



E18

VSE Gets Connected With zSeries

Stephen Gracin

zSeries® EXPO

**FEATURING Z/OS, Z/VM, Z/VSE
AND LINUX ON ZSERIES**

September 19 - 23, 2005

San Francisco, CA

Ground Rules

For this discussion unless otherwise noted

- VSE or VSE/ESA is VSE/ESA2.7 or zVSE
- zVM is zVM 5.1
- zSeries Processor refers to z890, z990
- TCPIP for VSE is the CSI TCPIP

Moving Forward

When moving from an old VSE to the most current VSE/ESA and a ZSeries processor. **Are you:**

Going to the latest zVM or add zVM ?

Going to bring Linux in with VSE ?

Considering IP networking with/without zVM ?

Considering IP networking options with zSeries hardware ?

- **With the latest software and zSeries hardware there are many connectivity options available. Which ones do you need?**

zSeries Hardware Connectivity Considerations



zSeries Hardware Connectivity

- OSA Express/2 cards – Some can operate in two modes, one of which supports SNA.
- HIPERSockets adapter – High speed zero latency Ethernet LAN device, can connect IP stacks within and across LPARs
- IFL's – *I*ntegrated *F*acility for *L*inux, this is a zSeries engine specifically to support Linux. Not directly a networking option but can have an effect on topology.

