

z/OS Communications Server Part 2 - Implementing TCP/IP under z/OS

Course Summary

Description

This new, four-day course is the second part of the definitive z/OS Communications Server training program. This course explains in detail how TCP/IP works in a z/OS environment. Installation, profile definition and implementation are all taught in depth. All versions of TCP/IP for z/OS are covered, along with all the servers. Additionally, all the essential and important configuration options are explained and examples are provided.

Extensive hands-on practical sessions, in which each student has their own system to work on, form the central part of the course. These sessions make up approximately 30% of the whole course. Each segment of the course also contains extensive review questions/exercises - thus ensuring that all students fully grasp each topic before moving on to the next.

This course is also available for one-company, on-site presentations and for live presentation over the Internet, via the Virtual Classroom Environment service.

Objectives

At the end of this course, students will be able to:

- Describe the structure, operation and the addressing mechanisms used in a TCP/IP network
- List the major configuration steps involved in customizing TCP/IP for z/OS and explain the Security Server customization required in z/OS
- Explain the purpose and use of Virtual IP addressing (VIPA) and explain how to code for both a static and dynamic VIPA configuration
- Explain the purpose and use of Distributed VIPAs and the need for Sysplex Distributor
- Describe and define devices to TCP/IP for z/OS and explain how to define the TCP/IP for z/OS host IP address(es)
- Describe and define the purpose and customization of the DATA dataset and RESOLVER
- Define the host name, domain name and DNS information
- Describe and define the HOSTS file and the SERVICES dataset
- Explain the configuration of the TN3270 server and the SNA gateway and explain the VTAM configuration required to support the gateway
- Implement a VTAM USS table for TN3270 users
- Describe and define the Telenet servers, INETD and SSHD
- Describe and define the operation and customization of the FTP server and its major security features
- Explain the differences between SFTP and FTPS
- Explain and define the operation and customization of the CSSMTP server and OMPROUTE server
- Describe the purpose and use of the major TCPIP, TSO and USS commands
- Explain how to start, stop and interpret a TCP/IP packet trace and a component trace using IPCS and WireShark
- Explain and define the purpose of the Enterprise Extender
- Explain how the security product Policy Agent is used and why it is needed
- Explain and define the structures required in a Parallel Sysplex for TCP/IP High Availability.

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Course Summary (cont'd)

Topics

- TCP/IP Review
- An Overview of TCP/IP on z/OS
- TCP/IP for z/OS Installation
- TCP/IP for z/OS - Command Overview
- Basic Profile Definitions
- VIPAs and Sysplex
- Other Datasets Needed
- Server Customization
- TCP/IP Security
- Problem Determination Considerations
- Sample Definitions

Audience

This course is designed for network technicians, systems programmers and technical managers who need a thorough understanding of how TCP/IP for z/OS is installed and configured.

Prerequisites

Attendance on the courses TCP/IP Fundamentals and z/OS Communications Server Part 1 - Implementing APPN and VTAM or equivalent experience. A familiarity with UNIX on z/OS is also required and some z/OS systems programming experience is needed.

Duration

Four days

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Course Outline

I. TCP/IP Review

- A. What is TCP/IP?
- B. Why are we interested in TCP/IP?
- C. What does TCP/IP comprise?
- D. Internetworking principles
- E. IPv4 addressing
- F. IPv4 subnetting
- G. IPv4 variable subnetting
- H. Network Address Translation
- I. One to One NAT
- J. Network Address Port Translation (NAPT)
- K. TCP/IP protocol stack
- L. IPv4 Address Resolution Protocol
- M. IPv4 Dynamic Host Configuration Protocol
- N. Why IPv6?
- O. IPv6 addressing
- P. IPv6 prefixes and address types
- Q. Global unicast address format
- R. Anycast address
- S. Multicast address
- T. Required host information
- U. Port numbers
- V. IPv4 Transport Protocol message formats
- W. IPv4 Internet Protocol: message format, packet format, header format
- X. Extension Headers
- Y. IPv6 Routing Header
- Z. IPv6 fragmentation header
- AA. IPv6 options header
- BB. Internet domain names
- CC. Internet domain name hierarchy
- DD. Common user application
- EE. Common system applications.

II. An Overview of TCP/IP on z/OS

- A. TCP/IP for z/OS
- B. TCP/IP access to SNA applications
- C. How the gateway works
- D. SNA access to TCP/IP applications
- E. Communications Storage Manager
- F. Device connectivity and attachments
- G. Direct vs indirect attachment
- H. Direct attachment problem
- I. Virtual IP addressing - the solution
- J. Sharing attachments across LPARs
- K. UNIX Systems Services considerations.

