z/VM Simplified Network Configuration

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z/VM TCP/IP Development
Monday, 21 April 2008

IBM Systems

In this session we will cover two tools designed to make configuring z/VM TCP/IP easier. The IPWIZARD function that allows you to quickly and easily perform the base configuration as you initially try and get TCP/IP running. The IFCONFIG command allows you to quickly and easily add new connections to your running TCP/IP stack. These functions mean that you can get up and running quickly without have to learn the format of the z/VM TCP/IP configuration files. The IFCONFIG command allows you to display information about and make temporary dynamic changes to the TCP/IP configuration without stopping and restarting the TCPIP virtual machine. The command syntax is very similar to that of Linux, making skills more transferable.

Agenda

- **Discuss tools available in z/VM to simplify network configuration tasks**
  - **Generate initial configuration files**
  - **Modify a running stack without bringing it down**

The Problem

- Format of z/VM configuration files differs from that of Linux®/Unix systems
- Growth of Linux on System z means many Linux sys-admins must begin to learn about z/VM
- Need to address learning curve issues

Solution #1:
The IPWIZARD Command

What You Need

- A fresh z/VM TCP/IP stack
  - User must be previously defined
  - IPWIZARD is NOT a migration tool
  - IPWIZARD creates a initial/minimal setup
- Access to MAINT's 193 disk
- Write access to the TCP/IP stack's 592 & 198 disks
- A full screen 3270 device
  - IPWIZARD does not support line mode
- A completed “Basic IP Connectivity Worksheet”
  - See the “Plan Your Installation” chapter in “z/VM Guide for Automated Installation and Service”

What You Don't Need

- **Knowledge or experience with z/VM TCP/IP configuration file formats**

Host Configuration Panel

```
                    *** z/VM TCP/IP Configuration Wizard ***

The items that follow describe your z/VM host

User ID of VM TCP/IP Stack Virtual Machine:   TCPIP06_

Host Name:      MIGUELD_______________
Domain Name:    IBM.COM_____________________________________

Gateway IP Address:  10.10.0.1_____________________________________

DNS Addresses:
1) 10.10.0.2_______
2) ________________
3) ________________

      PF1 = HELP    PF3 = QUIT    PF8 = Continue    ENTER = Refresh
```

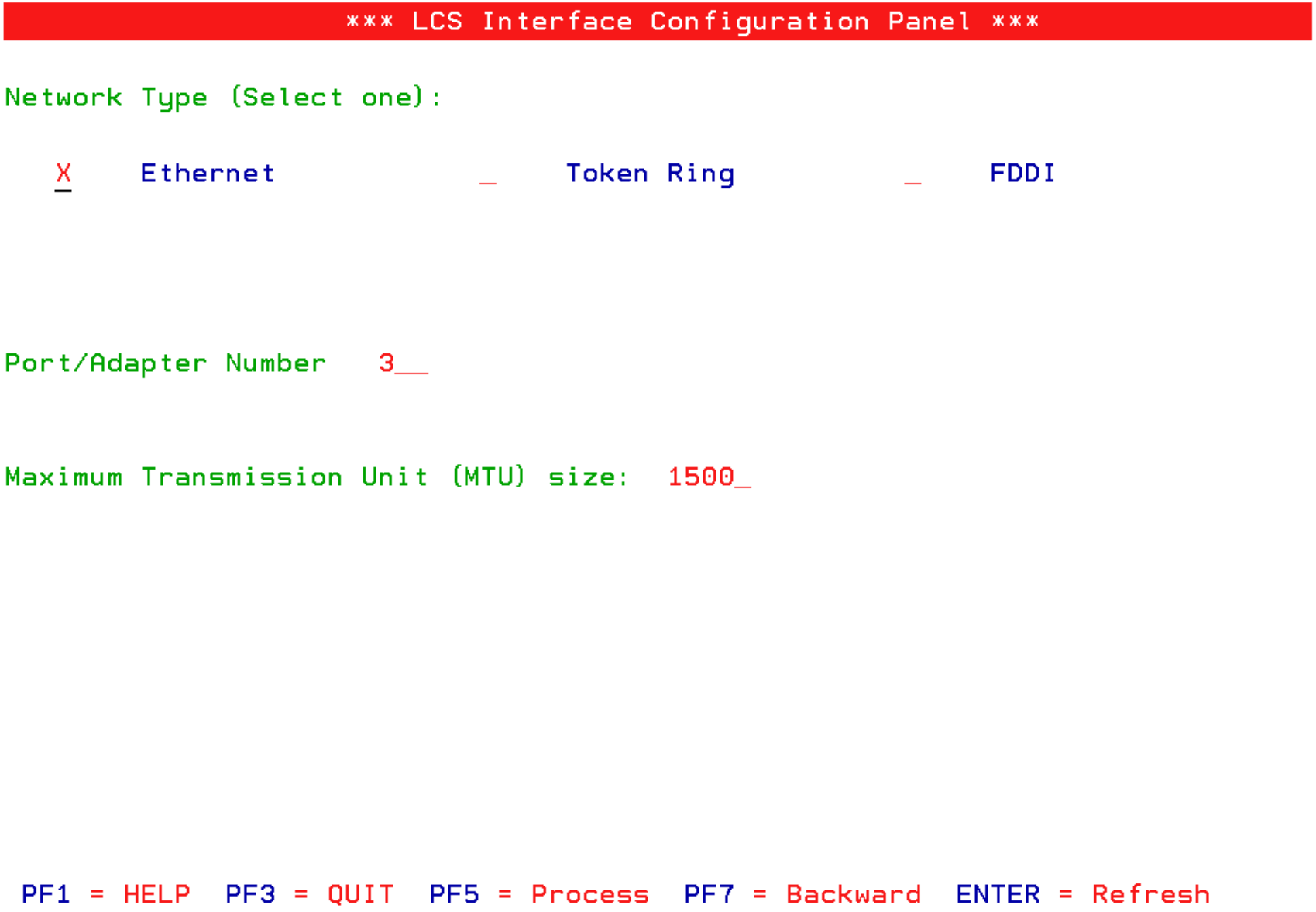
IPv4 Interface Configuration Panel

```
                *** General Interface Configuration Panel ***

Interface Name:   INT0_____________     Device Number:   4712

IP Address:       10.10.0.6_______
Subnet Mask:      255.255.255.0___

Interface Type (Select one):

   X     QDIO                  _     LCS                   _     HiperSockets
   _     CLAW                  _     CTC

PF1 = HELP  PF3 = QUIT  PF7 = Backward  PF8 = Continue  ENTER = Refresh
```

