E34

High Availability IMS Using TCP/IP

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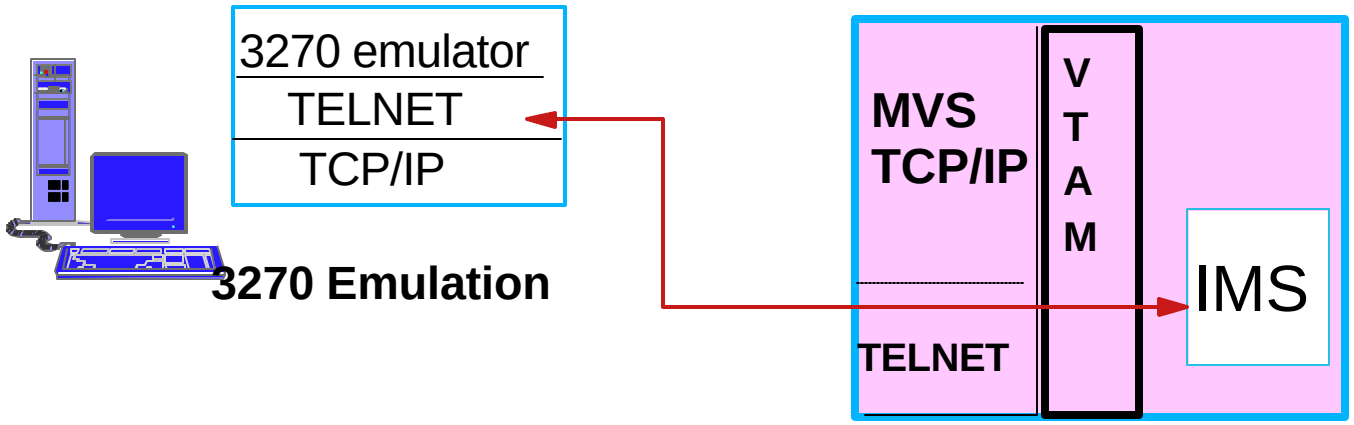
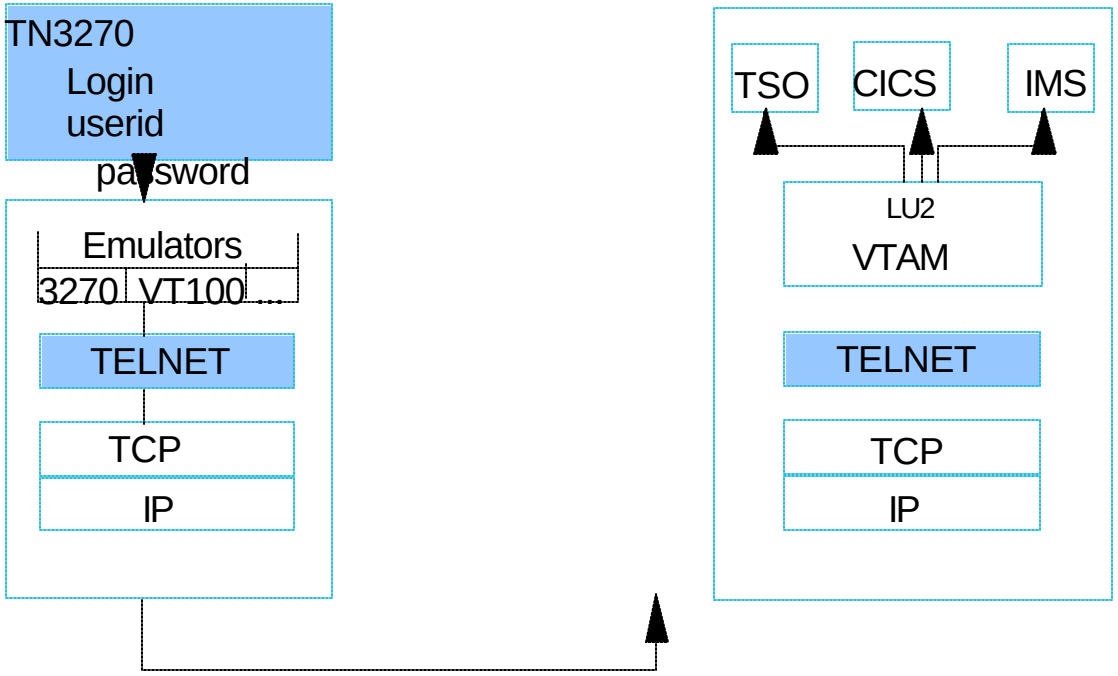
TCP/IP and IMS - Topics

- **Primary requirements for IMS access**
  - **Remote login - terminal emulation**
  - **Printer support**
  - **Program-to-program**
    - Web access
    - Sockets support
      - IMS Connect
      - Extended Sockets
- **Usability**
  - **Workload distribution and failover**
    - Network Dispatcher/ Load Balancer
    - Routers
    - VIPA
    - Sysplex Distributor

Internet

Remote Login - Terminal Emulation



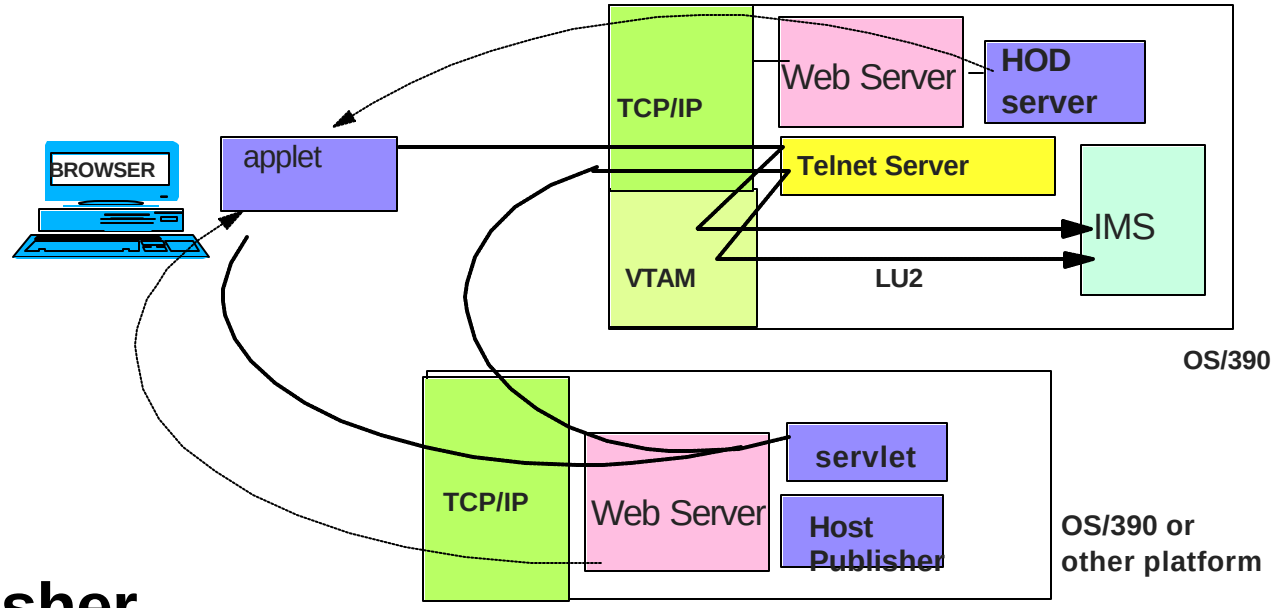



```
BEGINVTAM
      ** LOGMODES **
      3278-2     LMD32782
      ...

      ** LU POOL **
      TCP00001 TCP00002
      TCP00003 TCP00004 ...
      ...

      ALLOWAPPL TSO
      ...

      RESTRICTAPPL IMS
            **e.g. only 3 users**

      USER user1 user2 user3
```

