

Getting Started with VM TCP/IP

The Basics

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VM/ESA

VSE/ESA

Technical Conference

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

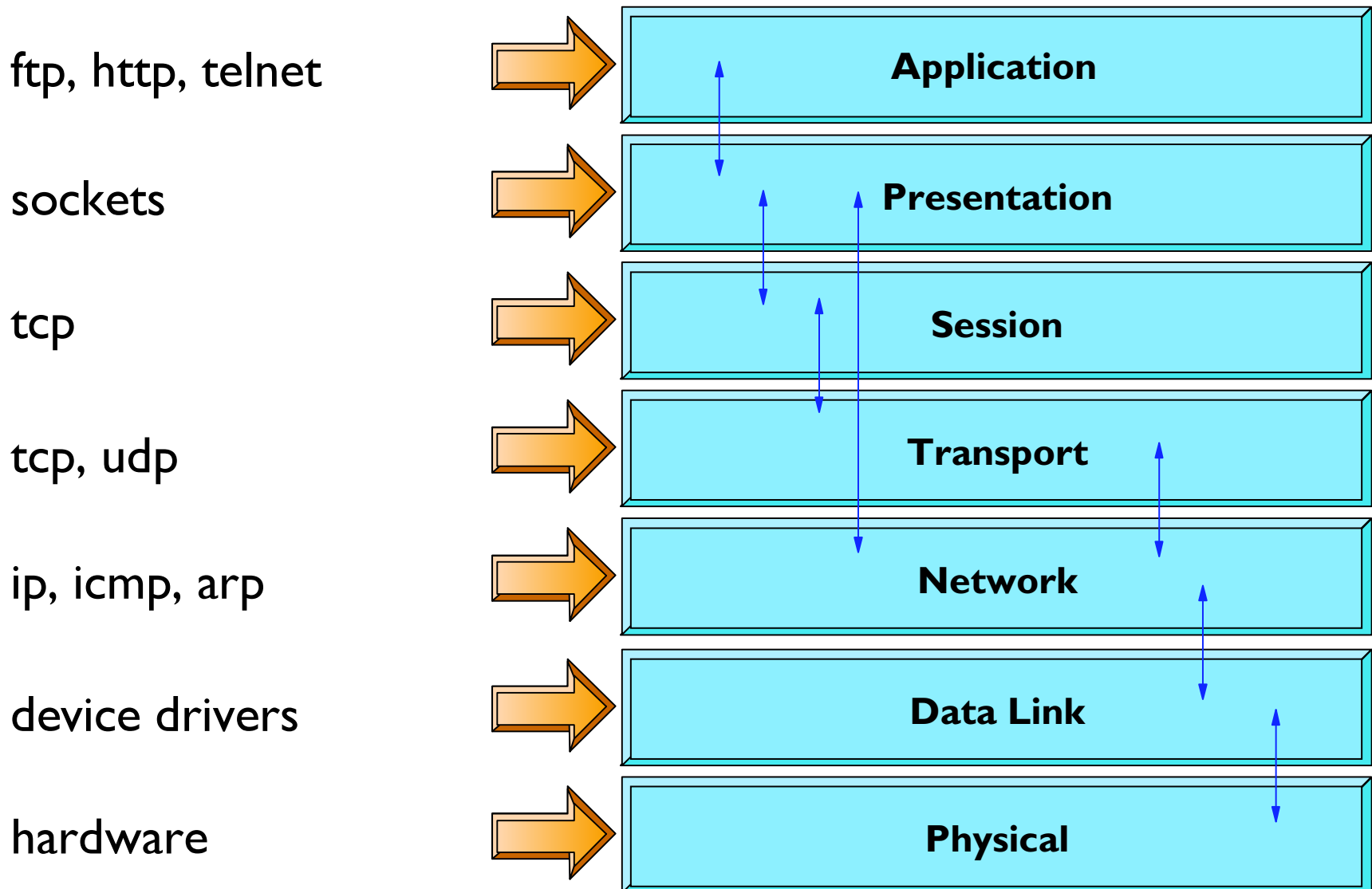
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VM TCP/IP Overview

