zSTSU Session Z5022
HiperSockets on z/OS

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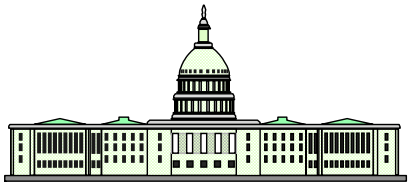
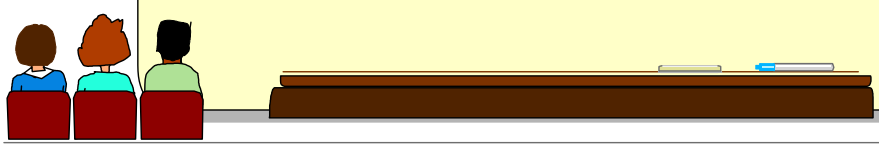


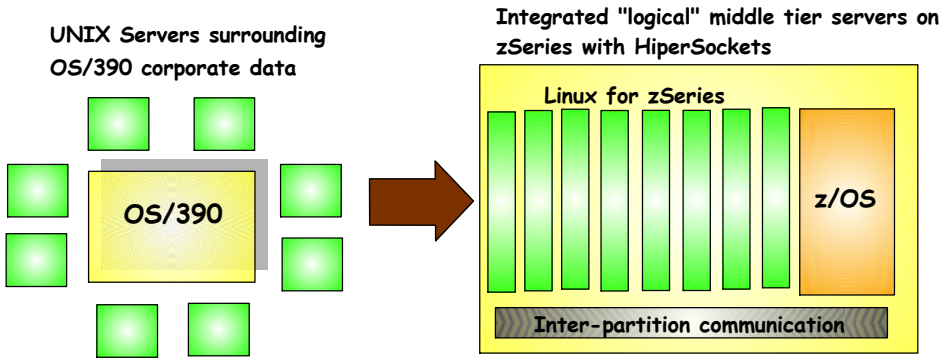
Topics

- **iQDIO (HiperSockets)**
  - Overview
  - Configuration
  - Routing
  - HiperSockets Accelerator
- **QDIO/iQDIO Storage**



iQDIO (HiperSockets) Overview

HiperSockets Introduced in V1R2



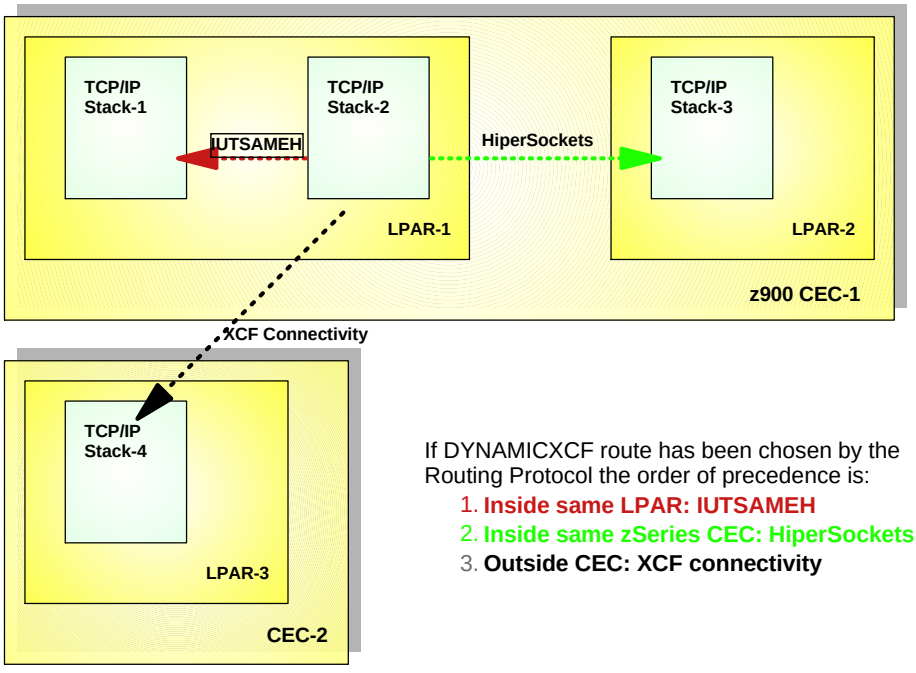
HiperSockets = "internal QDIO" (iQDIO)

- LPAR to LPAR communication via shared memory
  - No physical media constraint, so no priority queuing or cabling required
  - zSeries processor pre-requisite
  - Based on QDIO - High speed low latency connectivity to other operating systems
    - Linux for zSeries, z/VM (and guests), or another z/OS on same CEC
  - IP only communication
  - SNA communication requires Enterprise Extender
- z/OS Communications Server supports HiperSockets connectivity for two IP device types within the TCP/IP Profile data set:
  - HiperSockets device dynamically created with IPCONFIG statement "DYNAMICXCF"
  - HiperSockets device manually configured with device type of "MPCIPA"

z/OS HiperSockets Hardware & Software

- **z/OS HiperSockets hardware requirements**
  - z/OS (stand alone or as a guest under z/VM) supports HiperSockets on all zSeries processors
  - z/OS supports HiperSockets z/VM Guest LANs on S/390 G5 or G6 or zSeries processor (not covered in this presentation)
- **Maximum Number of HiperSockets LANs**
  - Up to 4 HiperSockets LANs on z800 or z900
    - Up to 4096 IP addresses per CEC
    - z900 requires microcode level 2064 EC E26949 level 013
  - Up to 16 HiperSockets LANs on z890 or z990
    - Up to 12,288 IP addresses per CEC
- **z/OS HiperSockets software release requirements**
  - z/OS V1R2+ required on z800 or z900
    - V1R2 requires APAR OW49475
  - z/OS V1R4+ required on z890 or z990
- **HiperSockets Accelerator**
  - Part of z/OS HiperSockets support (details later in this presentation)

