Implementing an Enterprise Print Server Using VM/ESA

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The information contained in this presentation was developed as a result of a residency at the ITSO Poughkeepsie in the summer of 1999 which resulted the IBM Redbook, *TCP/IP Solutions for VM/ESA*, SG24-5459-00

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- Erich Amrehn, Roy Costa, Mike Schwartz - ITSO Poughkeepsie

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Topics

- Print server consolidation
- Concepts
- Configuring Windows
- Configuring TCP/IP for VM/ESA
- Configuring RSCS
- Printing from VM/ESA
- Printing from Windows
- Conclusions and action plan
Multiple network print servers managing network printers
PC workstations with attached printers
Individually managed print servers
Additional printing capacity requires more printers and servers
High speed printers only available to S/390 applications
PC to/from S/390 printing requires file transfer
Network print servers eliminated
Queue management function is provided by VM/ESA
Print queues reside on large, reliable S/390 attached disk
Any TCP/IP LPR client can print to any printer
All printers managed centrally
Enterprise printing for VM/ESA

- CMS users can print to any IP printer
  - Printing via domain name or IP address
  - Postscript printing via the LPR or PPS command
- Host creation of Postscript files using the Document Composition Facility (DCF, aka SCRIPT)
- Workstation users can print to any desired printer using the VM system as the print server
  - Host attached printers
  - IP printers
- Single point of management for any and all printers:
  - Mainframe line printers
  - High capacity quality printers
  - LAN printers
  - Workstation attached printers
- IBM Redbook *TCP/IP Solutions for VM/ESA*, SG24-5459

Print server consolidation

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Concepts

- Configuration of both TCP/IP and RSCS required
  - Use RSCS LPD not TCP/IP LPSERVE function
- LPD serves workstation print requests
  - Local printers on VM/ESA
  - Remote printers through RSCS
  - TCP/IP printers
  - PSF printers
- VM/ESA print requests
  - LPR synchronous direct to the LPD which controls the printer
  - LPR asynchronous through RSCS
  - PPS asynchronous through RSCS
- TCP/IP printers are not dedicated to VM/ESA
- Dedicated links in RSCS or pool of links
## Required documentation

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A short reference to PCL Commands, Basic Page Formatting, and Font Selection is available on the Hewlett-Packard Web site at:
http://www.interactive.hp.com/cgi-bin/cspt/ljxxxx/dyndocwrap.pl?lid=general&fid=bpl02705

## Concepts

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Chart 9
Configuring Windows to receive print from VM/ESA

- Windows 95/98 does not include an LPD

- Windows NT 4 LPD "TCP/IP Print Server" less than robust
  - If used, printer queues must be renamed to conform to LPD rules

- 3rd party LPD server recommended, many available
  - We used NIPrint from Network Instruments, Inc. during residency
  - Maps selected installed printers to a printer name for use with LPR
Configuring Windows NT 4 as a print client

- Windows NT 4 includes a LPR port monitor
- Provides for seamless Windows NT network printing
- Port monitor configured using the Add Printer Wizard
- LPR command also provided in Windows NT 4
Using the Add Printer Wizard on the port selection menu, click "Add Port...", then select "LPR Port" and click "New Port..."
Enter the name or address of the VM/ESA system providing the LPD server and the printer queue name as defined in LPDXMANY CONFIG.
The IBM LPR Remote Printing Client utility provides a TCP/IP print monitor port driver for seamless Windows 95/98 network printing.

This package also includes a command line LPR, RFC 1179, executable program for printing jobs directly from DOS.

Available **at no charge** from the IBM Printing Systems web site for use with IBM Network Printers and IBM InfoPrint printers.

ACITS LPR Remote Printing Windows 95/98 and NT 4.0 available from the University of Texas at Austin for non-IBM printers for a charge.