Web Access Via Telnet

Host On-Demand/ Host Integration Solution

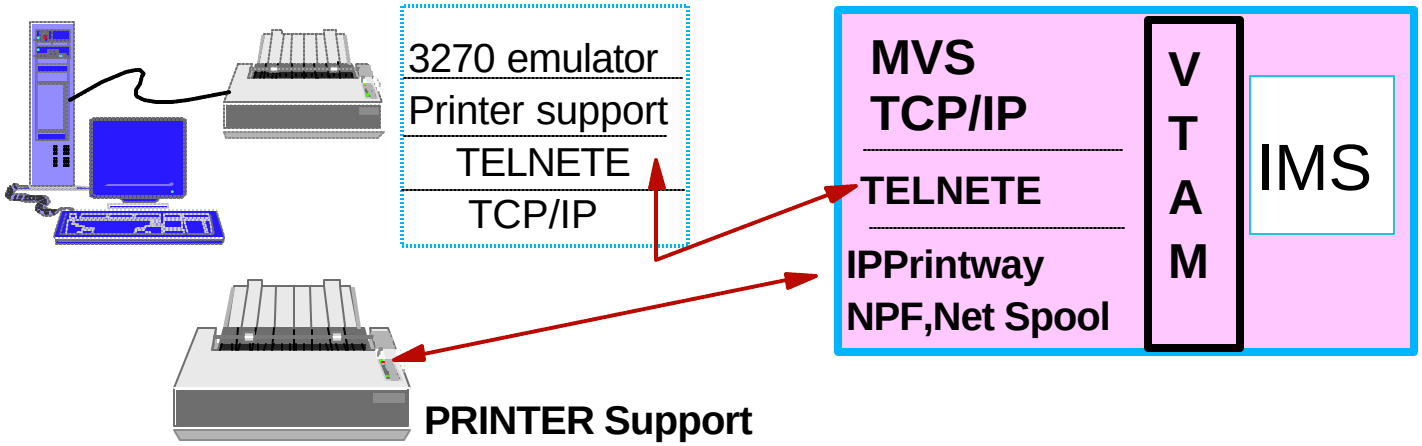
- Downloads a Java applet (includes a TN3270 emulator)
  - Provides GUI functions, screen customization
- Host Access Class Library API
  - Allows access to the emulator data stream to extend
  - Create customized e-business applications



Host Publisher

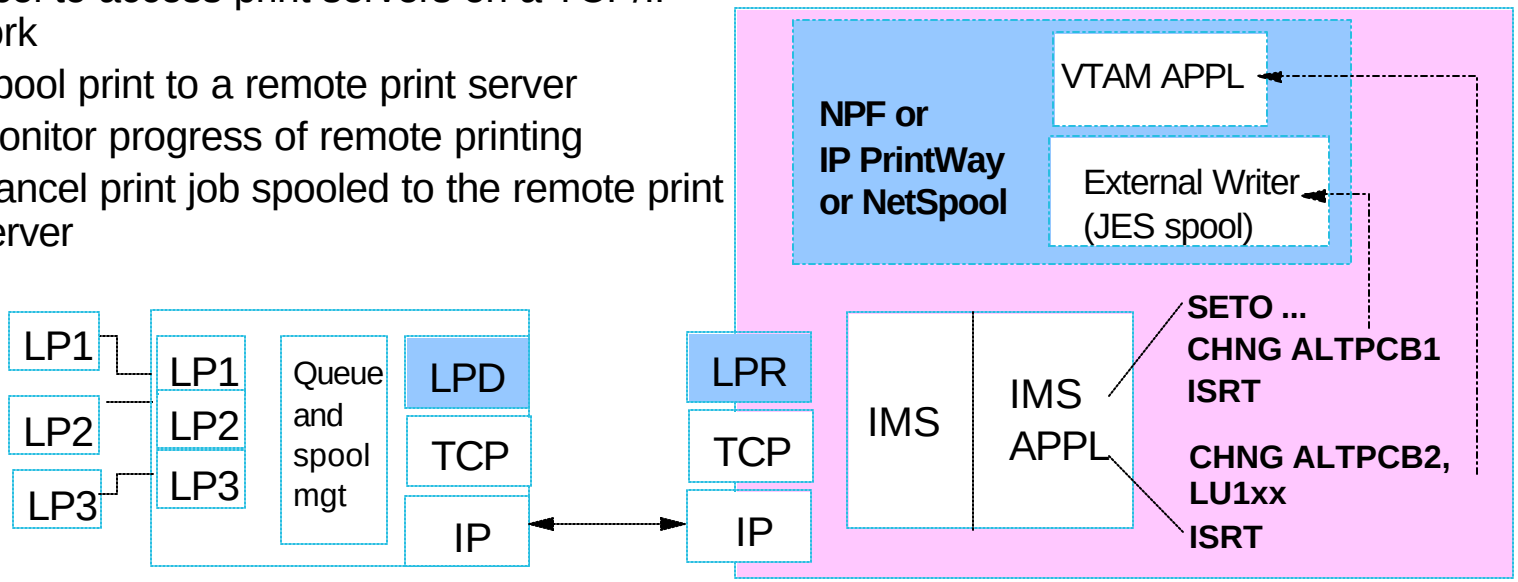
- Provides a servlet that provides the TN3270 client support

Printer Support

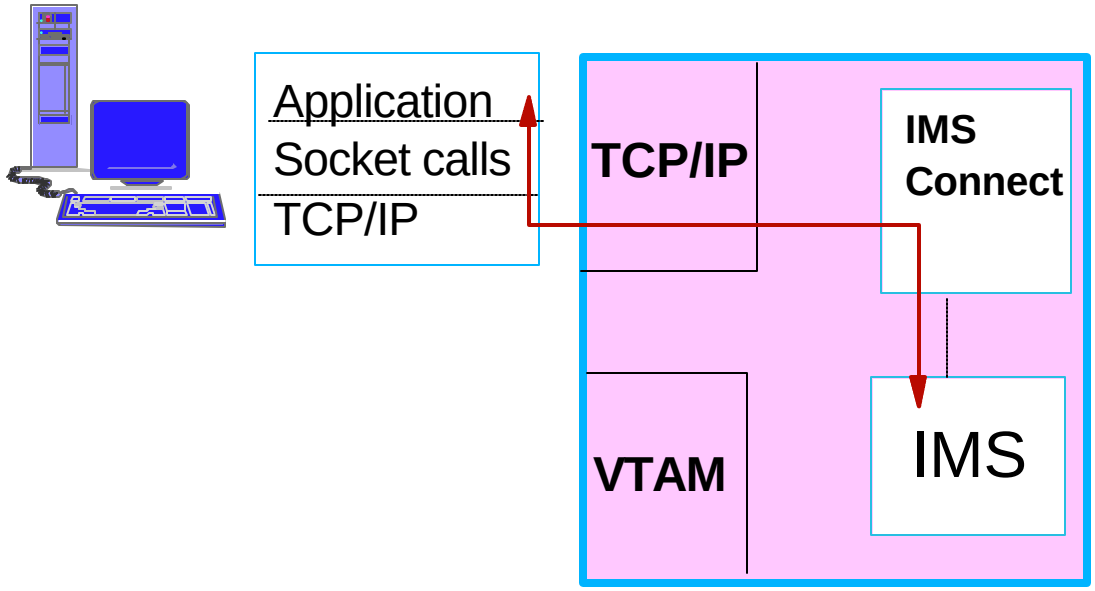


Line printer Daemon Protocol (LPR/LPD)

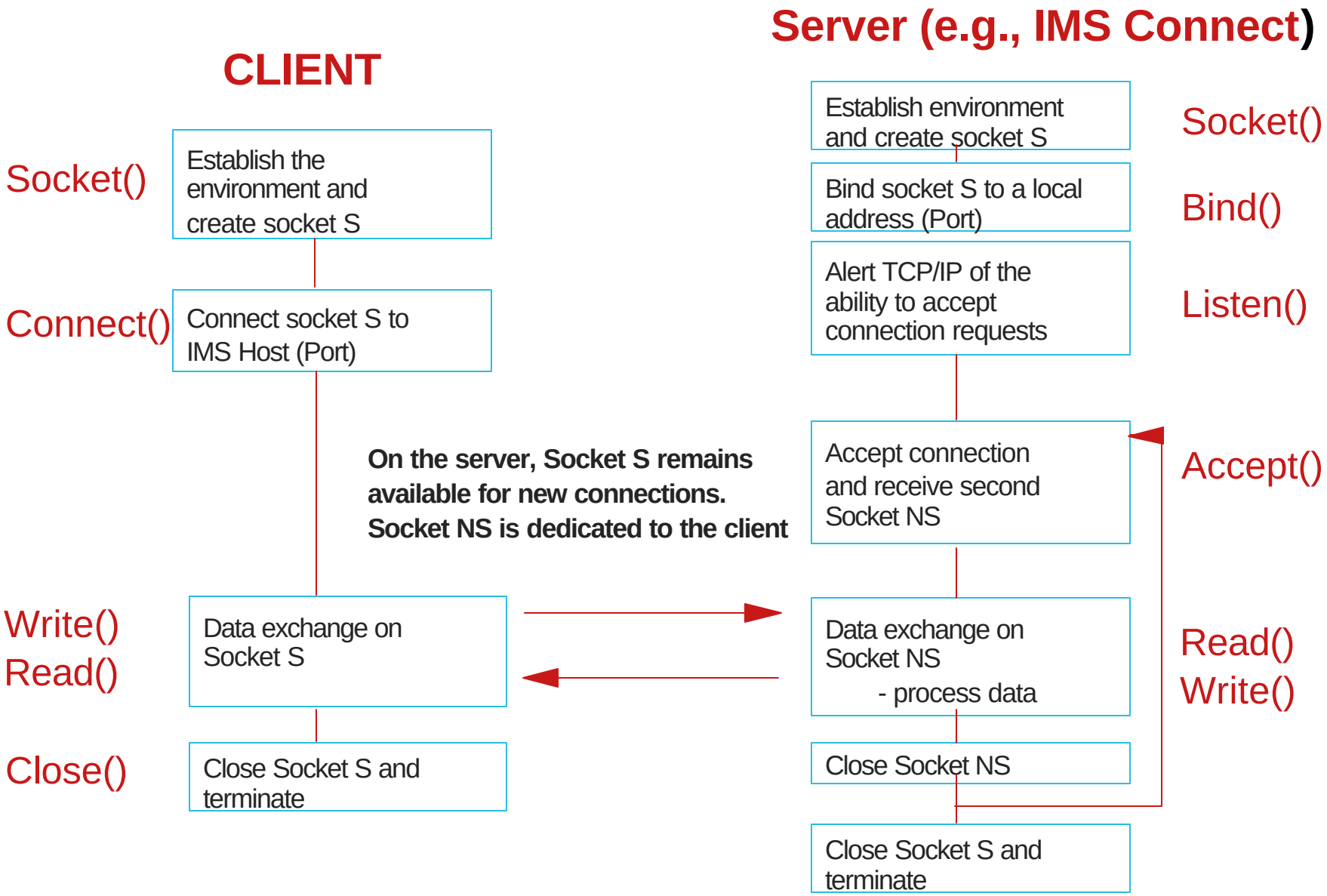
- Protocol to access print servers on a TCP/IP network
  - Spool print to a remote print server
  - Monitor progress of remote printing
  - Cancel print job spooled to the remote print server