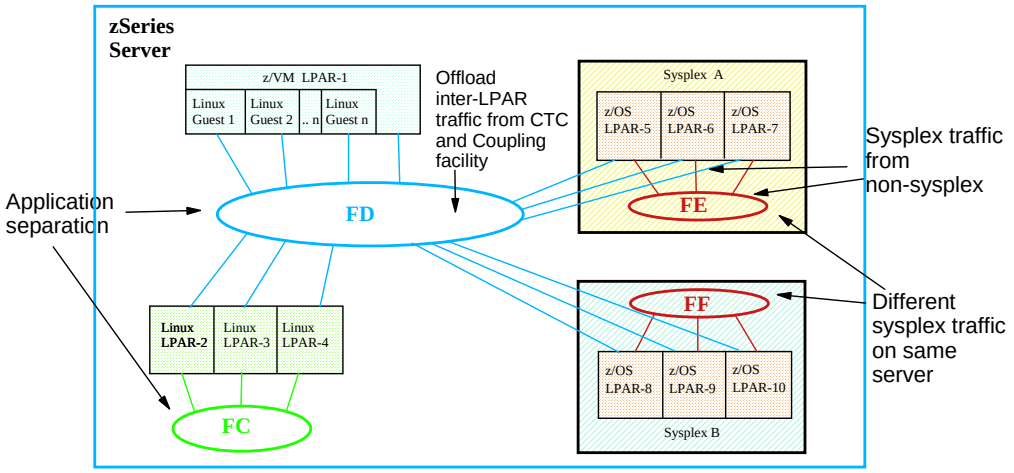
Understanding DYNAMICXCF Transport Choices



If DYNAMICXCF route has been chosen by the Routing Protocol the order of precedence is:

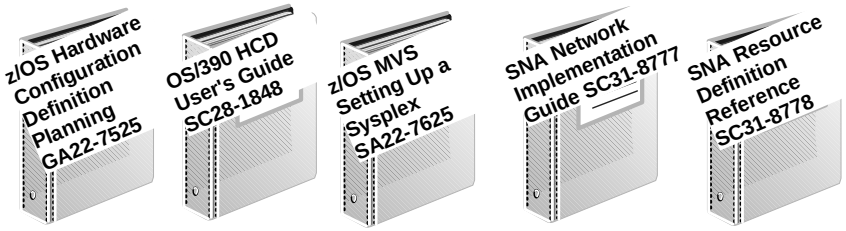
1. **Inside same LPAR: IUTSAMEH**
2. **Inside same zSeries CEC: HiperSockets**
3. **Outside CEC: XCF connectivity**

HiperSockets Configuration Variations

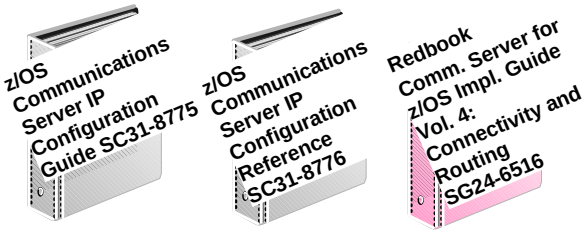


4 HiperSockets simulated Virtual LANs in z900 CEC:

- **HiperSockets FC is used for native Linux LPARs communications**
- **HiperSockets FD is used for z900 server-wide communications**
- **HiperSockets FE is used for communication between Sysplex A LPARs**
- **HiperSockets FF is used for communication between Sysplex B LPARs**



HiperSockets Configuration



Define HiperSockets CHPIDs

HiperSockets "simulated virtual LANs"

- Each LAN has its own CHPID
  - New CHPID type **IQD**
    - Controlled like regular CHPID
    - Must be defined as shared - Can be shared by all defined LPARs
    - HiperSockets CHPIDs do not reside physically in the hardware of the zSeries box, however these CHPIDs cannot be used by any other device
  - Each OS image configures its own usage of available HiperSockets CHPIDs
  - Each CHPID has configurable IQD frame size (16K, 24K, 40K, 64K) - which allows optimization per HiperSockets for small packets versus large streams (affects MTU size):

	CHPID	MFS	MTU	
Default	OS=00	16K	8K	**Default**
	OS=40	24K	16K	
	OS=80	40K	32K	
	OS=C0	64K	56K	