III. TCP/IP for z/OS Installation

- A. UNIX Systems Services prerequisites
- B. Security Server prerequisites
- C. Communications storage manager
- D. Datasets required
- E. TCP/IP and TN3270 procedures
- F. Required host information

- G. Customizing the DATA dataset
- H. DATA dataset syntax
- I. Association with the TCP/IP stack
- J. Specifying the Host Name and Domain Name
- K. Specifying the name server parameters
- L. A typical DATA dataset
- M. RESOLVER: procedure, files, other statements
- N. CINET GLOBALTCPIPDATA
- O. TCPIP.DATA search order
- P. VTAM TRL Major Node
- Q. Servers and devices
- R. HCD definitions
- S. Sysplex distributor
- T. z/OS libraries required
- U. 'Must Have' reference manuals
- V. 'Nice to Have' reference manuals.

IV. TCP/IP for z/OS - Command Overview

- A. Available TCP/IP commands
- B. The START and STOP commands
- C. The MODIFY command
- D. The DISPLAY command
- E. The VARY command
- F. The OBEYFILE command
- G. The NETSTAT and onetstat commands
- H. NETSTAT command options.

V. Basic Profile Definitions

- A. Customizing the PROFILE dataset
- B. PROFILE dataset syntax
- C. Device interface properties
- D. Statements that define an interface
- E. The basic DEVICE statement
- F. The basic LINK statement
- G. Defining LCS devices
- H. Defining CLAW devices
- I. OSAs, Hipersockets and Channel Attached Routers
- J. OSA diagnostic device
- K. QDIO and non-QDIO
- L. OSA Express CHPID definitions
- M. Adding an OSA Control Unit and device
- N. Adding OSAD device
- O. Hipersockets
- P. Hipersockets definition
- Q. CHPID Type IQD
- R. MTU sizes
- S. Channel Attached Routers and Servers
- T. Defining MPCPTP devices
- U. Defining MPCIPA devices
- V. The HOME statement
- W. The START statement

z/OS Communications Server Part 2 - Implementing TCP/IP under z/OS

Course Outline (cont'd)

- X. INTERFACE - IPAQENET OSA-Express QDIO interfaces statement
- Y. Syntax for INTERFACE - IPAQENET OSA-Express QDIO
- Z. Syntax for INTERFACE -- IPAQIDIO HiperSockets interfaces statement
- AA. The routing statements
- BB. Subnetting - a reminder
- CC. The GATEWAY statement
- DD. The BEGINROUTES statement
- EE. The BSDROUTINGPARMS statement
- FF. Variable subnets and GATEWAY
- GG. Variable subnets and BEGINROUTES
- HH. Operational statements.

VI. VIPAs and Sysplex

- A. VIPAs
- B. Static VIPA
- C. Dynamic VIPA
- D. Virtual IP addressing - a reminder
- E. Defining VIPA devices
- F. Specifying the source IP address
- G. Syntax for INTERFACE -- VIRTUAL interfaces statement
- H. Examples of the INTERFACE statement for VIPA
- I. IP solutions in a sysplex
- J. Communication paths in a Sysplex
- K. DynamicXCF transport choices
- L. IUTSAMEH
- M. XCF Groups and their usage
- N. Display XCF groups
- O. DYNAMICXCF
- P. DYNAMICXCF & HiperSockets
- Q. Dynamic VIPA – introduction
- R. Dynamic VIPA takeover
- S. Stack-managed DVIPA
- T. Non-disruptive dynamic VIPA takeback
- U. Application-specific DVIPA
- V. IOCTL or Command-Activated DVIPA
- W. Dynamic VIPA statements
- X. MODDVIPA (EZBXFDVP) utility
- Y. Dynamic VIPA usage
- Z. When does the DVIPA move?
- AA. Load balancing and availability
- BB. Sysplex Distributor
- CC. How the Sysplex Distributor works
- DD. Backup capability
- EE. Recovery
- FF. The role of dynamic routing with Sysplex Distributor
- GG. Sysplex Distributor and policy
- HH. Sysplex Distributor and MNLB
- II. Connection Optimizing DNS

- JJ. Information flow overview
- KK. DNS weights
- LL. DNS/WLM registration
- MM. Starting the DNS server
- NN. Distributed VIPA – introduction
- OO. Distributed VIPA statements
- PP. Single system IP perspective of the sysplex
- QQ. TCPSTACKSOURCEVIPA / SYSPLEXPORTS
- RR. CFRM policy example.

VII. Other Datasets Needed

- A. The SITE dataset
- B. The SERVICES file.

VIII. Server Customization

- A. Configurable servers
- B. TN3270 server customization steps
- C. Updating the TN3270 started task JCL
- D. TelnetGlobals statement
- E. Reducing demand for ECSA storage
- F. The TELNETPARMS statement
- G. The PORT statement
- H. The BEGINVTAM statement
- I. The VTAM application major node
- J. Defining a USS table
- K. Identifying the USS table in the PROFILE dataset
- L. The UNIX Telnet server
- M. Customizing the INETD Server
- N. Starting INETD and Telnet
- O. SSHD UNIX files
- P. SSHD - Using ICSF and /dev/random)
- Q. SSHD - Creating configuration files
- R. SHD - Creating SSHD server keys
- S. SSHD - Set up SSHD server userids
- T. SSHD - Create SSHD server started task
- U. SSHD - TCP configuration
- V. SSHD - Verify z/OS DNS / Resolver operation
- W. The FTP server
- X. FTPS and SFTP
- Y. Pros and cons of FTPS and SFTP
- Z. Customizing the FTP.DATA dataset
- AA. Customizing the PROFILE & SERVICES datasets
- BB. Starting FTP
- CC. SYSLOGD
- DD. SYSLOGD -/dev/console and /dev/log
- EE. SYSLOGD - create the syslog daemon configuration file
- FF. SYSLOGD - create empty syslog output file
- GG. SYSLOGD - port and services assignments
- HH. SYSLOGD started task JCL
- II. OMVS startup

z/OS Communications Server Part 2 - Implementing TCP/IP under z/OS

Course Outline (cont'd)