Program-to-Program

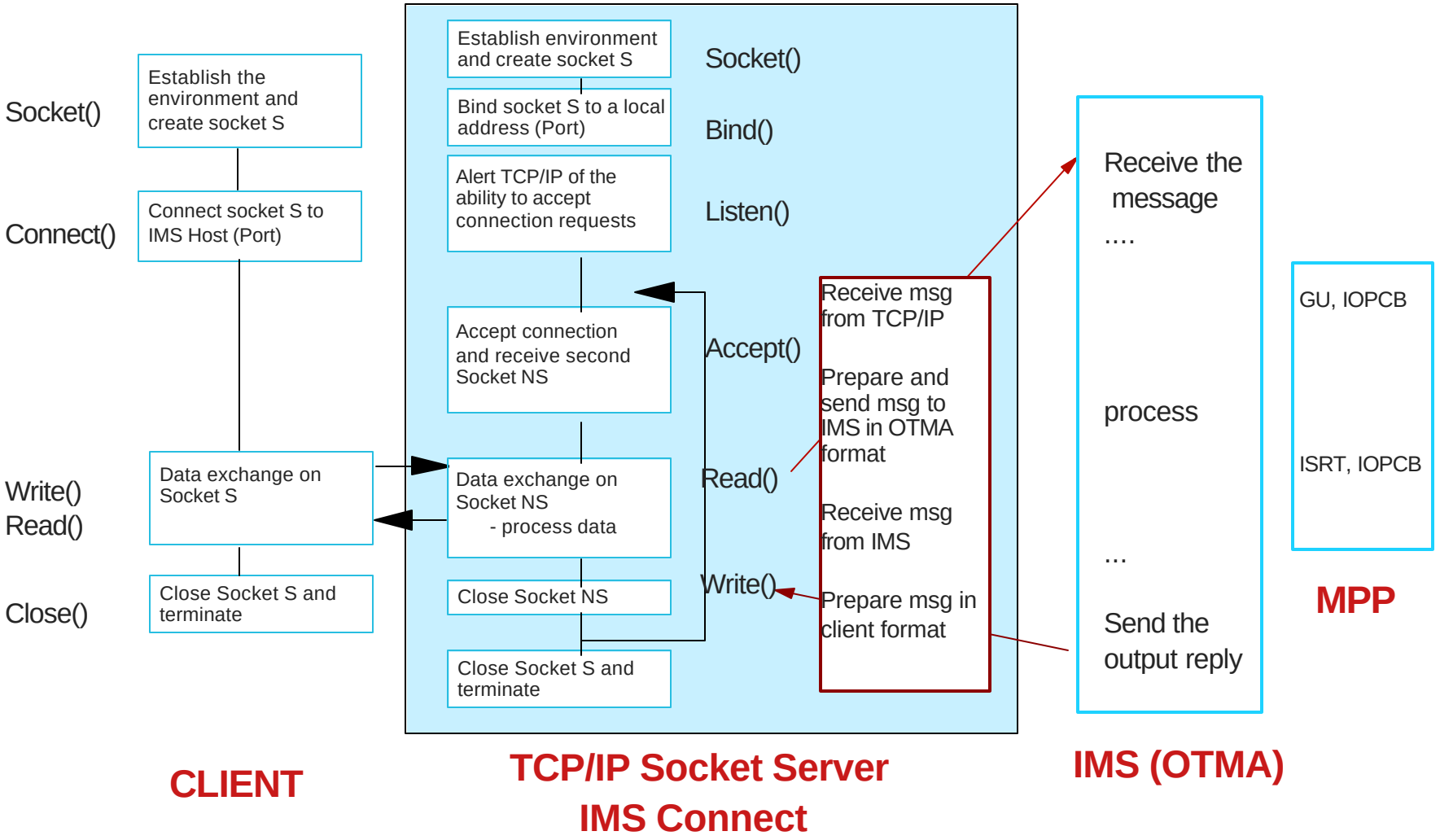


Socket Application Basic Design



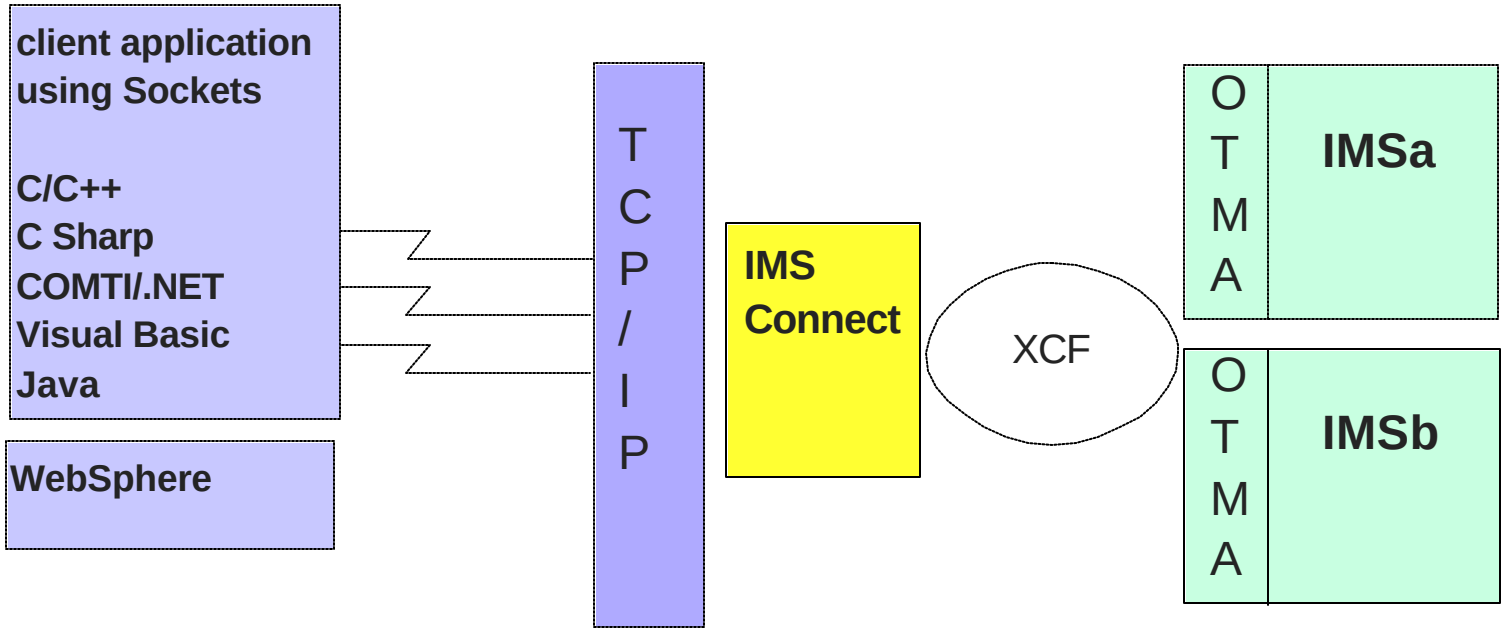
Socket Application Basic Design ...