Sample IOCP deck for HiperSockets

```
*****************************************************************
* OS  values are '00'=16K, '40'=24K, '80'=40K  and 'C0'=64K.   *
*                                                               *
* Need at least 3 addresses per z/OS, maximum of 10:           *
*   - 2 addresses for control                                   *
*   - 1 address for data for each TCP stack (between 1 and 8) *
*****************************************************************
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
        CHPID PATH=(FA),SHARED,                                 *
              PARTITION=((LPAR1,LPAR2,LPAR3),(LPAR1,LPAR2,LPAR3)),  *
              TYPE=IQD,OS=00
        CNTLUNIT CUNUMBR=FD00,PATH=(FA),UNIT=IQD
        IODEVICE ADDRESS=(FD00,010),CUNUMBR=(FD00),UNIT=IQD
        CHPID PATH=(FB),SHARED,                                 *
              PARTITION=((LPAR1,LPAR2,LPAR3),(LPAR1,LPAR2,LPAR3)),  *
              TYPE=IQD,OS=40
        CNTLUNIT CUNUMBR=FD10,PATH=(FB),UNIT=IQD
        IODEVICE ADDRESS=(FD10,010),CUNUMBR=(FD10),UNIT=IQD
        CHPID PATH=(FC),SHARED,                                 *
              PARTITION=((LPAR1,LPAR2,LPAR3),(LPAR1,LPAR2,LPAR3)),  *
              TYPE=IQD,OS=80
        CNTLUNIT CUNUMBR=FD20,PATH=(FC),UNIT=IQD
        IODEVICE ADDRESS=(FD20,010),CUNUMBR=(FD20),UNIT=IQD
        CHPID PATH=(FD),SHARED,                                 *
              PARTITION=((LPAR1,LPAR2,LPAR3),(LPAR1,LPAR2,LPAR3)),  *
              TYPE=IQD,OS=C0
        CNTLUNIT CUNUMBR=FD30,PATH=(FD),UNIT=IQD
        IODEVICE ADDRESS=(FD30,010),CUNUMBR=(FD30),UNIT=IQD
```

CHPID	MFS	MTU
OS=00	16K	8K
OS=40	24K	16K
OS=80	40K	32K
OS=C0	64K	56K

Coding z/OS TCP/IP HiperSockets Interfaces

```
z/OS TCP/IP profile options:
1  IPCONFIG DYNAMICXCF 10.1.2.n ...
```

```
z/OS VTAM start-option:
2  IQDCHPID=FA
   XCFINIT=YES
```

1. **DYNAMIC XCF (iQDIO device): when DYNAMICXCF is configured**
   - The iQDIO DEVICE/LINK/HOME and VTAM TRLE are all dynamically built
   - If using static routing, this information is also dynamically built
   - Device name is IUTIQDIO
2. **VTAM determines HiperSockets CHPID**

```
3  DEVICE IUTIQDFB MPCIPA
   LINK HIPERLFB IPAQIDIO IUTIQDFB

   HOME 10.1.1.n HIPERLFB
   START IUTIQDFB
```

3. **User-configured MPCIPA (iQDIO device): when manually configured**
   - Each DEVICE/LINK/HOME is specified by the user
   - Static routing is also specified by the user
   - VTAM TRLE is still dynamically built
   - Device name is IUTIQDxx (where xx = CHPID)

The HiperSockets CHPID for DYNAMICXCF

```
F NET,VTAMOPTS,IQDCHPID=FA
IST097I MODIFY ACCEPTED
IST223I MODIFY COMMAND COMPLETED
```

```
D NET,VTAMOPTS
IST097I DISPLAY ACCEPTED
IST1188I VTAM CSV1R2 STARTED AT 15:05:07 ON 12/14/01 073
IST1349I COMPONENT ID IS 5695-11701-120
IST1348I VTAM STARTED AS END NODE
IST1189I AFFDELAY = 600                  ALSREQ   = NO
   ********more**********
 IST1189I IQDCHPID = FA                   IRNSTRGE = 0
 IST1189I ISTCOSDF = INDLU                LIMINTCP = ***NA***
 IST1189I LIST     = TS                   MAINTLVL = *BLANKS*
 IST1189I MAXLOCAT = 5000                 MAXLURU  = 6144
```

- VTAM start option IQDCHPID selects which HiperSockets IQD CHPID is used for TCP/IP DynamicXCF.
- It is not possible to use the VARY OBEY command to activate DynamicXCF use of a HiperSockets link.

HiperSockets - Display TRL, TRLE

```
D NET,TRL,TRLE=IUTIQDIO
IST097I DISPLAY ACCEPTED
IST075I NAME = IUTIQDIO, TYPE = TRLE 906
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = LEASED, CONTROL = MPC , HPDT = YES
IST1715I MPCLEVEL = QDIO       MPCUSAGE = SHARE
IST1716I PORTNAME = IUTIQDFA LINKNUM = 0 OSA CODE LEVEL = C3C7
IST1577I HEADER SIZE = 4096 DATA SIZE = 16384 STORAGE = ***NA***
IST1221I WRITE DEV = FD01 STATUS = ACTIVE     STATE = ONLINE
IST1577I HEADER SIZE = 4092 DATA SIZE = 0 STORAGE = ***NA***
IST1221I READ  DEV = FD00 STATUS = ACTIVE     STATE = ONLINE
IST1221I DATA  DEV = FD02 STATUS = ACTIVE     STATE = N/A
IST1724I I/O TRACE = OFF  TRACE LENGTH = *NA*
IST1717I ULPID = TCPIPA
IST1814I IQDIO ROUTING ENABLED
IST1757I PRIORITY1: UNCONGESTED PRIORITY2: UNCONGESTED
IST1757I PRIORITY3: UNCONGESTED PRIORITY4: UNCONGESTED
IST1801I UNITS OF WORK FOR NCB AT ADDRESS X'08FE9010'
```

