @VR2OZOZ
.*                                                                  *
.*  STATUS - Version 2 Release 4                             @VR2OZOZ
.*                                                                  *
.*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4           *
.*******************************************************************
.* A000000-999999   New for VM/ESA Version 2 Release 4       @VR74PVM
.*******************************************************************
.@ASMME1 ANOP
         PUSH  PRINT
         AIF   ('&SYSPARM' NE 'SUP').ASMME2
         PRINT OFF,NOGEN
.ASMME2  ANOP
         LCLC  &$XXTRN
&$XXTRN  SETC  'EXTRN'
         AIF   ('&WEAK' NE 'YES').ASMME3
&$XXTRN  SETC  'WXTRN'
.ASMME3  ANOP
*------------------------------------------------------------------*
*     Return and reason codes for memory functions                 *
*------------------------------------------------------------------*
         SPACE 1
*
* return codes
SS_MEM_RC_SUCCESS                EQU      0
SS_MEM_RC_WARNING                EQU      4
SS_MEM_RC_ERROR                  EQU      8
SS_MEM_RC_ABEND                  EQU      12
*
* reason codes
SS_MEM_RE_SUCCESS                EQU      0
SS_MEM_RE_OUT_OF_STORAGE         EQU      801
SS_MEM_RE_BAD_AMOUNT             EQU      802
SS_MEM_RE_BAD_ALIGN              EQU      803
SS_MEM_RE_NO_SUBPOOL             EQU      804
SS_MEM_RE_NOT_ALLOC              EQU      805
SS_MEM_RE_SUBPOOL_DELETED        EQU      806
SS_MEM_RE_SPD_FAIL               EQU      807
SS_MEM_RE_BAD_KEY                EQU      808
SS_MEM_RE_SUBPOOL_EXISTS         EQU      809
SS_MEM_RE_SPCC_FAIL              EQU      810
SS_MEM_RE_SPLA_FAIL              EQU      811
*
```

```
*------------------------------------------------------------------*
*     Constants for memory functions                               *
*------------------------------------------------------------------*
         SPACE 1
*
*     Alignment attributes
*
SS_MEM_ALIGN_NORM                EQU      0
SS_MEM_ALIGN_PAGE                EQU      1
         SPACE 1
*------------------------------------------------------------------*
*     Definitions for memory functions                             *
*------------------------------------------------------------------*
*
*     create a data space
*
         SPACE 1
         &$XXTRN  BKWMCR
SSMEMORYCREATEDS                EQU      BKWMCR
         SPACE 1
BKWMCR_PLIST                    DSECT
BKWMCR_PLIST_RC                 DS       A   * return code
BKWMCR_PLIST_RE                 DS       A   * reason code
BKWMCR_PLIST_SUBPOOL            DS       A   * subpool name
BKWMCR_PLIST_SIZE               DS       A   * DS size (pages)
BKWMCR_PLIST_KEY                DS       A   * storage key
BKWMCR_PLIST_OCOUNT             DS       A   * option count
BKWMCR_PLIST_OARRAY             DS       A   * option array
BKWMCR_PLIST_ASIT               DS       A   * DS ASIT
BKWMCR_PLIST_ALET               DS       A   * DS ALET
BKWMCR_PLIST_LENGTH             EQU      *-BKWMCR_PLIST
                                VMASMMAX
         SPACE 1
*
*     allocate memory
*
         SPACE 1
         &$XXTRN  BKWMAL
SSMEMORYALLOCATE                EQU      BKWMAL
         SPACE 1
BKWMAL_PLIST                    DSECT
BKWMAL_PLIST_RC                 DS       A   * return code
BKWMAL_PLIST_RE                 DS       A   * reason code
BKWMAL_PLIST_LB                 DS       A   * lower bound
BKWMAL_PLIST_UB                 DS       A   * upper bound
BKWMAL_PLIST_SUBPOOL            DS       A   * subpool name
BKWMAL_PLIST_ALIGN              DS       A   * align type
BKWMAL_PLIST_BA                 DS       A   * buffer address
BKWMAL_PLIST_BG                 DS       A   * bytes gotten
BKWMAL_PLIST_LENGTH             EQU      *-BKWMAL_PLIST
                                VMASMMAX
         SPACE 1
*
*     release memory
*
         SPACE 1
         &$XXTRN  BKWMRE
SSMEMORYRELEASE                 EQU      BKWMRE
```

```
         SPACE 1
BKWMRE_PLIST                    DSECT
BKWMRE_PLIST_RC                 DS       A   * return code
BKWMRE_PLIST_RE                 DS       A   * reason code
BKWMRE_PLIST_BR                 DS       A   * bytes released
BKWMRE_PLIST_SUBPOOL            DS       A   * subpool name
BKWMRE_PLIST_BA                 DS       A   * buffer address
BKWMRE_PLIST_LENGTH             EQU      *-BKWMRE_PLIST
                                VMASMMAX
         SPACE 1
*
*     delete subpool
*
         SPACE 1
         &$XXTRN  BKWMDE
SSMEMORYDELETE                  EQU      BKWMDE
         SPACE 1
BKWMDE_PLIST                    DSECT
BKWMDE_PLIST_RC                 DS       A   * return code
BKWMDE_PLIST_RE                 DS       A   * reason code
BKWMDE_PLIST_SUBPOOL            DS       A   * subpool name
BKWMDE_PLIST_LENGTH             EQU      *-BKWMDE_PLIST
                                VMASMMAX
         SPACE 1
*------------------------------------------------------------------*
*     End of declarations                                          *
*------------------------------------------------------------------*
         EJECT
         POP   PRINT
         MEND
```

Storage Group Bindings (SSASMSGP MACRO)

```
         MACRO
         SSASMSGP &WEAK=
         AGO   .@ASMSG1
.*  Branch around prolog so it is not included in listings          *
.*******************************************************************
.*                                                                  *
.*  NAME      -  Reusable Server Kernel   storage group bindings    *
.*                                                                  *
.*  FUNCTION  -  Defines the storage group constants and dsects     *
.*                                                                  *
.*  COPYRIGHT -                                             @VR2OZOZ
.*                                                          @VR2OZOZ
.*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992          @VR2OZOZ
.*      LICENSED MATERIALS - PROPERTY OF IBM                @VR2OZOZ
.*      SEE COPYRIGHT INSTRUCTIONS, G120-2083               @VR2OZOZ
.*      ALL RIGHTS RESERVED                                 @VR2OZOZ
.*                                                                  *
.*  STATUS - VM/ESA Version 2 Release 4                     @VR2OZOZ
.*                                                                  *
.*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4           *
.*******************************************************************
.* A000000-999999   New for VM/ESA Version 2 Release 4      @VR2LMVM
.*******************************************************************
.@ASMSG1 ANOP
         PUSH  PRINT
         AIF   ('&SYSPARM' NE 'SUP').ASMSG2
         PRINT OFF,NOGEN
.ASMSG2  ANOP
         LCLC  &$XXTRN
&$XXTRN  SETC  'EXTRN'
         AIF   ('&WEAK' NE 'YES').ASMSG3
&$XXTRN  SETC  'WXTRN'
.ASMSG3  ANOP
*-------------------------------------------------------------------*
*     Return and reason codes for storage group functions          *
*-------------------------------------------------------------------*
         SPACE 1
* return codes
SS_SGP_RC_SUCCESS                EQU      0
SS_SGP_RC_WARNING                EQU      4
SS_SGP_RC_ERROR                  EQU      8
SS_SGP_RC_ABEND                  EQU      12
*
* reason codes
SS_SGP_RE_SUCCESS                EQU      0
SS_SGP_RE_TOO_MANY               EQU      601
SS_SGP_RE_NOT_FOUND              EQU      602
SS_SGP_RE_OUT_OF_STORAGE         EQU      603
SS_SGP_RE_MX_FAIL                EQU      604
SS_SGP_RE_INIT_DONE              EQU      605
SS_SGP_RE_EXISTS                 EQU      607
SS_SGP_RE_VDQ_FAIL               EQU      608
SS_SGP_RE_ONLINE                 EQU      609
SS_SGP_RE_OFFLINE                EQU      610
SS_SGP_RE_Q_FAIL                 EQU      611
SS_SGP_RE_CV_FAIL                EQU      612
SS_SGP_RE_E_FAIL                 EQU      613
SS_SGP_RE_MAINT                  EQU      614
SS_SGP_RE_DS_FAIL                EQU      615
SS_SGP_RE_POOL_FAIL              EQU      616
SS_SGP_RE_MAP_FAIL               EQU      617
SS_SGP_RE_BAD_ATTRIB             EQU      618
SS_SGP_RE_REWRITE_FAIL           EQU      619
SS_SGP_RE_READ_ONLY              EQU      620
SS_SGP_RE_OUT_OF_RANGE           EQU      622
SS_SGP_RE_WRONG_MODE             EQU      623
SS_SGP_RE_IO_FAIL                EQU      624
SS_SGP_RE_DIAG_250_FAIL          EQU      625
SS_SGP_RE_TOO_BIG                EQU      626
SS_SGP_RE_BAD_NAME               EQU      628
SS_SGP_RE_NAME_IN_USE            EQU      629
         SPACE 1
*
* attributes
SS_SGP_ATTRIB_DS                 EQU      0
SS_SGP_ATTRIB_NO_DS              EQU      1
SS_SGP_ATTRIB_BLOCK_RW           EQU      2
SS_SGP_ATTRIB_BLOCK_RO           EQU      3
SS_SGP_ATTRIB_OFFLINE            EQU      7
         SPACE 1
*-------------------------------------------------------------------*
*     Definitions for storage group functions                      *
*-------------------------------------------------------------------*
```

```
         SPACE 1
*
*     storage group create
*
         SPACE 1
         &$XXTRN  BKWSGC
SSSGPCREATE                     EQU      BKWSGC
         SPACE 1
BKWSGC_PLIST                    DSECT
BKWSGC_PLIST_RC                 DS       A   * return code
BKWSGC_PLIST_RE                 DS       A   * reason code
BKWSGC_PLIST_SGN                DS       A   * sgp number
BKWSGC_PLIST_VDC                DS       A   * vdev count
BKWSGC_PLIST_VDA                DS       A   * vdev array
BKWSGC_PLIST_AC                 DS       A   * attrib count
BKWSGC_PLIST_AA                 DS       A   * attrib array
BKWSGC_PLIST_LENGTH             EQU      *-BKWSGC_PLIST
                                VMASMMAX
         SPACE 1
*
*     storage group delete
*
         SPACE 1
         &$XXTRN  BKWSGD
SSSGPDELETE                     EQU      BKWSGD
         SPACE 1
BKWSGD_PLIST                    DSECT
BKWSGD_PLIST_RC                 DS       A   * return code
BKWSGD_PLIST_RE                 DS       A   * reason code
BKWSGD_PLIST_SGN                DS       A   * sgp number
BKWSGD_PLIST_LENGTH             EQU      *-BKWSGD_PLIST
                                VMASMMAX
         SPACE 1
*
*     storage group find
*
         SPACE 1
         &$XXTRN  BKWSGF
SSSGPFIND                       EQU      BKWSGF
         SPACE 1
BKWSGF_PLIST                    DSECT
BKWSGF_PLIST_RC                 DS       A   * return code
BKWSGF_PLIST_RE                 DS       A   * reason code
BKWSGF_PLIST_SGNAME             DS       A   * sg name
BKWSGF_PLIST_SGN                DS       A   * sgp number
BKWSGF_PLIST_IOMODE             DS       A   * I/O mode
BKWSGF_PLIST_TOTAL              DS       A   * total blocks
BKWSGF_PLIST_LENGTH             EQU      *-BKWSGF_PLIST
                                VMASMMAX
         SPACE 1
*
*     storage group list (what's defined?)
*
         SPACE 1
         &$XXTRN  BKWSGL
SSSGPLIST                       EQU      BKWSGL
         SPACE 1
BKWSGL_PLIST                    DSECT
```