Add IMS into the picture



IMS Connect

TCP/IP sockets support for IMS



- Provides "implicit" support for IMS applications
  - Continue to use DL/I calls: GU, ISRT
- Primarily for inbound requests from external clie
  - Access to transactions

IMS Connect Tips

IMS Connect client TCP/IP environment

- SO_Linger=Y,VALUE=10
  - Ensures no loss of data
  - close() is blocked until ACK is received or 10 sec
- TCPNODELAY=DISABLE
  - Optimizes transmission
  - Waits until buffer is full (multiple writes)

IMS Connect mainframe TCP/IP environment in the PROFILE.TCPIP configuration

- PORT
  - NODELAYACKS
    - Allows any required ACKs to be sent immediately
- SOMAXCONN
  - Maximum number of sockets queued on a listener
    - Defaults to 10, should be large enough to support the maximum number of concurrent requests

IMS Connect Tips...

IMS Connect configuration - TCPIP parameters

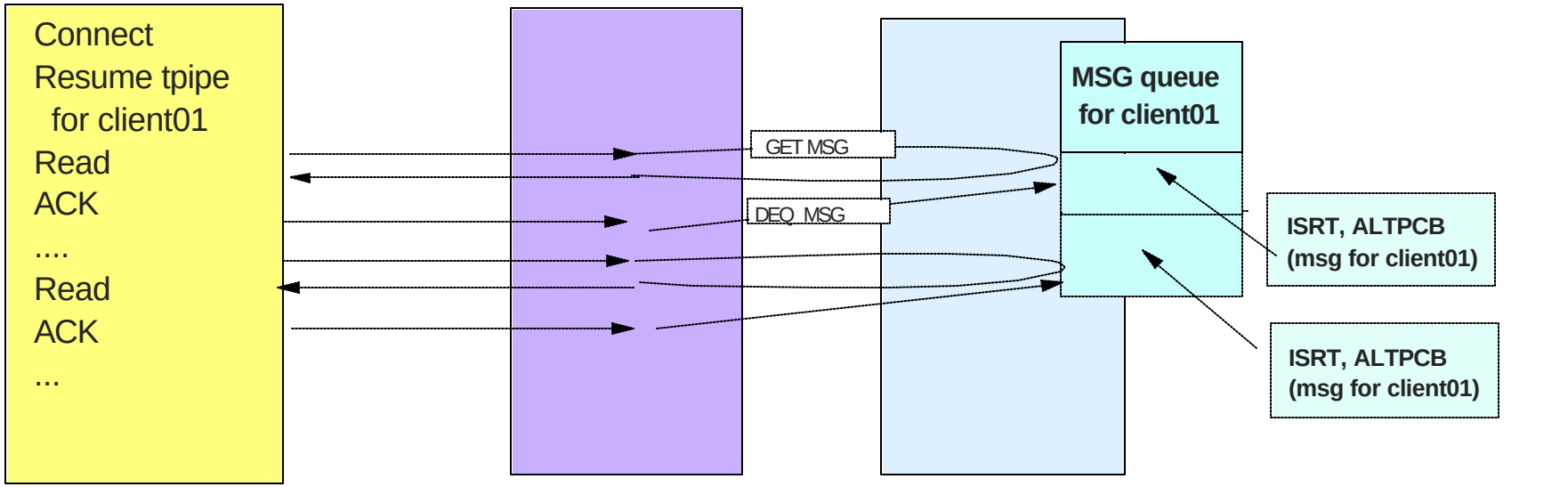
- ECB=Y
  - Posts an ECB when there is work to do
- MAXSOC = xxxx
  - Defaults to 50
    - Specify large enough value to support concurrent throughput requirement
- IPV6=Y (PQ66151)
  - Require z/OS V1R4
  - Better performance even if the network itself is not at IPV6 level

XCF tuning

- MAXMSG
  - XCF signalling buffers
    - XCF buffer shortage can be seen as an IMS Connect hang condition
  - How big should they be?
    - Depends on requirements for message traffic
      - size and frequency of the messages, as well as the performance of the signaling paths and systems involved in the message transfer
    - z/OS V1R4.0 MVS Setting Up a Sysplex (SA22-7625)

IMS Connect - Outbound

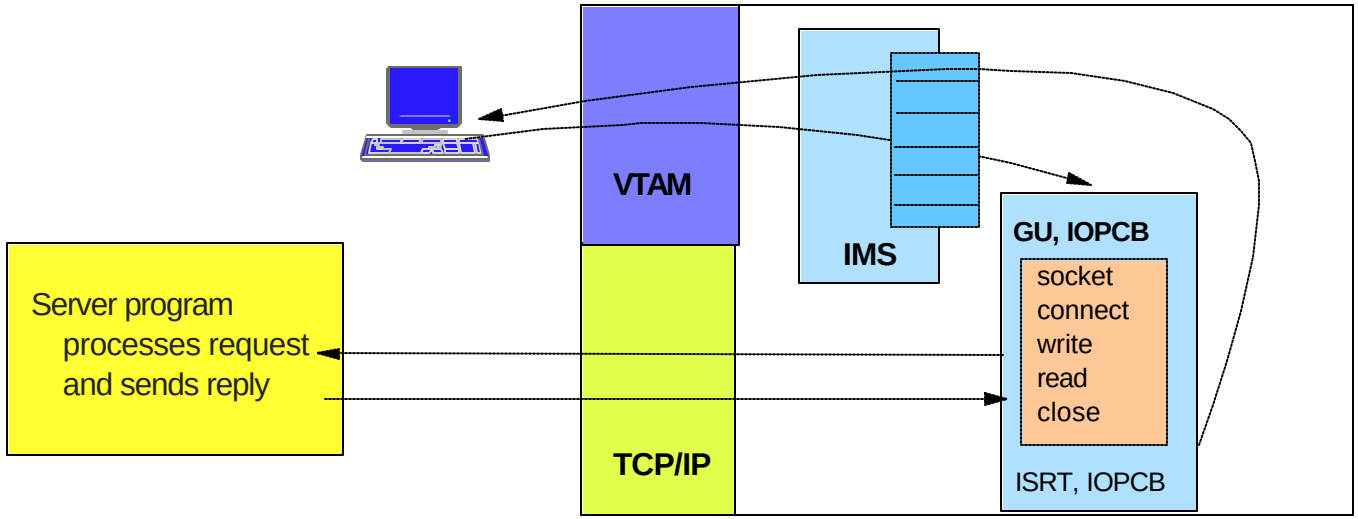
- **Originating a message from the IMS application**
  - **ISRT, ALTPCB**
    - **Asynchronous outbound support**



Outbound Explicit Sockets

IMS applications can issue TCP/IP socket calls

- Outside IMS control and knowledge
- Synchronous communication where the IMS application is the client



Outbound Explicit Sockets ...

OS/390 sockets support

- Standard sockets api - C, Java
- Extended sockets api - Assembler, Cobol, PL/I
  - Callable sockets api

Extended Socket functions:

Initapi() - establishes the extended sockets environment if Cobol, Assembler, or PL/I

Socket() - allocates a socket on which communication will flow

Connect() - defines and connects to a server

Write() / Read() — transfers data

Close() - closes the connection

Cobol:

```
CALL 'EZASOKET'  USING SOC-FUNCTION parm1, parm2, .. ERRNO RETCODE.
```

Assembler:

```
CALL  EZASOKET,(SOC-FUNCTION,__parm1, parm2, ...__ERRNO RETCODE),VL
```

PL/I:

```
CALL EZASOKET (SOC-FUNCTION__parm1, parm2, ...__ERRNO
RETCODE);
```

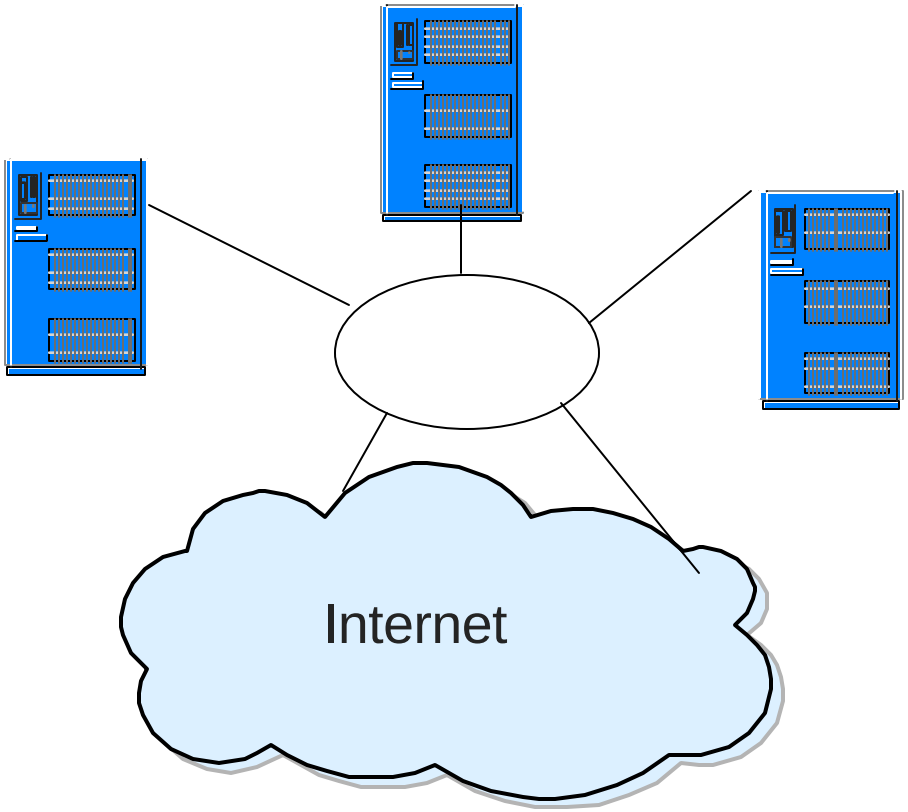
EZASOKET interface delivered in PDS "hlq.SEZATCP"