TCP/IP Protocol Stack



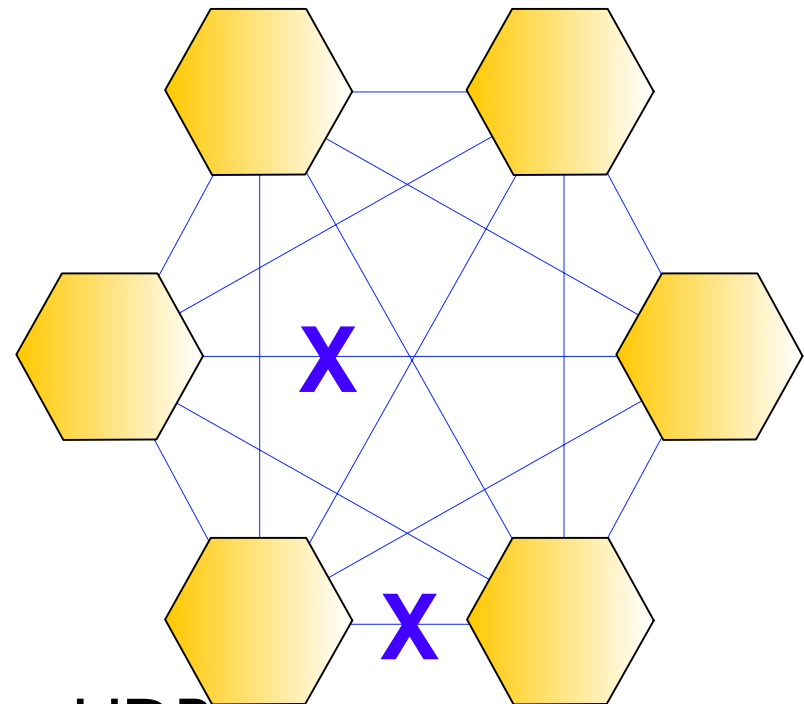
The Data Link Layer

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



The Network Layer

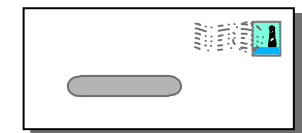
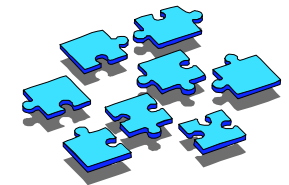
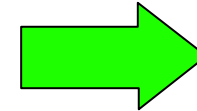
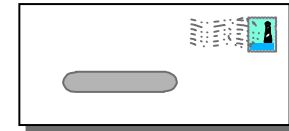
- Understands content of packets
- Aware of network topology
- Knows link status
- Routes packets
 - Outbound to correct link
 - Inbound to transport layer (TCP or UDP)
 - Between links (IP routing)



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



Socket Interface

■ C

- BSD
- Portable
- IBM extensions
- Uses IUCV

■ Rexx

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

■ Pascal

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

■ Assembler

- IUCV
- VMCF

Open APIs

- Remote procedure call (RPC)
- X-Windows**
- Encryption & Authentication - Kerberos
- SNMP distributed programming interface