Dynamically Created

HiperSockets - NETSTAT DEV

```
D TCPIP,,N,DEV
EZZ2500I NETSTAT CS V1R2 TCPIPA 121
          .
          .
          .
DEVNAME: IUTIQDIO          DEVTYPE: MPCIPA    DEVNUM: 0000
  DEVSTATUS: READY         CFGROUTER: NON  ACTROUTER: NON
  LNKNAME: IQDIOLNK0A010201  LNKTYPE: IPAQIDIO    LNKSTATUS: READY
    NETNUM: 0   QUESIZE: 0
    BYTESIN: 301507               BYTESOUT: 80599
    BROADCASTCAPABILITY: NO
    ARPOFFLOAD: YES  ARPOFFLOADINFO: NO
  BSD ROUTING PARAMETERS:
    MTU SIZE: 08192            METRIC: 01
    DESTADDR: 0.0.0.0          SUBNETMASK: 255.255.255.0
  MULTICAST SPECIFIC:
    MULTICAST CAPABILITY: YES
```

HiperSockets - Display, NETSTAT HOME

```
D TCPIP,,N,HOME
EZZ2500I NETSTAT CS V1R2 TCPIPA 131
HOME ADDRESS LIST:
ADDRESS          LINK                          FLG
9.82.24.165      GIG2                          P
9.82.135.71      OSATRA00
9.82.24.150      GIG1
10.1.1.1         HIPERLFB
10.1.2.1         EZASAMEMVS
10.1.2.1         IQDIOLNK0A010201
127.0.0.1        LOOPBACK
7 OF 7 RECORDS DISPLAYED
```

Predefined HiperSockets Link

IUTSAMEH Link (DynamicXCF)

Dynamically Built HiperSockets Link (DynamicXCF)

Routing

DynamicXCF Route Definition

- DynamicXCF routes are dynamically created but the defaults used are not usually the optimal. To manually define the DYNAMICXCF HiperSockets Routing use one of the following methods:
  - BEGINROUTES
    ROUTE 10.100.5.0 255.255.255.0 = IQDIOLNKC0000241 MTU 8000
  - GATEWAY
    10 = IQDIOLNKC0000241 8000 0.255.255.0 0.100.5.0
  - BSDROUTINGPARMS
    IQDIOLNKC0000241 8000 1 255.255.255.0 10.100.5.0
  - RIP_Interface
    IP_address=10.100.5.41
    Name=IQDIOLNKC0000241
    Subnet_mask=255.255.255.0
    MTU=8000
    RIPV2=YES
    RECEIVE_RIP=RIP2
  - OSPF_Interface
    IP_address=10.100.5.41
    Name=IQDIOLNKC0000241
    Subnet_mask=255.255.255.0
    Attaches_To_Area=10.100.5.0
    MTU=8000
    Hello_Interval=10
    Dead_Router_Interval=40

Non-DynamicXCF Route Definition

- To define Routing for manually defined (non-DYNAMICXCF) HiperSockets use one of the following methods:
  - BEGINROUTES
    ROUTE 10.100.5.0 255.255.255.0 = HIPERLEC MTU 8000
  - GATEWAY
    10 = HIPERLEC 8000 0.255.255.0 0.100.5.0
  - BSDROUTINGPARMS
    HIPERLEC 8000 1 255.255.255.0 10.100.5.0
  - RIP_Interface
    IP_address=10.100.5.41
    Name=HIPERLEC
    Subnet_mask=255.255.255.0
    MTU=8000
    RIPV2=YES
    RECEIVE_RIP=RIP2
  - OSPF_Interface
    IP_address=10.100.5.41
    Name=HIPERLEC
    Subnet_mask=255.255.255.0
    Attaches_To_Area=10.100.5.0
    MTU=8000
    Hello_Interval=10
    Dead_Router_Interval=40