```
BKWSGL_PLIST_RC                 DS       A   * return code              00142000
BKWSGL_PLIST_RE                 DS       A   * reason code              00143000
BKWSGL_PLIST_NX                 DS       A   * number expected          00144000
BKWSGL_PLIST_NF                 DS       A   * number filled            00145000
BKWSGL_PLIST_SGNA               DS       A   * sgp number array         00146000
BKWSGL_PLIST_LENGTH             EQU      *-BKWSGL_PLIST                 00147000
                                VMASMMAX                                00148000
         SPACE 1                                                        00149000
*                                                                       00150000
*     storage group query                                               00151000
*                                                                       00152000
         SPACE 1                                                        00153000
         &$XXTRN  BKWSGQ                                                00154000
SSSGPQUERY                      EQU      BKWSGQ                         00155000
         SPACE 1                                                        00156000
BKWSGQ_PLIST                    DSECT                                   00157000
BKWSGQ_PLIST_RC                 DS       A   * return code              00158000
BKWSGQ_PLIST_RE                 DS       A   * reason code              00159000
BKWSGQ_PLIST_SGN                DS       A   * sgp number               00160000
BKWSGQ_PLIST_SGNAME             DS       A   * sg name                  00161000
BKWSGQ_PLIST_IOMODE             DS       A   * I/O mode                 00162000
BKWSGQ_PLIST_TOTAL              DS       A   * total blocks             00163000
BKWSGQ_PLIST_STATUS             DS       A   * status word              00164000
BKWSGQ_PLIST_AX                 DS       A   * attributes expected      00165000
BKWSGQ_PLIST_AF                 DS       A   * attributes filled in     00166000
BKWSGQ_PLIST_AA                 DS       A   * attribute array          00167000
BKWSGQ_PLIST_VX                 DS       A   * vdevs expected           00168000
BKWSGQ_PLIST_VF                 DS       A   * vdevs filled in          00169000
BKWSGQ_PLIST_VA                 DS       A   * vdev array               00170000
BKWSGQ_PLIST_BA                 DS       A   * blocks array             00171000
BKWSGQ_PLIST_LENGTH             EQU      *-BKWSGQ_PLIST                 00172000
                                VMASMMAX                                00173000
         SPACE 1                                                        00174000
*                                                                       00175000
*     storage group read                                                00176000
*                                                                       00177000
         SPACE 1                                                        00178000
         &$XXTRN  BKWSGR                                                00179000
SSSGPREAD                       EQU      BKWSGR                         00180000
         SPACE 1                                                        00181000
BKWSGR_PLIST                    DSECT                                   00182000
BKWSGR_PLIST_RC                 DS       A   * return code              00183000
BKWSGR_PLIST_RE                 DS       A   * reason code              00184000
BKWSGR_PLIST_SGN                DS       A   * sgp number               00185000
BKWSGR_PLIST_PN                 DS       A   * page number              00186000
BKWSGR_PLIST_PC                 DS       A   * number of pages          00187000
BKWSGR_PLIST_ALET               DS       A   * buffer ALET              00188000
BKWSGR_PLIST_BUF                DS       A   * buffer                   00189000
BKWSGR_PLIST_LENGTH             EQU      *-BKWSGR_PLIST                 00190000
                                VMASMMAX                                00191000
         SPACE 1                                                        00192000
*                                                                       00193000
*     storage group start (like a mount)                                00194000
*                                                                       00195000
         SPACE 1                                                        00196000
         &$XXTRN  BKWSGS                                                00197000
SSSGPSTART                      EQU      BKWSGS                         00198000
```

```
         SPACE 1
BKWSGS_PLIST                    DSECT
BKWSGS_PLIST_RC                 DS       A   * return code
BKWSGS_PLIST_RE                 DS       A   * reason code
BKWSGS_PLIST_SGN                DS       A   * sgp number
BKWSGS_PLIST_SGNAME             DS       A   * sgp name
BKWSGS_PLIST_AC                 DS       A   * attribute count
BKWSGS_PLIST_AA                 DS       A   * attribute array
BKWSGS_PLIST_LENGTH             EQU      *-BKWSGS_PLIST
                                VMASMMAX
         SPACE 1
*
*     storage group stop (like a dismount)
*
         SPACE 1
         &$XXTRN  BKWSGT
SSSGPSTOP                       EQU      BKWSGT
         SPACE 1
BKWSGT_PLIST                    DSECT
BKWSGT_PLIST_RC                 DS       A   * return code
BKWSGT_PLIST_RE                 DS       A   * reason code
BKWSGT_PLIST_SGN                DS       A   * sgp number
BKWSGT_PLIST_AC                 DS       A   * attribute count
BKWSGT_PLIST_AA                 DS       A   * attribute array
BKWSGT_PLIST_LENGTH             EQU      *-BKWSGT_PLIST
                                VMASMMAX
         SPACE 1
*
*     storage group write
*
         SPACE 1
         &$XXTRN  BKWSGW
SSSGPWRITE                      EQU      BKWSGW
         SPACE 1
BKWSGW_PLIST                    DSECT
BKWSGW_PLIST_RC                 DS       A   * return code
BKWSGW_PLIST_RE                 DS       A   * reason code
BKWSGW_PLIST_SGN                DS       A   * sgp number
BKWSGW_PLIST_PN                 DS       A   * page number
BKWSGW_PLIST_PC                 DS       A   * page count
BKWSGW_PLIST_ALET               DS       A   * buffer ALET
BKWSGW_PLIST_BUF                DS       A   * buffer
BKWSGW_PLIST_LENGTH             EQU      *-BKWSGW_PLIST
                                VMASMMAX
         SPACE 1
*------------------------------------------------------------------*
*     End of storage group declarations                            *
*------------------------------------------------------------------*
         EJECT
         POP   PRINT
         MEND
```

Services Bindings (SSASMSRV MACRO)

```
         MACRO
         SSASMSRV &WEAK=
         AGO   .@ASMSR1
.*  Branch around prolog so it is not included in listings         *
.*******************************************************************
.*                                                                 *
.*  NAME      -  Reusable Server Kernel   services bindings        *
.*                                                                 *
.*  FUNCTION  -  Defines the services constants and dsects         *
.*                                                                 *
.*  COPYRIGHT -                                            @VR2OZOZ
.*                                                         @VR2OZOZ
.*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992         @VR2OZOZ
.*      LICENSED MATERIALS - PROPERTY OF IBM               @VR2OZOZ
.*      SEE COPYRIGHT INSTRUCTIONS, G120-2083              @VR2OZOZ
.*      ALL RIGHTS RESERVED                                @VR2OZOZ
.*                                                                 *
.*  STATUS - Version 2 Release 4                           @VR2OZOZ
.*                                                                 *
.*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4          *
.*******************************************************************
.* A000000-999999   New for VM/ESA Version 2 Release 4     @VR24PVM
.*******************************************************************
.@ASMSR1 ANOP
         PUSH  PRINT
         AIF   ('&SYSPARM' NE 'SUP').ASMSR2
         PRINT OFF,NOGEN
.ASMSR2  ANOP
         LCLC  &$XXTRN
&$XXTRN  SETC  'EXTRN'
         AIF   ('&WEAK' NE 'YES').ASMSR3
&$XXTRN  SETC  'WXTRN'
.ASMSR3  ANOP
*-----------------------------------------------------------------*
*     Return and reason codes for services functions              *
*-----------------------------------------------------------------*
         SPACE 1
* return codes
SS_SRV_RC_SUCCESS               EQU      0
SS_SRV_RC_WARNING               EQU      4
SS_SRV_RC_ERROR                 EQU      8
SS_SRV_RC_ABEND                 EQU      12
*
* reason codes
SS_SRV_RE_SUCCESS               EQU      0
SS_SRV_RE_BAD_TYPE              EQU      701
SS_SRV_RE_NOT_FOUND             EQU      702
SS_SRV_RE_OUT_OF_RANGE          EQU      703
SS_SRV_RE_OUT_OF_STORAGE        EQU      706
SS_SRV_RE_EXISTS                EQU      709
*
* types of messages
SS_SRV_MSGTYPE_INSTANCE         EQU      0
SS_SRV_MSGTYPE_LINEDRIVER       EQU      1
*
* types of services
```

```
SS_SRV_SRVTYPE_NORMAL            EQU      0                                SSA00570
SS_SRV_SRVTYPE_LD                EQU      1                                SSA00580
SS_SRV_SRVTYPE_LDSS              EQU      2                                SSA00590
*                                                                          SSA00600
* values of various msg bits... these have to line                         SSA00610
* up with the message structures below... be careful                       SSA00620
SS_SRV_IBIT_CCLOSE               EQU      32768                            SSA00630
SS_SRV_IBIT_ACLOSE               EQU      16384                            SSA00640
SS_SRV_IBIT_CDONE                EQU      8192                             SSA00650
SS_SRV_IBIT_LDSTOP               EQU      4096                             SSA00660
SS_SRV_IBIT_NEWDATA              EQU      2048                             SSA00670
SS_SRV_LBIT_STOPACK              EQU      32768                            SSA00680
SS_SRV_LBIT_NEWDATA              EQU      16384                            SSA00690
*                                                                          SSA00700
* length of keys                                                           SSA00710
SS_SRV_KEYLENGTH                 EQU      32                               SSA00720
         SPACE 1                                                           SSA00730
*-------------------------------------------------------------------*   SSA00740
*     Stuctures                                                     *   SSA00750
*-------------------------------------------------------------------*   SSA00760
         SPACE 1                                                           SSA00770
*                                                                          SSA00780
*  S-block                                                                 SSA00790
*                                                                          SSA00800
VMSS_SBLOCK                     DSECT                                      SSA00810
SBL_NEXT                        DS       A   * next service                SSA00820
SBL_PREV                        DS       A   * prev service                SSA00830
SBL_SN                          DS       CL8 * its name                    SSA00840
SBL_SNL                         DS       F   * name length                 SSA00850
SBL_INITADDR                    DS       A   * init addr                   SSA00860
SBL_AGTADDR                     DS       A   * agent addr                  SSA00870
SBL_CMPLADDR                    DS       A   * cmpltn addr                 SSA00880
SBL_TYPE                        DS       F   * service type                SSA00890
SBL_LOCKWORD                    DS       F   * lock word                   SSA00900
SBL_STARTCOUNT                  DS       F   * start count                 SSA00910
SBL_MONINDEX                    DS       F   * MON BUF INDEX               SSA00920
VMSS_SBLOCK_LEN                 EQU      *-VMSS_SBLOCK                     SSA00930
         SPACE 1                                                           SSA00940
*                                                                          SSA00950
*  C-block                                                                 SSA00960
*                                                                          SSA00970
VMSS_CBLOCK                     DSECT                                      SSA00980
VC_SBLOCK                       DS       A                                 SSA00990
VC_LDNAME                       DS       CL8                               SSA01000
VC_STATBITS                     DS       XL4                               SSA01010
                                ORG      VC_STATBITS                       SSA01020
                                DS       XL1                               SSA01030
VC_B_RECORD                     EQU      X'80'                             SSA01040
                                DS       XL3                               SSA01050
VC_QH                           DS       F                                 SSA01060
VC_SID                          DS       F                                 SSA01070
VC_INSTANCE                     DS       F                                 SSA01080
VC_THREADID                     DS       F                                 SSA01090
VC_IKEY                         DS       CL32                              SSA01100
VC_LKEY                         DS       CL32                              SSA01110
VC_USERID                       DS       CL64                              SSA01120
VC_BYTESIN                      DS       F                                 SSA01130
VC_BYTESOUT                     DS       F                                 SSA01140
```

```
VC_IBW                          DS       F                              SSA01150
VC_LDBW                         DS       F                              SSA01160
VC_STARTSTCK                    DS       CL8                            SSA01170
VC_STOPSTCK                     DS       CL8                            SSA01180
VC_RESERVED                     DS       CL128                          SSA01190
VC_LDDATA                       DS       0C                             SSA01200
VMSS_CBLOCK_LEN                 EQU      *-VMSS_CBLOCK                  SSA01210
         SPACE 1                                                        SSA01220
*                                                                       SSA01230
*  msg to instance                                                      SSA01240
*                                                                       SSA01250
VMSS_IMSG                       DSECT                                   SSA01260
VI_IKEY                         DS       CL32                           SSA01270
VI_TYPE                         DS       F                              SSA01280
VI_CBITS                        DS       XL2                            SSA01290
                                ORG      VI_CBITS                       SSA01300
                                DS       XL1                            SSA01310
VI_B_CCLOSE                     EQU      X'80'                          SSA01320
VI_B_ACLOSE                     EQU      X'40'                          SSA01330
VI_B_CDONE                      EQU      X'20'                          SSA01340
VI_B_LDSTOP                     EQU      X'10'                          SSA01350
VI_B_NEWDATA                    EQU      X'08'                          SSA01360
                                DS       XL1                            SSA01370
VMSS_IMSG_LEN                   EQU      *-VMSS_IMSG                    SSA01380
         SPACE 1                                                        SSA01390
*                                                                       SSA01400
*  msg to line driver                                                   SSA01410
*                                                                       SSA01420
VMSS_LMSG                       DSECT                                   SSA01430
VL_LKEY                         DS       CL32                           SSA01440
VL_TYPE                         DS       F                              SSA01450
VL_IKEY                         DS       CL32                           SSA01460
VL_IBITS                        DS       XL2                            SSA01470
                                ORG      VL_IBITS                       SSA01480
                                DS       XL1                            SSA01490
VL_B_STOPACK                    EQU      X'80'                          SSA01500
VL_B_NEWDATA                    EQU      X'40'                          SSA01510
                                DS       XL1                            SSA01520
VMSS_LMSG_LEN                   EQU      *-VMSS_LMSG                    SSA01530
         SPACE 1                                                        SSA01540
*------------------------------------------------------------------*    SSA01550
*     Definitions for services function                            *    SSA01560
*------------------------------------------------------------------*    SSA01570
         SPACE 1                                                        SSA01580
*                                                                       SSA01590
*     bind service to addresses                                         SSA01600
*                                                                       SSA01610
         SPACE 1                                                        SSA01620
         &$XXTRN  BKWVBN                                                SSA01630
SSSERVICEBIND                   EQU      BKWVBN                         SSA01640
         SPACE 1                                                        SSA01650
BKWVBN_PLIST                    DSECT                                   SSA01660
BKWVBN_PLIST_RC                 DS       A   * return code              SSA01670
BKWVBN_PLIST_RE                 DS       A   * reason code              SSA01680
BKWVBN_PLIST_SN                 DS       A   * service name             SSA01690
BKWVBN_PLIST_SNL                DS       A   * its length               SSA01700
BKWVBN_PLIST_IA                 DS       A   * init addr                SSA01710
BKWVBN_PLIST_SA                 DS       A   * service addr             SSA01720
```