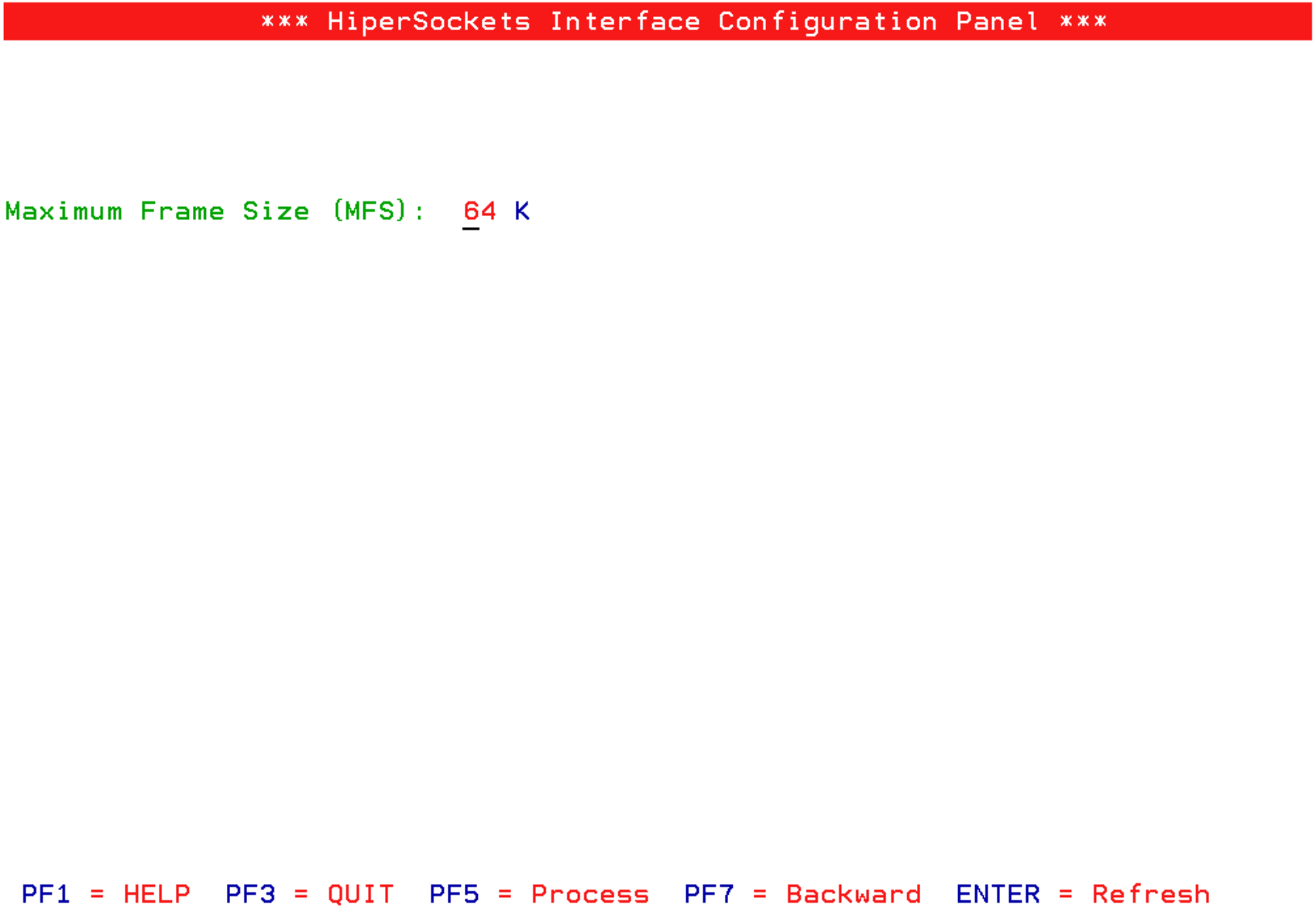
QDIO Configuration Panel (IPv4)

```
                    *** QDIO Interface Configuration Panel ***

Network Type (Select one):

   X    Ethernet              _    Token Ring

Port Name (optional):  ________

Router Type (Select one):

   X    Primary               _    Secondary             _    None

Maximum Transmission Unit (MTU) size:  1500_




 PF1 = HELP  PF3 = QUIT  PF5 = Process  PF7 = Backward  ENTER = Refresh
```