TCP/IP and the Sysplex

- Workload Distribution, load balancing and failover
  - DNS/WLM
  - VIPA
  - Sysplex Distributor

Sysplex

- **Collection of connected S/390 processors**
  - Enables horizontal growth
  - Provides a single system image

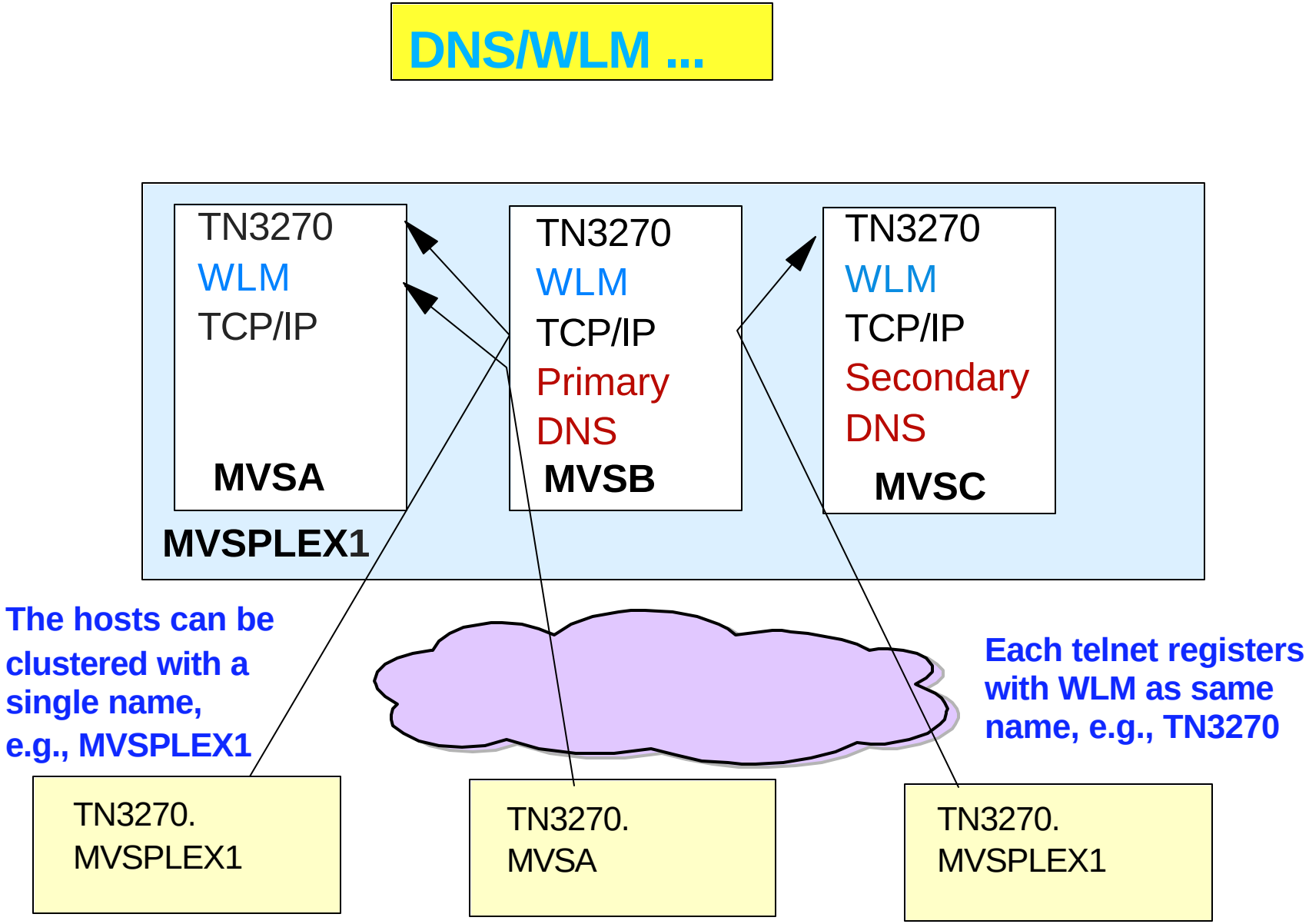


Workload Distribution and Load Balancing

DNS/WLM

- **TCP/IP Domain Name Service (DNS) interfaces with the MVS Workload Manager (WLM) to**
  - Distribute workload based on user-defined goals
    - Clustered host names, clustered server names, weighted IP addresses
- **Client requests a connection based on a cluster name**
  - Establishes connection with the host/server picked by DNS/WLM
- **Benefits**
  - Distributes connections based on current load and capacity
  - Dynamically avoids crashed hosts and servers
- ***Tends to be used for long running connections such as Telnet sessions***

Workload Distribution and Load Balancing ...



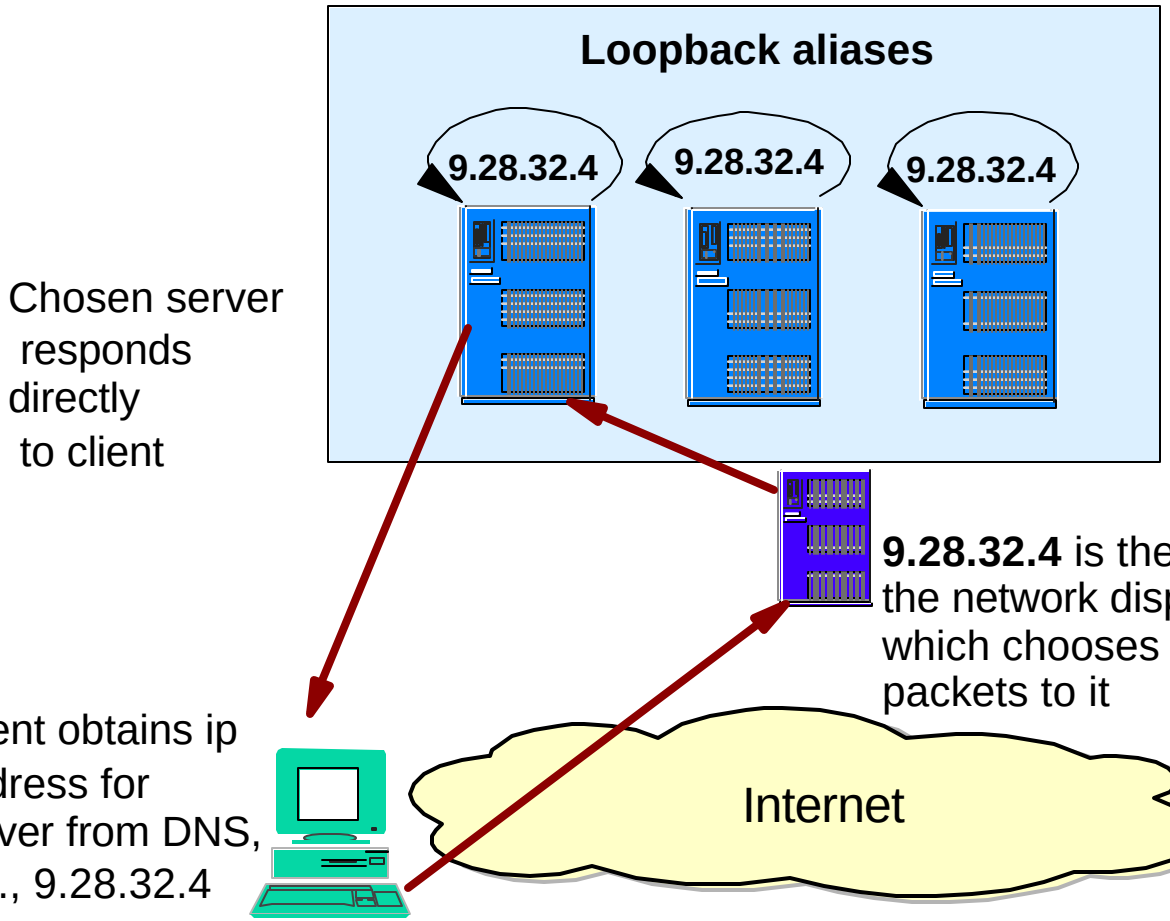
Workload Distribution and Load Balancing ...

