IBM Systems and Technology Group

Session 9112
z/VM TCP/IP
Stack Configuration

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This presentation is an in depth look at configuration of the z/VM TCP/IP server. Basic and advanced configuration topics will be discussed, with an emphasis on practical examples. Topics such as elementary routing, network hardware, and security are discussed in as much depth as necessary to provide an understanding of how to configure them on the z/VM TCPIP server. Common configuration errors will also be addressed. While prior experience with z/VM TCP/IP is not necessary for attendees, some basic knowledge of z/VM mini disk structure is assumed.

Agenda

- **Defining a TCP/IP Server**
- **Configuring Your TCP/IP Server**
- **General CMS TCP/IP Client Configuration**
- **Commonly Occurring Errors**

Defining a TCP/IP Server

The DTCPARMS File

- **Defines a server and various startup parameters**
- **Formatted as a CMS Names file**
- **Search Order**
  - <userid> DTCPARMS
  - <nodeid> DTCPARMS
  - SYSTEM DTCPARMS
  - IBM DTCPARMS
- **All but IBM DTCPARMS should reside on TCPMAINT 198**

The DTCPARMS file (cont.)

- **Important tags**
  - :ATTACH.
    - Attach a device to your TCP/IP Server
  - :VNIC.
    - Define and couple a virtual network card to a guest LAN or VSWITCH
  - :VCTC.
    - Define and couple a virtual channel-to-channel device to another user
- **Also typical**
  - :Owner.
    - Define the owner of the TCP/IP Server (Default: TCPMAINT)
  - :Exit.
    - Run a user defined exit

Server Profile Exits

- **Global exit called for all servers: TCPRUNXT EXEC**
- **Server-specific exit called via :Exit. tag**
- **Input: when called, server class**
- **Output: DTCPARMS-type tags**
- **Think of it as a dynamic DTCPARMS file**
- **Example:**

```
arg calltype class .

if calltype = “SETUP” & class = “STACK” then
  begin
    if LEFT( USERID(), 4 ) = 'TEST' then
      return “:OWNER.TESTMNT”
  end
```

Sample SYSTEM DTCPARMS

```
:nick.TCPIP          :type.SERVER      :class.STACK
                     :attach.1f08-1f09, 1e00-1e02
                     :vnic.e100 SYSTEM LAN1
                     :vctc.800 LINUX1 500,
                           801 LINUX1 501
```

Configuring Your TCP/IP Server

PROFILE TCPIP

- **Primary TCP/IP server configuration file**
- **Search order:**
  - <userid> TCPIP
  - <nodeid> TCPIP
  - PROFILE TCPIP
- **Only one is used**
- **Should reside on TCPMAINT 198**
- **Sample: PROFILE STCPIP**

Configuration Statements – Pool Sizes

- **Pool size configuration statements MUST appear first in the TCP/IP configuration file**
- **These may not be changed while the stack is running**
- **Values determined by TCP/IP stack's workload**
- **16 different pool statements are available in 3 formats:**
  - xxxBUFFERPOOLSIZE or xxxENVELOPEPOOLSIZE
    - <statement> <number of buffers allocated> <buffer size>
  - xxxPOOLSIZE
    - <statement> <number of control blocks allocated>
  - FIXEDPAGESTORAGEPOOL
    - FIXEDPAGESTORAGEPOOL <initial number> <maximum number>

Configuration Statements - LargeEnvelopePoolSize

- **<buffer size> must be at least as large as that of smaller envelope buffers**
- **Acts as an upper bound on the MTU value**
- **CTC connected hosts should have matching buffer sizes**
- **Example:**
  - LARGEENVELOPEPOOLSIZE 100 32K

Configuration Statements - Privileged Users

- **INFORM**
  - Specifies users who should be informed of major stack events
    - Pool expansion
    - Denial of service attacks
    - Dynamic configuration changes
- **OBEY**
  - Specifies users which can issue privileged stack commands
    - OBEYFILE, NETSTAT OBEY
    - Use of raw sockets
    - Use privileged services on IBM servers (via SMSG)
- **Examples:**
  - OBEY tcpmaint maint migueld mproute ENDOBEY
  - INFORM tcpmaint ENDINFORM