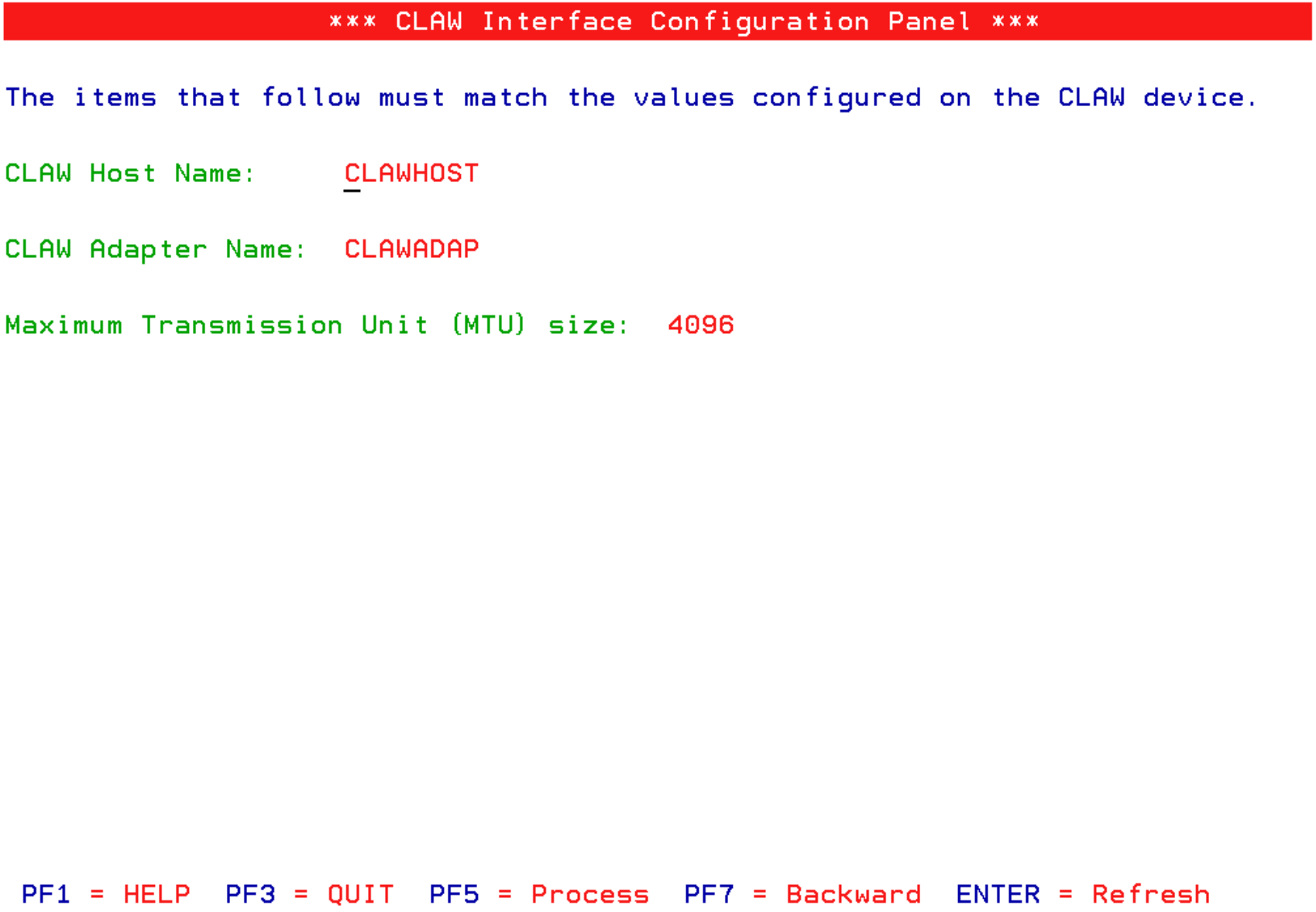
LCS Configuration Panel



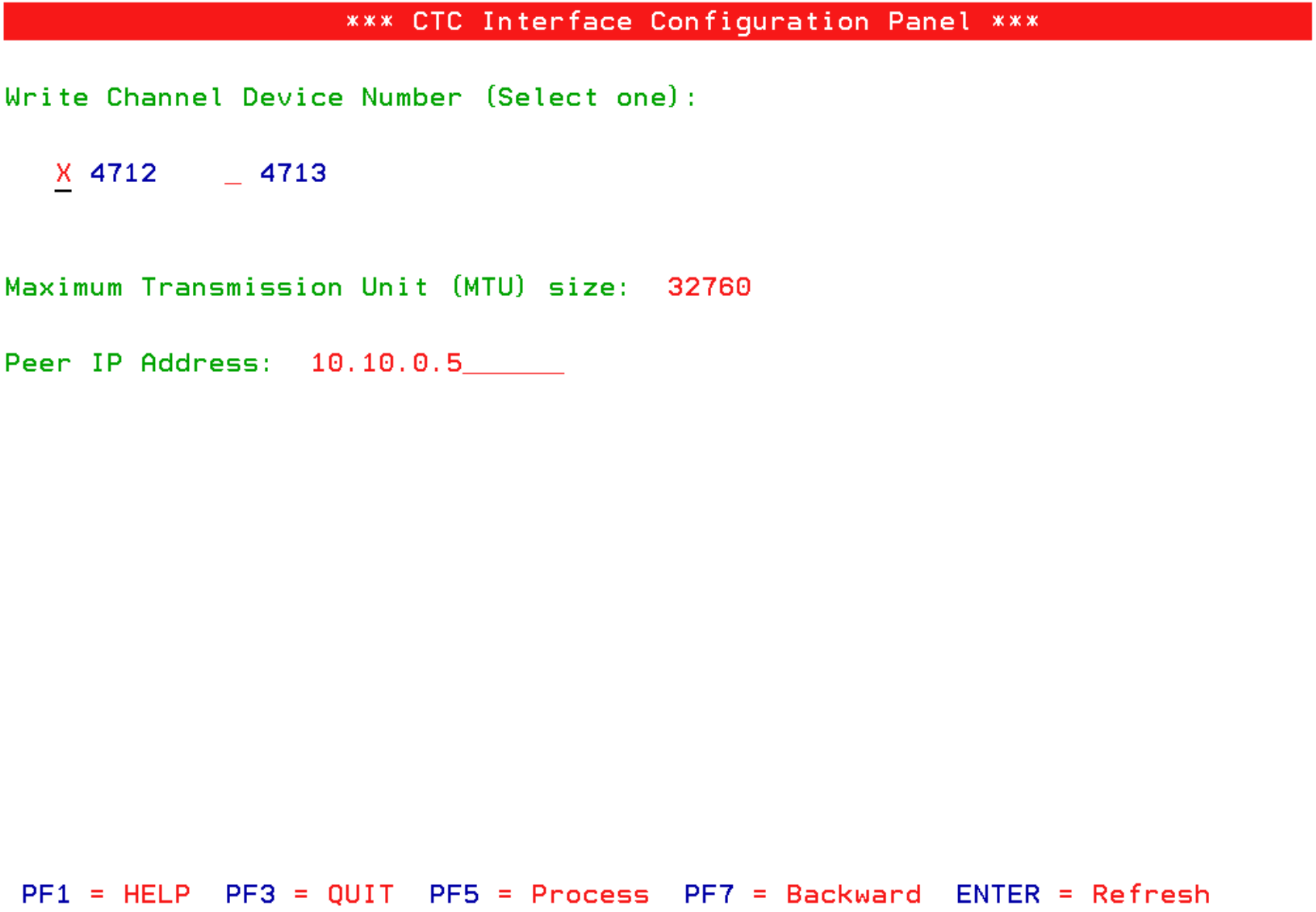
HiperSocket Configuration Panel (IPv4)



CLAW Configuration Panel



CTC Configuration Panel



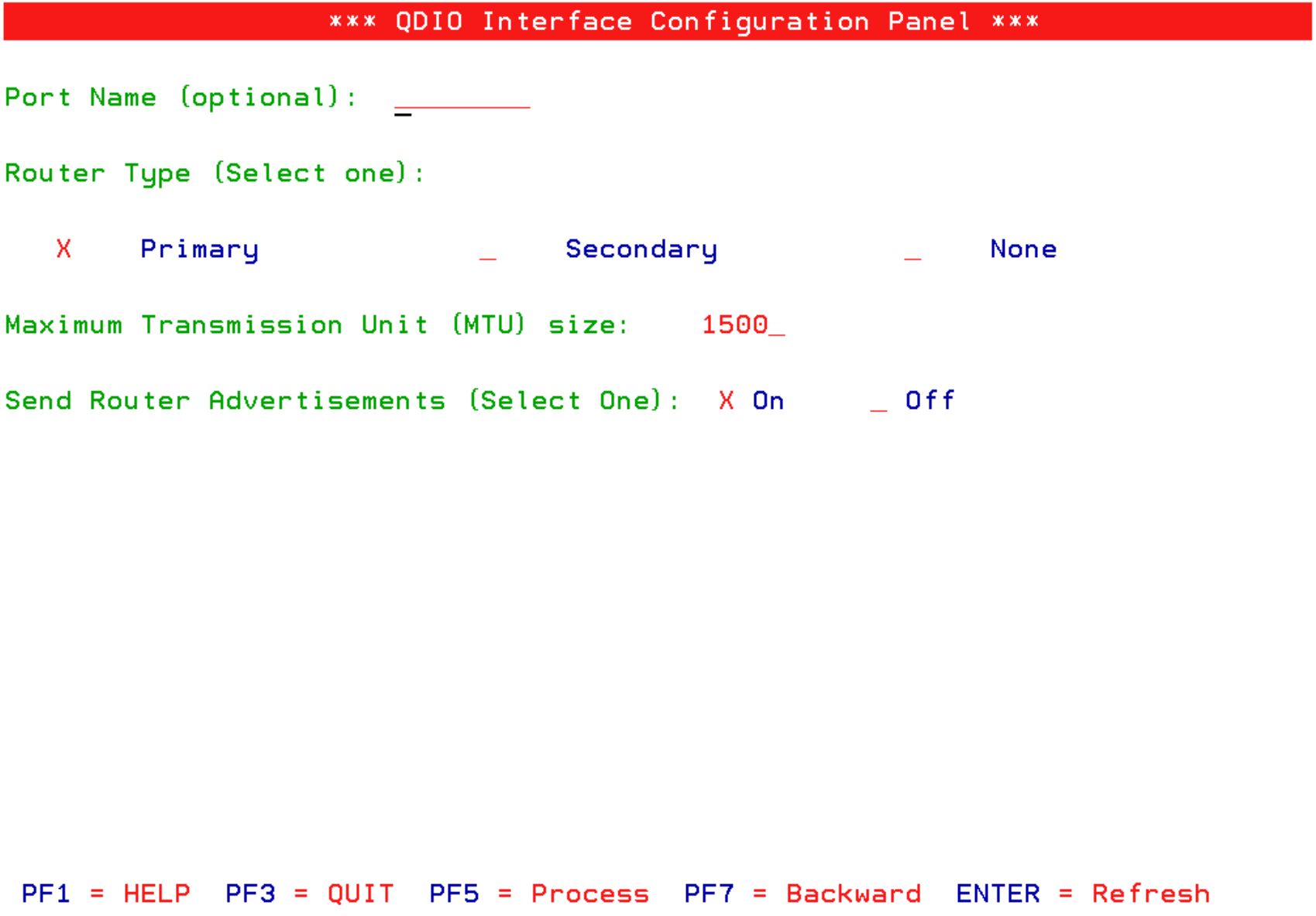
Initial Panel - Revisited

```
                    *** z/VM TCP/IP Configuration Wizard ***

The items that follow describe your z/VM host

User ID of VM TCP/IP Stack Virtual Machine:    TCPIP06_

Host Name:      MIGUELD_______________
Domain Name:    IBM.COM_____________________________________

Gateway IP Address:  50C0:C2C1:1010::1_____________________________

DNS Addresses:
1)  _________________
2)  _________________
3)  _________________

PF1 = HELP    PF3 = QUIT    PF8 = Continue    ENTER = Refresh
```