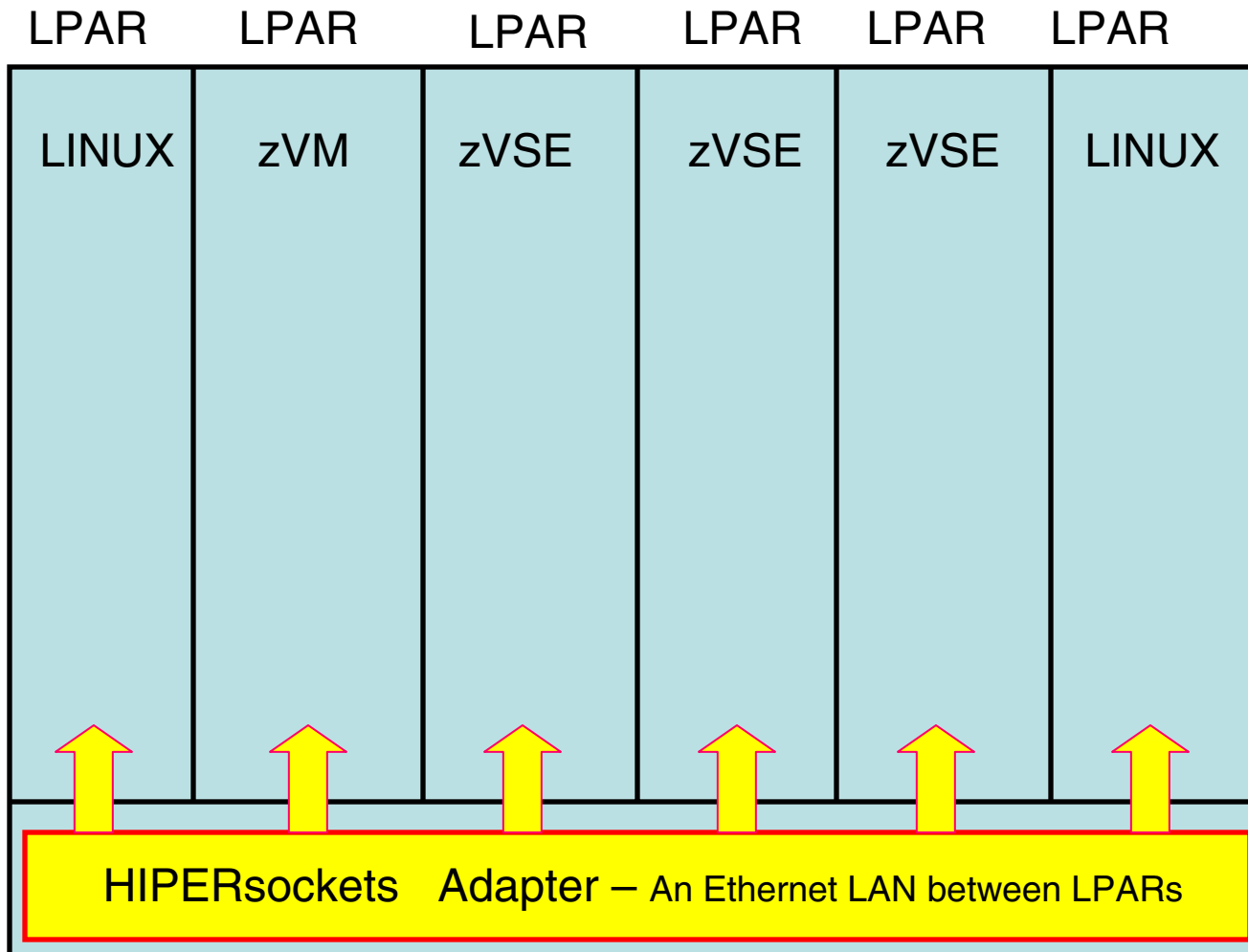
zSeries Hardware – OSA Express/2 Cards

- May not require OSA/SF for setup, but OSA/SF can still be used to QUERY a card.
- Some can be set to one of two modes. QDIO or Express. This is set in the IOCP, Express mode is LCS mode. For LCS Mode OSA/SF is required to configure the card.
- In QDIO or LCS mode, the cards can be shared among LPARs. They can provide IP connectivity between stacks in different LPARs but the HIPERSockets adapter is the preferred connection between LPARs.
- QDIO mode is **Q**ueued **D**ata **IO**. Until recent releases not supported by TCPIP for VSE, and there is no plan for support by VTAM.

zSeries Hardware – HIPERockets adapter

- Is a hardware implementation that is defined to a zSeries processor via the IOCP .
- Provides high speed connection between TCPIP stacks in different LPARs or in the same LPAR.
- In some Redbooks is referred too as an iQDIO device, *internal QDIO* the CHPID type is IQD.
- Not to be confused with a zVM Guest Lan TYPE=HIPER, which is an emulation of this device by zVM.

zSeries Hardware – HIPERsockets Adapter



zSeries Hardware - IFL

An **I**ntegrated **F**acility for **L**inux engine ...

- Supports zVM or Linux. Or zVM with Linux guests.
- Does Not Support VSE/ESA or zOS, they will report a processor malfunction.
- Does Not Support VSE/ESA, zOS running as a guest on zVM. The guests report a processor malfunction.

This means that a VSE connecting to a Linux would most likely be across LPARs, the HIPERSockets adapter would be the best choice.

zSeries Hardware - IFL

LPAR	LPAR
<p>VSE, zOS, zVM or Linux as a zVM Guest</p> <p>zOS</p> <p>VSE / zVSE</p> <p>LINUX</p> <p>zVM</p>	<p>zVM or Linux as a zVM Guest</p> <p>LINUX</p> <p>zVM</p>
<p>Processor Type</p> <p>Standard CP</p>	<p>Processor Type</p> <p>IFL</p>

zVM Connectivity Options

zVM5.1

Provides Two Guest LAN types:

- **QDIO** – Each guest machine has a virtual NIC defined that emulates a Gigabit OSA/E. They become hosts on a virtual LAN usually defined in zVM's SYSTEM CONFIG file.
- **HIPERSockets** – Each guest machine has a virtual NIC that emulates the HIPERsockets adapter. They become hosts on a virtual LAN usually defined in the SYSTEM CONFIG file.

Provides Point-to-Point:

- **IUCV** – Inter-user communications vehicle a memory transfer p2p network device that can be used zVM to zVM , Linux to Linux or zVM to Linux. VSE does not support this connection.
- **VCTC** – Virtual Channel to Channel P2P connection supported by VSE, zVM and Linux.

VSWITCH / VLAN

- zVM5.1 Can Provide a “Bridge Like” function for Layer 3 or in some circumstances can be a true Layer 2 switch.
- Is a specialized ODIO Guest LAN
- Requires an OSA/E card in QDIO mode
- With two OSA/E cards provides hardware backup.
- Can use/manage VLAN IDs, Does Not Have too.
- VSE/TCPIP is not VLAN aware. VSE can not manipulate an Ethernet frame to set or interrogate a VLAN ID . zVM can control a VLAN ID for the VSE guest.
- Without VLAN IDs you get an easy to use “Flat Network” layer 3 switch with OSA hardware redundancy.

OSA Info

OSA/E

OSA card settings to be aware of. Not understanding these settings has caused many problems when trying to use a stack as a router.

Primary Router – The stack that has this value will be presented with packets that have any destination IP address. You want this setting if your stack is a router. There can only be one Primary at a time per OSA port.

Secondary Router – The stack with this setting will be a non-router when the primary stack is up. If the primary stack goes down, this stack becomes primary until the original primary comes back up. This setting would be useful for a redundant stack/card backup scenario.