```
BKWVBN_PLIST_TA                 DS       A   * completion addr          SSA01730
BKWVBN_PLIST_ST                 DS       A   * service type             SSA01740
BKWVBN_PLIST_LENGTH             EQU      *-BKWVBN_PLIST                 SSA01750
                                VMASMMAX                                SSA01760
         SPACE 1                                                        SSA01770
*                                                                       SSA01780
*     find service block                                                SSA01790
*                                                                       SSA01800
         SPACE 1                                                        SSA01810
         &$XXTRN  BKWVFN                                                SSA01820
SSSERVICEFIND                   EQU      BKWVFN                         SSA01830
         SPACE 1                                                        SSA01840
BKWVFN_PLIST                    DSECT                                   SSA01850
BKWVFN_PLIST_RC                 DS       A   * return code              SSA01860
BKWVFN_PLIST_RE                 DS       A   * reason code              SSA01870
BKWVFN_PLIST_SN                 DS       A   * service name             SSA01880
BKWVFN_PLIST_SNL                DS       A   * its length               SSA01890
BKWVFN_PLIST_SBLK               DS       A   * S-blk address            SSA01900
BKWVFN_PLIST_LENGTH             EQU      *-BKWVFN_PLIST                 SSA01910
                                VMASMMAX                                SSA01920
         SPACE 1                                                        SSA01930
*                                                                       SSA01940
*     start the server                                                  SSA01950
*                                                                       SSA01960
         SPACE 1                                                        SSA01970
         &$XXTRN  BKWVRN                                                SSA01980
SSSERVERRUN                     EQU      BKWVRN                         SSA01990
         SPACE 1                                                        SSA02000
BKWVRN_PLIST                    DSECT                                   SSA02010
BKWVRN_PLIST_RC                 DS       A   * return code              SSA02020
BKWVRN_PLIST_RE                 DS       A   * reason code              SSA02030
BKWVRN_PLIST_EPLIST             DS       A   * ADDR OF EPLIST           SSA02040
BKWVRN_PLIST_LENGTH             EQU      *-BKWVRN_PLIST                 SSA02050
                                VMASMMAX                                SSA02060
         SPACE 1                                                        SSA02070
*                                                                       SSA02080
*     stop the server                                                   SSA02090
*                                                                       SSA02100
         SPACE 1                                                        SSA02110
         &$XXTRN  BKWVSP                                                SSA02120
SSSERVERSTOP                    EQU      BKWVSP                         SSA02130
         SPACE 1                                                        SSA02140
BKWVSP_PLIST                    DSECT                                   SSA02150
BKWVSP_PLIST_RC                 DS       A   * return code              SSA02160
BKWVSP_PLIST_RE                 DS       A   * reason code              SSA02170
BKWVSP_PLIST_LENGTH             EQU      *-BKWVSP_PLIST                 SSA02180
                                VMASMMAX                                SSA02190
         SPACE 1                                                        SSA02200
*-------------------------------------------------------------------*   SSA02210
*     End of declarations                                           *   SSA02220
*-------------------------------------------------------------------*   SSA02230
         EJECT                                                          SSA02240
         POP   PRINT                                                    SSA02250
         MEND                                                           SSA02260
```

Trie Bindings (SSASMTRI MACRO)

```
         MACRO
         SSASMTRI &WEAK=
         AGO   .@ASMSR1
.*  Branch around prolog so it is not included in listings          *
.********************************************************************
.*                                                                  *
.*  NAME      -  Reusable Server Kernel   services bindings         *
.*                                                                  *
.*  FUNCTION  -  Language bindings for trie API                     *
.*                                                                  *
.*                                                                  *
.*  COPYRIGHT -                                                     *
.*                                                                  *
.*     THIS MODULE IS "RESTRICTED MATERIALS OF IBM"                 *
.*     5654-030 (C) COPYRIGHT IBM CORP. - 1998, 1999                *
.*     LICENSED MATERIALS - PROPERTY OF IBM                         *
.*     ALL RIGHTS RESERVED.                                         *
.*                                                                  *
.*  STATUS - VM/ESA Version 2, Release 4.0                          *
.*                                                                  *
.*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4.0         *
.********************************************************************
.* A000000-999999   New for VM/ESA Version 2 Release 4.0       @VR74PVM
.********************************************************************
.@ASMSR1 ANOP
         PUSH  PRINT
         AIF   ('&SYSPARM' NE 'SUP').ASMSR2
         PRINT OFF,NOGEN
.ASMSR2  ANOP
         LCLC  &$XXTRN
&$XXTRN  SETC  'EXTRN'
         AIF   ('&WEAK' NE 'YES').ASMSR3
&$XXTRN  SETC  'WXTRN'
.ASMSR3  ANOP
*------------------------------------------------------------------*
*     return and reason codes, and other constants                 *
*------------------------------------------------------------------*
         SPACE 1
*
* return codes
SS_TRI_RC_SUCCESS                EQU      0
SS_TRI_RC_WARNING                EQU      4
SS_TRI_RC_ERROR                  EQU      8
SS_TRI_RC_ABEND                  EQU      12
*
* reason codes
SS_TRI_RE_SUCCESS                EQU      0
SS_TRI_RE_BAD_SIZE               EQU      1701
SS_TRI_RE_TRIE_EXISTS            EQU      1702
SS_TRI_RE_OUT_OF_STORAGE         EQU      1703
SS_TRI_RE_DSCR_FAIL              EQU      1704
SS_TRI_RE_TRIE_NOT_FOUND         EQU      1705
SS_TRI_RE_TRIE_BUSY              EQU      1706
SS_TRI_RE_BAD_INDEX_LEN          EQU      1707
SS_TRI_RE_BAD_CAPACITY           EQU      1708
```

```
SS_TRI_RE_OUT_OF_DS_STORAGE      EQU      1709
*
         SPACE 1
*------------------------------------------------------------------*
*     entry point definitions                                      *
*------------------------------------------------------------------*
         SPACE 1
*
*     routine to create a trie
*
         SPACE 1
         &$XXTRN  BKWYCR
SSTRIECREATE                    EQU      BKWYCR
         SPACE 1
BKWYCR_PLIST                    DSECT
BKWYCR_PLIST_RC                 DS       A   * return code
BKWYCR_PLIST_RE                 DS       A   * reason code
BKWYCR_PLIST_NAME               DS       A   * trie name
BKWYCR_PLIST_DS_SIZE            DS       A   * DS size
BKWYCR_PLIST_ASIT               DS       A   * DS ASIT
BKWYCR_PLIST_ALET               DS       A   * DS ALET
BKWYCR_PLIST_LENGTH             EQU      *-BKWYCR_PLIST
                                VMASMMAX
         SPACE 1
*
*     routine to delete a trie
*
         SPACE 1
         &$XXTRN  BKWYDE
SSTRIEDELETE                    EQU      BKWYDE
         SPACE 1
BKWYDE_PLIST                    DSECT
BKWYDE_PLIST_RC                 DS       A   * return code
BKWYDE_PLIST_RE                 DS       A   * reason code
BKWYDE_PLIST_NAME               DS       A   * trie name
BKWYDE_PLIST_LENGTH             EQU      *-BKWYDE_PLIST
         SPACE 1
*
*     routine to insert a record number
*
         SPACE 1
         &$XXTRN  BKWYRI
SSTRIERECORDINSERT              EQU      BKWYRI
         SPACE 1
BKWYRI_PLIST                    DSECT
BKWYRI_PLIST_RC                 DS       A   * return code
BKWYRI_PLIST_RE                 DS       A   * reason code
BKWYRI_PLIST_NAME               DS       A   * trie name
BKWYRI_PLIST_ALET               DS       A   * DS ALET
BKWYRI_PLIST_RECNUM             DS       A   * record number
BKWYRI_PLIST_IX_BUFFER          DS       A   * index buffer
BKWYRI_PLIST_IX_LENGTH          DS       A   * index length
BKWYRI_PLIST_LENGTH             EQU      *-BKWYRI_PLIST
                                VMASMMAX
         SPACE 1
*
*     routine to list all record numbers matching proposed key
*
```

```
         SPACE 1
         &$XXTRN  BKWYRL
SSTRIERECORDLIST                EQU      BKWYRL
         SPACE 1
BKWYRL_PLIST                    DSECT
BKWYRL_PLIST_RC                 DS       A   * return code
BKWYRL_PLIST_RE                 DS       A   * reason code
BKWYRL_PLIST_NAME               DS       A   * trie name
BKWYRL_PLIST_ALET               DS       A   * DS ALET
BKWYRL_PLIST_IX_BUFFER          DS       A   * index buffer
BKWYRL_PLIST_IX_LENGTH          DS       A   * index length
BKWYRL_PLIST_RECNUM_ARRAY       DS       A   * recnum array
BKWYRL_PLIST_RECNUM_ARRAY_CAP   DS       A   * array capacity
BKWYRL_PLIST_RECNUMS_FOUND      DS       A   * recnums found
BKWYRL_PLIST_LENGTH             EQU      *-BKWYRL_PLIST
                                VMASMMAX
         SPACE 1
*------------------------------------------------------------------*
*     End of declarations                                          *
*------------------------------------------------------------------*
         EJECT
         POP   PRINT
         MEND
```

User ID Bindings (SSASMUID MACRO)

```
         MACRO
         SSASMUID &WEAK=
         AGO   .@ASMSR1
.*  Branch around prolog so it is not included in listings          *
.*******************************************************************
.*                                                                  *
.*  NAME      -  Reusable Server Kernel   services bindings         *
.*                                                                  *
.*  FUNCTION  -  Language bindings for userid service               *
.*                                                                  *
.*  COPYRIGHT -                                             @VR2OZOZ
.*                                                          @VR2OZOZ
.*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992          @VR2OZOZ
.*      LICENSED MATERIALS - PROPERTY OF IBM                @VR2OZOZ
.*      SEE COPYRIGHT INSTRUCTIONS, G120-2083               @VR2OZOZ
.*      ALL RIGHTS RESERVED                                 @VR2OZOZ
.*                                                                  *
.*  STATUS - Version 2 Release 4                            @VR2OZOZ
.*                                                                  *
.*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4           *
.*******************************************************************
.* A000000-999999   New for VM/ESA Version 2 Release 4      @VR24PVM
.*******************************************************************
.@ASMSR1 ANOP
         PUSH  PRINT
         AIF   ('&SYSPARM' NE 'SUP').ASMSR2
         PRINT OFF,NOGEN
.ASMSR2  ANOP
         LCLC  &$XXTRN
&$XXTRN  SETC  'EXTRN'
         AIF   ('&WEAK' NE 'YES').ASMSR3
&$XXTRN  SETC  'WXTRN'
```

```
.ASMSR3  ANOP
*-------------------------------------------------------------------*
*     return and reason codes for userid service                    *
*-------------------------------------------------------------------*
         SPACE 1
*
* return codes
SS_UID_RC_SUCCESS                EQU      0
SS_UID_RC_WARNING                EQU      4
SS_UID_RC_ERROR                  EQU      8
SS_UID_RC_ABEND                  EQU      12
*
* reason codes
SS_UID_RE_SUCCESS                EQU      0
SS_UID_RE_NOT_FOUND              EQU      101
*
* config constants
SS_UID_INDEX_WIDTH               EQU      64
         SPACE 1
*-------------------------------------------------------------------*
*     definitions for userid service                                *
*-------------------------------------------------------------------*
         SPACE 1
*
*     routine to map user IDs
*
         SPACE 1
         &$XXTRN  BKWBMU
SSUSERIDMAP                     EQU      BKWBMU
         SPACE 1
BKWBMU_PLIST                    DSECT
BKWBMU_PLIST_RC                 DS       A   * return code
BKWBMU_PLIST_RE                 DS       A   * reason code
BKWBMU_PLIST_IC                 DS       A   * input conn
BKWBMU_PLIST_ICL                DS       A   * its length
BKWBMU_PLIST_IN                 DS       A   * input node
BKWBMU_PLIST_INL                DS       A   * its length
BKWBMU_PLIST_IU                 DS       A   * input user
BKWBMU_PLIST_IUL                DS       A   * its length
BKWBMU_PLIST_OU                 DS       A   * output user
BKWBMU_PLIST_OUL                DS       A   * its length
BKWBMU_PLIST_LENGTH             EQU      *-BKWBMU_PLIST
                                VMASMMAX
         SPACE 1
*-------------------------------------------------------------------*
*     End of declarations                                           *
*-------------------------------------------------------------------*
         EJECT
         POP   PRINT
         MEND
```

Worker Bindings (SSASMWRK MACRO)

```
         MACRO
         SSASMWRK &WEAK=
         AGO   .@ASMSR1
.*  Branch around prolog so it is not included in listings           *
.*********************************************************************
.*                                                                   *
.*  NAME      -  Reusable Server Kernel   services bindings          *
.*                                                                   *
.*  FUNCTION  -  Language bindings for worker API                    *
.*                                                                   *
.*                                                                   *
.*  COPYRIGHT -                                                      *
.*                                                                   *
.*     THIS MODULE IS "RESTRICTED MATERIALS OF IBM"                  *
.*     5654-030 (C) COPYRIGHT IBM CORP. - 1998, 1999                 *
.*     LICENSED MATERIALS - PROPERTY OF IBM                          *
.*     ALL RIGHTS RESERVED.                                          *
.*                                                                   *
.*  STATUS - VM/ESA Version 2, Release 4.0                           *
.*                                                                   *
.*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 3.0          *
.*   @SI124VM - alternate userid                                     *
.*                                                                   *
.*********************************************************************
.* A000000-999999   New for VM/ESA Version 2 Release 3.0      @VR74PVM
.*********************************************************************
.@ASMSR1 ANOP
         PUSH  PRINT
         AIF   ('&SYSPARM' NE 'SUP').ASMSR2
         PRINT OFF,NOGEN
.ASMSR2  ANOP
         LCLC  &$XXTRN
&$XXTRN  SETC  'EXTRN'
         AIF   ('&WEAK' NE 'YES').ASMSR3
&$XXTRN  SETC  'WXTRN'
.ASMSR3  ANOP
*-------------------------------------------------------------------*
*     return and reason codes for userid service                    *
*-------------------------------------------------------------------*
         SPACE 1
*
* return codes
SS_WRK_RC_SUCCESS                EQU      0
SS_WRK_RC_WARNING                EQU      4
SS_WRK_RC_ERROR                  EQU      8
SS_WRK_RC_ABEND                  EQU      12
*
* reason codes
SS_WRK_RE_SUCCESS                EQU      0
SS_WRK_RE_OUT_OF_STORAGE         EQU      1601
SS_WRK_RE_BAD_COUNT              EQU      1602
SS_WRK_RE_BAD_FLAG_NAME          EQU      1603
SS_WRK_RE_BAD_FLAG_VALUE         EQU      1604
SS_WRK_RE_NO_CLASS               EQU      1605
SS_WRK_RE_NO_SUBORDINATES        EQU      1606
SS_WRK_RE_ALGTRIES_EXCEEDED      EQU      1607
```