Other 3rd party LPR port monitors or clients available.
Changes required to PROFILE TCPIP on TCPMAINT's 198

- Comment out LPSERVE in the AUTOLOG section
  
  ; LPSERVE PASSWORD ; LP Server

- Comment out LPSERVE and add RSCS in the PORT section
  
  ; 515 TCP LPSERVE ; LP Server
  515 TCP RSCS ; LP Server

Install the latest RSU to get any fixes for LPR

Install the PTF for APAR PQ29745 to correct a problem with the LPR command not uppercasing the FORM, PREFIX and SUFFIX data
Configuring RSCS

- Install the latest RSU to get any fixes for LPR and LPD
  - Must be at RSU 9803 or higher

- Install PTF UV60455 for APAR VM62277 to correct several problems in LPR printing discovered during the residency

- Change RSCS's PROFILE GCS on P684096K's 401
  
  GLOBAL LOADLIB RSCS RSCSEXIT
RSCSDNS Server

- RSCSDNS provide an interface to the domain name server for use by LPR links in RSCS.
- Should be pre-defined if installing VM/ESA 2.4.0.
- If running VM/ESA 2.3.0 or earlier, RSCSDNS userid must be defined and a PROFILE EXEC created.

```/ * RSCSDNS PROFILE EXEC */
  'ACCESS 403 B'    /* access GETHOSTC MODULE */
  'ACCESS 592 C'    /* access TCPMAINT disk */
  'GLOBAL LOADLIB SCEERUN' /* LE runtime library */
  'GETHOSTC'        /* invoke DNS interface */
```
RSCSDNS Server ...

- RSCSDNS userid definition

```
USER RSCSDNS XXXXXXXX 8M 16M G
  IPL CMS PARM AUTOCR
  MACHINE ESA
  OPTION SVMSTAT LANG AMENG
  XAUTOLOG GCS
  CONSOLE 001F 3215 T OPERATOR
  SPOOL 000C 2540 READER A
  SPOOL 000D 2540 PUNCH A
  SPOOL 000E 1403 A
  LINK P684096K 0403 0403 RR
  LINK MAINT 0190 0190 RR
  LINK MAINT 019E 019E RR
  LINK TCPMAINT 0592 0592 RR
  MDISK 0191 3390 2798 001 240RES MR
```
Setting up LPD in RSCS

- Add to RSCS's PROFILE GCS on P684096K's 401
  ```
  FILEDEF LPD DISK LPDXMANY CONFIG
  ```
- Define LPD-type links in RSCS CONFIG (same disk)
  ```
  LINKDEFINE LPD1 TYPE LPD
  LINKDEFINE LPD2 TYPE LPD
  PARM LPD1 EXIT=LPDXMANY EP='C=LPDXMANY' TIMEOUT=300
  PARM LPD2 EXIT=LPDXMANY EP='C=LPDXMANY' TIMEOUT=300
  ```
- Multiple LPD links should be defined so that workstation users can always connect
- Increase timeout to allow for network response time problems
- Add to RSCS's PROFILE GCS after 'RSCS INIT' to start LPDs
  ```
  START LPD1
  START LPD2
  ```
Setting up LPD in RSCS ...

- Copy LPDXMANY CONFSAMP from P684096K's 406 to 401 as LPDXMANY CONFIG

- This file can be quite confusing to set up, check the Redbook for more information

- Define a DEFAULT entry for the most common configuration of printer in your installation

- Define additional entries for every other printer OR pool of printers in your installation, i.e. every print queue
Setting up LPR in RSCS

- Add to RSCS's PROFILE GCS on P684096K's 401
  
  FILEDEF LPR DISK LPR CONFIG
  FILEDEF LPRP DISK LPRP CONFIG
  FILEDEF LPRXFORM DISK LPRXFORM CONFIG

- Define the LPRXFORM exit in RSCS CONFIG (same disk)
  
  EXIT 0 ON LPRXFM00
  EXIT 1 ON LPRXFM01

- Create an LPRXFORM CONFIG (same disk)
Setting up LPR in RSCS ... 

- **LPRXFORM CONFIG (partial)**

```
FORM=HP890C
HOSTNAME=TOT48.ITSO.IBM.COM
PRINTER=HP890C
SEP=YES
PREFIX=1B45
PREFIX=1B28733050
PREFIX=1B2873313248
PREFIX=FF04
PREFIX=1B45
SUFFIX=1B45
*
FORM=NPPS
FORMSUB=P+ASCII
SEP=YES
PREFIX=252150532D41646F62650D0A
PREFIX=73746174757364696374206265676966E2066616C736574706C65
PREFIX=65786D6F646520322073657470617065727472617920656E640D0A
PREFIX=FF04
PREFIX=252150532D41646F62650D0A
PREFIX=73746174757364696374206265676966E2066616C736574706C65
PREFIX=786D6F646520322073657470617065727472617920656E640D0A
```

Configuring RSCS
Setting up LPR in RSCS ...