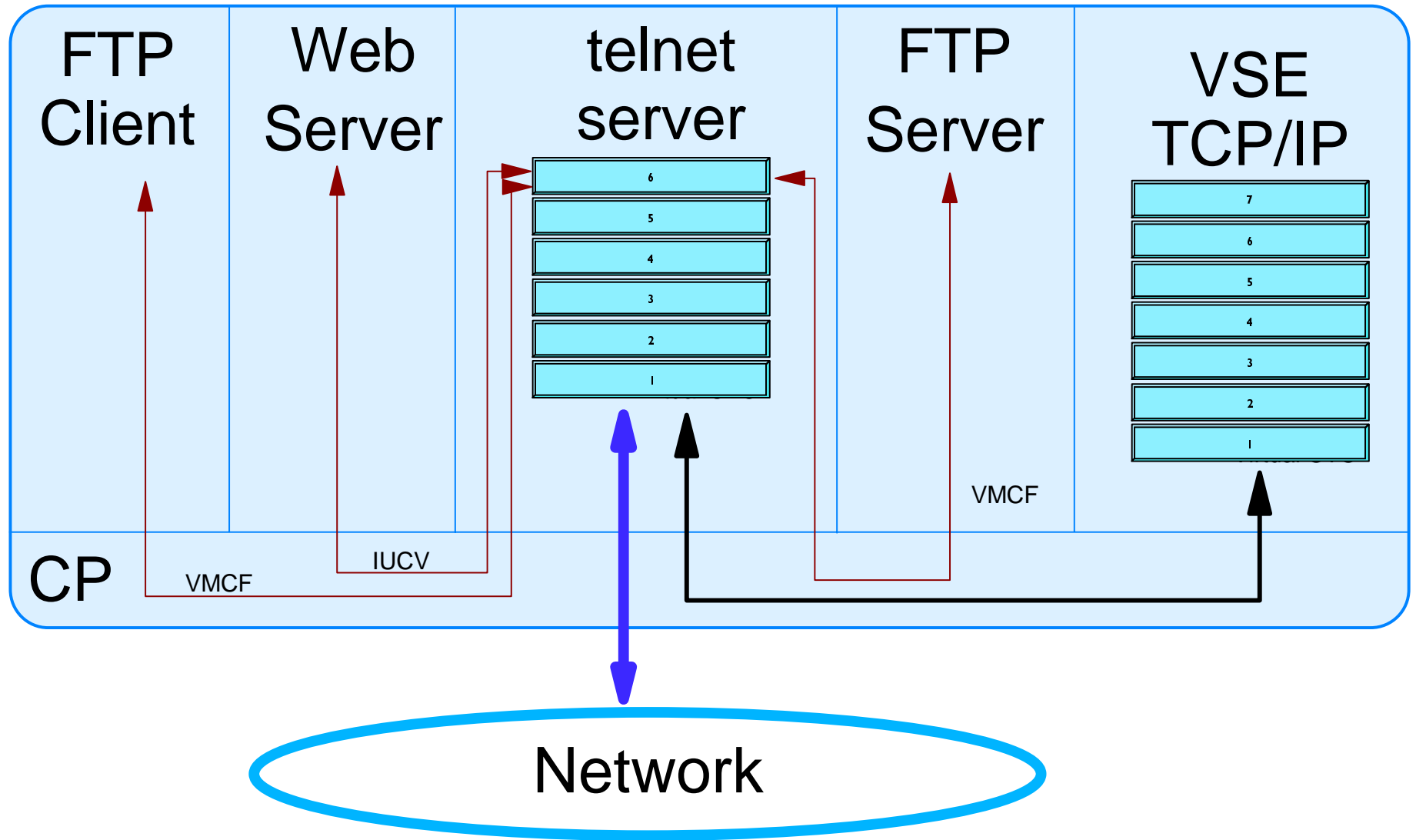
The Application Layer

- 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

An Inside Look



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Software Configuration

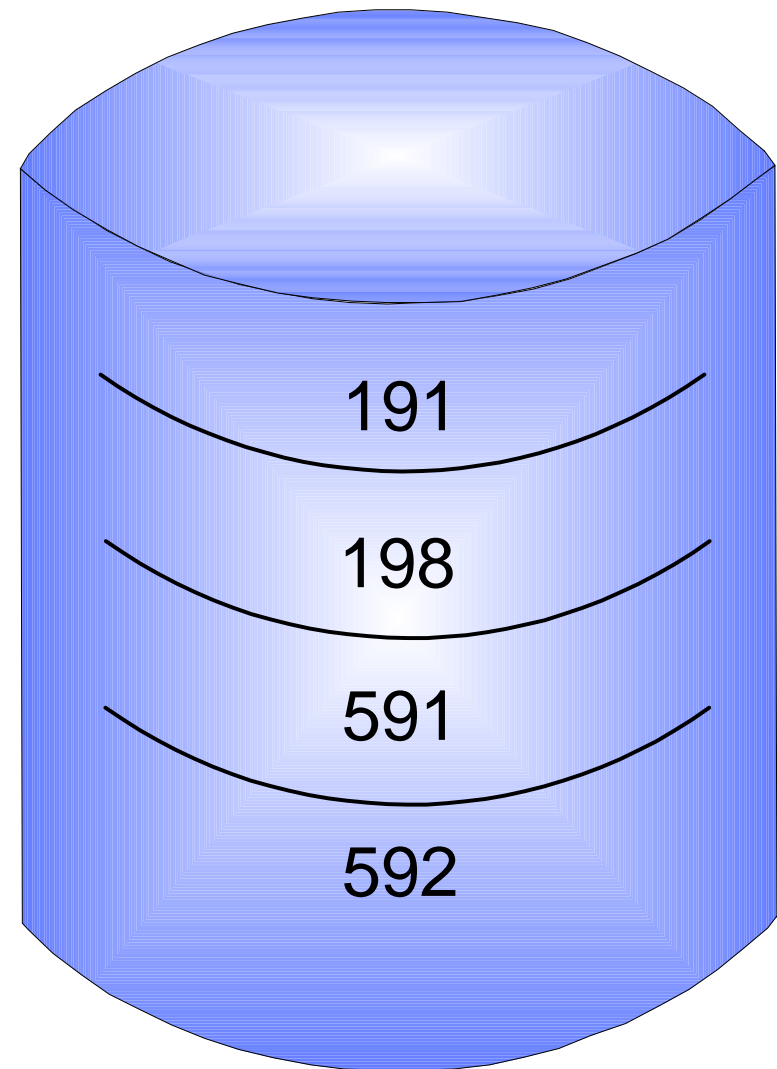
Server Disk Structure

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

- 198 - Configuration Files

- 591 - Server
 - No modifications

- 592 - Client
 - TCPIP DATA
 - HOSTS
 - FTP DATA



Server Configuration

- Configuration is controlled by
 - Server startup parameters
 - PROFILE TCPIP file
 - TCPIP DATA file
 - Application server configuration files
 - Translation tables

Server Startup Parameters

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