Network Dispatcher - WebSphere Edge Server - WebSphere Network Deployment Edition

- **Web infrastructure software**
- **Establishes session with MVS WLM if servers are OS/390 - z/OS**
  - Balances workload based on workload goals
  - Never selects an unavailable server
- **Client receives IP address of the server providing load balancing**
  - Packets are forwarded to chosen server unmodified
  - Server accepts packet because of alias on Loopback interface which matches the address of the Network Dispatcher (cluster address)
- ***Used for "short duration" applications like web traffic***
  - Inbound data goes through the router
  - Outbound data goes directly to the client

Workload Distribution and Load Balancing ...

Network Dispatcher - WebSphere Edge Server - WebSphere Network Deployment Edition ...



Workload Distribution and Load Balancing ...

Cisco

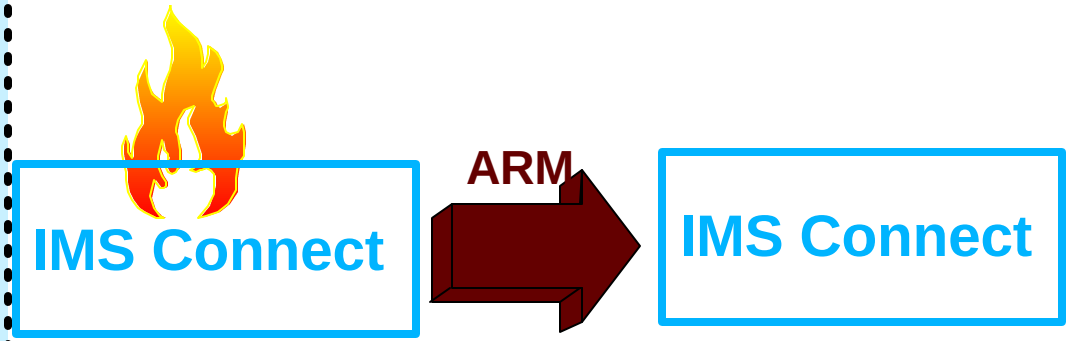
- **IBM/Cisco alliance**
- **Cisco MultiNnode Load Balancing (MNLB)**
  - Software solution on routers/switches for IP workload balancing
    - Can interact with WLM on OS/390
  - Similar in concept to the Network dispatcher

Failover

ARM

- **ARM (Automated job and started task restart)**
  - Managed by MVS - supports abends and MVS failures
  - Sysplex wide
    - Allows application to be restarted on a different MVS
- **Use**
  - Application, e.g., IMS has code to register/unregister with ARM
  - Programs that do not have code to invoke ARM, e.g., IMS Connect
    - Can use ARMWRAP
      - Via execution JCL
      - Downloaded from the Web

```
//IMSCONN PROC ..
//* invoke armwrap to register IMS Connect with ARM
//REGSTEP EXEC PGM=ARMWRAP,
//       PARM=('REQUEST=REGISTER'...
//......
//* invoke IMS Connect
//CONNSTP EXEC PGM=HWSHWS00 ...
//......
//UNREG EXEC PGM=ARMWRAP,
PARM=('REQUEST=UNREGISTER)
```



ARMWRAP

Information about ARMWRAP

- http://www.redbooks.ibm.com
  - Search on "z/OS Automatic Restart Manager"
    - This brings you to an abstract page where you can access the book

Download ARMWRAP code

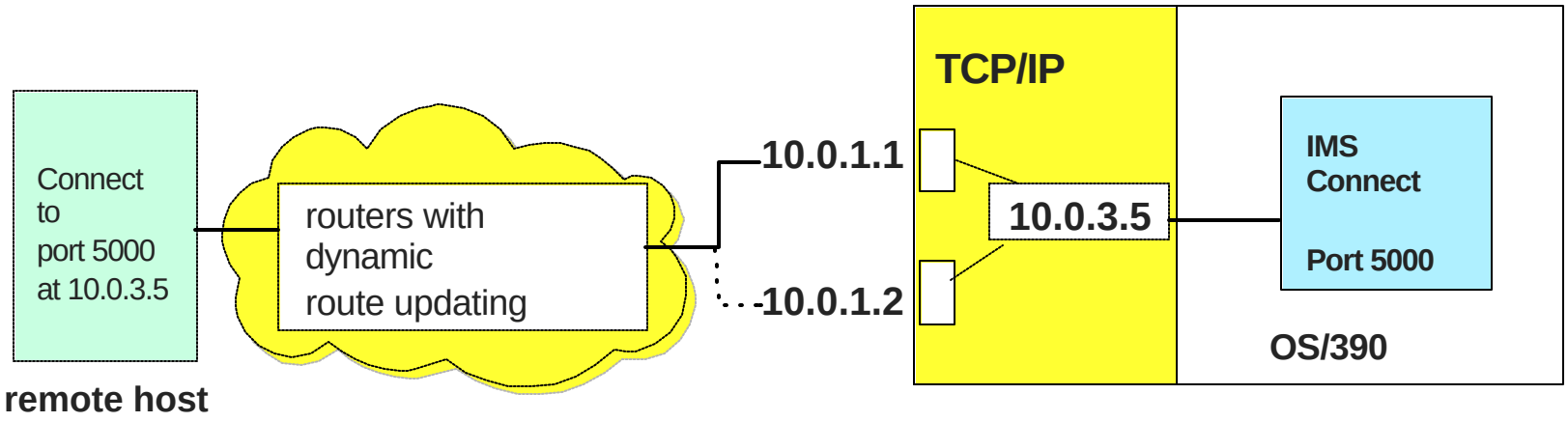
- On the redpaper abstract page click on "Additional Material"
  - ftp://www.redbooks.ibm.com/redbooks/REDP0173/
    - PDS in IEBCOPY UNLOAD format containing usermods to install the ARMWRAP program

Failover ...

Static VIPA

Static Virtual IP Addressing (VIPA)

- First VIPA implementation
- Eliminates an application's dependence on a particular network interface (IP address)
  - Non-disruptive rerouting of traffic in the event of failure
  - A defined VIPA does not relate to any physical network attachment
    - Multiple network interfaces on a single TCP/IP stack



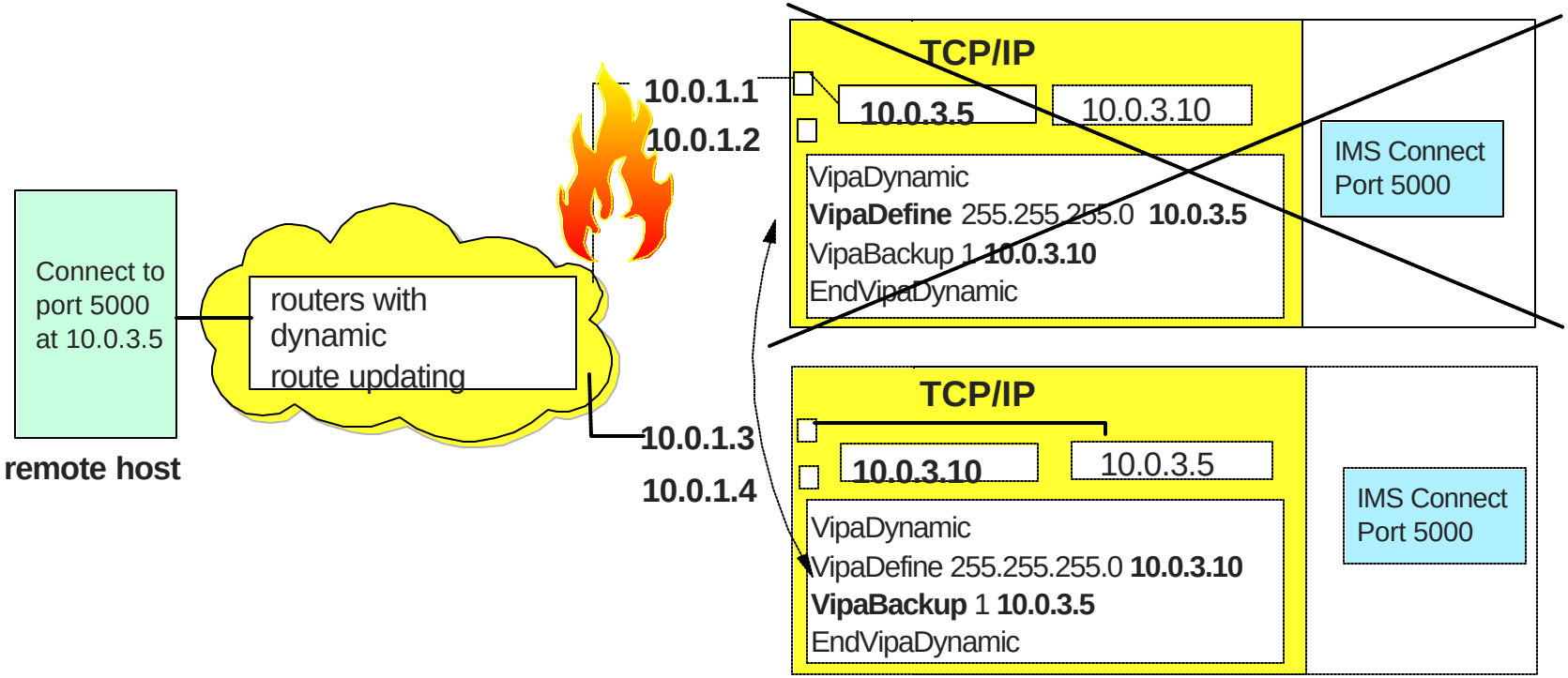
Note: The real network interfaces 10.0.1.1 and 10.0.1.2 appear to be intermediate hops

