Getting Started with VM TCP/IP

The Basics

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This presentation is a gentle introduction to VM TCP/IP. It discusses the major components of VM TCP/IP, software configuration options, as well as the practical aspects of the IBM System/390 Open Systems Adapter.

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Agenda

- VM TCP/IP Overview
  - Architecture
  - Capabilities

- Software Configuration
  - Configuration Files
  - Security
  - Operations

- Hardware
  - Open Systems Adapter
  - Integrated Communications Adapter
VM TCP/IP Overview
TCP/IP Protocol Stack

- Application
- Presentation
- Session
- Transport
- Network
- Data Link
- Physical

- ftp, http, telnet
- sockets
- tcp
- tcp, udp
- ip, icmp, arp
- device drivers
- hardware

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The Data Link Layer

- Contains device drivers to perform I/O
- Converts packets to/from medium-specific frames
- Frame error checking

IP datagram → S/390 I/O → IEEE 802.3 → MAC frame
The Network Layer

- Understands content of packets
- Aware of network topology
- Knows link status
- Routes packets
  - Outbound to correct link
  - Inbound to transport layer (TCP or UDP)
  - Between links (IP routing)
The Transport Layer

- **UDP - User Datagram Protocol**
  - Connectionless
  - Datagrams may be fragmented
  - Datagrams or fragments may arrive out of sequence
  - Datagrams or fragments may be lost
  - Application must provide retransmission logic

- **TCP - Transmission Control Protocol**
  - Connection-oriented
  - Guaranteed delivery
    - No lost data, sequence maintained
    - No retransmission logic required
Presentation Layer - Sockets

- **C**
  - BSD
  - Portable
  - IBM extensions
  - Uses IUCV

- **Pascal**
  - Control functions
  - State-change programming model
  - Uses VMCF

- **Rexx**
  - Similar to C
  - Support for RxWait and MT EventWait
  - Uses IUCV

- **Assembler**
  - IUCV
  - VMCF
Open APIs

- Remote procedure call (RPC)
- X-Windows**
- Encryption & Authentication - Kerberos
- SNMP distributed programming interface
These are programs: clients and servers

Provides services (Real Work)

May be distinct application or may be API

Two flavors
  - Standard, governed by RFC
  - Homegrown to meet specific needs
Standard Applications

- Domain Name System ..... dns, dig, nslookup
- User login ......................... telnet, tn3270
- File serving ....................... network file system
- File Transfer ..................... ftp, uft, tftp
- Printing ............................ lpr, tn3270e
- E-mail .............................. smtp, note, sendfile
- Network computers .......... dhcp, bootp, tftp
- Remote execution ............. rexec, rsh
- Network management .... snmp
- Dynamic routing .............. rip
Software Configuration
Server Disk Structure

- **191 - A disk**
  - PROFILE EXEC - do not modify!
  - trace files

- **198 - Configuration Files**

- **591 - Server**
  - No modifications

- **592 - Client**
  - TCPIP DATA
  - HOSTS
  - FTP DATA
Configuration is controlled by

- Server startup parameters
- PROFILE TCPIP file
- TCPIP DATA file
- Application server configuration files
- Translation tables
Server Startup Parameters

SYSTEM DTCPARMS file

: nick.TCPIP  : type.server  : class.stack
: attach.430-431, 320-321
: vctc.200 tcpip2 200, 201 tcpip2 201

: nick.FTPSERVE  : type.server  : class.ftp
: anonymous.yes

Server profile exits

- Global (TCPRUNXT EXEC)
- Server-specific defined by the :Exit. tag
PROFILE TCPIP

- Contains information used by TCP/IP stack
  - Host identification and contact information
  - Initial control block allocations
  - Authorizations
  - Services to start
  - Telnet server ("internal client") startup parameters
  - Routing

TCPMAINT 198, sample: PROFILE STCPIP
Routing

- **Static**
  - Use GATEWAY statement

- **Dynamic**
  - Use BsdRoutingParms statement
  - RouteD server
  - RIP1 or RIP2
  - Virtual IP Addressing (VIPA)
  - VM can broadcast routes for attached guests
TCPIP DATA

- Contains information used by VM clients and servers
  - Local host name
  - Local domain name
  - Stack virtual machine
  - Name servers to use
  - E-mail servers
  - Name resolver preferences

- Can contain data for multiple VM systems

- TCPMAINT 592
  sample: TCPIP SDATA
Some servers have their own configuration files
- SMTP, DNS, FTP, NFS

Format may be unique to VM or common with UNIX
- Security options often found here

Duplicate servers may need private copy

TCPMAINT 198, samples: xxxxx SCONFIG
Translation Tables

- Control EBCDIC-ASCII translation

- Need to know code page used on VM and on PC
  - OpenEdition = 1047, ISO 8859-1 = 819
  - ISO 8859-15 = 924 (ebcdic), 923 (ascii)