- RIPv1 or RIPv2
- 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

Configuration Files

- 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> 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

Operations

- NETSTAT command provides information and session controls
- OBEYFILE command changes PROFILE TCPIP
- SMSG 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

Want to Learn More?

Advanced Configuration

- Session 9381
- Immediately follows this session!

Routing

- Session 9386
- 3:00 pm, Tuesday

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Hardware Selection

Hardware

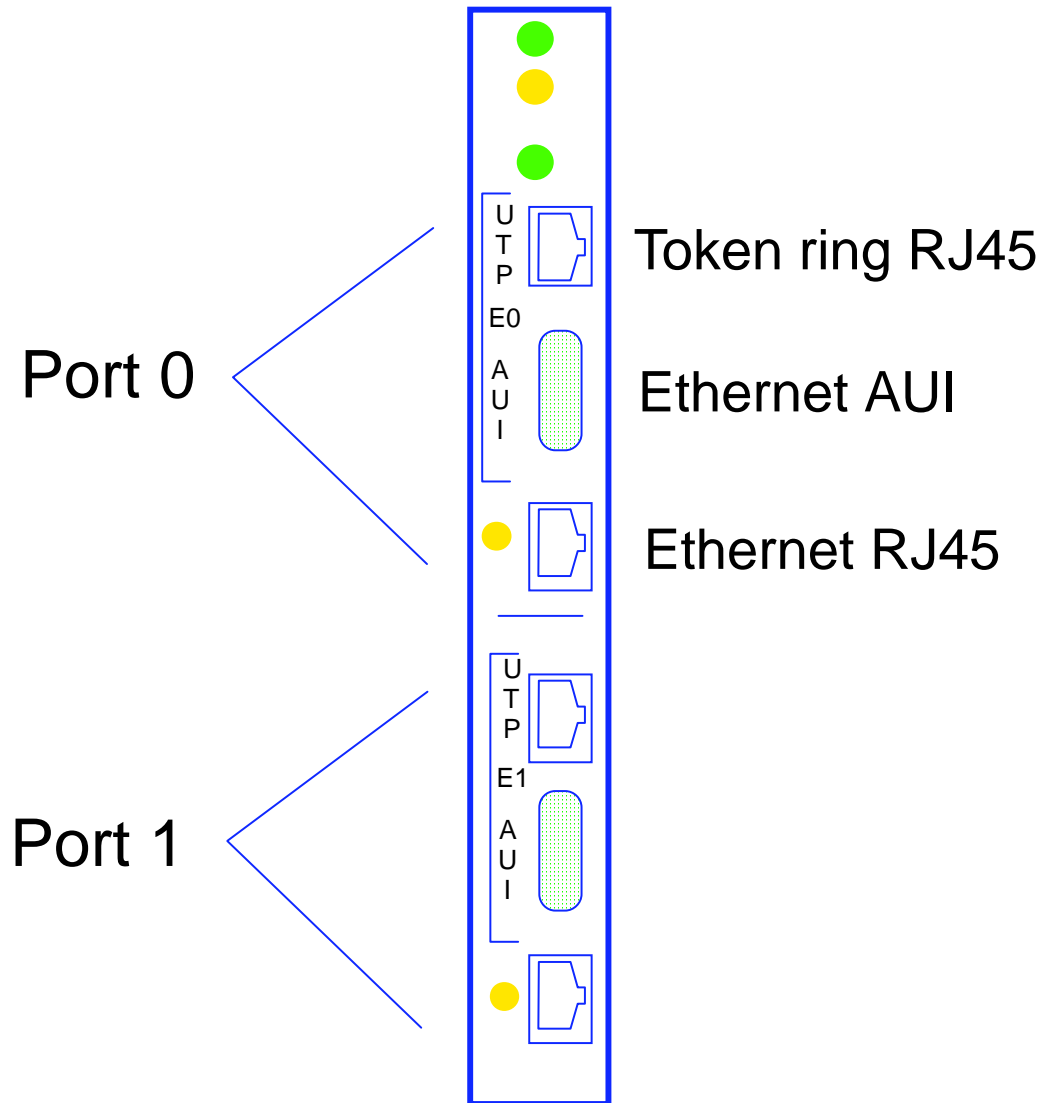
- Local Area Network
 - Open Systems Adapter
- Wide Area Network
 - X.25