```
SS_WRK_RE_AUTOLOG_FAIL           EQU      1608                          00054000
SS_WRK_RE_TIMER_FAIL             EQU      1609                          00055000
SS_WRK_RE_IUCVCON_FAIL           EQU      1610                          00056000
SS_WRK_RE_FORCE_FAIL             EQU      1611                          00057000
SS_WRK_RE_FORCE_TIMEOUT          EQU      1612                          00058000
SS_WRK_RE_OPER_DELETE            EQU      1613                          00059000
*                                                                       00060000
* option flag names                                                     00061000
SS_WRK_OFN_PREFER_EMPTY          EQU      0                             00062000
SS_WRK_OFN_RETRY_COUNT           EQU      1                             00063000
SS_WRK_OFN_ALT_USERID            EQU      2                    @SI124VM 00063300
SS_WRK_OFN_ALT_SECLABEL          EQU      3                    @SI124VM 00063600
*                                                                       00064000
* option value names                                                    00065000
SS_WRK_OFV_NO                    EQU      0                             00066000
SS_WRK_OFV_YES                   EQU      1                             00067000
         SPACE 1                                                        00068000
*------------------------------------------------------------------*    00069000
*     definitions for worker API                                   *    00070000
*------------------------------------------------------------------*    00071000
         SPACE 1                                                        00072000
*                                                                       00073000
*     routine to allocate a worker connection                           00074000
*                                                                       00075000
         SPACE 1                                                        00076000
         &$XXTRN  BKWCAL                                                00077000
SSWORKERALLOCATE                EQU      BKWCAL                         00078000
         SPACE 1                                                        00079000
BKWCAL_PLIST                    DSECT                                   00080000
BKWCAL_PLIST_RC                 DS       A   * return code              00081000
BKWCAL_PLIST_RE                 DS       A   * reason code              00082000
BKWCAL_PLIST_ICBLOCK            DS       A   * instance C-block ptr     00083000
BKWCAL_PLIST_CLASSNAME          DS       A   * class name               00084000
BKWCAL_PLIST_OCOUNT             DS       A   * option count             00085000
BKWCAL_PLIST_ONAMES             DS       A   * option names             00086000
BKWCAL_PLIST_OVALUES            DS       A   * option values            00087000
BKWCAL_PLIST_WCBLOCK            DS       A   * worker C-block ptr       00088000
BKWCAL_PLIST_CONNID             DS       A   * connection ID            00089000
BKWCAL_PLIST_LENGTH             EQU      *-BKWCAL_PLIST                 00090000
                                VMASMMAX                                00091000
         SPACE 1                                                        00092000
*------------------------------------------------------------------*    00093000
*     End of declarations                                          *    00094000
*------------------------------------------------------------------*    00095000
         EJECT                                                          00096000
         POP   PRINT                                                    00097000
         MEND                                                           00098000
```

PL/X Language Bindings

Anchor Bindings (SSPLXANC COPY)

```
*COPY SSPLXANC

 /*********************************************************************/
 /*                                                                   */
 /*  NAME      -    Reusable Server Kernel   PL/X bindings            */
 /*                                                                   */
 /*  FUNCTION  -    Language bindings for anchor services.            */
 /*                                                                   */
 /*  COPYRIGHT -                                             @VR2OZOZ */
 /*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992          @VR2OZOZ */
 /*      LICENSED MATERIALS - PROPERTY OF IBM                @VR2OZOZ */
 /*      SEE COPYRIGHT INSTRUCTIONS, G120-2083               @VR2OZOZ */
 /*      ALL RIGHTS RESERVED                                 @VR2OZOZ */
 /*                                                                   */
 /*  STATUS - VM/ESA Version 2 Release 4                     @VR2OZOZ */
 /*                                                                   */
 /*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4            */
 /*********************************************************************/

 Declare

  /* constants */

  /* return codes */
  ss_anc_rc_success           fixed(31) constant(0),
  ss_anc_rc_warning           fixed(31) constant(4),
  ss_anc_rc_error             fixed(31) constant(8),
  ss_anc_rc_abend             fixed(31) constant(12),

  /* reason codes */
  ss_anc_re_success           fixed(31) constant(0),

  /* entry points */

  /* set anchor */
  ssAnchorSet  entry
  (
   fixed(31),               /* return code  */
   fixed(31),               /* reason code  */
   pointer(31)              /* anchor value */
  )
  external as ('BKWAST'),

  /* get anchor */
  ssAnchorGet  entry
  (
   fixed(31),               /* return code  */
   fixed(31),               /* reason code  */
   pointer(31),             /* anchor value */
   pointer(31),             /* monitor buf  */
   fixed(31)                /* monitor len  */
  )
  external as ('BKWAGT');
```

Authorization Bindings (SSPLXAUT COPY)

```
*COPY SSPLXAUT

 /******************************************************************/
 /*                                                                */
 /*  NAME      -    Reusable Server Kernel PL/X Bindings           */
 /*                                                                */
 /*  FUNCTION  -    Language bindings for authorization services.  */
 /*                                                                */
 /*  COPYRIGHT -                                          @VR2OZOZ */
 /*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992       @VR2OZOZ */
 /*      LICENSED MATERIALS - PROPERTY OF IBM             @VR2OZOZ */
 /*      SEE COPYRIGHT INSTRUCTIONS, G120-2083            @VR2OZOZ */
 /*      ALL RIGHTS RESERVED                              @VR2OZOZ */
 /*                                                                */
 /*  STATUS - VM/ESA Version 2 Release 4                  @VR2OZOZ */
 /*                                                                */
 /*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4         */
 /******************************************************************/

 /********************************************************/
 /* CONSTANTS                                            */
 /********************************************************/

 Declare

  /* return codes */
  ss_aut_rc_success        fixed(31) constant(0),
  ss_aut_rc_warning        fixed(31) constant(4),
  ss_aut_rc_error          fixed(31) constant(8),
  ss_aut_rc_abend          fixed(31) constant(12),

  /* reason codes */
  ss_aut_re_success        fixed(31) constant(0),
  ss_aut_re_bad_count      fixed(31) constant(300+1),
  ss_aut_re_bad_user_length fixed(31) constant(300+2),
  ss_aut_re_bad_obj_length  fixed(31) constant(300+3),
  ss_aut_re_bad_option     fixed(31) constant(300+4),
  ss_aut_re_bad_qual       fixed(31) constant(300+5),
  ss_aut_re_bad_use        fixed(31) constant(300+6),
  ss_aut_re_exists         fixed(31) constant(300+7),
  ss_aut_re_no_class       fixed(31) constant(300+8),
  ss_aut_re_no_object      fixed(31) constant(300+9),
  ss_aut_re_maq_fail       fixed(31) constant(300+10),
  ss_aut_re_cvw_fail       fixed(31) constant(300+11),
  ss_aut_re_cvs_fail       fixed(31) constant(300+12),
  ss_aut_re_mr_fail        fixed(31) constant(300+13),
  ss_aut_re_too_many       fixed(31) constant(300+14),
  ss_aut_re_out_of_storage  fixed(31) constant(300+15),
  ss_aut_re_no_user        fixed(31) constant(300+16),
  ss_aut_re_prev_io_error   fixed(31) constant(300+17),
  ss_aut_re_prev_sync_error fixed(31) constant(300+18),
  ss_aut_re_read_fail      fixed(31) constant(300+19),
  ss_aut_re_write_fail     fixed(31) constant(300+20),
  ss_aut_re_trunc          fixed(31) constant(300+21),
  ss_aut_re_gwu_fail       fixed(31) constant(300+22),
  ss_aut_re_open_fail      fixed(31) constant(300+23),
 ss_aut_re_bad_cache       fixed(31) constant(300+24),
 ss_aut_re_bad_free        fixed(31) constant(300+25),
 ss_aut_re_bad_op          fixed(31) constant(300+26),

 /* other constants */

 /* return values from ssAuthTestOperations */
 /* and ssAuthPermitUser */
 ss_aut_op_permitted       fixed(31) constant(0),
 ss_aut_op_not_permitted   fixed(31) constant(1),
 ss_aut_op_not_defined     fixed(31) constant(2),
 ss_aut_no_change          fixed(31) constant(3),

 /* qualifiers for ssAuthPermitUser */
 ss_aut_add_operation      fixed(31) constant(0),
 ss_aut_remove_operation   fixed(31) constant(1),

 /* use arrays in ssAuthPermitUser? */
 ss_aut_use_arrays         fixed(31) constant(0),
 ss_aut_delete_all         fixed(31) constant(1),
 ss_aut_add_all            fixed(31) constant(2),

 /* qualifiers for ssAuthDeleteObject */
 ss_aut_rules_only         fixed(31) constant(0),
 ss_aut_rules_and_object   fixed(31) constant(1),

 /* qualifiers for ssAuthDeleteUser */
 ss_aut_specific_class     fixed(31) constant(0),
 ss_aut_all_classes        fixed(31) constant(1),

 /* qualifiers for ssAuthDeleteClass */
 ss_aut_objects_only       fixed(31) constant(0),
 ss_aut_objects_and_class  fixed(31) constant(1);

/************************************************************/
/* ENTRY POINTS                                             */
/************************************************************/

Declare

 /**************************************************/
 /* operations on classes                          */
 /**************************************************/

 /* create class */
 ssAuthCreateClass  entry
 (
  fixed(31),               /* return code       */
  fixed(31),               /* reason code       */
  character(8),            /* class identifier  */
  fixed(31),               /* operation count   */
  character(4)             /* operation array   */
 )
 external as ('BKWUCC'),

 /* modify class */
 ssAuthModifyClass  entry
 (
 fixed(31),              /* return code      */
 fixed(31),              /* reason code      */
 character(8),           /* class identifier  */
 fixed(31),              /* operation count   */
 character(4)            /* operation array   */
)
external as ('BKWUMC'),

/* list classes */
ssAuthListClasses entry
(
 fixed(31),              /* return code      */
 fixed(31),              /* reason code      */
 char(*),                /* match key        */
 fixed(31),              /* match key length  */
 fixed(31),              /* number expected   */
 char(*),                /* output buffer     */
 fixed(31)               /* number returned   */
)
external as ('BKWULC'),

/* delete class */
ssAuthDeleteClass entry
(
 fixed(31),              /* return code      */
 fixed(31),              /* reason code      */
 character(8),           /* class identifier  */
 fixed(31),              /* options count     */
 fixed(31)               /* options array     */
)
external as ('BKWUDC'),

/***********************************************/
/* operations on objects                       */
/***********************************************/

/* create object */
ssAuthCreateObject  entry
(
 fixed(31),              /* return code      */
 fixed(31),              /* reason code      */
 character(*),           /* object name      */
 fixed(31),              /* its length       */
 character(8)            /* object class     */
)
external as ('BKWUCO'),

/* list objects in class */
ssAuthListObjects entry
(
 fixed(31),              /* return code      */
 fixed(31),              /* reason code      */
 char(8),                /* class name       */
 char(*),                /* match key        */
 fixed(31),              /* match key length  */
 fixed(31),              /* number expected   */
 pointer(31),            /* buffer pointers   */
 fixed(31),              /* buffer sizes      */
 fixed(31),              /* returned lengths  */
 fixed(31)               /* number returned   */
)
external as ('BKWULO'),

/* query an object */
ssAuthQueryObject entry
(
 fixed(31),              /* return code       */
 fixed(31),              /* reason code       */
 character(*),           /* object name       */
 fixed(31),              /* its length        */
 character(8),           /* class name        */
 fixed(31),              /* userids expected  */
 pointer(31),            /* userid ptrs       */
 fixed(31),              /* userid buf sizes  */
 fixed(31),              /* userid lengths    */
 fixed(31)               /* userids returned  */
)
external as ('BKWUQO'),

/* delete object */
ssAuthDeleteObject entry
(
 fixed(31),              /* return code       */
 fixed(31),              /* reason code       */
 character(*),           /* object name       */
 fixed(31),              /* its length        */
 fixed(31),              /* options count     */
 fixed(31)               /* options array     */
)
external as ('BKWUDO'),

/**********************************************/
/* operations on users                         */
/**********************************************/

/* permit user */
ssAuthPermitUser  entry
(
 fixed(31),              /* return code       */
 fixed(31),              /* reason code       */
 character(*),           /* user name         */
 fixed(31),              /* its length        */
 character(*),           /* object name       */
 fixed(31),              /* its length        */
 fixed(31),              /* use arrays?       */
 fixed(31),              /* operation count   */
 character(4),           /* operation array   */
 fixed(31),              /* op qualifiers     */
 fixed(31)               /* op results        */
)
external as ('BKWUPU'),