- Non-reversible 7-bit ASCII (0x00-0x7F only!) is the default, a.k.a STANDARD

- See [http://www.ibm.com/vm/euro](http://www.ibm.com/vm/euro) for a complete discussion of code pages
Security

- Superuser definitions
- Protecting well-known port numbers
- Auditing, logging, accounting
- Interface with External Security Manager
- Control which VM users may or may not use TCP/IP services
  - Useful with multiple stacks
- Control network access to telnet, ftp, smtp, nfs
- Local protocol restrictions
  - e.g. FTP PUT only, no GET
NETSTAT command provides information and session controls

OBEYFILE command changes PROFILE TCPIP

SMMSG commands for some (not all) servers

Stack port monitor will force/autolog as required

SNMP client can query stack information
The Minimum

PROFILE TCPIP
- IP address
- Subnet mask
- Default gateway
- Network device

SYSTEM DTCPARMS
- Network device addresses on :Attach. tag

TCPIP DATA
- Host name
- Domain name
- IP address of DNS

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Want to Learn More?

Advanced Configuration
- Session 9361 or 9381
- Immediately follows this session!

Routing
- Session 9386
- 3:00 pm, Tuesday
Hardware Selection
Hardware

- Local Area Network
  - Open Systems Adapter

- Wide Area Network
  - X.25

- Point to Point
  - Channel-to-Channel
  - SNA
  - IUCV
OSA: Ethernet or Token Ring (ENTR)

- 16 Mb
- Device type LCS
- Link type IBMTR or ETHERNET
- Two address pairs
  - one pair per port
- OSA/SF not required

Port 0

Token ring RJ45
Ethernet AUI
Ethernet RJ45

Port 1
OSA: Fast Ethernet

- 100 Mb half duplex
- 200 Mb full duplex

- Device type LCS
- Link type ETHERNET
- One address pair
- OSA/SF not required

Ethernet RJ45
OSA: FDDI

- 100Mb
- Device type LCS
- Link type FDDI
- Single address pair
- OSA/SF not required
OSA: ATM Native

- 155 Mb
- LAN emulation
  - Emulates both ports of an ENTR card
  - Device type LCS
  - Link type IBMTR or ETHERNET

- Native
  - Device and link type ATM

- OSA/SF required
OSA: ATM LAN Emulation

Address pair 1

LEC

Address pair 2

LEC

ATM switch

ethernet

LECS

token ring
What is ATM, anyway?

ATM Logical IP Subnets

Typical Local Area Network

IP over ATM

Where are the subnetworks?
Hello. This is 10.9.8.7
My MAC is 123456789ABC

Calling IP  10.9.8.7
My MAC is CAB987654321

What's the ATM addr of IP  10.9.8.7 ?

10.9.8.7 is 3911FF2299999900000000014900203599757201

ATM Address Resolution
OSA: The First Time

1. Unplug wrap plugs from connectors you will **not** be using

2. Leave wrap plugs in connectors you **will** be using
   - You **cannot** have plugs in more than one connector at the same time on the same port. Card will not work.

3. Deactivate and re-activate partition
   - Allow up to 5 minutes for card to come online
Automatic Detection of Cables

Hardware Management Console (HMC)

1. Groups
2. Select CPC
3. CPC Operational Customization
4. OSA Advanced Facilities
5. Select chpid
6. Card Specific Advanced Facilities
7. Enable auto sense on next reset event
8. Take OSA offline, then online
   - Can use CP VARY CHPID instead of HMC
   - Give adapter time to come online
OSA Support Facility

- OSA/SF is required if you want to:
  - Share ports
  - Use with VTAM
  - Use ATM
WAN X.25

- X.25 NPSI with IBM 3745/3746 communications controller
- Usually handled by switch or router, not host
Point to Point

Channel to Channel
- Virtual or real address pair
  - one sends, the other receives
  - sender must be matched to receiver
- Excellent for OS/390 or VSE/ESA guests

IUCV
- Connect to another VM TCP/IP stack on local system
- Connect via PVM to VM TCP/IP stack on remote system
- Connect to Linux for S/390 guest
Point to Point

- **CLAW**
  - High-speed channel connection
  - IBM RISC System/6000
  - CISCO routers

- **SNA**
  - SNALNKA virtual machine is device driver
  - LU Type 0
  - Can communicate with OS/390, VM/ESA, or IBM 3745
  - Can connect to multiple remote hosts
  - Not the same as AnyNet
LAN ICAs unique to IBM 9221

Very old technology

Easy to configure

Not suitable for applications with high data arrival rates
- Network File System (NFS)
- FTP
- Web serving
Summary

- VM TCP/IP has a lot of function
  - You probably don't need everything
  - Keep It Simple

- Read the manual and follow instructions

- Spend some time reading relevant textbooks

- Experiment
Read More About It

- TCP/IP FL320 Planning and Customization, SC24-5847
- TCP/IP Solutions for VM/ESA, SG24-5459
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