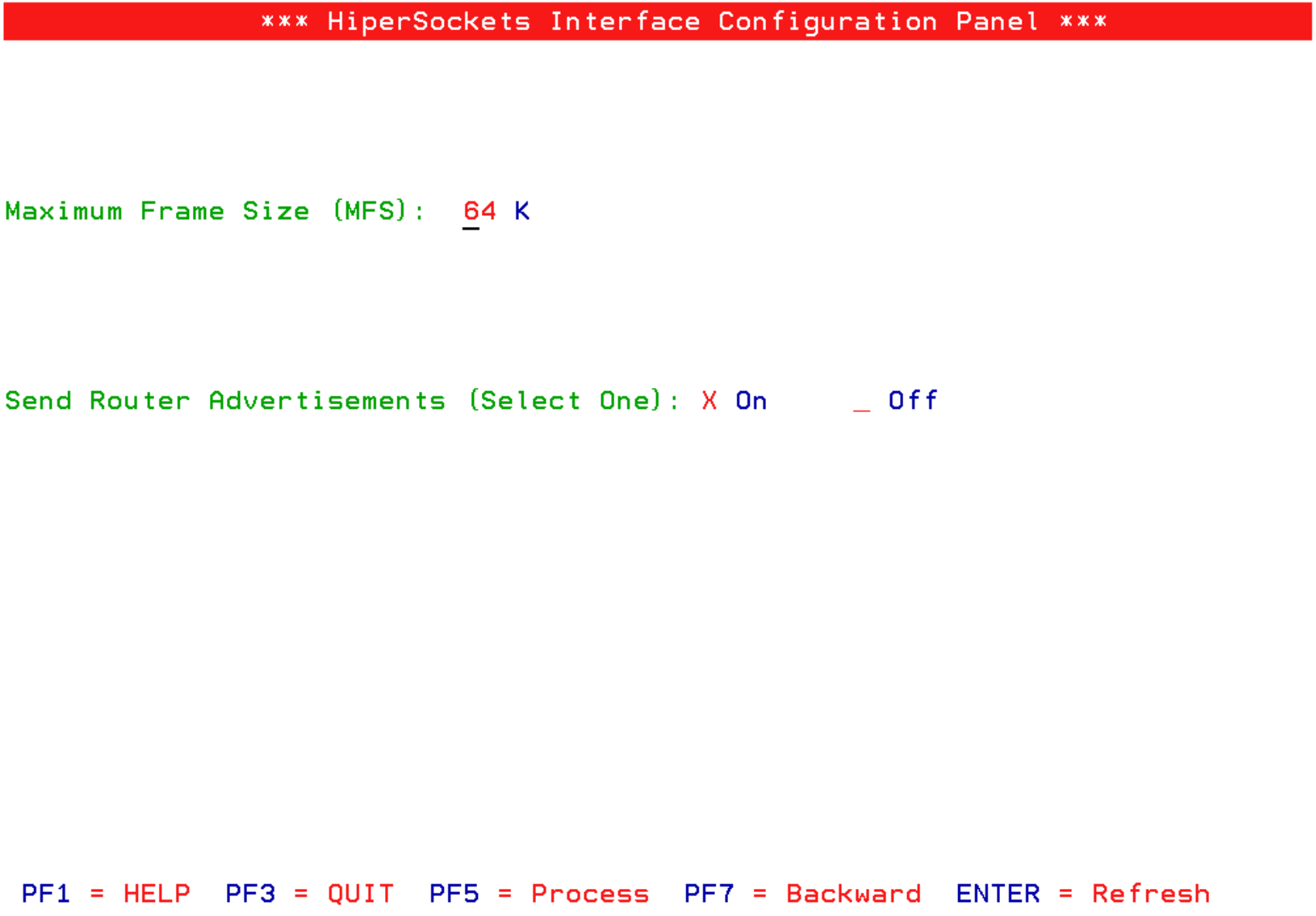
IPv6 Interface Configuration Panel

```
                *** General Interface Configuration Panel ***


Interface Name:   INT0_____________      Device Number:   4712

IP Address:       50C0:C2C1:1010::6_____________________________
Prefix Length:    64_

Interface Type (Select one):

   X    QDIO                  _    HiperSockets




PF1 = HELP  PF3 = QUIT  PF7 = Backward  PF8 = Continue  ENTER = Refresh
```

QDIO Configuration Panel (IPv6)



HiperSockets Configuration Panel (IPv6)



IPWIZARD Panels

- Input all required fields
  - You will be prompted if you miss one
- Press PF5 to process your input
- The following files are created for you:
  - On TCPMAINT's 198 disk:
    - PROFILE TCPIP
    - SYSTEM DTCPARMS
  - On TCPMAINT's 592 disk:
    - TCPIP DATA
- Basic connectivity tests performed