/* query specific rule */
ssAuthQueryRule entry
(
 fixed(31),              /* return code       */
 fixed(31),             /* reason code      */
 character(*),          /* user name        */
 fixed(31),             /* its length       */
 character(*),          /* object name      */
 fixed(31),             /* its length       */
 fixed(31),             /* ops expected     */
 character(4),          /* operation array  */
 fixed(31)              /* ops returned     */
)
external as ('BKWUQR'),

/* test operations */
ssAuthTestOperations  entry
(
 fixed(31),             /* return code      */
 fixed(31),             /* reason code      */
 character(*),          /* user name        */
 fixed(31),             /* its length       */
 character(*),          /* object name      */
 fixed(31),             /* its length       */
 fixed(31),             /* operation count  */
 character(4),          /* desired ops      */
 fixed(31)              /* test results     */
)
external as ('BKWUTO'),

/* delete user */
ssAuthDeleteUser entry
(
 fixed(31),             /* return code      */
 fixed(31),             /* reason code      */
 character(*),          /* user name        */
 fixed(31),             /* its length       */
 character(8),          /* class name       */
 fixed(31),             /* options count    */
 fixed(31)              /* options array    */
)
external as ('BKWUDU'),

/************************************************/
/* utility functions                            */
/************************************************/

/* try to reset access to data files */
ssAuthReload entry
(
 fixed(31),                /* return code */
 fixed(31)                 /* reason code */
)
external as ('BKWURL');
```

Cache Bindings (SSPLXCAC COPY)

```
*COPY SSPLXCAC

 /********************************************************************/
 /*                                                                  */
 /*  NAME      -    Reusable Server Kernel   PL/X bindings           */
 /*                                                                  */
 /*  FUNCTION  -    Language bindings for file cache.                */
 /*                                                                  */
 /*  COPYRIGHT -                                            @VR2OZOZ */
 /*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992         @VR2OZOZ */
 /*      LICENSED MATERIALS - PROPERTY OF IBM               @VR2OZOZ */
 /*      SEE COPYRIGHT INSTRUCTIONS, G120-2083              @VR2OZOZ */
 /*      ALL RIGHTS RESERVED                                @VR2OZOZ */
 /*                                                                  */
 /*  STATUS - VM/ESA Version 2 Release 4                    @VR2OZOZ */
 /*                                                                  */
 /*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4           */
 /********************************************************************/

 /****************************************************/
 /* CONSTANTS                                        */
 /****************************************************/

 Declare

  /* return codes */
  ss_cac_rc_success         fixed(31) constant(0),
  ss_cac_rc_warning         fixed(31) constant(4),
  ss_cac_rc_error           fixed(31) constant(8),
  ss_cac_rc_abend           fixed(31) constant(12),

  /* reason codes */
  ss_cac_re_success             fixed(31) constant(0),
  ss_cac_re_out_of_storage      fixed(31) constant(1501),
  ss_cac_re_table_replaced      fixed(31) constant(1502),
  ss_cac_re_cache_not_found     fixed(31) constant(1503),
  ss_cac_re_dscr_fail           fixed(31) constant(1504),
  ss_cac_re_cache_exists        fixed(31) constant(1505),
  ss_cac_re_bad_size            fixed(31) constant(1506),
  ss_cac_re_bad_token           fixed(31) constant(1511),
  ss_cac_re_bad_length          fixed(31) constant(1512),
  ss_cac_re_bad_count           fixed(31) constant(1513),
  ss_cac_re_bad_esmdl           fixed(31) constant(1514),
  ss_cac_re_bad_fname           fixed(31) constant(1515),
  ss_cac_re_bad_fval            fixed(31) constant(1516),
  ss_cac_re_exist_fail          fixed(31) constant(1517),
  ss_cac_re_file_not_found      fixed(31) constant(1518),
  ss_cac_re_delete_in_progress  fixed(31) constant(1519),
  ss_cac_re_bad_offset          fixed(31) constant(1520),
  ss_cac_re_bad_table_id        fixed(31) constant(1521),
  ss_cac_re_table_not_found     fixed(31) constant(1522),
  ss_cac_re_open_fail           fixed(31) constant(1523),
  ss_cac_re_bad_recfm           fixed(31) constant(1524),
  ss_cac_re_bad_lrecl           fixed(31) constant(1525),
  ss_cac_re_out_of_storage_ds   fixed(31) constant(1526),
  ss_cac_re_read_fail           fixed(31) constant(1527),
 ss_cac_re_bad_data_stream     fixed(31) constant(1528),

 /* open flag names */
 ss_cac_ofn_xlate            fixed(31) constant(0),
 ss_cac_ofn_preserve_dolr    fixed(31) constant(1),
 ss_cac_ofn_bfs              fixed(31) constant(2),
 ss_cac_ofn_recmethod_fs     fixed(31) constant(3),
 ss_cac_ofn_recmethod_cache  fixed(31) constant(4),

 /* open flag values */
 ss_cac_ofv_no             fixed(31) constant(0),
 ss_cac_ofv_yes            fixed(31) constant(1);

/****************************************************/
/* STRUCTURES                                       */
/****************************************************/

/****************************************************/
/* FUNCTIONS                                        */
/****************************************************/

Declare

 /******************************************/
 /* cache creation and deletion            */
 /******************************************/

 /* create a cache */
 ssCacheCreate entry
 (
  fixed(31),                /* return code   */
  fixed(31),                /* reason code   */
  char(8),                  /* cache name    */
  fixed(31),                /* pages rqstd   */
  fixed(31)                 /* ALET          */
 )
 external as ('BKWOCC'),

 /* delete a cache */
 ssCacheDelete entry
 (
  fixed(31),                /* return code   */
  fixed(31),                /* reason code   */
  char(8)                   /* cache name    */
 )
 external as ('BKWOCD'),

 /******************************************/
 /* utility functions                      */
 /******************************************/

 /* queries cache utilitization */
 ssCacheQuery entry
 (
  fixed(31),                /* return code   */
  fixed(31),                /* reason code   */
  char(8),                  /* cache name    */
  fixed(31),                /* files cached  */
 fixed(31),              /* cache size    */
 fixed(31),              /* amt in use    */
 fixed(31),              /* open count    */
 fixed(31)               /* hit count     */
)
external as ('BKWOCQ'),

/* sets translation table */
ssCacheXlTabSet entry
(
 fixed(31),              /* return code   */
 fixed(31),              /* reason code   */
 fixed(31),              /* table ID      */
 char(256)               /* table         */
)
external as ('BKWOTS'),

/*******************************************/
/* file management primitives             */
/*******************************************/

/* begin using cached file */
ssCacheFileOpen entry
(
 fixed(31),              /* return code      */
 fixed(31),              /* reason code      */
 char(8),                /* cache name       */
 char(*),                /* file spec        */
 fixed(31),              /* its length       */
 char(*),                /* ESM data         */
 fixed(31),              /* its length       */
 fixed(31),              /* flag count       */
 fixed(31),              /* flag name array  */
 fixed(31),              /* flag value array */
 char(8),                /* file token       */
 fixed(31),              /* ALET             */
 pointer(31),            /* address          */
 fixed(31),              /* length           */
 char(32)                /* last update date */
)
external as ('BKWOFO'),

/* read cached file */
ssCacheFileRead entry
(
 fixed(31),              /* return code    */
 fixed(31),              /* reason code    */
 char(8),                /* cache name     */
 char(8),                /* file token     */
 fixed(31),              /* byte offset    */
 fixed(31),              /* num of bytes   */
 char(*),                /* output buffer  */
 fixed(31)               /* bytes returned */
)
external as ('BKWOFR'),

/* done using cached file */
ssCacheFileClose entry
```

```
 (
  fixed(31),              /* return code      */
  fixed(31),              /* reason code      */
  char(8),                /* cache name       */
  char(8)                 /* file token       */
 )
 external as ('BKWOFC');

```

Client Bindings (SSPLXCLI COPY)

```
*COPY SSPLXCLI

 /*****************************************************************/
 /*                                                               */
 /*  NAME      -    Reusable Server Kernel   PL/X bindings          */
 /*                                                               */
 /*  FUNCTION  -    Language bindings for client services          */
 /*                                                               */
 /*  COPYRIGHT -                                        @VR2OZOZ */
 /*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992     @VR2OZOZ */
 /*      LICENSED MATERIALS - PROPERTY OF IBM           @VR2OZOZ */
 /*      SEE COPYRIGHT INSTRUCTIONS, G120-2083          @VR2OZOZ */
 /*      ALL RIGHTS RESERVED                            @VR2OZOZ */
 /*                                                               */
 /*  STATUS - VM/ESA Version 2 Release 4                @VR2OZOZ */
 /*                                                               */
 /*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4          */
 /*****************************************************************/

 /*********************************************************/
 /* constants                                             */
 /*********************************************************/

 Declare

  /* return codes */
  ss_cli_rc_success           fixed(31) constant(0),
  ss_cli_rc_warning           fixed(31) constant(4),
  ss_cli_rc_error             fixed(31) constant(8),
  ss_cli_rc_abend             fixed(31) constant(12),

  /* reason codes */
  ss_cli_re_success           fixed(31) constant(0),
  ss_cli_re_out_of_range      fixed(31) constant(900+1),
  ss_cli_re_out_of_storage    fixed(31) constant(900+2),
  ss_cli_re_bad_iam           fixed(31) constant(900+3),
  ss_cli_re_bad_method        fixed(31) constant(900+4),
  ss_cli_re_semc_fail         fixed(31) constant(900+5),

  /* who i am */
  ss_cli_iam_instance         fixed(31) constant(0),
  ss_cli_iam_linedriver       fixed(31) constant(1),

  /* ways to get data */
  ss_cli_method_read          fixed(31) constant(0),
  ss_cli_method_peek          fixed(31) constant(1),
  ss_cli_method_discard       fixed(31) constant(2);
```

```

/**********************************************************/
/* structures                                             */
/**********************************************************/

/**********************************************************/
/* entry points                                           */
/**********************************************************/

Declare

 /* initialize client data queues */
 ssClientDataInit entry
 (
  fixed(31),                   /* return code    */
  fixed(31),                   /* reason code    */
  pointer(31),                 /* C-block addr   */
  char(8)                      /* subpool name   */
 )
 external as ('BKWIIN'),

 /* terminate client data queues */
 ssClientDataTerm entry
 (
  fixed(31),                   /* return code    */
  fixed(31),                   /* reason code    */
  pointer(31)                  /* C-block addr   */
 )
 external as ('BKWITM'),

 /* get input from client C-block */
 ssClientDataGet entry
 (
  fixed(31),                  /* return code     */
  fixed(31),                  /* reason code     */
  fixed(31),                  /* instance or ld? */
  pointer(31),                /* C-block pointer */
  fixed(31),                  /* get method      */
  fixed(31),                  /* ALET to use     */
  char(*),                    /* buffer          */
  fixed(31),                  /* amt wanted      */
  fixed(31),                  /* amt given       */
  fixed(31)                   /* amt left        */
 )
 external as ('BKWIDG'),

 /* put output onto client C-block */
 ssClientDataPut entry
 (
  fixed(31),                  /* return code     */
  fixed(31),                  /* reason code     */
  fixed(31),                  /* instance or ld? */
  pointer(31),                /* C-block pointer */
  fixed(31),                  /* ALET to use     */
  char(*),                    /* buffer          */
  fixed(31),                  /* amt to put      */
  fixed(31)                   /* new amount      */
 )
 external as ('BKWIDP');

```

Enrollment Bindings (SSPLXENR COPY)

```
*COPY SSPLXENR

/*******************************************************************/
/*                                                                 */
/*  NAME      -    Reusable Server Kernel   PL/X bindings          */
/*                                                                 */
/*  FUNCTION  -    Language bindings for enrollment services.      */
/*                                                                 */
/*  COPYRIGHT -                                         @VR2OZOZ */
/*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992      @VR2OZOZ */
/*      LICENSED MATERIALS - PROPERTY OF IBM            @VR2OZOZ */
/*      SEE COPYRIGHT INSTRUCTIONS, G120-2083           @VR2OZOZ */
/*      ALL RIGHTS RESERVED                             @VR2OZOZ */
/*                                                                 */
/*  STATUS - VM/ESA Version 2 Release 4                 @VR2OZOZ */
/*                                                                 */
/*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4          */
/*******************************************************************/

/*****************************************************/
/* CONSTANTS                                         */
/*****************************************************/

Declare

 /* API maxima */
 ss_enr_index_width          fixed(31) constant(64),
 ss_enr_max_data             fixed(31) constant(65450),

 /* return codes */
 ss_enr_rc_success           fixed(31) constant(0),
 ss_enr_rc_warning           fixed(31) constant(4),
 ss_enr_rc_error             fixed(31) constant(8),
 ss_enr_rc_abend             fixed(31) constant(12),