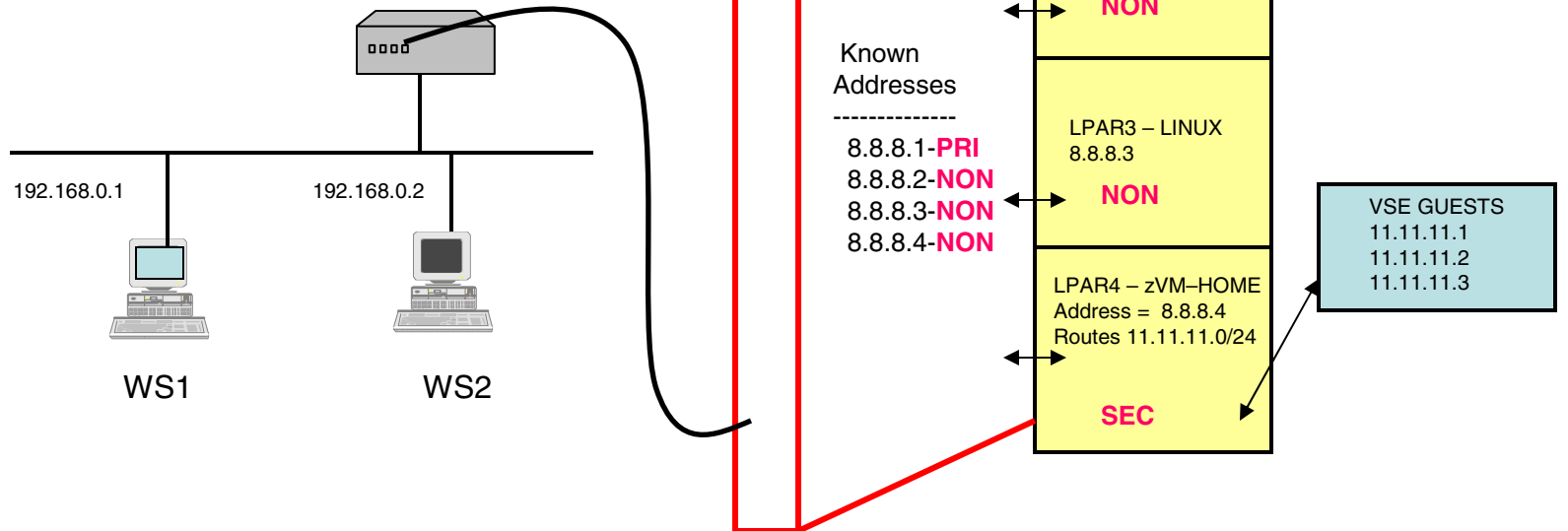
Non-router – This stack will only be presented with *Known Addresses*. This would be an IP address loaded into the OSA card when the stack initializes, such as its HOME address. Only packets whose destination address is the HOME address would be presented to the stack by the OSA card. You do not want this if your stack is a router.

Note: At this time VSE/TCPIP can not set Primary, it is always a non-router. zVM, zOS, Linux can be Primary.

OSA Cards – PRIR / SEC / NON

The Workstations can get to Linux Guests
10.10.10.1-3 but not to VSE Guests 11.11.11.1-3

Unless the stack is known to the OSA Card as the PRIR Stack, only Known Addresses are presented to the stack. Any others are not routed out of the OSA card.

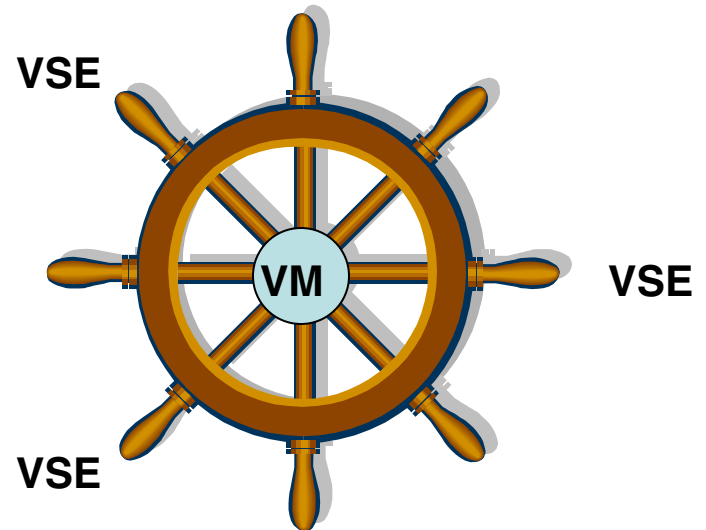


VSE Connectivity In The Past...