- JJ. SYSLOGD RACF definitions
 - KK. OMPROUTE
 - LL. OMPROUTE - configuration file
 - MM. OMPROUTE reserve the ports
 - NN. OMPROUTE - update the RESOLVER configuration file
 - OO. OMPROUTE - started task JCL
 - PP. OMPROUTE services port numbers
 - QQ. OMPROUTE - RACF definitions
 - RR. OMPROUTE – SYSLOGD
 - SS. OMPROUTE - static routes
 - TT. OMPROUTE - Configure OSPF authentication
 - UU. CSSMTP v SMTPD438
 - VV. SMTPD to CSSMTP migration considerations
 - WW. Installing CSSMTP with Started Class procedure: RACF OPERCMDS CLASS, Additional security if required
 - XX. The CSSMTP Configuration file
 - YY. Resolver Search
 - ZZ. Starting CSSMTP
 - AAA. Customizing other servers
 - BBB. Enterprise Extender
 - CCC. z/OS services for SNA traffic
 - DDD. PPN parameters in startup options
 - EEE. Implementation considerations
 - FFF. TCP/IP implementation
 - GGG. DYNAMICXCF
 - HHH. IUTSAMEH
 - III. DYNAMICXCF & HiperSockets
 - JJJ. Modifications to TCP/IP profile
 - KKK. Modifications to OSPF interface
 - LLL. Proof of initialization of IUTSAMEH
 - MMM. VTAM implementation
 - NNN. Defining the XCA HPRIP major node
 - OOO. Defining model major nodes for EE connections and RTP pipes
 - PPP. Defining switched Pus for EE connections.
- IX. TCP/IP Security**
- A. Why secure the TCP/IP network
 - B. Tasks that need protection with SERVAUTH Class
 - C. Policy based networking
 - D. SERVAUTH Resource Class responsibilities
 - E. SERVAUTH Resource Class
 - F. Protecting the TCPIP stack
 - G. Example of protecting the stack
 - H. Protecting your network access
 - I. Application considerations when using NETACCESS
 - J. Using the NETSTAT and PING commands to check protection
 - K. Protecting your network ports
 - L. RACF definitions for protecting network ports
 - M. Using the NETSTAT command to check PORT access
 - N. Protecting the use of socket options
 - O. What are network commands
 - P. Protecting network commands - z/OS TCPIP commands
 - Q. Protecting network commands - NETSTAT and ONESTAT commands
 - R. Protecting network commands - EZACMD REXX program
 - S. Protecting FTP access
 - T. Other FTP profiles
 - U. Protecting TN3270 Secure Telnet Port
 - V. Protecting the MODDVIPA command
 - W. Introduction to policy based networking The Policy Agent RACF and PAGENT
 - X. Other address spaces that will need RACF profiles
 - Central policy server
 - Y. SERVAUTH authorization for Policy Client
 - Z. Quality of Service
 - AA. SNMP overview
 - BB. SNMP in operation
 - CC. IP filtering
 - DD. IP Security
 - EE. IKE protocols
 - FF. CSFSERV resource class
 - GG. Network Address Translation
 - HH. Intrusion Detection Services
 - II. Application Transparent Transport Layer Security
 - JJ. TN3270 security
 - KK. Secure FTP
 - LL. Note to Auditors
 - MM. Next step?.
- X. Problem Determination Considerations**
- A. Problem determination tools
 - B. The PING and OPING commands
 - C. The TRACERTE and the OTRACERT commands
 - D. TCP/IP SYSLOG output
 - E. TCP/IP packet trace overview
 - F. Starting a packet trace
 - G. The external writer procedure
 - H. Stopping a packet trace
 - I. Analyzing a packet trace with IPCS
 - J. Non-z/OS packet traces
 - K. TCP/IP component trace overview
 - L. Starting and stopping a component trace
 - M. Analyzing a component trace via IPCS
 - N. Analyzing a component trace
 - O. Other available traces
 - P. Packet trace.

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Course Outline (cont'd)

XI. Sample Definitions

- A. Sample TCPIP.PROFILE dataset
- B. Sample TCPIP.DATA dataset
- C. Sample TCPIP.SERVICES dataset
- D. Sample Inted Configuration file
- E. Sample FTP Configuration file
- F. Sample ROUTED Configuration file
- G. Sample SMPT Configuration file.