Generated PROFILE TCPIP

```
ASSORTEDPARMS
PROXYARP
ENDASSORTEDPARMS
; ------------------------------------------------------------------
OBEY
OPERATOR TCPMAINT MAINT MPROUTE DHCPD REXECD SNMPD SNMPQE TCPMNT06
ENDOBEY
; ------------------------------------------------------------------
PORT
  23   TCP INTCLIEN              ; TELNET Server
; ------------------------------------------------------------------
DEVICE DEV@4712  OSD 4712  PRIROUTER
LINK INT0 QDIOETHERNET DEV@4712  MTU 1500
; ------------------------------------------------------------------
HOME
10.10.0.6 255.255.255.0 INT0
; ------------------------------------------------------------------
GATEWAY
DEFAULTNET                          10.10.0.1       INT0              1500
; ------------------------------------------------------------------
START DEV@4712
```

Generated SYSTEM DTCPARMS

```
:nick.TCPIP06   :type.server
                :class.stack
                :attach.4712-4714
```

Generated TCPIP DATA

```
TCPIPUSERID TCPIP06
; ------------------------------------------------------------------------
HOSTNAME MIGUELD
; ------------------------------------------------------------------------
DOMAINORIGIN IBM.COM
; ------------------------------------------------------------------------
NSINTERADDR  10.10.0.2
```

Solution #2:
The IFCONFIG Command

OBEYFILE: It Looked Like Such a Nice Toy...

- **OBEYFILE can be used to make dynamic changes to statements configured in PROFILE TCPIP**
- **It is not necessary to recycle your TCP/IP server to pick up these changes**
- **Usable by anyone in the TCP/IP server's OBEY list**

...Until I Tried to Use It

- Identical syntax to PROFILE TCPIP
  - Not good for a Unix/Linux user
- Some statements require full replacement
  - GATEWAY
  - HOME
- Need to issue CP commands to inform stack of new devices prior to issuing OBEYFILE
  - The CP commands differ for Real and Virtual devices

The OBEYFILE Process - “Simplified”

- Issue CP ATTACH to attach a new device to your stack
- Copy your current configuration file (PROFILE TCPIP) to a new file (e.g. NEWLINK TCPIP A)
- Delete everything but the HOME and GATEWAY statements
- Add new DEVICE and LINK statements at the top
- Insert new HOME and GATEWAY entries
- Add new START statement at the bottom
- Issue OBEYFILE NEWLINK TCPIP

The IFCONFIG “Process”

- Issue IFCONFIG command with the appropriate parameters
- Go get a cup of coffee

IFCONFIG — Goodies

- Can be used to display device information, define a new device or modify an existing device
- Most device types are supported
- Command syntax is similar to Linux/Unix
  - Keyword driven
  - Command options are preceded by a —
- It can create Guest LANs
  - Specify a LAN that doesn't exist when creating a virtual device

IFCONFIG — Gotchas

- Changes made are NOT permanent!
  - An IPL will revert to configuration in PROFILE TCPIP
  - Commands could be issued by a service machine at IPL to setup network environment
- Does not fully support dynamic routing (MPRoute)
  - Queries work fine
  - Adding or modifying interfaces requires more work on your part

Useful IFCONFIG Options

- —SHOW
  - Displays the TCP/IP server configuration file statements that are required to make the changes specified by the command, but does NOT change the running system
- —VERBOSE
  - Displays any CP or NETSTAT commands that are used while changing the running system
- —FORCE
  - Specifies that IFCONFIG should ignore the sense data returned from the device when attempting to create a new interface

More Useful IFCONFIG Options

- —MDISKPW *password*
  - Specifies the read password for the 'A' disk of the user issuing the IFCONFIG command
- —TCP *userid*
  - Directs the IFCONFIG command to the specified TCP/IP server
- —ALL
  - Displays configuration information for all interfaces, regardless of their status
- —REMOVE (New in z/VM 5.3.0)
  - Deletes an interface from the TCP/IP stack's configuration

Displaying Interfaces With IFCONFIG

```
ifconfig
ETH0      inet addr: <NONE> mask: ?
          UP BROADCAST MULTICAST MTU: 1500
          vdev: 3300 type: QDIO ETHERNET portname: UNASSIGNED
          ipv4 router type: NONROUTER
          ipv6 router type: NONROUTER ipv6: ENABLED
          LAN owner: TCPIP06 name: LAN1
          cpu: 0 forwarding: ENABLED
          RX bytes: 0 TX bytes: 816
          IPv6 Addresses:
            10:0:0:0:0:0:0:1
            FE80:0:0:0:209:5700:100:3D
Ready; T=0.04/0.05 10:37:28
ifconfig eth1
ETH1      inet addr: 10.10.0.1 mask: 255.255.255.0
          DOWN MTU: 4000
          vdev: FF00 type: HIPERS
          ipv6: DISABLED
          LAN owner: TCPIP06 name: LAN2
          cpu: 0 forwarding: ENABLED
          RX bytes: 0 TX bytes: 0
Ready; T=0.04/0.05 10:37:38
```