Connectivity History

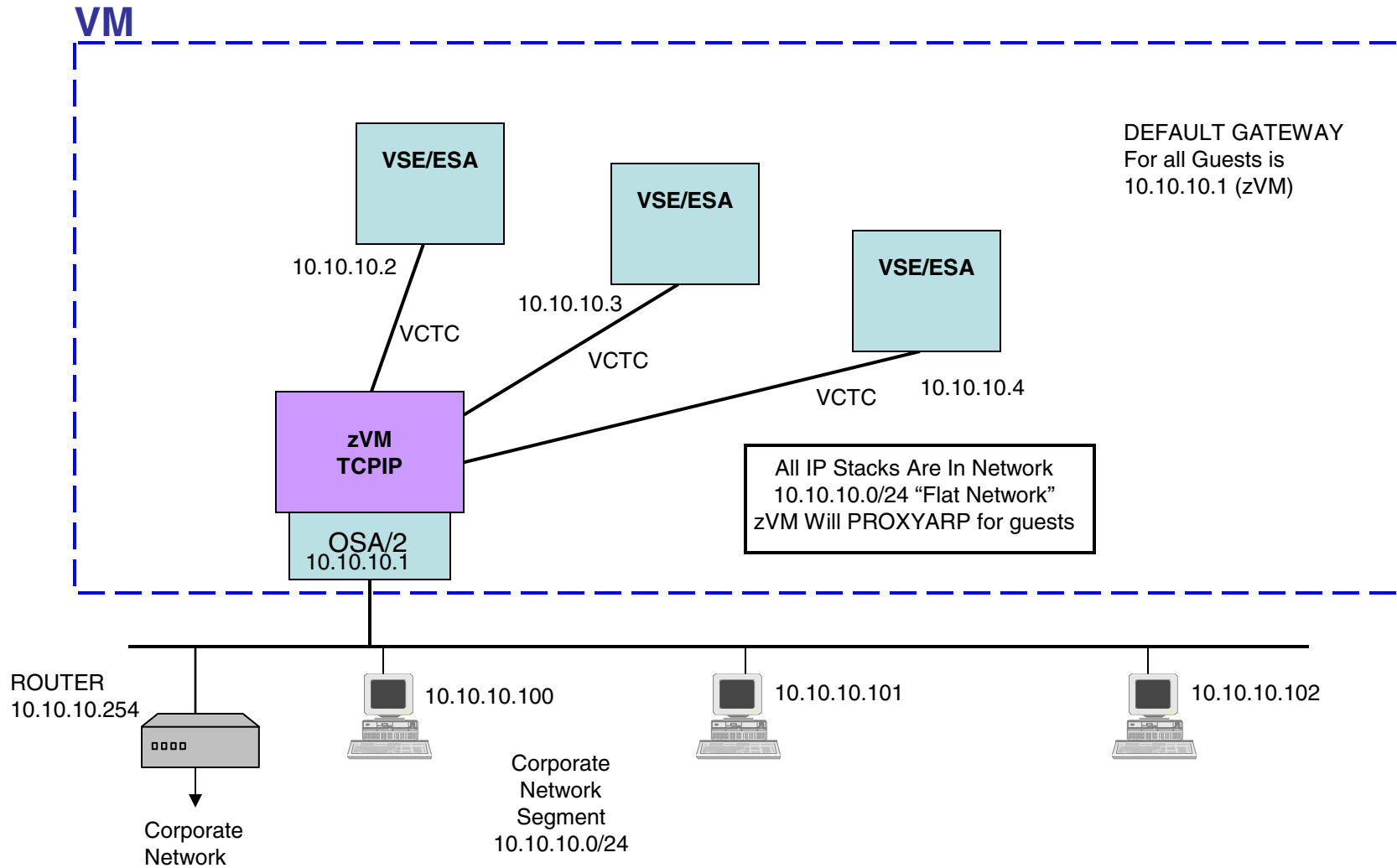
A hub-and-spoke topology using CTC connections is most often seen with old VSE/ESA guest systems for IP and SNA. With IP it is the one topology with two IP addressing schemes.

1. The guests are in the same network as the OSA IP controller. This scheme, the “Flat Network”, is usually the easiest to integrate into an existing network.
2. The guests are in a different IP network.