- Point to Point
 - Channel-to-Channel
 - SNA
 - IUCV

OSA: Ethernet or Token Ring (ENTR)

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



OSA: Fast Ethernet

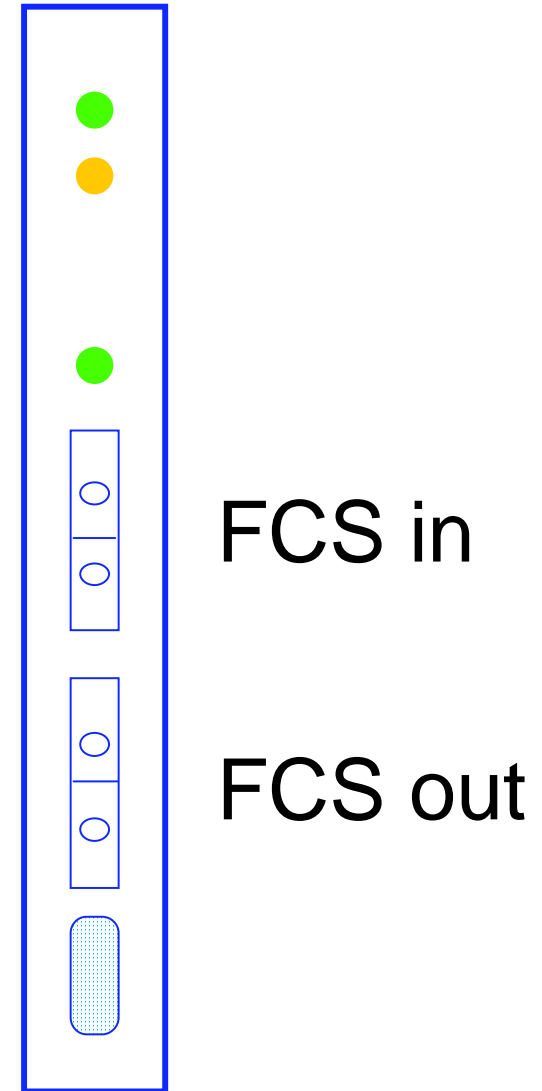
- 100 Mb half duplex
200 Mb full duplex
- Device type **LCS**
- Link type **ETHERNET**
- One address pair
- OSA/SF not required