Displaying All Interfaces

```
ifconfig -all
ETH0      inet addr: <NONE> mask: ?
          UP BROADCAST MULTICAST MTU: 1500
          vdev: 3300 type: QDIO ETHERNET portname: UNASSIGNED
          ipv4 router type: NONROUTER
          ipv6 router type: NONROUTER ipv6: ENABLED
          LAN owner: TCPIP06 name: LAN1
          cpu: 0 forwarding: ENABLED
          RX bytes: 0 TX bytes: 816
          IPv6 Addresses:
            10:0:0:0:0:0:0:1
            FE80:0:0:0:209:5700:100:3D

ETH1      inet addr: 10.10.0.1 mask: 255.255.255.0
          DOWN MTU: 4000
          vdev: FF00 type: HIPERS
          ipv6: DISABLED
          LAN owner: TCPIP06 name: LAN2
          cpu: 0 forwarding: ENABLED
          RX bytes: 0 TX bytes: 0
Ready; T=0.05/0.07 10:39:05
```

Creating a Virtual HiperSockets Device

```
ifconfig vhsi0 10.2.0.1/25 vhs 3904 system lantest mtu 8192 -v -s
* NETSTAT TCP TCPIP06 CP DEFINE LAN LANTEST OWNER SYSTEM TYPE HIPERS MFS 16K
* NETSTAT TCP TCPIP06 CP DEFINE NIC 3904 HIPERS
* NETSTAT TCP TCPIP06 CP COUPLE 3904 SYSTEM LANTEST
; Generated by <IFCONFIG vhsi0 10.2.0.1/25 vhs 3904 system lantest mtu 8192 -v
; -s>
; 4 Aug 2006 10:42:21
DEVICE DEV@3904  HIPERS 3904
LINK VHSI0 QDIOIP DEV@3904  MTU 8192
HOME
10.2.0.1 255.255.255.128 VHSI0
START DEV@3904
Ready; T=0.05/0.06 10:42:21
```

Creating a Virtual CTC Device

```
ifconfig vctc0 10.14.6.1/30 vctc 800 laplace1 3600 ptp 10.14.6.2 portnumber 0 -s -v
* NETSTAT TCP TCPIP06 CP DEFINE 3088 800
* NETSTAT TCP TCPIP06 CP DEFINE 3088 801
* NETSTAT TCP TCPIP06 CP COUPLE 800 LAPLACE1 3600
* NETSTAT TCP TCPIP06 CP COUPLE 801 LAPLACE1 3601
; Generated by <IFCONFIG vctc0 10.14.6.1/30 vctc 800 laplace1 3600 ptp 10.14.6.2
; portnumber 0 -s -v>
; 31 Jan 2007 13:50:32
DEVICE DEV@800  CTC 800
LINK VCTC0 CTC 0 DEV@800  MTU 0
HOME
10.14.6.1 255.255.255.252 VCTC0
GATEWAY
10.14.6.2 HOST = VCTC0 0
START DEV@800
Ready; T=0.02/0.02 13:50:32
```

Modifying an Interface

```
ifconfig eth1
ETH1      inet addr: 10.10.0.1 mask: 255.255.255.0
          UP BROADCAST MULTICAST MTU: 4000
          vdev: FF00 type: HIPERS
          ipv6: DISABLED
          LAN owner: TCPIP06 name: LAN2
          cpu: 0 forwarding: ENABLED
          RX bytes: 0 TX bytes: 0
Ready; T=0.06/0.07 11:09:17
ifconfig eth1 mask 255.255.255.128 mtu 1500
Ready; T=0.12/0.14 11:09:28
ifconfig eth1
ETH1      inet addr: 10.10.0.1 mask: 255.255.255.128
          UP BROADCAST MULTICAST MTU: 1500
          vdev: FF00 type: HIPERS
          ipv6: DISABLED
          LAN owner: TCPIP06 name: LAN2
          cpu: 0 forwarding: ENABLED
          RX bytes: 0 TX bytes: 0
Ready; T=0.06/0.07 11:09:32
```

Bringing an Interface UP or DOWN

```
ifconfig eth1
ETH1      inet addr: 10.10.0.1 mask: 255.255.255.128
          UP BROADCAST MULTICAST MTU: 1500
          vdev: FF00 type: HIPERS
          ipv6: DISABLED
          LAN owner: TCPIP06 name: LAN2
          cpu: 0 forwarding: ENABLED
          RX bytes: 0 TX bytes: 0
Ready; T=0.06/0.07 11:12:55
ifconfig eth1 down
Ready; T=0.12/0.14 11:13:15
ifconfig eth1
ETH1      inet addr: 10.10.0.1 mask: 255.255.255.128
          DOWN MTU: 1500
          vdev: FF00 type: HIPERS
          ipv6: DISABLED
          LAN owner: TCPIP06 name: LAN2
          cpu: 0 forwarding: ENABLED
          RX bytes: 0 TX bytes: 0
Ready; T=0.06/0.07 11:13:18
ifconfig eth1 up
Ready; T=0.12/0.14 11:13:22
ifconfig eth1
ETH1      inet addr: 10.10.0.1 mask: 255.255.255.128
          UP BROADCAST MULTICAST MTU: 1500
          vdev: FF00 type: HIPERS
          ipv6: DISABLED
          LAN owner: TCPIP06 name: LAN2
          cpu: 0 forwarding: ENABLED
          RX bytes: 0 TX bytes: 0
Ready; T=0.06/0.07 11:13:23
```

IP Version 6 Support

- Support for creating and displaying IPv6 interfaces
  - Dual protocol (IPv4/IPv6) support also available
- Support for multiple IP addresses per interface
  - Displaying all IP addresses for an interface
  - Adding or deleting IP addresses to or from an interface