Flat Network

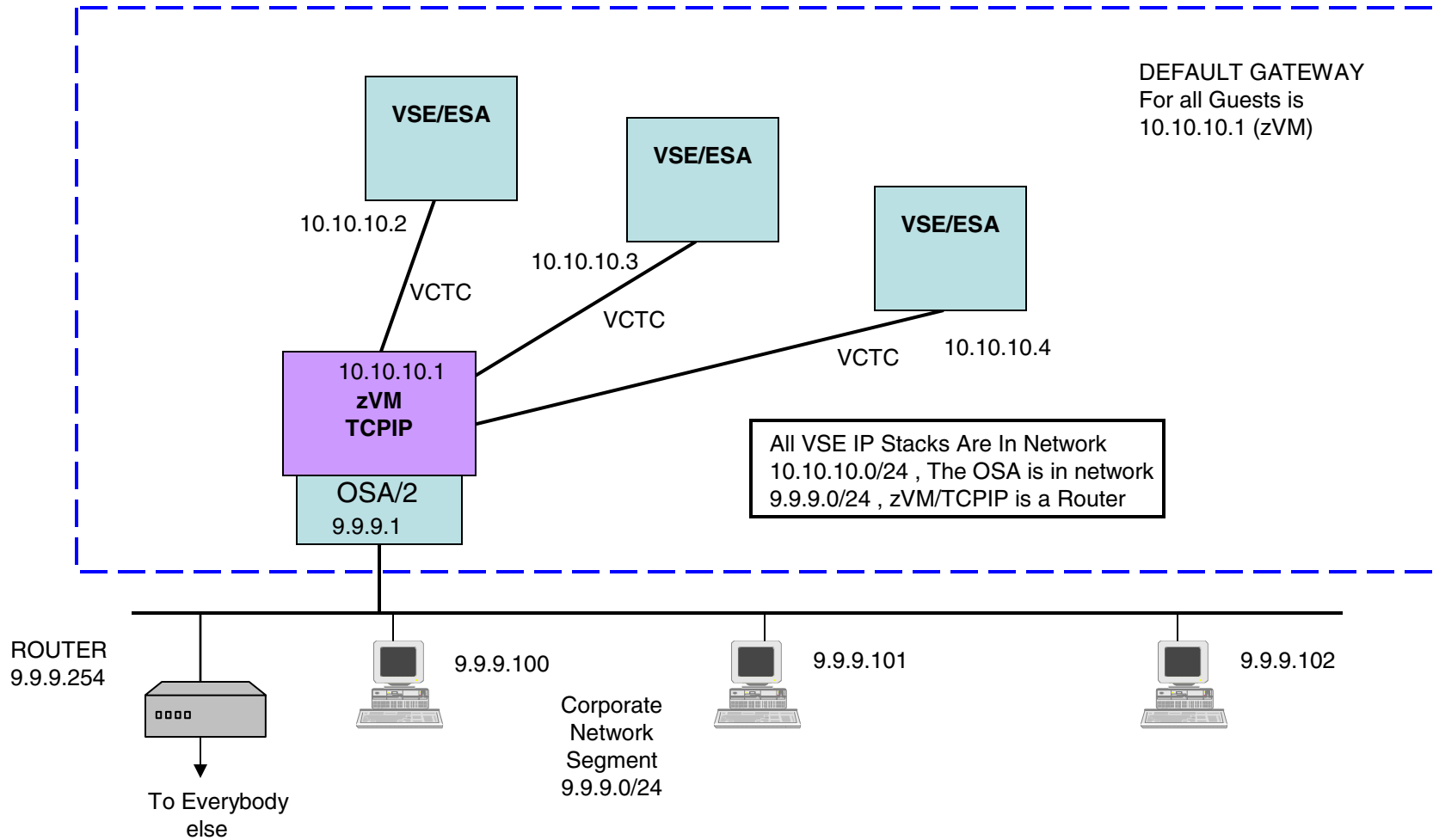
All the VSE/ESA guests and zVM are in the same IP network the ASSORTEDPARMS statement **PROXYARP** makes this possible.



Different Network

VSE/ESA connected to zVM via VCTC connections as this is what VSE supported. VM stack which is the router. This example the guests are in a different network than the OSA card.