Ethernet RJ45

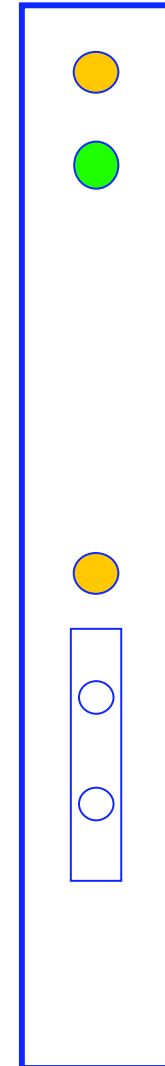
OSA: FDDI

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

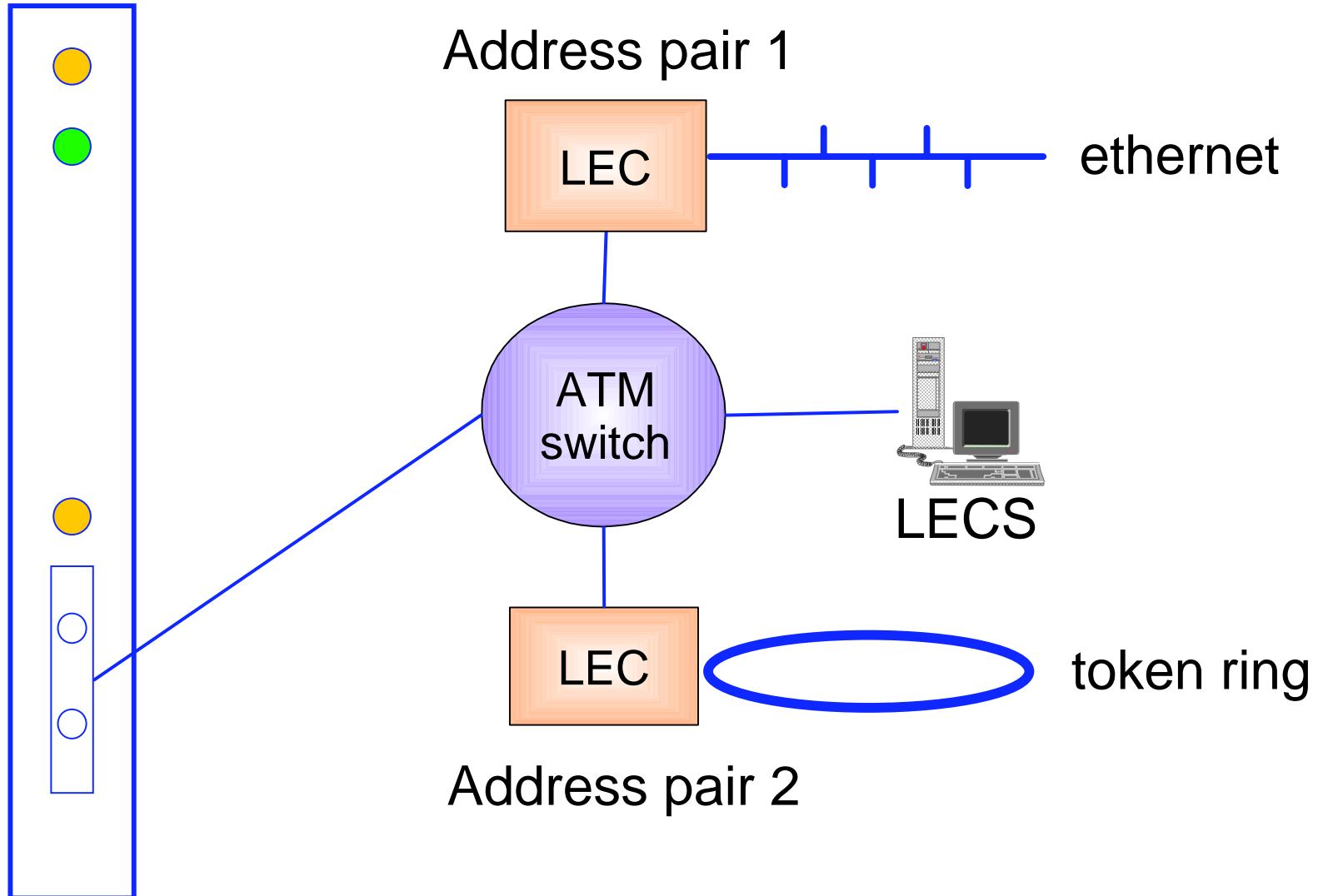


OSA: ATM Native

- 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

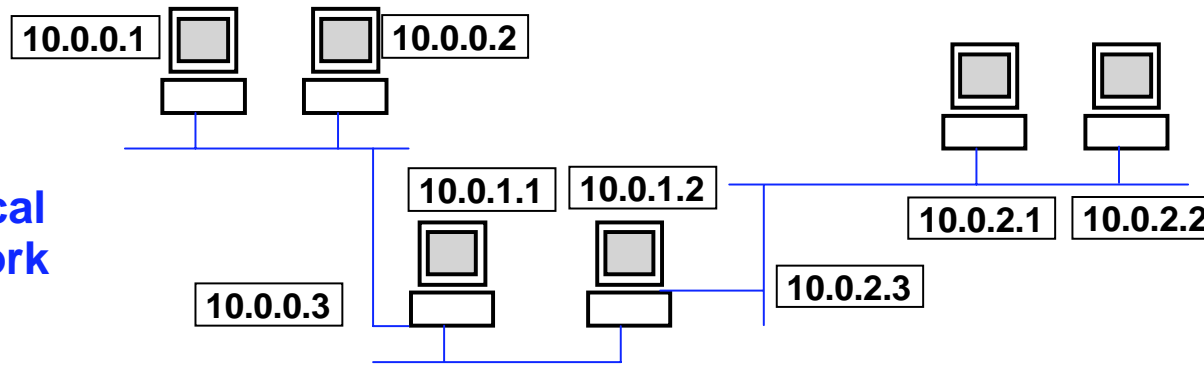


What *is* ATM, anyway?