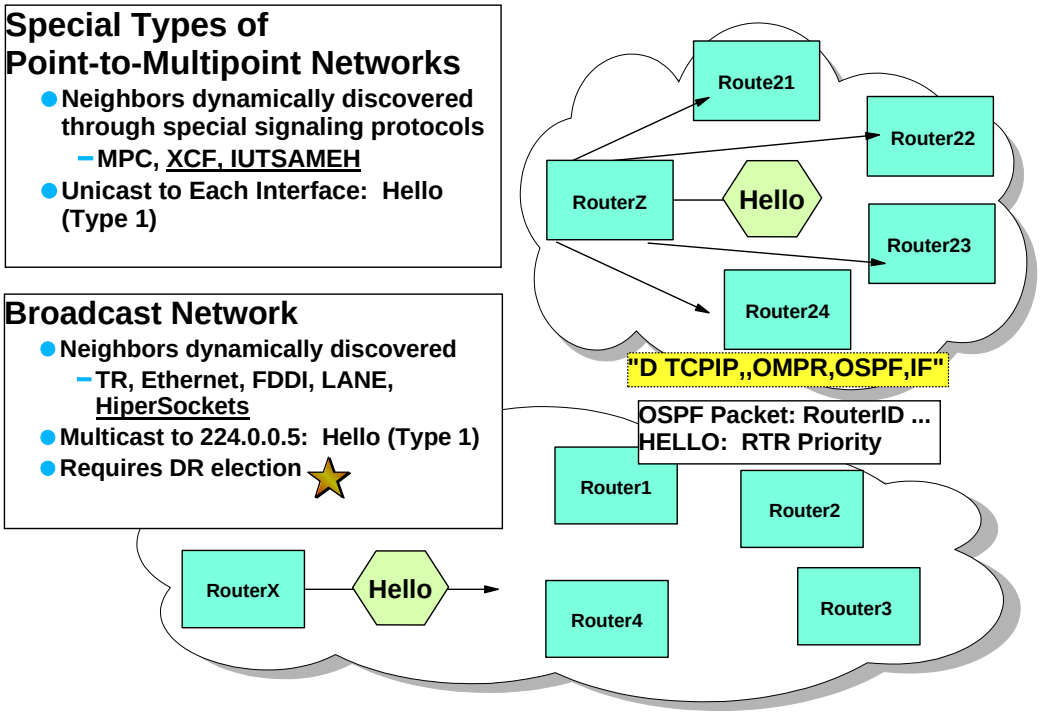
HiperSockets & DR Eligibility in OSPF

Special Types of Point-to-Multipoint Networks

- Neighbors dynamically discovered through special signaling protocols
  - MPC, XCF, IUTSAMEH
- Unicast to Each Interface: Hello (Type 1)

Broadcast Network

- Neighbors dynamically discovered
  - TR, Ethernet, FDDI, LANE, HiperSockets
- Multicast to 224.0.0.5: Hello (Type 1)
- Requires DR election



HiperSockets IP Routing table

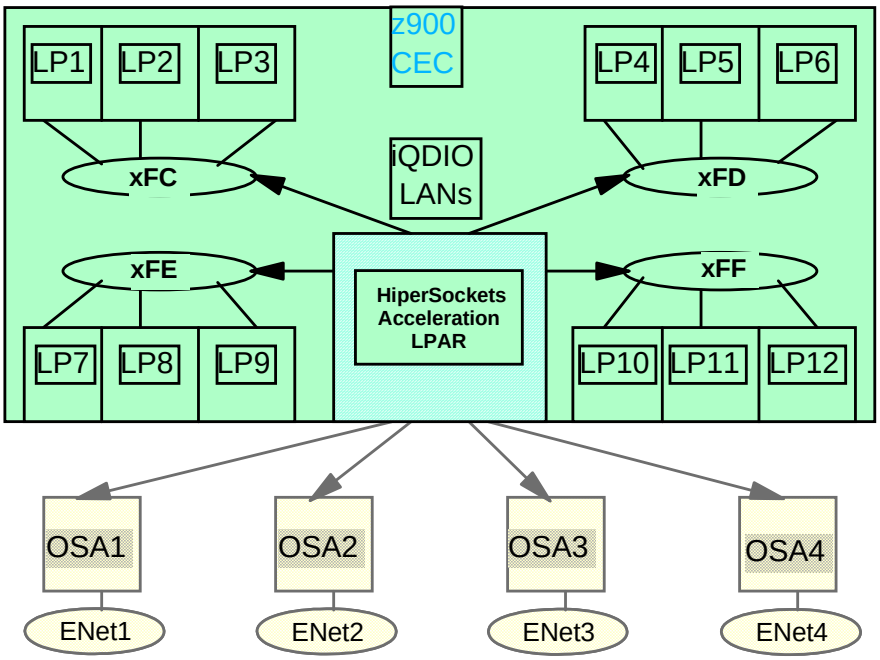
```
D TCPIP,,N,ROUTE
EZZ2500I NETSTAT CS V1R2 TCPIPA 194
DESTINATION      GATEWAY          FLAGS     REFCNT  INTERFACE
DEFAULTNET       9.82.128.1       UGS       000001  OSATRA00
9.82.22.0        0.0.0.0          US        000000  GIG2
9.82.22.0        0.0.0.0          US        000000  GIG1
9.82.24.0        0.0.0.0          US        000000  GIG2
9.82.24.0        0.0.0.0          US        000000  GIG1
9.82.24.150      0.0.0.0          UH        000000  GIG1
9.82.24.165      0.0.0.0          UH        000000  GIG2
9.82.128.0       0.0.0.0          US        000001  OSATRA00
9.82.135.71      0.0.0.0          UH        000000  OSATRA00
10.1.1.0         0.0.0.0          US        000000  HIPERLFB
10.1.1.1         0.0.0.0          UH        000000  HIPERLFB
10.1.2.0         0.0.0.0          US        000000  IQDIOLNK0A010201
10.1.2.1         0.0.0.0          H         000000  EZASAMEMVS
10.1.2.1         0.0.0.0          UH        000000  IQDIOLNK0A010201
10.1.2.2         0.0.0.0          UHS       000000  IQDIOLNK0A010201
10.1.2.3         0.0.0.0          UHS       000000  IQDIOLNK0A010201
10.1.2.4         0.0.0.0          UHS       000000  IQDIOLNK0A010201
127.0.0.1        0.0.0.0          UH        000003  LOOPBACK
18 OF 18 RECORDS DISPLAYED
```