Configuration Statements - AssortedParms

- **Various miscellaneous stack settings**
- **Look at what is available and decide what you need**
- **Suggested**
  - RestrictLowPorts (z/VM 4.3.0 and earlier)
  - VarSubnetting (z/VM 4.3.0 and earlier)
  - IgnoreRedirect (if not running a dynamic router)
- **Example:**
  - ASSORTEDPARMS
    equalcostmultipath
    ignoreredirect
    ENDASSORTEDPARMS

Configuration Statements – AUTOLOG, PORT

- **AUTOLOG**
  - Defines which servers to start when the stack comes up
  - Stack will restart the server if it is logged off
- **PORT**
  - Gives permission for a server to listen on a port
  - Low ports (0-1023) are restricted by default (since z/VM 4.4.0)
  - Listed ports are monitored unless NOAUTOLOG is specified
  - Used to start the Telnet server (assign a port to INTCLIEN)
- **Examples:**
  - AUTOLOG
ftpserve 0
ENDAUTOLOG
  - PORT
20 tcp ftpserve noautolog
21 tcp ftpserve

Configuration Statements – Device and Link

- **Configure network interfaces to the stack**
- **Examples:**
  - Real QDIO Ethernet Device
    - DEVICE qdio0 OSD 1e00 PRIROUTER
      LINK eth0 QDIOETHERNET qdio0 MTU 1500
  - Virtual QDIO Ethernet Device
    - DEVICE qdio1 OSD e100 NONROUTER
      LINK veth0 QDIOETHERNET qdio1 MTU 32768
  - LCS Ethernet Device
    - DEVICE lcs0 LCS 1f08
      LINK eth1 ETHERNET 0 lcs0 MTU 1500
  - Virtual Channel to Channel Device
    - DEVICE ctc0 CTC 800
      LINK vctc0 CTC 1 ctc0 MTU 32760

Configuration Statements - HOME

- **Configures IP addresses and subnet masks for each link**
  - If a subnet mask is specified, a subnet route will be generated for that interface (i.e. You won't need a GATEWAY entry for it)
- **Determines which VIPA address is associated with each link**
- **Examples:**
  - With VIPA
    - HOME
      7.0.0.1 lcs1
      8.0.0.1 vipa1
      9.1.0.3 qdio1
      8.0.0.2 vipa2
      9.2.0.2 qdio2
  - Without VIPA
    - HOME

10.6.3.159	255.255.255.0	eth0
192.8.12.19	255.255.255.240	veth0
192.8.12.12/27		eth1
192.4.0.1		vctc0

Configuration Statements – GATEWAY and START

- **GATEWAY – Defines static routes**
- **START – Starts devices**
- **Examples:**
  - GATEWAY

```
10.6.3.0          255.255.255.0      =              eth0    0
192.8.12.19       255.255.255.240    =              veth0   0
192.8.12.12/27                       =              eth1    0
192.4.0.2         HOST               =              ctc0    0
DEFAULTNET                           10.6.3.1       eth0    0
DEFAULTNET                           192.8.12.1     eth1    0
```

  - START qdio0
    START qdio1
    START lcs0
    START ctc0

Configuration Statements - Miscellaneous

- **VSWITCH CONTROLLER**
  - Specifies the stack is available to control CP-defined virtual switches.
  - Requires IUCV *VSWITCH in user directory entry to function
- **INTERNALCLIENTPARMS**
  - Specifies settings for the Telnet server (internal client)
  - Look through the options and decide what works best for you
- **Examples:**
  - VSWITCH CONTROLLER ON
  - INTERNALCLIENTPARMS
    notn3270E
    port 23
    ENDINTERNALCLIENTPARMS

Sample PROFILE TCPIP

```
LARGEENVELOPEPOOLSIZE 100 32K

OBEY tcpmaint maint migueld ENDOBEY

INFORM tcpmaint ENDINFORM

ASSORTEDPARMS
equalcostmultipath
ignoreredirect
ENDASSORTEDPARMS

INTERNALCLIENTPARMS
notn3270E
port 23
ENDINTERNALCLIENTPARMS

PORT
23 tcp INTCLIEN
```