LPRXFORM CONFIG (partial)

FORM=NP
SEP=YES
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2066616C7365207365746475706C
PREFIX=65786D6F646520322073657470617065727472617920656E640D0A
PREFIX=FF04
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2066616C7365207365746475706C
PREFIX=786D6F646520332073657470617065727472617920656E640D0A
*
FORM=STANDARD
SEP=YES
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2066616C7365207365746475706C
PREFIX=65786D6F646520322073657470617065727472617920656E640D0A
PREFIX=FF04
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2066616C7365207365746475706C
PREFIX=786D6F646520332073657470617065727472617920656E640D0A

Configuring RSCS
Setting up LPR in RSCS ...

- Define the LPR-type links in RSCS CONFIG (same disk)
- Definition for a pool of IBM Network Printer 24s

```
LINKDEFINE NP24PSA TYPE LPR FORM * AST
LINKDEFINE NP24PSB TYPE LPR FORM * AST
LINKDEFINE NP24PSC TYPE LPR FORM * AST
PARM NP24PSA EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP' HOST=9.12.2.5 PR=PASS
PARM NP24PSB EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP' HOST=9.12.2.6 PR=PASS
PARM NP24PSC EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP' HOST=9.12.2.8 PR=PASS
ROUTE GROUP NP24PS TO LINK NP24PSA NP24PSB NP24PSC
```
Setting up LPR in RSCS

- Generic printers are mapped to real printers via LPRXFORM
- Generic PostScript printer definitions

```plaintext
LINKDEFINE LPRP1 TYPE LPR FORM * AST
...
LINKDEFINE LPRP8 TYPE LPR FORM * AST
PARM LPRP1 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
...
PARM LPRP8 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
ROUTE GROUP LPRP TO LINK LPRP1 ... LPRP8
```

- Generic non-PostScript printer definitions

```plaintext
LINKDEFINE LPR1 TYPE LPR FORM * AST
...
LINKDEFINE LPR8 TYPE LPR FORM * AST
PARM LPR1 EXIT=LPRXONE ITO=0 US=Y SYS=Y EP='S=Y FF=N C=LPR'
...
PARM LPR8 EXIT=LPRXONE ITO=0 US=Y SYS=Y EP='S=Y FF=N C=LPR'
ROUTE GROUP LPR TO LINK LPR1 ... LPR8
```
Setting up LPR in RSCS ...

- EXECs in Redbook to transform EBCDIC to ASCII HEX
- PCL prefix and suffix strings defined in LPRXFORM

```
FORM=HP890C
HOSTNAME=TOT48.ITSO.IBM.COM
PRINTER=HP890C
SEP=YES
PREFIX=1B45
PREFIX=1B28733050
PREFIX=1B2873313248
PREFIX=FF04
PREFIX=1B45
SUFFIX=1B45
```

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<th>Hex value</th>
<th>ASCII value</th>
<th>Description</th>
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<tbody>
<tr>
<td>1B45</td>
<td>escE</td>
<td>Reset</td>
</tr>
<tr>
<td>1B28733050</td>
<td>esc(s0P</td>
<td>Monospace font</td>
</tr>
<tr>
<td>1B2873313248</td>
<td>esc(s12H</td>
<td>Pitch 12 CPI</td>
</tr>
<tr>
<td>FF04</td>
<td></td>
<td>Separator placement</td>
</tr>
</tbody>
</table>
### PostScript prefix and suffix strings defined in LPRXFORM

FORM=NPPS  
FORMSUB=P+ASCII  
SEP=YES  
PREFIX=252150532D41646F62650D0A  
PREFIX=7374617475736469637420626567696E2066616C7365207365746564675706C  
PREFIX=65786D6F6465203220736574706170657472617920656E640D0A  
PREFIX=FF04  
PREFIX=252150532D41646F62650D0A  
PREFIX=7374617475736469637420626567696E2066616C7365207365746564675706C65  
PREFIX=786D6F6465203220736574706170657472617920656E640D0A