Failover ...

Dynamic VIPA

Automatic VIPA Takeover

- OS/390 V2R8
- Support for other TCP/IP stacks to be backup VIPA address
  - Allows an active stack to assume the load of a failing stack
    - Stacks share information using OS/390 XCF messaging



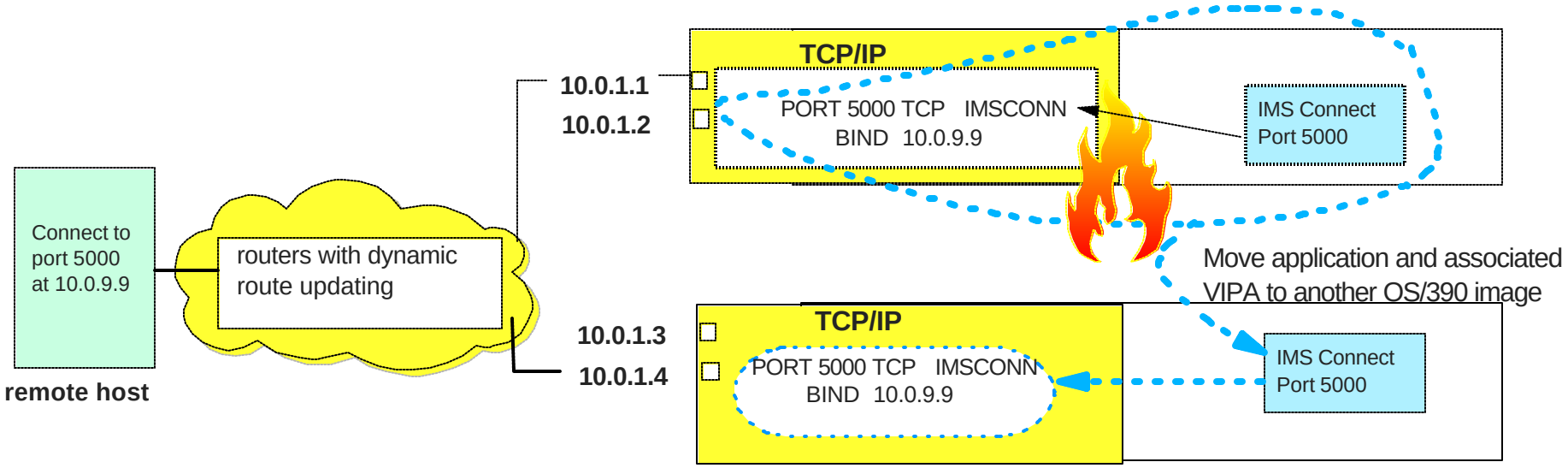
Note: Server application may need to be started on the same port on the backup host

Failover ...

Dynamic VIPA ...

Application-initiated Dynamic VIPA

- Allows a server application to create and activate its own VIPA
  - Moves with the application wherever the application is started or restarted
- Invoked via api call or through a utility or through a TCP/IP configuration statement
- IMS Connect does not issue the api call
  - USE the configuration statement in *hlq*.PROFILE.TCPIP
    - PORT *portnum* TCP *startedtaskname* BIND *ipaddress*



Failover ...

ARM and Application-initiated Dynamic VIPA

- Automatically move the application and DVIPA to another MVS if primary fails

```
//IMSCONN PROC ..
//...
//* invoke armwrap to register IMS Connect with ARM
//*      Register element 'EXAMPLE' using element type of
//*      'XAMP'with ARM.  Restart on all types of terminations.
//REGSTEP EXEC PGM=ARMWRAP, PARM=('REQUEST=REGISTER'...
//                  'TERMTYPE=ALLTERM,ELEMENT=EXAMPLE,',
//                   'ELEMTYPE=XAMP,READYBYMSG=N')
//......
//
//.....
//* invoke IMS Connect
//CONNSTP EXEC PGM=HWSHWS00 ...
//
//
//......
//* unregister with ARM
//UNREG EXEC PGM=ARMWRAP, PARM=('REQUEST=UNREGISTER)
```

To invoke application-initiated DVIPA, add a PORT definition in *hlq.*TCPIP.PROFILE

PORT xxx TCP startedtaskname BIND ipaddr

This will be activated when IMS Connect initializes - this is the recommended approach

As an alternative to the above, IMS Connect JCL can include the following step

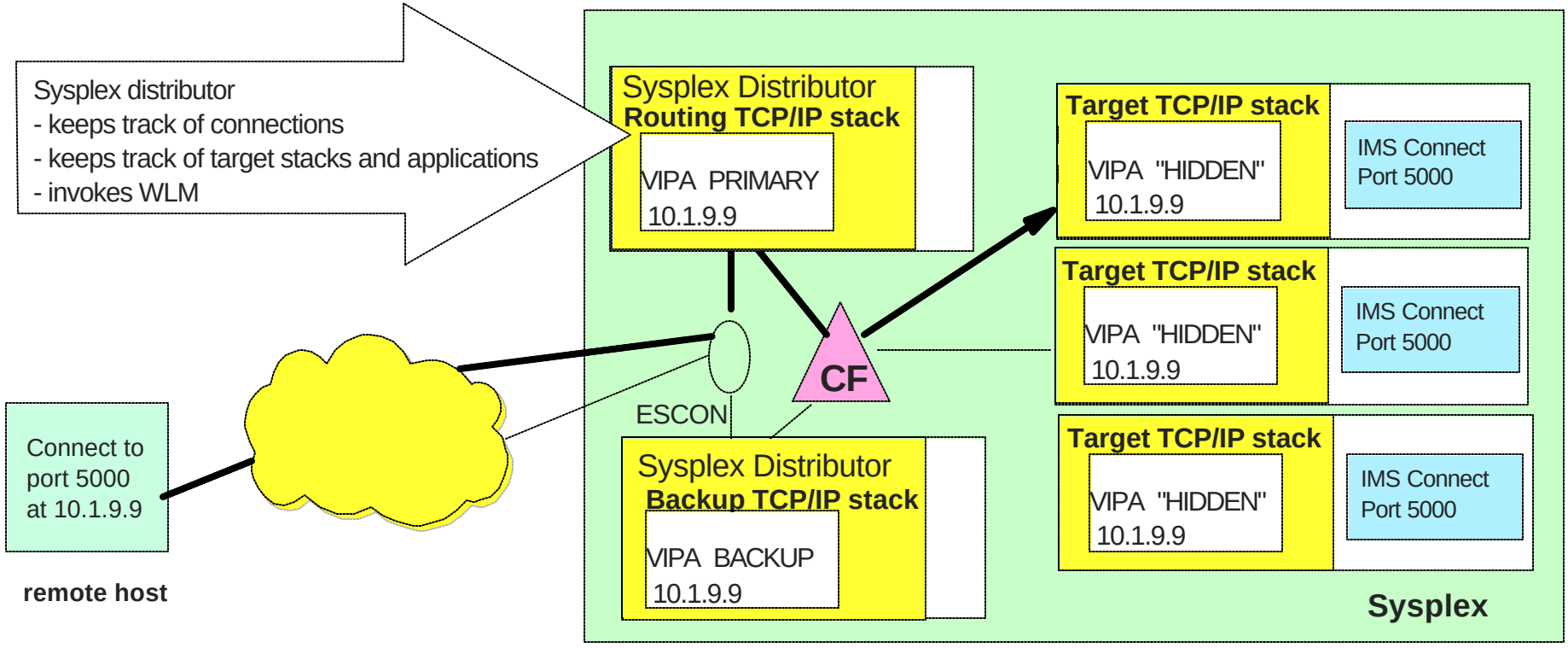
```
//TCPDVP  EXEC PGM=MODDVIPA,....
//           PARM='-p  TCPIP -c 10.0.9.9'
//....
```