Predefined

Dynamically Defined

HiperSockets Accelerator

HiperSockets Accelerator - New in V1R2

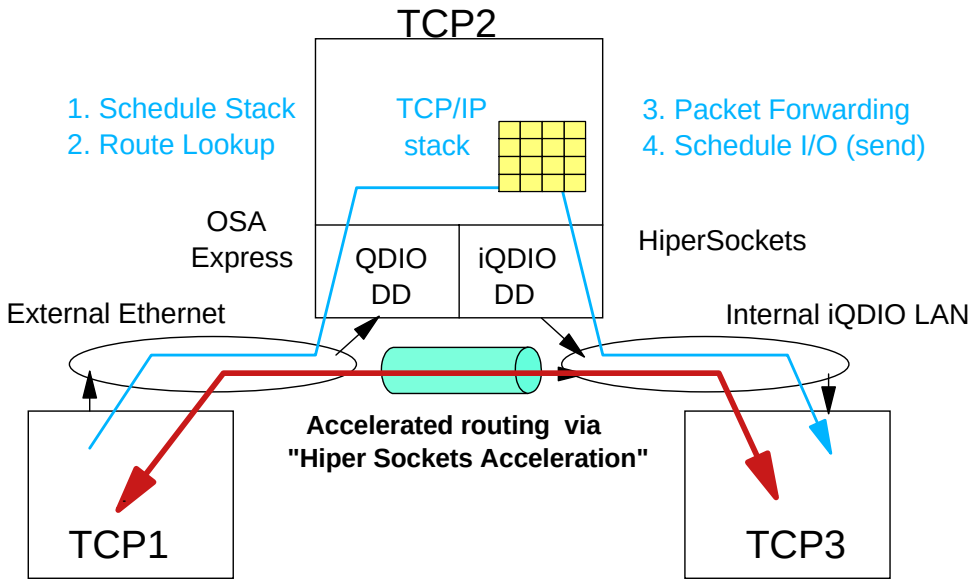


OSA QDIO IP Stacks Limit

	Limit without latest MCL	Limit with latest MCL
9672 G5/G6	15	N/A
z900	15	80
z800	80	N/A
z990	15	160
z890	160	N/A

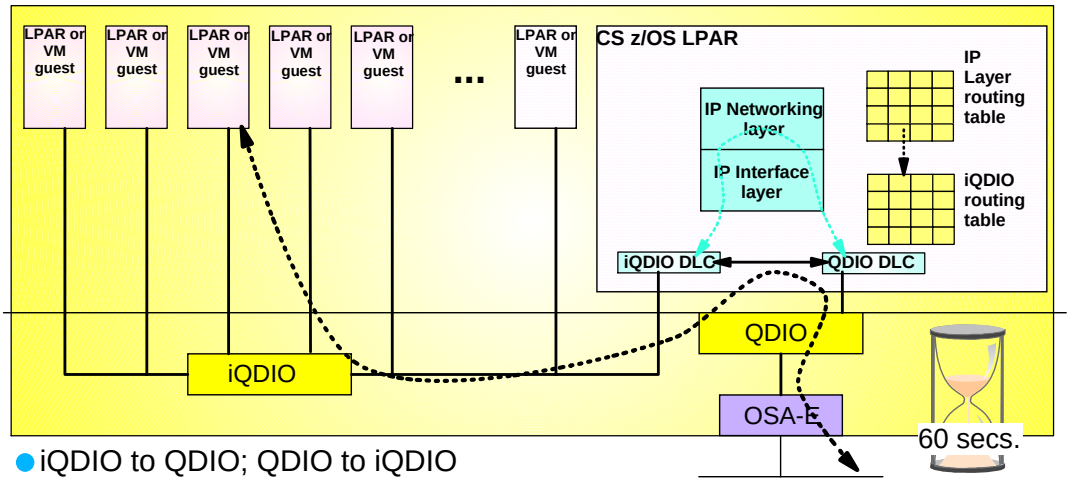
- The above chart shows the maximum number of LPs that may be configured to share an OSA-Express port.
  - You should refer to the IBM Preventive Service Planning (PSP) bucket 9672DEVICE, subset OSA (for G5/G6), 2064DEVICE, subset OSA (for z900), 2066DEVICE (for z800), 2084DEVICE (for z900), and 2086DEVICE (for z890) for the latest Micro Code Levels (MCLs). The customer should install the latest MCLs.
  - Alternatively the customer may contact IBM Service for the latest MCL information.

HiperSockets Accelerator Basics



iQDIO to QDIO and vice-versa

HiperSockets Accelerator Technical Overview



- iQDIO to QDIO; QDIO to iQDIO
- iQDIO Routing Table manages all packets after first.
- PRIROUTER required on OSA-E
- HSA Stack codes "IPCONFIG IQDIORouting DATAGRAMFORWD"
  - Firewall functions MUST be disabled
- IP Fragmentation not supported (VTAM Device Drivers do not fragment)
  - Suggest "IPCONFIG PATHMTUDiscovery"
- One OSA-E priority queue ("IPCONFIG QDIOPRIORITY=1")

HiperSockets Accelerator Sample Coding

```
;TCPIP PROFILE (TCPIPB)
;
;GbE --- CHPID 0C ----------------
DEVICE KGIG0C   MPCIPA   PRIROUTER
LINK GIG2 IPAQENET KGIG0C
;
HOME

  9.82.24.166    GIG2
  9.82.135.72    OSATRA00
  9.82.24.151    GIG1
            :
            :
            :

IPCONFIG   DATAGRAMFWD   VARSUBNETTING
SYSPLEXROUTING
IQDIORouting   QDIOPriority 1     PATHMTUDISCovery
DYNAMICXCF    10.1.2.2      255.255.255.0     1
```