<table>
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<th>Hex value</th>
<th>ASCII value</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>252150532D41646F62650D0A</td>
<td>%!PS-Adobe CRLF</td>
<td>PostScript header</td>
</tr>
<tr>
<td>7374617475736469637420626567696E2066616C7365207365746564675706C</td>
<td>statusdict begin false setduplexmode 0 setpapertray end CRLF</td>
<td>Paper tray 0, duplex off</td>
</tr>
<tr>
<td>75706C65786D6F6465203220736574706170657472617920656E640D0A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7374617475736469637420626567696E2066616C7365207365746564675706C65</td>
<td>statusdict begin true setduplexmode 1 setpapertray end CRLF</td>
<td>Paper tray 1, duplex on</td>
</tr>
<tr>
<td>FF04</td>
<td></td>
<td>Separator placement</td>
</tr>
</tbody>
</table>
LPRSET, LPR and PPS commands utilized
LPRSET used to set defaults for LPR

lprset (perm asynch rscs np24ps,totvm1
Ready; T=0.03/0.04 11:32:10
lprset (query
Printer and host values have not been defined
Server is defined as: RSCS (Default)
Printer is connected on link: NP24PS
Printer is connected on node: TOTVM1
LPR mode: ASYNCHRONOUS
Ready; T=0.03/0.03 11:32:12
Printing to a PostScript printer

- Printing an EBCDIC file to our Network Printer pool
  
  PPS filename filetype (PRINTER NP24PS FORM NP
  PPS filename filetype (PRINTER NP24PS
  LPR filename filetype (RSCS NP24PS,TOTVM1 FORM NP
  LPR filename filetype (RSCS NP24PS,TOTVM1
  LPR filename filetype

- Printing a PostScript file to our Network Printer pool
  
  PPS filename filetype (PRINTER NP24PS FORM NPPS
  LPR filename filetype (RSCS ASCII,NP24PS FORM NPPS
  LPR filename filetype (RSCS NP24PS,TOTVM1 FORM NPPS
  LPR filename filetype (FORM NPPS

- PostScript file created by DCF (Script), uploaded from a workstation, or created by a utility program

- It is NOT possible to print an ASCII (including PCL) file using the PostScript printer exit (LPRXPSE)
Printing to a non-PostScript printer

- Can print non-Postscript ASCII (including PCL) and EBCDIC through LPRXONE exit
- Use LPR command (not PPS)

To print an EBCDIC file on our HP890C

```
LPR filename filetype (FORM HP890C
```

To print an ASCII (including PCL) file on our HP890C

```
LPR filename filetype (FORM HP890C RSCS ASCII,LPR
```
i-data Print Subsystem for VM

- Product of i-data international
- ida PSS transforms AFP into PCL and PostScript
  - Dynamic scaling to 300 pel
- Runs as a GCS service machine support PSF syntax
- Binary files (formatted PCL or PostScript) can be printed transparently
- Direct interface to TCP/IP printers
  - Program available for "batch" conversion, a utility to convert AFP or EBCDIC "line" data into PostScript or PCL
Printing from Windows

- Printing to a network printer
  - Just select a printer you defined on a TCP/IP port and print to it
  - Print output will be routed to VM/ESA through TCP/IP
  - Print output will be routed from VM/ESA by RSCS through TCP/IP to the selected printer

- Printing to a host printer
  - For non-AFP printers, the host printer should be defined in LPDXMANY CONFIG with the TRAN option to translate the file to EBCDIC
  - For AFP printers use the IBM AFP printer driver for Windows and define the printer in LPDXMANY CONFIG as a PSF printer
Sources of Information on the Internet

- VM/ESA http://www.ibm.com/s390/vm/
  - Select "Support", then "Fixes, printer drivers and updates", then "Network Printers Utilities and Microcode" then follow the instructions under "IBM LPR Remote Printing Client Version 2.30 for Windows 95"
- IBM Printing Systems - AFP Printer Drivers for Windows
  - Select "Support", then "Fixes, printer drivers and updates", then "IBM AFP printer drivers for Windows" and follow the instructions
Sources of Information on the Internet ...

- ACITS LPR Remote Printing for Windows 95/98 and NT 4.0
  http://www.utexas.edu/academic/otl/software/lpr/

- NIPrint from Network Instruments, Inc.
  http://www.netinst.com/

- ida PSS from i-data international
  http://www.i-data.com/
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