Creating an IPv6 Interface

```
ifconfig eth2 50c0:c2c1:1010::6/64 veth fe00 tcpip06 lan1 -v -s
* NETSTAT TCP TCPIP06 CP DEFINE NIC FE00 QDIO
* NETSTAT TCP TCPIP06 CP COUPLE FE00 TCPIP06 LAN1
; Generated by <IFCONFIG eth2 50c0:c2c1:1010::6/64 veth fe00 tcpip06 lan1 -v -s>
; 4 Aug 2006 10:43:26
DEVICE DEV@FE00  OSD FE00
LINK ETH2 QDIOETHERNET DEV@FE00  MTU 0  ENABLEIPV6
HOME
50C0:C2C1:1010:0:0:0:0:6                                    ETH2
START DEV@FE00
Ready; T=0.05/0.06 10:43:26
```

Adding An IP Address

```
ifconfig eth0
ETH0      inet addr: <NONE> mask: ?
          UP BROADCAST MULTICAST MTU: 1500
          vdev: 3300 type: QDIO ETHERNET portname: UNASSIGNED
          ipv4 router type: NONROUTER
          ipv6 router type: NONROUTER ipv6: ENABLED
          LAN owner: TCPIP06 name: LAN1
          cpu: 0 forwarding: ENABLED
          RX bytes: 752 TX bytes: 1170
          IPv6 Addresses:
            10:0:0:0:0:0:0:1
            FE80:0:0:0:209:5700:100:3D
Ready; T=0.05/0.06 10:46:15
ifconfig eth0 add 50c0:c2c1:1010::1/64
Ready; T=0.10/0.12 10:46:57
ifconfig eth0
ETH0      inet addr: <NONE> mask: ?
          UP BROADCAST MULTICAST MTU: 1500
          vdev: 3300 type: QDIO ETHERNET portname: UNASSIGNED
          ipv4 router type: NONROUTER
          ipv6 router type: NONROUTER ipv6: ENABLED
          LAN owner: TCPIP06 name: LAN1
          cpu: 0 forwarding: ENABLED
          RX bytes: 752 TX bytes: 1266
          IPv6 Addresses:
            10:0:0:0:0:0:0:1
            50C0:C2C1:1010:0:0:0:0:1
            FE80:0:0:0:209:5700:100:3D
Ready; T=0.05/0.06 10:47:01
```

Putting It All Together

```
ifconfig eth4
DTCIFC2612E Unknown interface: eth4
Ready(00012); T=0.04/0.05 10:47:58
ifconfig eth4 10.0.0.1/27 add 50c0:c2c1:1010::7/64 veth fc00 tcpip06 lan3
Ready; T=0.14/0.17 10:48:57
ifconfig eth4
ETH4      inet addr: 10.0.0.1 mask: 255.255.255.224
          UP BROADCAST MULTICAST MTU: 1500
          vdev: FC00 type: QDIO ETHERNET portname: UNASSIGNED
          ipv4 router type: NONROUTER
          ipv6 router type: NONROUTER ipv6: ENABLED
          LAN owner: TCPIP06 name: LAN3
          cpu: 0 forwarding: ENABLED
          RX bytes: 0 TX bytes: 2376
          IPv6 Addresses:
            50C0:C2C1:1010:0:0:0:0:7
            FE80:0:0:0:209:5700:100:40
Ready; T=0.06/0.07 10:49:04
```

Removing an Interface – z/VM 5.3.0

```
ifconfig eth1
ETH1      inet addr: 10.10.0.1 mask: 255.255.255.128
          UP BROADCAST MULTICAST MTU: 1500
          vdev: FF00 type: HIPERS
          ipv6: DISABLED
          LAN owner: TCPIP06 name: LAN2
          cpu: 0 forwarding: ENABLED
          RX bytes: 0 TX bytes: 0
Ready; T=0.02/0.02 12:56:56
netstat devlinks
VM TCP/IP Netstat Level 530

Device DEV@FF00                  Type: HIPERS          Status: Ready
  Queue size: 0      CPU: 0      Address: FF00         Port name: UNASSIGNED
  IPv4 Router Type: NonRouter    Arp Query Support: Yes
    Link ETH1                    Type: QDIOIP          Net number: 0
      BytesIn: 0                 BytesOut: 0
      Forwarding: Enabled        MTU: 1500             IPv6: Disabled
      Maximum Frame Size  : 16384
      Broadcast Capability: Yes
      Multicast Capability: Yes
      Group                                        Members
      -----                                        -------
      224.0.0.1                                       1
Ready; T=0.01/0.01 12:57:01
ifconfig eth1 -remove
DTCIFC2668E -REMOVE cannot be specified for an active interface
Ready(00008); T=0.01/0.01 12:57:07
```

Removing an Interface – z/VM 5.3.0 (Continued)

```
ifconfig eth1 down
Ready; T=0.03/0.04 12:59:40
ifconfig eth1 -remove
Ready; T=0.02/0.02 12:59:48
ifconfig eth1
DTCIFC2612E Unknown interface: eth1
Ready(00012); T=0.01/0.01 12:59:54
netstat devlinks
VM TCP/IP Netstat Level 530

Ready; T=0.01/0.01 13:00:00
```

- **Details**
  - **Uses the new SIOCDINTERFACE ioctl() subcommand**
    - **Available to both REXX & C programs**
    - **Removes control block definitions and releases associated memory in the stack**

Read More About It

- IPWIZARD
  - z/VM Guide for Automated Installation and Service, GC24-6099
- IFCONFIG
  - z/VM TCP/IP Planning and Customization, SC24-6125

Contact Information

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  A number of listservs relevant to z/VM are available. Information on how to subscribe and view/search archives can be found at the following website:
  http://www.vm.ibm.com/techinfo/listserv.html

  Of particular interest:
  IBMVM@listserv.uark.edu
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