HiperSockets Accelerator Display TRLE Output

```
D U,,,FD00,4
IEE457I 11.03.40 UNIT STATUS 074
UNIT TYPE STATUS      VOLSER    VOLSTATE
FD00 IQD  A-BSY
FD01 IQD  A
FD02 IQD  A-BSY
FD03 IQD  O
```

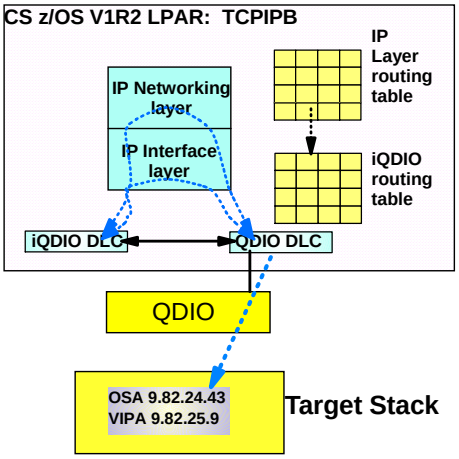
```
D NET,TRL,TRLE=IUTIQDIO
IST097I DISPLAY ACCEPTED
IST075I NAME = IUTIQDIO, TYPE = TRLE 070
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = LEASED           , CONTROL = MPC , HPDT = YES
IST1715I MPCLEVEL = QDIO      MPCUSAGE = SHARE
IST1716I PORTNAME = IUTIQDFA   LINKNUM =   0   OSA CODE LEVEL = C3C7
IST1577I HEADER SIZE = 4096 DATA SIZE = 16384 STORAGE = ***NA***
IST1221I WRITE DEV = FD01 STATUS = ACTIVE     STATE = ONLINE
IST1577I HEADER SIZE = 4092 DATA SIZE = 0 STORAGE = ***NA***
IST1221I READ  DEV = FD00 STATUS = ACTIVE     STATE = ONLINE
IST1221I DATA  DEV = FD02 STATUS = ACTIVE     STATE = N/A
IST1724I I/O TRACE = OFF  TRACE LENGTH = *NA*
IST1717I ULPID = TCPIPA
IST1814I IQDIO ROUTING ENABLED
IST1757I PRIORITY1: UNCONGESTED PRIORITY2: UNCONGESTED
```


HiperSockets Accelerator Display Config Output

```
D TCPIP,TCPIPB,N,CONFIG
EZZ2500I NETSTAT CS V1R2 TCPIPB 921
TCP CONFIGURATION TABLE:
DEFAULTRCVBUFSIZE:  00066560  DEFAULTSNDBUFSIZE: 00066560
DEFLTMAXRCVBUFSIZE: 00262144
        .
TCPTIMESTAMP:      YES      FINWAIT2TIME:     600
UDP CONFIGURATION TABLE:
DEFAULTRCVBUFSIZE: 00065535  DEFAULTSNDBUFSIZE: 00065535
        .
IP CONFIGURATION TABLE:
FORWARDING: YES    TIMETOLIVE: 00064  RSMTIMEOUT:  00060
FIREWALL:   00000
ARPTIMEOUT: 00300  MAXRSMSIZE: 65535
IGREDIRECT: 00000  SYSPLXROUT: 00001  DOUBLENOP:   00000
STOPCLAWER: 00000  SOURCEVIPA: 00000  VARSUBNET:   00001
MULTIPATH:  NO     PATHMTUDSC: 00001  DEVRTRYDUR:  0000000090
DYNAMICXCF: 00001
  IPADDR: 10.1.2.2        SUBNET: 255.255.255.0    METRIC: 01
IQDIOROUTE: YES  QDIOPRIORITY: 1
SMF PARAMETERS:
TYPE 118:
 TCPINIT:     00   TCPTERM:    00   FTPCLIENT:    00
 TN3270CLIENT: 00   TCPIPSTATS: 00
        :
        :
```

Netstat Options for HiperSockets Accelerator

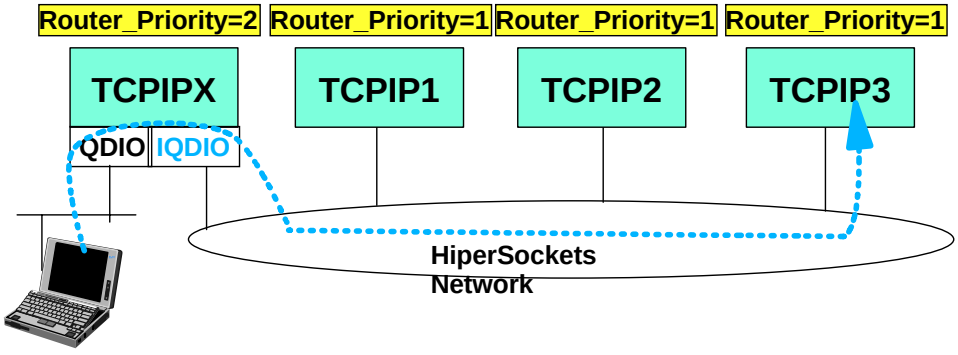
```
D TCPIP,TCPIPB,N,ROUTE,IQDIO

 EZZ2500I NETSTAT CS V1R2 TCPIPB 060
 DESTINATION      GATEWAY          INTERFACE
 9.82.25.9        9.82.24.43       GIG2
 1 OF 1 RECORDS DISPLAYED
```