 /* reason codes */
 ss_enr_re_success           fixed(31) constant(0),
 ss_enr_re_db_not_found      fixed(31) constant(1000+1),
 ss_enr_re_rec_not_found     fixed(31) constant(1000+2),
 ss_enr_re_truncated         fixed(31) constant(1000+3),
 ss_enr_re_dirty             fixed(31) constant(1000+4),
 ss_enr_re_rec_exists        fixed(31) constant(1000+5),
 ss_enr_re_bad_length        fixed(31) constant(1000+6),
 ss_enr_re_bad_droptype      fixed(31) constant(1000+7),
 ss_enr_re_no_storage        fixed(31) constant(1000+8),
 ss_enr_re_close_fail        fixed(31) constant(1000+9),
 ss_enr_re_write_fail        fixed(31) constant(1000+10),
 ss_enr_re_bad_method        fixed(31) constant(1000+11),
 ss_enr_re_open_fail         fixed(31) constant(1000+12),
 ss_enr_re_gwu_fail          fixed(31) constant(1000+13),
 ss_enr_re_point_fail        fixed(31) constant(1000+14),
 ss_enr_re_exist_fail        fixed(31) constant(1000+15),
 ss_enr_re_not_sfs           fixed(31) constant(1000+16),
 ss_enr_re_not_v             fixed(31) constant(1000+17),
 ss_enr_re_dscr_fail         fixed(31) constant(1000+18),
 ss_enr_re_read_fail         fixed(31) constant(1000+19),
 ss_enr_re_db_exists         fixed(31) constant(1000+20),
 ss_enr_re_comm_fail         fixed(31) constant(1000+21),
 ss_enr_re_not_disk          fixed(31) constant(1000+22),
 ss_enr_re_bad_kind          fixed(31) constant(1000+23),
 ss_enr_re_new_file          fixed(31) constant(1000+24),
 ss_enr_re_no_sets           fixed(31) constant(1000+25),
 ss_enr_re_set_empty         fixed(31) constant(1000+26),

 /* KIND types */
 ss_enr_kind_memory          fixed(31) constant(0),
 ss_enr_kind_disk            fixed(31) constant(1),

 /* INSERT types */
 ss_enr_insert_new           fixed(31) constant(0),
 ss_enr_insert_replace       fixed(31) constant(1),

 /* DROP types */
 ss_enr_drop_commit          fixed(31) constant(0),
 ss_enr_drop_rollback        fixed(31) constant(1);

/*****************************************************/
/* ENTRY POINTS                                      */
/*****************************************************/

Declare

 /* commit enrollment data base */
 ssEnrollCommit entry
 (
  fixed(31),              /* return code   */
  fixed(31),              /* reason code   */
  char(8)                 /* dbase name    */
 )
 external as ('BKWJCM'),

 /* drop enrollment data base */
 ssEnrollDrop entry
 (
  fixed(31),              /* return code   */
  fixed(31),              /* reason code   */
  char(8),                /* dbase name    */
  fixed(31)               /* drop type     */
 )
 external as ('BKWJDP'),

 /* list data bases */
 ssEnrollList entry
 (
  fixed(31),              /* return code   */
  fixed(31),              /* reason code   */
  pointer(31)             /* C-block       */
 )
 external as ('BKWJDL'),

 /* load enrollment data base */
```

```
ssEnrollLoad entry
(
 fixed(31),               /* return code  */
 fixed(31),               /* reason code  */
 char(8),                 /* dbase name   */
 fixed(31),               /* DS kind      */
 fixed(31),               /* DS size      */
 char(*),                 /* filename     */
 fixed(31)                /* length of    */
)
external as ('BKWJLO'),

/* get record */
ssEnrollRecordGet entry
(
 fixed(31),                  /* return code   */
 fixed(31),                  /* reason code   */
 char(8),                    /* dbase name    */
 char(ss_enr_index_width),   /* index         */
 char(*),                    /* buffer        */
 fixed(31),                  /* buf size      */
 fixed(31)                   /* amt returned  */
)
external as ('BKWJRG'),

/* insert record */
ssEnrollRecordInsert entry
(
 fixed(31),                  /* return code   */
 fixed(31),                  /* reason code   */
 char(8),                    /* dbase name    */
 char(ss_enr_index_width),   /* index         */
 char(*),                    /* data          */
 fixed(31),                  /* length        */
 fixed(31)                   /* replace?      */
)
external as ('BKWJRI'),

/* list records */
ssEnrollRecordList entry
(
 fixed(31),               /* return code   */
 fixed(31),               /* reason code   */
 char(8),                 /* dbase name    */
 pointer(31)              /* C-block       */
)
external as ('BKWJRL'),

/* remove record */
ssEnrollRecordRemove entry
(
 fixed(31),                  /* return code   */
 fixed(31),                  /* reason code   */
 char(8),                    /* dbase name    */
 char(ss_enr_index_width)    /* index         */
)
external as ('BKWJRR');
```

Memory Bindings (SSPLXMEM COPY)

```
*COPY SSPLXMEM

 /********************************************************************/
 /*                                                                  */
 /*  NAME      -    Reusable Server Kernel   PL/X bindings           */
 /*                                                                  */
 /*  FUNCTION  -    Language bindings for memory services.           */
 /*                                                                  */
 /*  COPYRIGHT -                                           @VR2OZOZ */
 /*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992        @VR2OZOZ */
 /*      LICENSED MATERIALS - PROPERTY OF IBM              @VR2OZOZ */
 /*      SEE COPYRIGHT INSTRUCTIONS, G120-2083             @VR2OZOZ */
 /*      ALL RIGHTS RESERVED                               @VR2OZOZ */
 /*                                                                  */
 /*  STATUS - VM/ESA Version 2 Release 4                   @VR2OZOZ */
 /*                                                                  */
 /*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4           */
 /********************************************************************/

 Declare

  /* return and reason codes */
  ss_mem_rc_success         fixed(31) constant(0),
  ss_mem_rc_warning         fixed(31) constant(4),
  ss_mem_rc_error           fixed(31) constant(8),
  ss_mem_rc_abend           fixed(31) constant(12),

  ss_mem_re_success         fixed(31) constant(0),
  ss_mem_re_out_of_storage  fixed(31) constant(800+1),
  ss_mem_re_bad_amount      fixed(31) constant(800+2),
  ss_mem_re_bad_align       fixed(31) constant(800+3),
  ss_mem_re_no_subpool      fixed(31) constant(800+4),
  ss_mem_re_not_alloc       fixed(31) constant(800+5),
  ss_mem_re_subpool_deleted fixed(31) constant(800+6),
  ss_mem_re_spd_fail        fixed(31) constant(800+7),
  ss_mem_re_bad_key         fixed(31) constant(800+8),
  ss_mem_re_subpool_exists  fixed(31) constant(800+9),
  ss_mem_re_spcc_fail       fixed(31) constant(800+10),
  ss_mem_re_spla_fail       fixed(31) constant(800+11),

  /* alignment attributes */
  ss_mem_align_norm         fixed(31) constant(0),
  ss_mem_align_page         fixed(31) constant(1),

  /* create a data space we can manage */
  ssMemoryCreateDS entry
  (
   fixed(31),               /* return code   */
   fixed(31),               /* reason code   */
   char(8),                 /* subpool name  */
   fixed(31),               /* size (pages)  */
   fixed(31),               /* storage key   */
   fixed(31),               /* option count  */
   fixed(31),               /* option array  */
   char(8),                 /* ASIT          */
   fixed(31)                /* ALET          */
)
external as ('BKWMCR'),

/* allocate memory */
ssMemoryAllocate entry
(
 fixed(31),             /* return code   */
 fixed(31),             /* reason code   */
 fixed(31),             /* lower bound   */
 fixed(31),             /* upper bound   */
 character(8),          /* subpool name  */
 fixed(31),             /* alignment rqt */
 pointer(31),           /* addr of block */
 fixed(31)              /* amount gotten */
)
external as ('BKWMAL'),

/* release memory */
ssMemoryRelease  entry
(
 fixed(31),             /* return code    */
 fixed(31),             /* reason code    */
 fixed(31),             /* bytes released */
 character(8),          /* subpool name   */
 pointer(31)            /* addr of block  */
)
external as ('BKWMRE'),

/* delete subpool */
ssMemoryDelete  entry
(
 fixed(31),             /* return code    */
 fixed(31),             /* reason code    */
 character(8)           /* subpool name   */
)
external as ('BKWMDE');

```

Storage Group Bindings (SSPLXSGP COPY)

```
*COPY SSPLXSGP

 /*******************************************************************/
 /*                                                                 */
 /*  NAME      -    Reusable Server Kernel   PL/X bindings          */
 /*                                                                 */
 /*  FUNCTION  -    Language bindings for storage group services.   */
 /*                                                                 */
 /*  COPYRIGHT -                                          @VR2OZOZ */
 /*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992        @VR2OZOZ */
 /*      LICENSED MATERIALS - PROPERTY OF IBM              @VR2OZOZ */
 /*      SEE COPYRIGHT INSTRUCTIONS, G120-2083             @VR2OZOZ */
 /*      ALL RIGHTS RESERVED                               @VR2OZOZ */
 /*                                                                 */
 /*  STATUS - VM/ESA Version 2 Release 4                   @VR2OZOZ */
 /*                                                                 */
 /*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4          */
 /*******************************************************************/
```

```
/*******************************************************************/
/* CONSTANTS                                                     */
/*******************************************************************/

Declare

 /* return codes */
 ss_sgp_rc_success         fixed(31) constant(0),
 ss_sgp_rc_warning         fixed(31) constant(4),
 ss_sgp_rc_error           fixed(31) constant(8),
 ss_sgp_rc_abend           fixed(31) constant(12),

 /* reason codes */
 ss_sgp_re_success         fixed(31) constant(0),
 ss_sgp_re_too_many        fixed(31) constant(600+1),
 ss_sgp_re_not_found       fixed(31) constant(600+2),
 ss_sgp_re_out_of_storage  fixed(31) constant(600+3),
 ss_sgp_re_mx_fail         fixed(31) constant(600+4),
 ss_sgp_re_init_done       fixed(31) constant(600+5),
 ss_sgp_re_exists          fixed(31) constant(600+7),
 ss_sgp_re_vdq_fail        fixed(31) constant(600+8),
 ss_sgp_re_online          fixed(31) constant(600+9),
 ss_sgp_re_offline         fixed(31) constant(600+10),
 ss_sgp_re_q_fail          fixed(31) constant(600+11),
 ss_sgp_re_cv_fail         fixed(31) constant(600+12),
 ss_sgp_re_e_fail          fixed(31) constant(600+13),
 ss_sgp_re_maint           fixed(31) constant(600+14),
 ss_sgp_re_ds_fail         fixed(31) constant(600+15),
 ss_sgp_re_pool_fail       fixed(31) constant(600+16),
 ss_sgp_re_map_fail        fixed(31) constant(600+17),
 ss_sgp_re_bad_attrib      fixed(31) constant(600+18),
 ss_sgp_re_rewrite_fail    fixed(31) constant(600+19),
 ss_sgp_re_read_only       fixed(31) constant(600+20),
 ss_sgp_re_out_of_range    fixed(31) constant(600+22),
 ss_sgp_re_wrong_mode      fixed(31) constant(600+23),
 ss_sgp_re_io_fail         fixed(31) constant(600+24),
 ss_sgp_re_diag_250_fail   fixed(31) constant(600+25),
 ss_sgp_re_too_big         fixed(31) constant(600+26),
 ss_sgp_re_bad_name        fixed(31) constant(600+28),
 ss_sgp_re_name_in_use     fixed(31) constant(600+29),

 /* attributes */
 ss_sgp_attrib_ds          fixed(31) constant(0),
 ss_sgp_attrib_no_ds       fixed(31) constant(1),
 ss_sgp_attrib_block_rw    fixed(31) constant(2),
 ss_sgp_attrib_block_ro    fixed(31) constant(3),
 ss_sgp_attrib_offline     fixed(31) constant(7);

/*******************************************************************/
/* FUNCTIONS                                                     */
/*******************************************************************/

Declare

 /* storage group create */
 ssSgpCreate  entry
 (
 fixed(31),            /* return code        */
 fixed(31),            /* reason code        */
 fixed(31),            /* sg number          */
 fixed(31),            /* num of vdevs       */
 fixed(31),            /* vdev array         */
 fixed(31),            /* attrib count       */
 fixed(31)             /* attrib array       */
)
external as ('BKWSGC'),

/* storage group delete */
ssSgpDelete  entry
(
 fixed(31),            /* return code        */
 fixed(31),            /* reason code        */
 fixed(31)             /* sg number          */
)
external as ('BKWSGD'),

/* storage group find */
ssSgpFind  entry
(
 fixed(31),            /* return code */
 fixed(31),            /* reason code */
 char(8),              /* sg name     */
 fixed(31),            /* sgp id      */
 fixed(31),            /* I/O mode    */
 fixed(32)             /* total blks  */
)
external as ('BKWSGF'),

/* storage group list (what's defined?) */
ssSgpList  entry
(
 fixed(31),            /* return code      */
 fixed(31),            /* reason code      */
 fixed(31),            /* num expected     */
 fixed(31),            /* number filled in  */
 fixed(31)             /* array for IDs     */
)
external as ('BKWSGL'),

/* storage group query (details on particular sg) */
ssSgpQuery  entry
(
 fixed(31),            /* return code      */
 fixed(31),            /* reason code      */
 fixed(31),            /* sgp id           */
 char(8),              /* sg name          */
 fixed(31),            /* i/o mode         */
 fixed(32),            /* total blocks     */
 fixed(31),            /* status word      */
 fixed(31),            /* attrib expected  */
 fixed(31),            /* attrib filled in  */
 fixed(31),            /* attrib array      */
 fixed(31),            /* vdevs expected    */
 fixed(31),            /* vdevs filled in   */
 fixed(31),            /* vdev array        */
 fixed(31)             /* blks array        */
)
external as ('BKWSGQ'),

/* storage group read */
ssSgpRead  entry
(
 fixed(31),                  /* return code */
 fixed(31),                  /* reason code */
 fixed(31),                  /* sgp ID      */
 fixed(32),                  /* page number */
 fixed(32),                  /* num of pgs  */
 fixed(31),                  /* buffer ALET */
 character(*)                /* buffer      */
)
external as ('BKWSGR'),