VM



VSE/ESA

Moving forward assumes that we will upgrade to VSE/ESA 2.7 and zVM 5.1

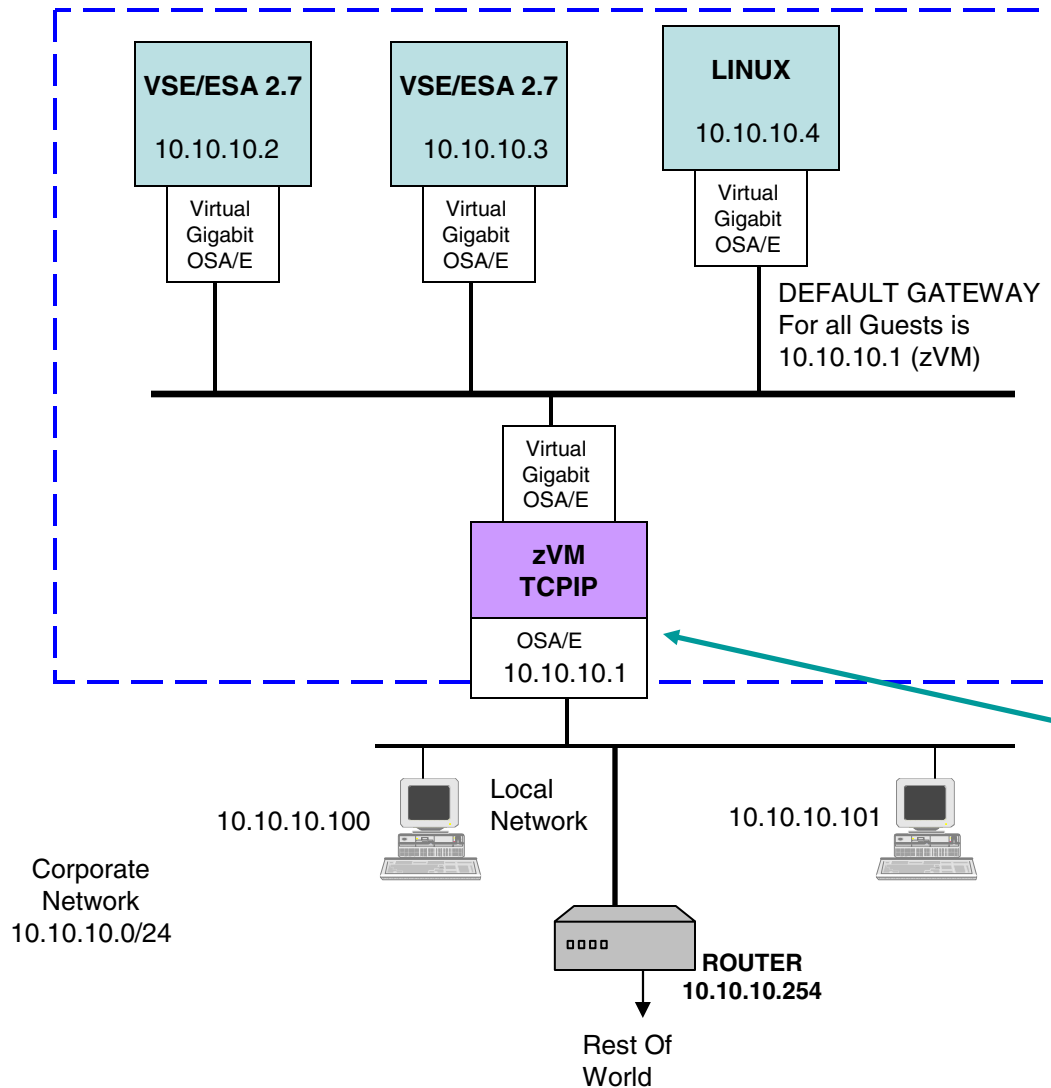
- VSE/ESA 2.7 brings support for QDIO and HIPERSocket adapters
- zVM5.1 brings support for QDIO and HIPERSocket guest lan emulation
The guest lan emulation allows each guest to operate a virtual adapter (NIC). Each guest has a virtual adapter connecting it to the guest LAN.
- zVM5.1 also bring support for VSWITCH which allows the guest machines
To bridge to the corporate network.

Migration Observations

- With the latest VSE , zVM and hardware the number of topology options increases dramatically. There is usually more than one way to provide a function.
- The changes may be all inside the zSeries processor, not apparent to the external network structure.
- The apparent changes will be in performance, ease of use, system management
- Using the latest hardware/software we have for example, at least four ways to migrate our original Flat Network.