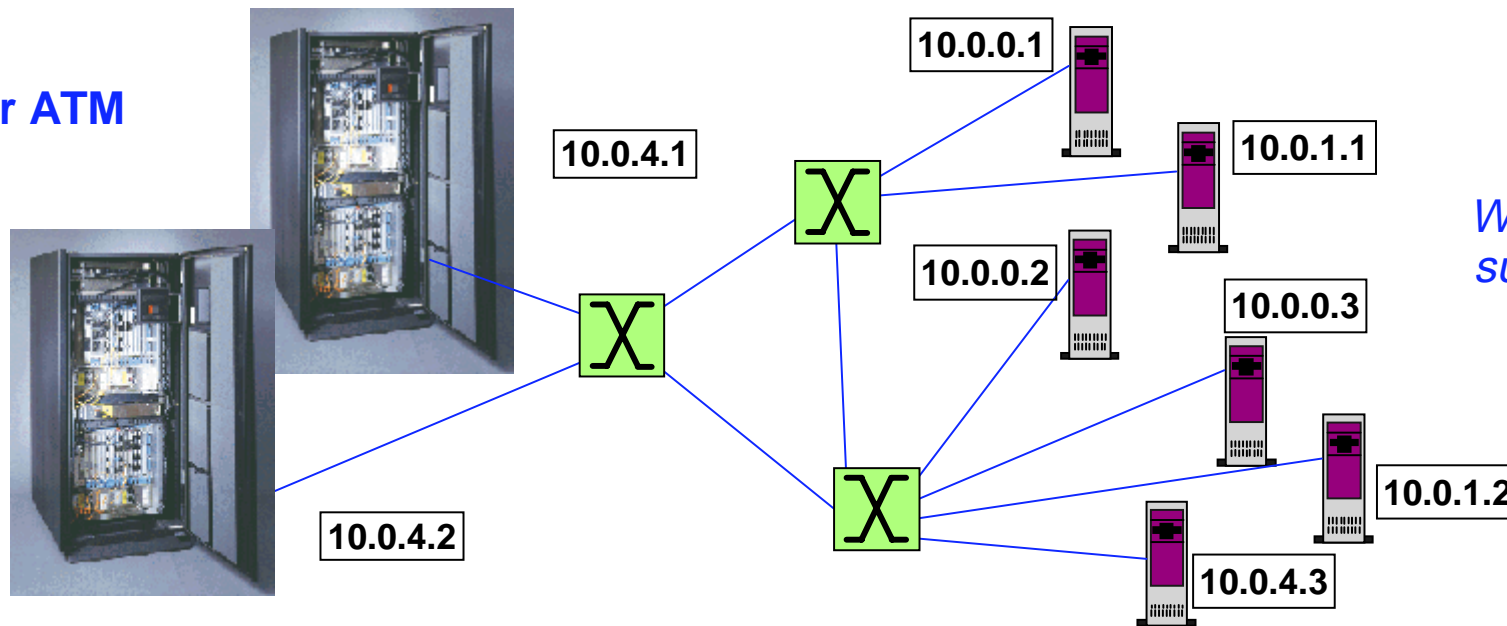
ATM Logical IP Subnets

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Typical Local Area Network

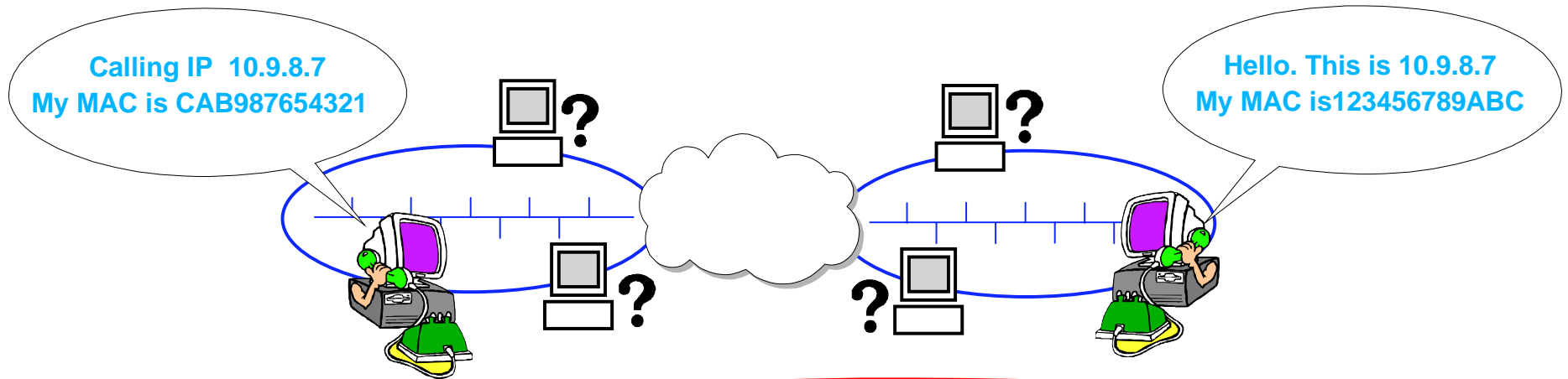


IP over ATM

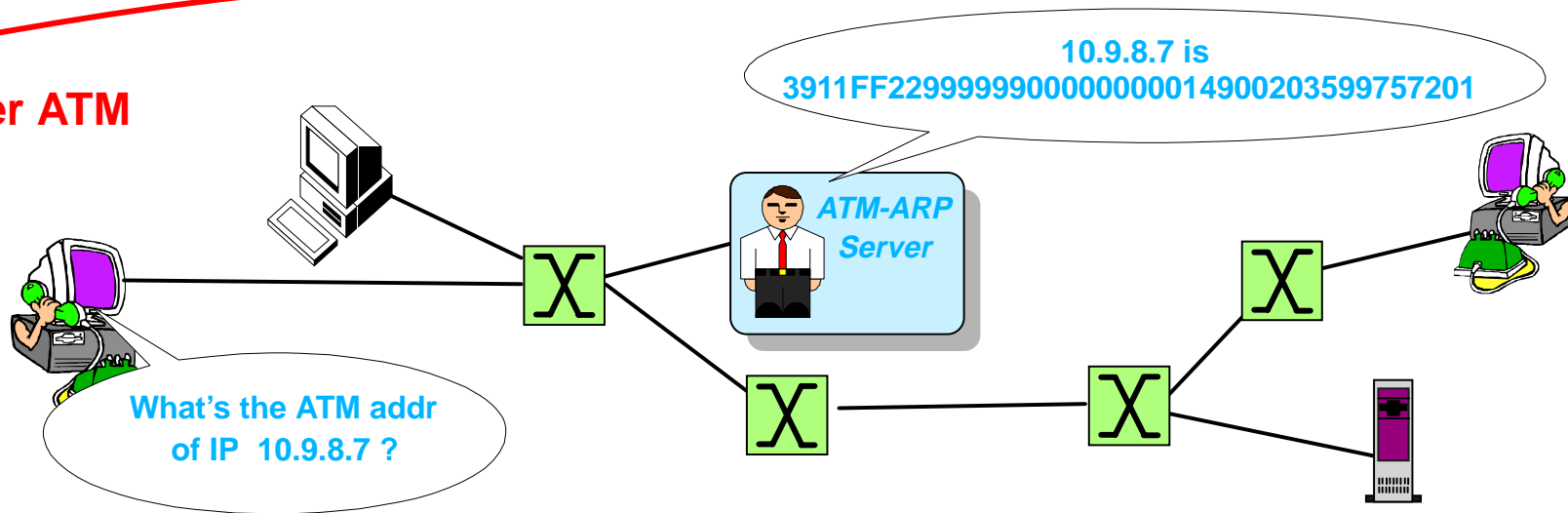


Where are the subnetworks?

ATM Address Resolution



IP over ATM



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

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■ 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

Integrated Communications Adapters

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- 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
- *TCP/IP Illustrated, Volume I*, Stevens,
Addison Wesley, ISBN 0-201-63346-9
- *Internetworking with TCP/IP, Volume I*, Comer,
Prentice Hall, ISBN 0-13-216987-8

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