D TCPIP,TCPIPB,N,ROUTE,IQDIO

- DESTINATION = Target VIPA
- GATEWAY = Next Hop after exiting TCPIPB's QDIO
- INTERFACE = QDIO LinkName to use to reach Gateway

OSPF_Interface for HiperSockets



PROFILE.TCPIP for Dynamic XCF

```
IPConfig DynamicXCF 192.168.2.2 255.255.255.0 1
```

Dynamic XCF in OMPROUTE

- **EZASAMEMVS Connection**
- **XCF Data Connection**
- **HiperSockets Connection**

```
OSPF_Interface
  IP_address = 192.168.2.*
  MTU=4096
  Router_Priority=1
  Subnet_mask = 255.255.255.0;
```

QDIO/iQDIO Storage

Increased QDIO/iQDIO Storage Defaults

- The default amount of storage used for read processing for both OSA-E QDIO and iQDIO (HiperSockets) devices was increased in z/OS V1R4.
  - Retrofitted back to z/OS V1R2 via APAR OW52291
- OSA-Express - amount of storage for read processing:

	Pre-V1R4 value	V1R4 defaults
non-64 bit	.5 meg	**1 Meg**
zSeries (64-bit)	.5 meg	**4 Meg**

- HiperSockets - amount of storage for read processing:

CHPID OS=	CHPID MFS	Pre-V1R4 value	V1R4 defaults	TCP/IP MTU
00	16 K	2 Meg	2 Meg	8K
40	24 K	3 Meg	3 Meg	16K
80	40 K	4 Meg	**5 Meg**	32K
C0	64 K	4 Meg	**8 Meg**	56K

QDIOSTG and IQDIOSTG

- **Two new VTAM Start Options in V1R4**
  - QDIOSTG
    - Allows you to define how much storage VTAM keeps available for read processing for all **OSA** QDIO data devices
  - IQDIOSTG
    - Allows you to define how much storage VTAM keeps available for read processing for all **HiperSockets** (iQDIO) data devices that use an MFS of **64K**
- **Storage units defined in terms of QDIO SBALs (QDIO read buffers)**
  - Each OSA SBAL = 64K
  - Each HiperSockets SBAL = MFS
    - **IQDIOSTG only applies to MFS = 64K (CHPID OS=C0)**

Storage Changes Recommendations

- **Start Option defaults are appropriate for most environments**
  - Default is MAX on 64bit machines and MIN on other machines
  - AVG, MIN, or nnn (where nnn is exact number of SBALs in the range 8-126) may also be specified

```
          --IQDIOSTG=-MAX--------
          |                      |
   >>------------------------------------------>
          |--IQDIOSTG=-MAX------|
                    |-AVG-------|
                    |-MIN-------|
                    |-NNN-------|

          --QDIOSTG=-MAX---------
          |                      |
   >>------------------------------------------>
          |--QDIOSTG=-MAX-------|
                    |-AVG-------|
                    |-MIN-------|
                    |-NNN-------|
```

- **Review CSM specifications in PARMLIB member IVTPRMxx and increase, if appropriate**
  - Use the D NET,CSM to display CSM usage
- **Modify storage settings using Start Options, as appropriate**

READSTORAGE

- **New keyword Readstorage on Link and Interface in V1R5**
  - Link statement for IPAQENET, IPAQTR, and IPAQIDIO
  - Interface statement for IPAQENET6
  - Override QDIOSTG or IQDIOSTG for a specific QDIO or iQDIO device.
    - For HiperSockets, only affects devices with 64K MFS

```
>>-LINK--link_name--IPAQENET--device_name--+---------+--+--------------+---->
                                           '-IPBCAST-'  '-VLANID id-----'

  .-READSTORAGE-----GLOBAL-.   .-INBPERF-----BALANCED---.
>-+------------------------+---+-----------------------+--|
  +-READSTORAGE--+--MAX----+   +-INBPERF--+--MINCPU-----+
                 +--AVG----+               '--MINLATENCY-'
                 '--MIN----'

    .-IFSPEED 100000000-.
>--+------------------+-----------------------------------><
   +-IFSPEED ifspeed---+
   '-IFHSPEED ifhspeed-'
```

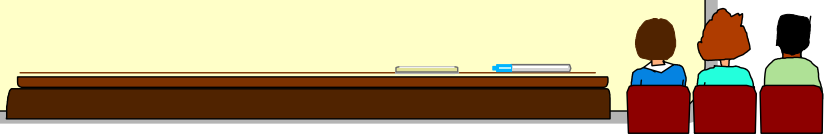

Broadcast Support

- **New keyword IPBCAST on Link in V1R5**
  - IPv4 packets only
  - IBM eServer zSeries 990 or 890 required
  - No broadcast support for HiperSockets device used for DYNAMICXCF (IUTIQDIO)

```
>>-LINK--link_name--IPAQIDIO--device_name--+---------+--->
                                           '-IPBCAST-'

  .-READSTORAGE-----GLOBAL-.
>-+------------------------+--|
  +-READSTORAGE--+--MAX----+
                 '--AVG----+
                 '--MIN----'
```

Summary

- **iQDIO (HiperSockets)**
  - Overview
  - Configuration
  - Routing
  - HiperSockets Accelerator
- **QDIO/iQDIO Storage**



End of Section