Migrate Flat Network – To Guest LAN QDIO or HIPER

zVM with zSeries Hardware



Each Guest Machine and zVM TCPIP has a virtual Gigabit OSA/E defined as their interface to the Guest LAN. The Virtual NIC (Gigabit card) is Defined in the Guest machines Directory Entry.

zVM TCPIP routes packets between the guest LAN And the real OSA/E to local network.

zVM allows PROXYARP for a guest LAN (Broadcast Network) . You must have HOST routes in zVM/TCPIP For each Guests for PROXYARP to work. A NETWORK route will not do. If PROXYARP and HOST routes are not defined in PROFILE TCPIP the Guests can not be in the 10.10.10.0/24 corporate network

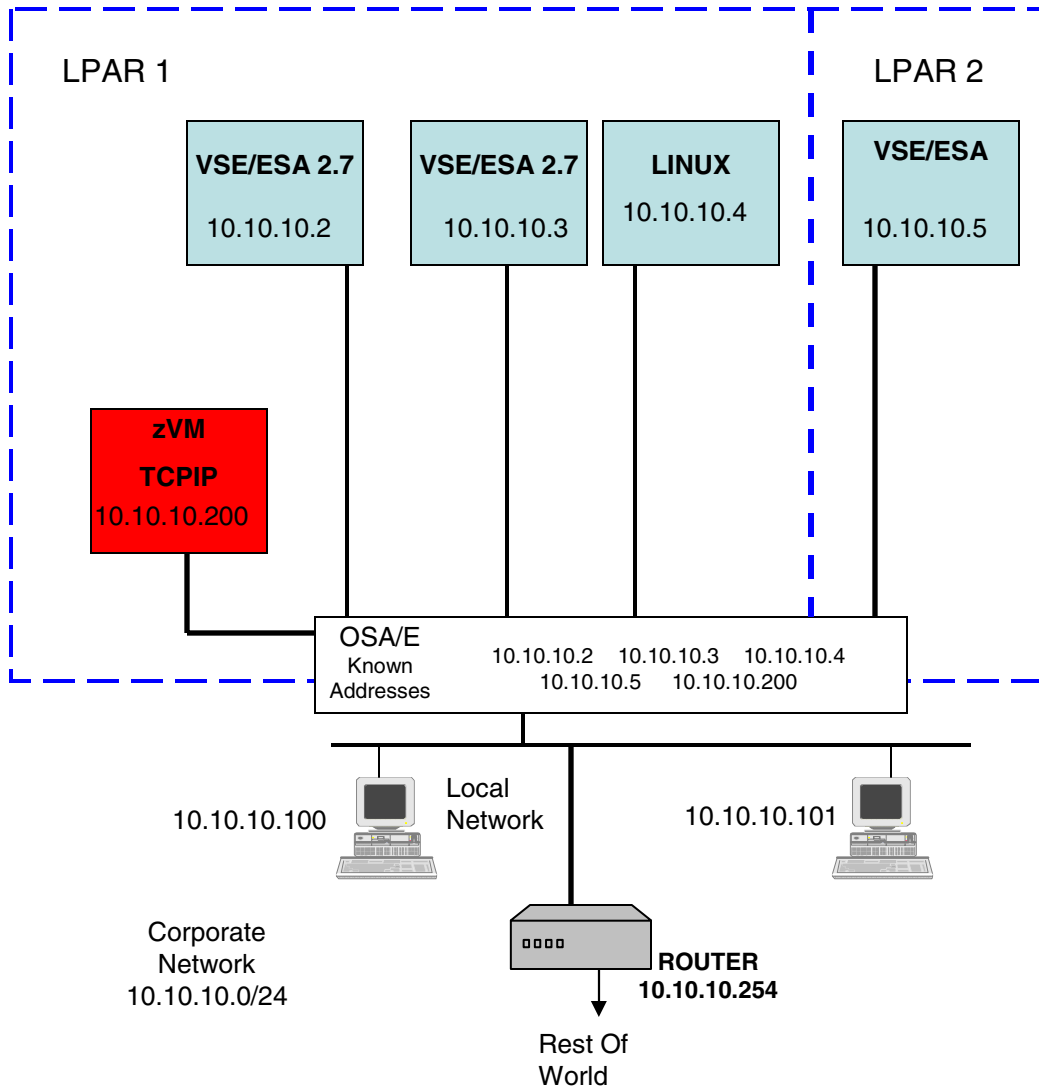
The guest LAN (VM/CP) carries interguest traffic the zVM TCPIP stack is not required for this function.

FYI - The zVM stack routes for guest machines On the Guest LAN and provides TN3270 access For zVM access.

In this case zVM needs the OSA card as PRIMARY ROUTER.

Migrate Flat Network - To Direct OSA/E Attach

zVM with zSeries Hardware



Each VSE/ESA guest is given a set of Sub channel Addresses with which to access the OSA card.

The OSA/E card builds an internal ARP table to track the IP address of stacks connected to the card. If a packet is destined to go to 10.10.10.4 from 10.10.10.2 then the packet does not leave the card to be routed.