/* storage group start (like a mount) */
ssSgpStart  entry
(
 fixed(31),            /* return code       */
 fixed(31),            /* reason code       */
 fixed(31),            /* sgp id            */
 char(8),              /* sgp name          */
 fixed(31),            /* attrib count      */
 fixed(31)             /* attrib array      */
)
external as ('BKWSGS'),

/* storage group stop (like a dismount) */
ssSgpStop  entry
(
 fixed(31),            /* return code       */
 fixed(31),            /* reason code       */
 fixed(31),            /* sgp ID            */
 fixed(31),            /* attrib count      */
 fixed(31)             /* attrib array      */
)
external as ('BKWSGT'),

/* storage group write */
ssSgpWrite  entry
(
 fixed(31),                  /* return code */
 fixed(31),                  /* reason code */
 fixed(31),                  /* sgp ID      */
 fixed(32),                  /* page number */
 fixed(32),                  /* num of pgs  */
 fixed(31),                  /* buffer ALET */
 character(*)                /* buffer      */
)
external as ('BKWSGW');
```

Services Bindings (SSPLXSRV COPY)

```
*COPY SSPLXSRV

 /*****************************************************************/
 /*                                                               */
 /*  NAME      -    Reusable Server Kernel   PL/X bindings        */
 /*                                                               */
 /*  FUNCTION  -    Language bindings for service services.       */
 /*                                                               */
 /*  COPYRIGHT -                                          @VR2OZOZ */
 /*      5684-112 (C) COPYRIGHT IBM CORP.1991, 1992       @VR2OZOZ */
 /*      LICENSED MATERIALS - PROPERTY OF IBM             @VR2OZOZ */
 /*      SEE COPYRIGHT INSTRUCTIONS, G120-2083            @VR2OZOZ */
 /*      ALL RIGHTS RESERVED                              @VR2OZOZ */
 /*                                                               */
 /*  STATUS - VM/ESA Version 2 Release 4                  @VR2OZOZ */
 /*                                                               */
 /*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4        */
 /*****************************************************************/

 /*******************************************************/
 /* constants                                           */
 /*******************************************************/

 Declare

  /* return codes */
  ss_srv_rc_success            fixed(31) constant(0),
  ss_srv_rc_warning            fixed(31) constant(4),
  ss_srv_rc_error              fixed(31) constant(8),
  ss_srv_rc_abend              fixed(31) constant(12),

  /* reason codes */
  ss_srv_re_success            fixed(31) constant(0),
  ss_srv_re_bad_type           fixed(31) constant(700+1),
  ss_srv_re_not_found          fixed(31) constant(700+2),
  ss_srv_re_out_of_range       fixed(31) constant(700+3),
  ss_srv_re_out_of_storage     fixed(31) constant(700+6),
  ss_srv_re_exists             fixed(31) constant(700+9),

  /* types of messages */
  ss_srv_msgtype_instance      fixed(31) constant(0),
  ss_srv_msgtype_linedriver    fixed(31) constant(1),

  /* types of services */
  ss_srv_srvtype_normal        fixed(31) constant(0),
  ss_srv_srvtype_ld            fixed(31) constant(1),
  ss_srv_srvtype_ldss          fixed(31) constant(2),

  /* values of various msg bits... these have to line   */
  /* up with the message structures below... be careful */
  ss_srv_ibit_cclose           fixed(16) constant(32768),
  ss_srv_ibit_aclose           fixed(16) constant(16384),
  ss_srv_ibit_cdone            fixed(16) constant(8192),
  ss_srv_ibit_ldstop           fixed(16) constant(4096),
  ss_srv_ibit_newdata          fixed(16) constant(2048),

 ss_srv_lbit_stopack          fixed(16) constant(32768),
 ss_srv_lbit_newdata          fixed(16) constant(16384),

 /* length of keys */
 ss_srv_keylength             fixed(31) constant(32);

/**********************************************************/
/* structures                                             */
/**********************************************************/

Declare

 /* S-block */
 1 vmss_sblock             Boundary(Word) Based,
   5  sbl_next             pointer(31),        /* next service  */
   5  sbl_prev             pointer(31),        /* prev service  */
   5  sbl_sn               character(8),       /* its name      */
   5  sbl_snl              fixed(31),          /* name length   */
   5  sbl_initaddr         pointer(31),        /* init addr     */
   5  sbl_agtaddr          pointer(31),        /* agent addr    */
   5  sbl_cmpladdr         pointer(31),        /* cmpltn addr   */
   5  sbl_type             fixed(31),          /* service type  */
   5  sbl_lockword         fixed(31),          /* lock word     */
   5  sbl_startcount       fixed(31),          /* start count   */
   5  sbl_monindex         fixed(31),          /* mon buf index */

 /* C-block */
 1  vmss_cblock                 boundary(word) based,
    5  vc_sblock                pointer(31),
    5  vc_ldname                character(8),
    5  vc_statbits              bit(32),
       10 vc_b_record           bit(1),
    5  vc_qh                    fixed(31),
    5  vc_sid                   fixed(31),
    5  vc_instance              fixed(31),
    5  vc_threadid              fixed(31),
    5  vc_ikey                  character(ss_srv_keylength),
    5  vc_lkey                  character(ss_srv_keylength),
    5  vc_userid                character(64),
    5  vc_bytesin               fixed(31),
    5  vc_bytesout              fixed(31),
    5  vc_ibw                   fixed(31),
    5  vc_ldbw                  fixed(31),
    5  vc_startstck             char(8),
    5  vc_stopstck              char(8),
    5  vc_reserved              char(128),
    5  vc_lddata                char(0),

 /* msg to instance */
 1  vmss_imsg                   boundary(word) based,
    5  vi_ikey                  character(ss_srv_keylength),
    5  vi_type                  fixed(31),
    5  vi_cbits                 bit(16),
       10  vi_b_cclose          bit(1),
       10  vi_b_aclose          bit(1),
       10  vi_b_cdone           bit(1),
       10  vi_b_ldstop          bit(1),
       10  vi_b_newdata         bit(1),
 /* msg to line driver */
 1  vmss_lmsg                boundary(word) based,
    5  vl_lkey               character(ss_srv_keylength),
    5  vl_type               fixed(31),
    5  vl_ikey               character(ss_srv_keylength),
    5  vl_ibits              bit(16),
       10  vl_b_stopack      bit(1),
       10  vl_b_newdata      bit(1);

/*********************************************************/
/* entry points                                          */
/*********************************************************/

Declare

 /* bind service to addresses */
 ssServiceBind  entry
 (
  fixed(31),                /* return code     */
  fixed(31),                /* reason code     */
  character(*),             /* service name    */
  fixed(31),                /* its length      */
  pointer(31),              /* init addr       */
  pointer(31),              /* service addr    */
  pointer(31),              /* completion addr */
  fixed(31)                 /* service type    */
 )
 external as ('BKWVBN'),

 /* find service block */
 ssServiceFind  entry
 (
  fixed(31),                /* return code     */
  fixed(31),                /* reason code     */
  character(*),             /* service name    */
  fixed(31),                /* its length      */
  pointer(31)               /* S-blk address   */
 )
 external as ('BKWVFN'),

 /* start the server */
 ssServerRun  entry
 (
  fixed(31),                /* return code     */
  fixed(31)                 /* reason code     */
 )
 external as ('BKWVRN'),

 /* stop the server */
 ssServerStop  entry
 (
  fixed(31),                /* return code     */
  fixed(31)                 /* reason code     */
 )
 external as ('BKWVSP');

```

Trie Bindings (SSPLXTRI COPY)

```
*COPY SSPLXTRI

 /*************************************************/
 /*                                               */
 /* external bindings for trie routines           */
 /*                                               */
 /*                                               */
 /* Brian Wade    April 1999                      */
 /*                                               */
 /*************************************************/


 /*************************************************/
 /* constants                                     */
 /*************************************************/

 Declare

  /* ssTrie return codes */
  ss_tri_rc_success     fixed(31)   constant(0),
  ss_tri_rc_warning     fixed(31)   constant(4),
  ss_tri_rc_error       fixed(31)   constant(8),
  ss_tri_rc_abend       fixed(31)   constant(12),

  /* ssTrie reason codes */
  ss_tri_re_success            fixed(31)   constant(0),
  ss_tri_re_bad_size           fixed(31)   constant(1700+1),
  ss_tri_re_trie_exists        fixed(31)   constant(1700+2),
  ss_tri_re_out_of_storage     fixed(31)   constant(1700+3),
  ss_tri_re_dscr_fail          fixed(31)   constant(1700+4),
  ss_tri_re_trie_not_found     fixed(31)   constant(1700+5),
  ss_tri_re_trie_busy          fixed(31)   constant(1700+6),
  ss_tri_re_bad_index_len      fixed(31)   constant(1700+7),
  ss_tri_re_bad_capacity       fixed(31)   constant(1700+8),
  ss_tri_re_out_of_ds_storage  fixed(31)   constant(1700+9);


 /*************************************************/
 /* Entry points                                  */
 /*************************************************/

 Declare

  /* ssTrieCreate */
  ssTrieCreate entry
  (
   fixed(31),            /* return code    */
   fixed(31),            /* reason code    */
   char(8),              /* trie name      */
   fixed(31),            /* DS size (pgs)  */
   char(8),              /* ASIT           */
   fixed(31)             /* ALET           */
  )
  external as ('BKWYCR'),

  /* ssTrieDelete */
 ssTrieDelete entry
 (
  fixed(31),             /* return code    */
  fixed(31),             /* reason code    */
  char(8)                /* trie name      */
 )
 external as ('BKWYDE'),

 /* ssTrieRecordInsert */
 ssTrieRecordInsert entry
 (
  fixed(31),             /* return code    */
  fixed(31),             /* reason code    */
  char(8),               /* trie name      */
  fixed(31),             /* trie ALET      */
  fixed(31),             /* record number  */
  char(*),               /* index buffer   */
  fixed(31)              /* index length   */
 )
 external as ('BKWYRI'),

 /* ssTrieRecordList */
 ssTrieRecordList entry
 (
  fixed(31),             /* return code    */
  fixed(31),             /* reason code    */
  char(8),               /* trie name      */
  fixed(31),             /* trie ALET      */
  char(*),               /* index buffer   */
  fixed(31),             /* index length   */
  fixed(31),             /* recnum array   */
  fixed(31),             /* array capacity */
  fixed(31)              /* recs found     */
 )
 external as ('BKWYRL');
```

User ID Bindings (SSPLXUID COPY)

```
*COPY SSPLXUID

 /*******************************************************************/
 /*                                                                 */
 /*  NAME      -    Reusable Server Kernel   PL/X bindings          */
 /*                                                                 */
 /*  FUNCTION  -    Language bindings for userid services           */
 /*                                                                 */
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 /*      ALL RIGHTS RESERVED                               @VR2OZOZ */
 /*                                                                 */
 /*  STATUS - VM/ESA Version 2 Release 4                   @VR2OZOZ */
 /*                                                                 */
 /*  CHANGE ACTIVITY  - New for VM/ESA Version 2 Release 4          */
 /*******************************************************************/
```

```
/*********************************************************/
/* CONSTANTS                                             */
/*********************************************************/

Declare

 /* config constants */
 ss_uid_index_width      fixed(31) constant(64),

 /* return and reason codes */
 ss_uid_rc_success       fixed(31) constant(0),
 ss_uid_rc_warning       fixed(31) constant(4),
 ss_uid_rc_error         fixed(31) constant(8),
 ss_uid_rc_abend         fixed(31) constant(12),

 ss_uid_re_success       fixed(31) constant(0),
 ss_uid_re_not_found     fixed(31) constant(100+1);

/*********************************************************/
/* STRUCTURES                                            */
/*********************************************************/

/*********************************************************/
/* FUNCTIONS                                             */
/*********************************************************/

Declare

 /* routine to map user IDs */
 ssUseridMap entry
 (
  fixed(31),                         /* return code   */
  fixed(31),                         /* reason code   */
  character(*),                      /* input conn    */
  fixed(31),                         /* its length    */
  character(*),                      /* input node    */
  fixed(31),                         /* its length    */
  character(*),                      /* input user    */
  fixed(31),                         /* its length    */
  character(ss_uid_index_width),     /* output user   */
  fixed(31)                          /* its length    */
 )
 external as ('BKWBMU');
```

Worker Bindings (SSPLXWRK COPY)

```
*COPY SSPLXWRK

 /********************************************************************/
 /*                                                                  */
 /*  NAME      -    Reusable Server Kernel   PL/X bindings           */
 /*                                                                  */
 /*  FUNCTION  -    Language bindings for worker services            */
 /*                                                                  */
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 /*                                                                  */
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/*                                                                  */
/*  STATUS - VM/ESA Version 2, Release 4.0                          */
/*                                                                  */
/*  CHANGE ACTIVITY  - New for VM/ESA Version X Release Y          */
/*   @SI124VM - alternate userid support in worker API              */
/********************************************************************/

/*********************************************************/
/* CONSTANTS                                             */
/*********************************************************/