Sample PROFILE TCPIP (cont.)

```
DEVICE qdio0 OSD 1e00 PRIROUTER
LINK eth0 QDIOETHERNET qdio0 MTU 1500

DEVICE qdio1 OSD e100 NONROUTER
LINK veth0 QDIOETHERNET qdio1 MTU 32768

DEVICE lcs0 LCS 1f08
LINK eth1 ETHERNET 0 lcs0 MTU 1500

DEVICE ctc0 CTC 800
LINK vctc0 CTC 1 ctc0 MTU 32760

HOME
10.6.3.159      255.255.255.0     eth0
192.8.12.19     255.255.255.240   veth0
192.8.12.12     255.255.255.240   eth1
192.4.0.1                         vctc0
```

Sample PROFILE TCPIP (cont.)

```
GATEWAY
192.4.0.1        HOST        192.4.0.2        ctc0      0
DEFAULTNET                   10.6.3.1         eth0      0
DEFAULTNET                   192.8.12.1       eth1      0

START qdio0
START qdio1
START lcs0
START ctc0
```

General CMS Client Configuration

TCPIP DATA File

- **Information used by both clients and servers**
  - Resolver Information
    - host name
    - domain name
    - resolver preferences
    - resolver tracing
    - DNS servers to use
  - Stack virtual machine name
  - E-mail servers
- **Lives on TCPMAINT's 592 disk (client code)**
- **Sample: TCPIP SDATA**

Sample TCPIP DATA

```
TCPIPUSERID     TCPIP

NSINTERADDR     10.6.3.252
NSINTERADDR     10.6.3.253

HOSTNAME        vmhost1

DOMAINORIGIN    testnet.bigblue.com
```

Commonly Occurring Errors

Common Hardware Errors

- **Forgot to attach all addresses for a particular adapter**
- **Wrong device type on DEVICE statement**
  - You have to relate chpid type to device type
- **Wrong adapter number on LINK statement**
  - Identifies which port on a multiport device
  - '0' and '1' on CTC (or cross-couple instead)

Common Routing Errors

- **Incorrect MTU size in routing configuration statements**
  - Consult hardware documentation
  - Everyone on LAN segment should use the same value
- **Wrong subnet masks or values**
  - BSD format should help with this
- **Trying to put guest connected via a point-to-point link in same subnet as VM without PROXYARP**

The #1 Problem: Incorrect TCPIP DATA file

- **Copy on the incorrect disk (should be on TCPMAINT 592)**
  - User's A-disk
  - Server's A-disk
  - TCPMAINT 198
- **Incorrect NSINTERADDR value**
  - Ignorance of network changes is no excuse!
- **TCPIPUSERID pointing to wrong TCP/IP stack virtual machine**
  - IBM servers will not come up

Summary

- **A TCP/IP requires three (3) configuration files**
  - A DTCPARMS file (<userid>, <nodeid>, or SYSTEM)
  - A TCPIP file (<userid>, <nodeid>, or PROFILE)
  - A TCPIP DATA file
- **Communication with networking team is essential to having z/VM happily running on the network**

Read More About It

- ***TCP/IP Planning and Customization***
- ***TCP/IP Solutions for VM/ESA***
  - IBM redbooks at http://www.redbooks.ibm.com
- **IETF RFCs**
  - http://www.rfc-editor.org
- ***Internetworking with TCP/IP*, Comer, Prentice Hall, ISBN 0-13-216987-8**
- ***TCP/IP Illustrated, Vol. 1*, Stevens, Addison Wesley, ISBN 0-201-63346-9**

Contact Information

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  A number of listservs relevant to z/VM are available Information on how to subscribe can be found at the following website:

  http://www.vm.ibm.com/techinfo/listserv.html

  Of particular interest:
  VMESA-L@listserv.uark.edu
  IBMTCP-L@vm.marist.edu
  LINUX-390@vm.marist.edu