MODDVIPA is the OS/390 V2R10 (and later) utility
EZBXFDVP is the OS/390 V2R8 utility
(distributed in TCPIP.SEZALINK library)

Sysplex Distributor

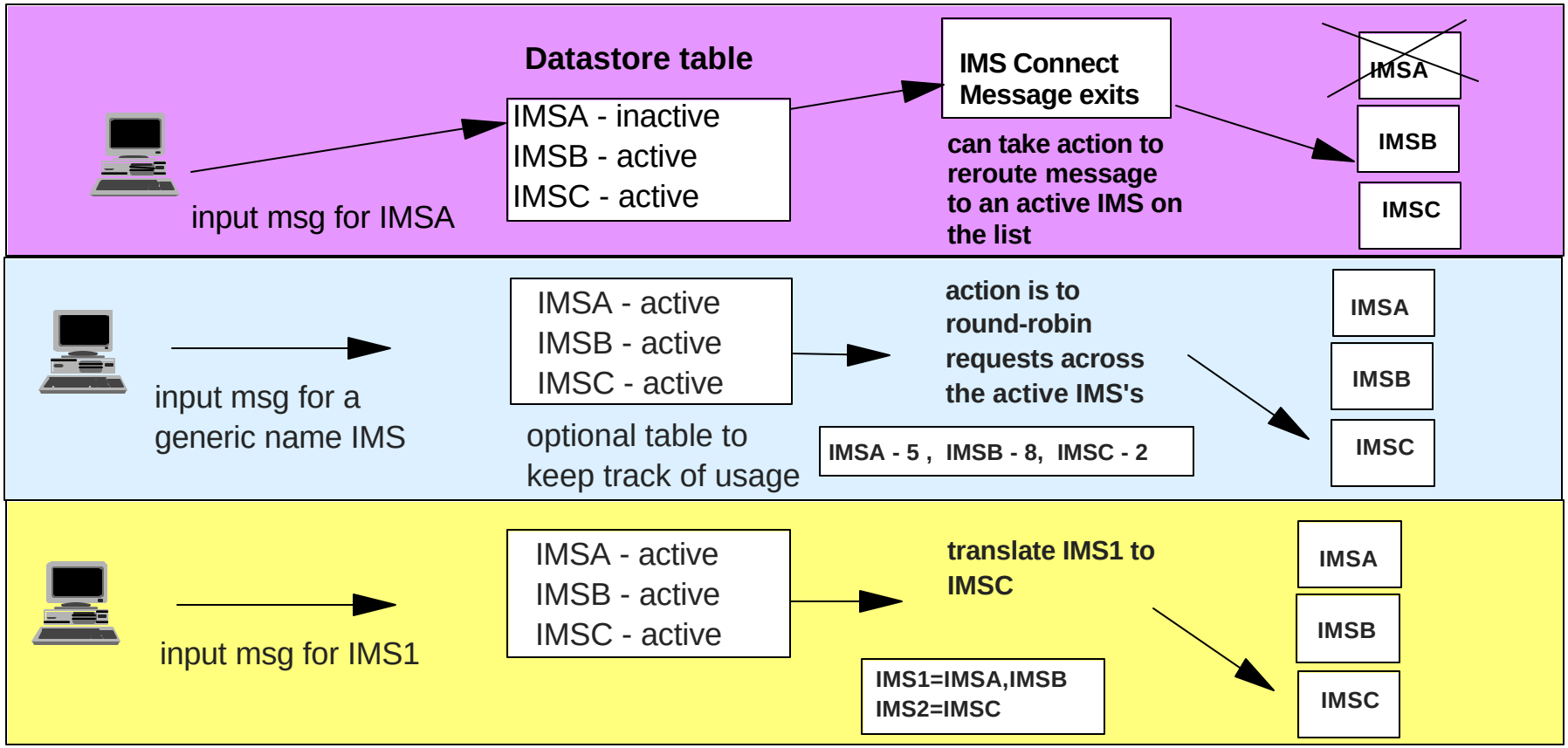
Sysplex function - Single IP address for a cluster of Hosts

- Sysplex-wide VIPA - OS/390 V2R10 and z/OS
- Workoad balancing across multiple servers
  - Performs a Network Dispatcher type function on the z/Series environment
- High availability - enhanced Dynamic VIPA and Automatic Takeover
  - Allows movement of VIPAs without disrupting existing connections

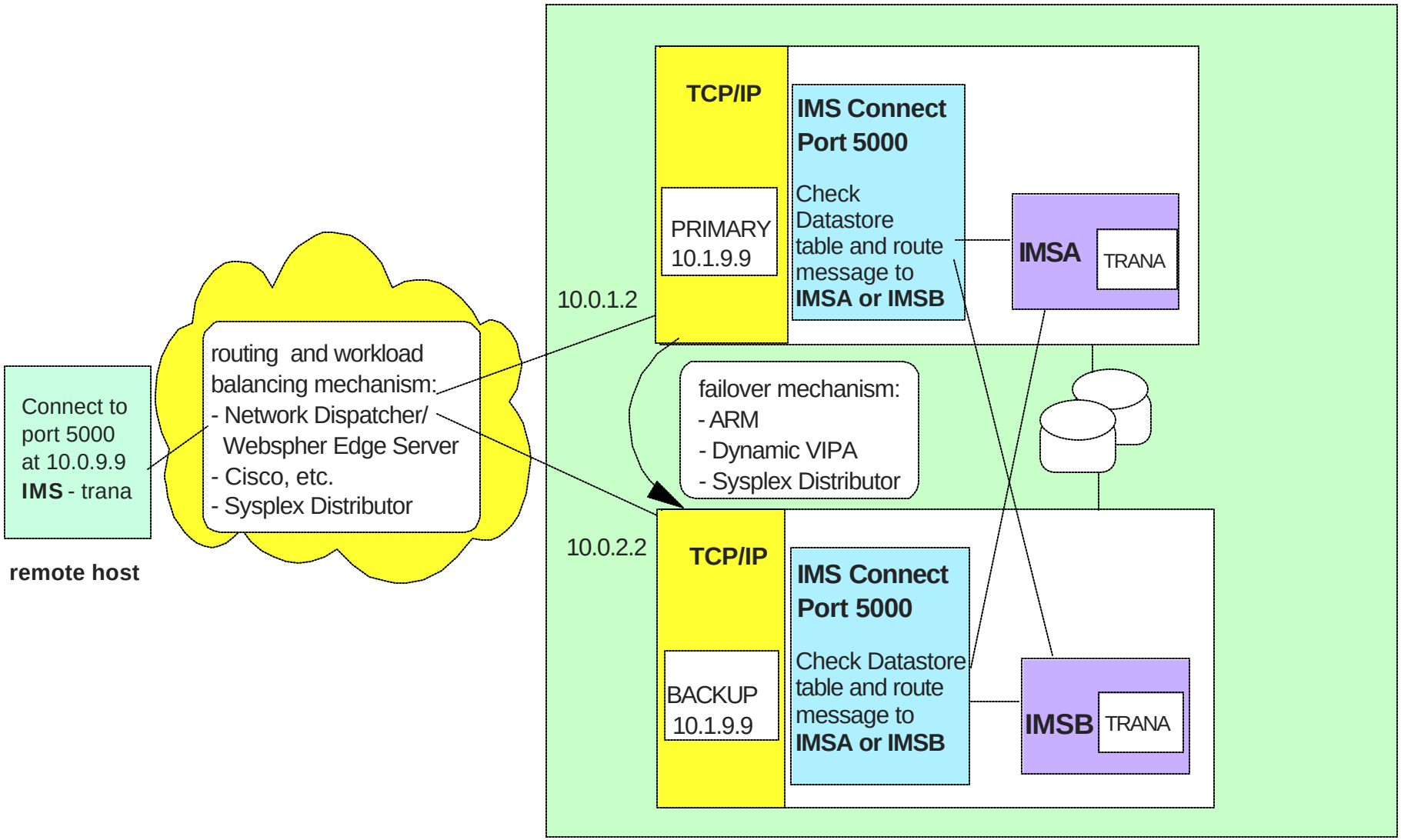


IMS Connect Workload Balancing and Failover

- **Once a message destination is resolved to a particular host and IMS Connect system**
  - IMS Connect can access multiple IMS Systems
  - Message exits can reroute a message to a different target IMS
    - The Datastore table provides information as to which systems are active



In a Nutshell



References

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