Declare

 /* return and reason codes */
 ss_wrk_rc_success        fixed(31)   constant(0),
 ss_wrk_rc_warning        fixed(31)   constant(4),
 ss_wrk_rc_error          fixed(31)   constant(8),
 ss_wrk_rc_abend          fixed(31)   constant(12),

 ss_wrk_re_success           fixed(31)   constant(0),
 ss_wrk_re_out_of_storage    fixed(31)   constant(1600+1),
 ss_wrk_re_bad_count         fixed(31)   constant(1600+2),
 ss_wrk_re_bad_flag_name     fixed(31)   constant(1600+3),
 ss_wrk_re_bad_flag_value    fixed(31)   constant(1600+4),
 ss_wrk_re_no_class          fixed(31)   constant(1600+5),
 ss_wrk_re_no_subordinates   fixed(31)   constant(1600+6),
 ss_wrk_re_algtries_exceeded fixed(31)   constant(1600+7),
 ss_wrk_re_autolog_fail      fixed(31)   constant(1600+8),
 ss_wrk_re_timer_fail        fixed(31)   constant(1600+9),
 ss_wrk_re_iucvcon_fail      fixed(31)   constant(1600+10),
 ss_wrk_re_force_fail        fixed(31)   constant(1600+11),
 ss_wrk_re_force_timeout     fixed(31)   constant(1600+12),
 ss_wrk_re_oper_delete       fixed(31)   constant(1600+13),

 /* option flag names */
 ss_wrk_ofn_prefer_empty     fixed(31)   constant(0),
 ss_wrk_ofn_retry_count      fixed(31)   constant(1),
 ss_wrk_ofn_alt_userid       fixed(31)   constant(2),    /*@SI124VM*/
 ss_wrk_ofn_alt_seclabel     fixed(31)   constant(3),    /*@SI124VM*/

 /* option flag values */
 ss_wrk_ofv_no            fixed(31)   constant(0),
 ss_wrk_ofv_yes           fixed(31)   constant(1);

/*********************************************************/
/* STRUCTURES                                            */
/*********************************************************/

/*********************************************************/
/* FUNCTIONS                                             */
/*********************************************************/

Declare

 /* allocate a worker machine */
```

```
ssWorkerAllocate entry
(
 fixed(31),                     /* return code       */
 fixed(31),                     /* reason code       */
 pointer(31),                   /* instance C-block  */
 char(8),                       /* class name        */
 fixed(31),                     /* option count      */
 fixed(31),                     /* option names      */
 fixed(31),                     /* option values     */
 pointer(31),                   /* worker C-block    */
 fixed(31)                      /* connection ID     */
)
external as ('BKWCAL');

```

Appendix J. What's Changed Since the Beta

The reusable server kernel was available from *http://www.vm.ibm.com/* in beta form for several months before it became generally available. There are some differences between the beta level and the GA level. The following table summarizes the differences and describes the actions you must take to convert your program to run on the GA level.

Table 57 (Page 1 of 2). Differences Between Beta and GA Levels

Topic	Beta	GA	Action
Name of your mainline	`VSSMAIN`	`RSKMAIN`	Edit and recompile or reassemble your mainline.
Profile file name	`PROFILE VMSS`	`PROFILE RSK`	Change the name of your profile.
Subcom name	`VMSS`	`RSK`	Change your EXECs to use `ADDRESS RSK`.
Entry point names	`VSSxxx`	`BKWxxx`	Recompile or reassemble your program.
Names of CMS- or CP-managed objects the server kernel creates (mutexes, semaphores, condition variables, queues, subpools, `HNDIUCV` exit names, data spaces, and so on)	Often started with `SS` or `VSS`	All start with `BKW` or `DMS`	Avoid prefixes `BKW` and `DMS`.
IPC message keys, event keys, timer userwords	Often started with `SS` or `VSS`	All start with `BKW`	Avoid prefix `BKW`.
Macro library containing `SSASMxxx` bindings	`VSSGPI MACLIB`	`DMSGPI MACLIB`	Change the control file you use for assemblies.
Macro library containing `SSPLXxxx` bindings	`VSSPLX MACLIB`	`DMSRP MACLIB`	Change the control file you use for compilations.
The reusable server kernel text library	`VSS TXTLIB`	`BKWLIB TXTLIB`	Change your `GLOBAL TXTLIB` command.

Table 57 (Page 2 of 2). Differences Between Beta and GA Levels

Topic	Beta	GA	Action
Supplementary text library shipped with the beta	PSL TXTLIB	DMSPSLK TXTLIB	Change your GLOBAL TXTLIB command.
Default names for authorization data files	CMS filetypes started with VSS	CMS filetypes start with RSK	Rename your files or adjust PROFILE RSK.
Default name for storage group configuration file	DEFAULT VSSSGP A	DEFAULT RSKSGP A	Rename your file or adjust PROFILE RSK.
Default name for user ID mapping file	DEFAULT VSSUMAP *	DEFAULT RSKUMAP *	Rename your file or adjust PROFILE RSK.
Exit name a worker control program should use when it issues HNDIUCV SET	VSSWORK	RSKWORK	
Default filetype for request files arriving for the SPOOL line driver	VSSRQST	RSKRQST	Change your client or PROFILE RSK appropriately.
Default filetype for response files generated the SPOOL line driver	VSSRESP	RSKRESP	Change your client or PROFILE RSK appropriately.
Message repository file	VSSUME TEXT	BKWUME TEXT	Change the SET LANGUAGE command your server issues when it starts.
Runtime environment manager module	VSSRTE MODULE	BKWRTE MODULE	The old module is incompatible and must be replaced with the new one.
Message numbers	VSScccnnnns	BKWcccnnnns	Probably nothing.

Notices

Trademarks

BookManager	DFSMS
IBM	IBMLink
Language Environment	OpenEdition
OpenExtensions	S/390
VM/ESA	VTAM
z/VM	

Glossary

A list of VM terms and their definitions is available through the online HELP Facility. For example, to display the definition of “cms,” enter:

```
help glossary cms
```

You will enter the HELP Facility's online glossary file and the definition of “cms” will be displayed as the current line. When you are in the glossary file, you can also search for other terms.

If you are unfamiliar with the HELP Facility, you can enter:

```
help
```

to display the main HELP Menu, or enter:

```
help cms help
```

for information about the HELP command.

For more information about the HELP Facility, see the *z/VM: CMS User’s Guide*. For more about the HELP command, see the *z/VM: CMS Command Reference*.

Bibliography

This bibliography lists the publications that provide information about your z/VM system. The z/VM library includes z/VM base publications, publications for additional facilities included with z/VM, and publications for z/VM optional features. For abstracts of z/VM publications and information about current editions and available publication formats, see *z/VM: General Information*.

z/VM Base Publications

Evaluation

- *z/VM: Licensed Program Specifications*, GC24-5943
- *z/VM: General Information*, GC24-5944

Installation and Service

- *z/VM: Installation Guide*, GC24-5945
- *z/VM: Service Guide*, GC24-5946
- *z/VM: VMSES/E Introduction and Reference*, GC24-5947

Planning and Administration

- *z/VM: Planning and Administration*, SC24-5948
- *z/VM: CMS File Pool Planning, Administration, and Operation*, SC24-5949
- *z/VM: Migration Guide*, GC24-5928
- *VM/ESA: REXX/EXEC Migration Tool for VM/ESA*, GC24-5752
- *z/VM: Running Guest Operating Systems*, SC24-5950
- *VM/ESA: Connectivity Planning, Administration, and Operation*, SC24-5756
- *z/VM: Group Control System*, SC24-5951
- *z/VM: Performance*, SC24-5952

Customization

- *z/VM: CP Exit Customization*, SC24-5953

Operation

- *z/VM: System Operation*, SC24-5954
- *z/VM: Virtual Machine Operation*, SC24-5955

Application Programming

- *z/VM: CP Programming Services*, SC24-5956
- *z/VM: CMS Application Development Guide*, SC24-5957
- *z/VM: CMS Application Development Guide for Assembler*, SC24-5958
- *z/VM: CMS Callable Services Reference*, SC24-5959
- *z/VM: CMS Macros and Functions Reference*, SC24-5960
- *z/VM: CMS Application Multitasking*, SC24-5961
- *VM/ESA: REXX/VM Primer*, SC24-5598
- *z/VM: REXX/VM User's Guide*, SC24-5962
- *z/VM: REXX/VM Reference*, SC24-5963
- *z/VM: OpenExtensions POSIX Conformance Document*, GC24-5976
- *z/VM: OpenExtensions User's Guide*, SC24-5977
- *z/VM: OpenExtensions Command Reference*, SC24-5978
- *z/VM: OpenExtensions Advanced Application Programming Tools*, SC24-5979
- *z/VM: OpenExtensions Callable Services Reference*, SC24-5980
- *IBM z/VM: Reusable Server Kernel Programmer's Guide and Reference*, SC24-5964
- *z/VM: Enterprise Systems Architecture/Extended Configuration Principles of Operation*, SC24-5965
- *C for VM/ESA: Library Reference*, SC23-3908
- *OS/390: DFSMS Program Management*, SC27-0806
- *z/VM: Program Management Binder for CMS*, SC24-5934
- *Debug Tool User's Guide and Reference*, SC09-2137
- *External Security Interface (RACROUTE) Macro Reference for MVS and VM*, GC28-1366
- *VM/ESA: Programmer's Guide to the Server-Requester Programming Interface for VM*, SC24-5455
- *VM/ESA: CPI Communications User's Guide*, SC24-5595
- *Common Programming Interface Communications Reference*, SC26-4399
- *Common Programming Interface Resource Recovery Reference*, SC31-6821

End Use

- *z/VM: CP Command and Utility Reference*, SC24-5967
- *VM/ESA: CMS Primer*, SC24-5458
- *z/VM: CMS User's Guide*, SC24-5968
- *z/VM: CMS Command Reference*, SC24-5969
- *z/VM: CMS Pipelines User's Guide*, SC24-5970
- *z/VM: CMS Pipelines Reference*, SC24-5971
- *CMS/TSO Pipelines: Author's Edition*, SL26-0018
- *z/VM: XEDIT User's Guide*, SC24-5972
- *z/VM: XEDIT Command and Macro Reference*, SC24-5973
- *z/VM: Quick Reference*, SC24-5986

Diagnosis

- *z/VM: System Messages and Codes*, GC24-5974
- *z/VM: Diagnosis Guide*, GC24-5975
- *z/VM: VM Dump Tool*, GC24-5887
- *z/VM: Dump Viewing Facility*, GC24-5966

Publications for Additional Facilities

DFSMS/VM®

- *VM/ESA: DFSMS/VM Function Level 221 Planning Guide*, GC35-0121
- *VM/ESA: DFSMS/VM Function Level 221 Installation and Customization*, SC26-4704
- *VM/ESA: DFSMS/VM Function Level 221 Storage Administration Guide and Reference*, SH35-0111
- *VM/ESA: DFSMS/VM Function Level 221 Removable Media Services User's Guide and Reference*, SC35-0141
- *VM/ESA: DFSMS/VM Function Level 221 Messages and Codes*, SC26-4707
- *VM/ESA: DFSMS/VM Function Level 221 Diagnosis Guide*, LY27-9589

OSA/SF

- *Planning for the System/390 Open Systems Adapter Feature*, GC23-3870
- *VM/ESA: Open Systems Adapter Support Facility User's Guide*, SC28-1992
- *S/390: Open Systems Adapter-Express Customer's Guide and Reference*, SA22-7403

Language Environment®

- *Language Environment for OS/390 & VM: Concepts Guide*, GC28-1945
- *Language Environment for OS/390 & VM: Migration Guide*, SC28-1944
- *Language Environment for OS/390 & VM: Programming Guide*, SC28-1939
- *Language Environment for OS/390 & VM: Programming Reference*, SC28-1940
- *Language Environment for OS/390 & VM: Writing Interlanguage Communication Applications*, SC28-1943
- *Language Environment for OS/390 & VM: Debugging Guide and Run-Time Messages*, SC28-1942

Publications for Optional Features

CMS Utilities Feature

- *VM/ESA: CMS Utilities Feature*, SC24-5535

TCP/IP Feature for VM/ESA

- *z/VM: TCP/IP Level 3A0 Planning and Customization*, SC24-5981
- *z/VM: TCP/IP Level 3A0 User's Guide*, SC24-5982
- *IBM z/VM: TCP/IP FL 3.2.0 Programmer's Reference*, SC24-5983
- *z/VM: TCP/IP Level 3A0 Messages and Codes*, GC24-5984
- *z/VM: TCP/IP Level 3A0 Diagnosis Guide*, GC24-5985

OpenEdition® DCE Feature for VM/ESA®

- *OpenEdition DCE for VM/ESA: Introducing the OpenEdition Distributed Computing Environment*, SC24-5735
- *OpenEdition DCE for VM/ESA: Planning*, SC24-5737
- *OpenEdition DCE for VM/ESA: Configuring and Getting Started*, SC24-5734
- *OpenEdition DCE for VM/ESA: Administration Guide*, SC24-5730
- *OpenEdition DCE for VM/ESA: Administration Reference*, SC24-5731
- *OpenEdition DCE for VM/ESA: Application Development Guide*, SC24-5732
- *OpenEdition DCE for VM/ESA: Application Development Reference*, SC24-5733
- *OpenEdition DCE for VM/ESA: User's Guide*, SC24-5738
- *OpenEdition DCE for VM/ESA: Messages and Codes*, SC24-5736

LAN Resource Extension and Services/VM

- *LAN Resource Extension and Services/VM: Licensed Program Specifications*, GC24-5617
- *LAN Resource Extension and Services/VM: General Information*, GC24-5618
- *LAN Resource Extension and Services/VM: Guide and Reference*, SC24-5622

CD-ROM

The following CD-ROM contains all the IBM libraries that are available in IBM BookManager® format for current VM system products and current IBM licensed programs that run on VM. It also contains PDF versions of z/VM publications and publications for some related IBM licensed programs.

- *Online Library Omnibus Edition: VM Collection*, SK2T-2067

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