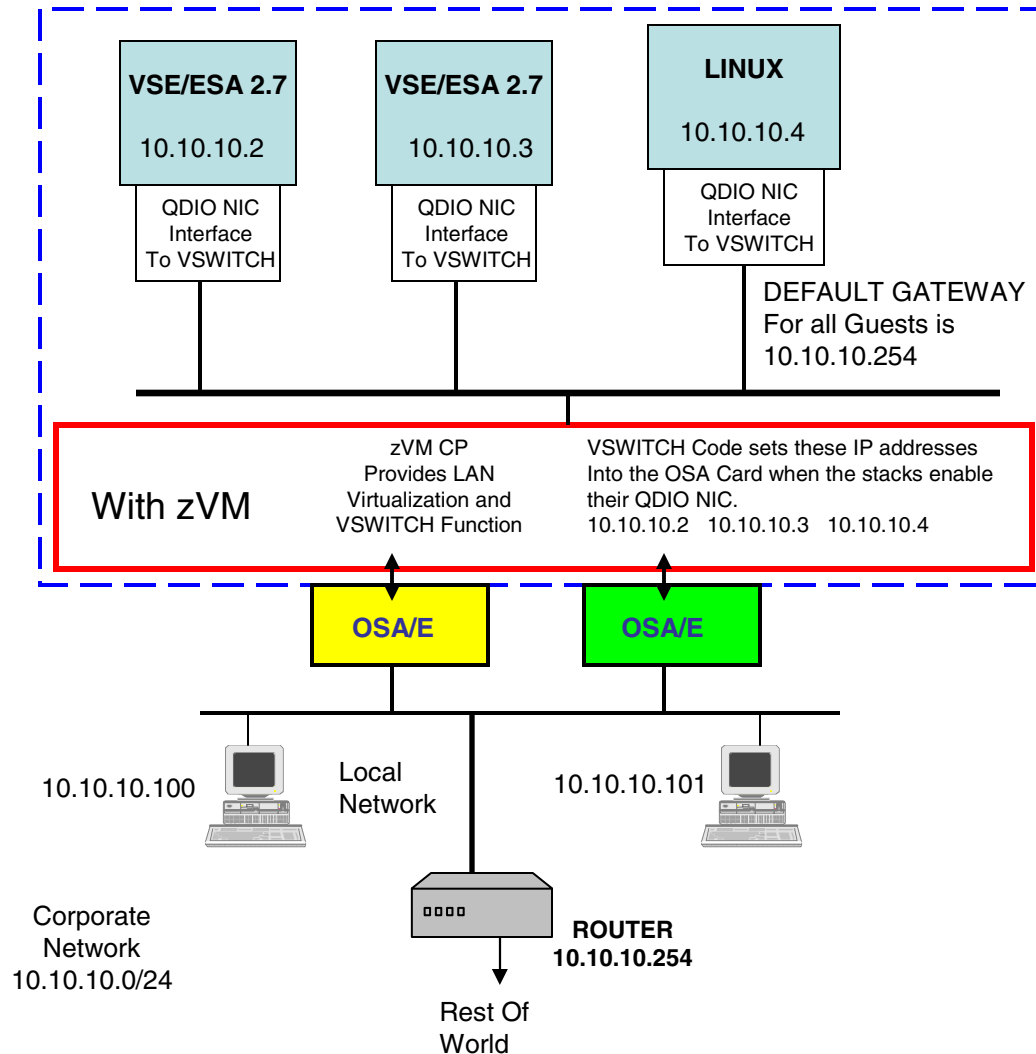
Since the OSA/E sub channel addresses can be Shared across LPARs this is a interguest and a LPAR-to-LPAR IP connectivity option. Not as fast as the HIPERSockets Adapter.

You can define some sub channel addresses of the OSA/E card for use by zVM/TCP/IP for TN3270 access. Otherwise a 2074 or OSA3270 is required for non-SNA 3270 device access.

In this case all stacks can be NON-ROUTER. None have networks behind them they are routing for.

MOVE - To VSWITCH

zVM with zSeries Hardware



The VSWITCH by its nature provides a “flat network” topology, it acts like an IP bridge between the virtual Network and the corporate network. At zVM5.1 VSWITCH can be a layer 2 or Layer 3 switch.

With just VSWITCH enabled zVM will not have a HOME IP Address in a PROFILE TCPIP. You can have A functioning VSWITCH providing connectivity to Your Guests but have no connectivity to zVM its self.

The VSWITCH can function with one OSA/E. Two OSA/E cards can be defined to the VSWITCH. One active the other provides hardware backup.

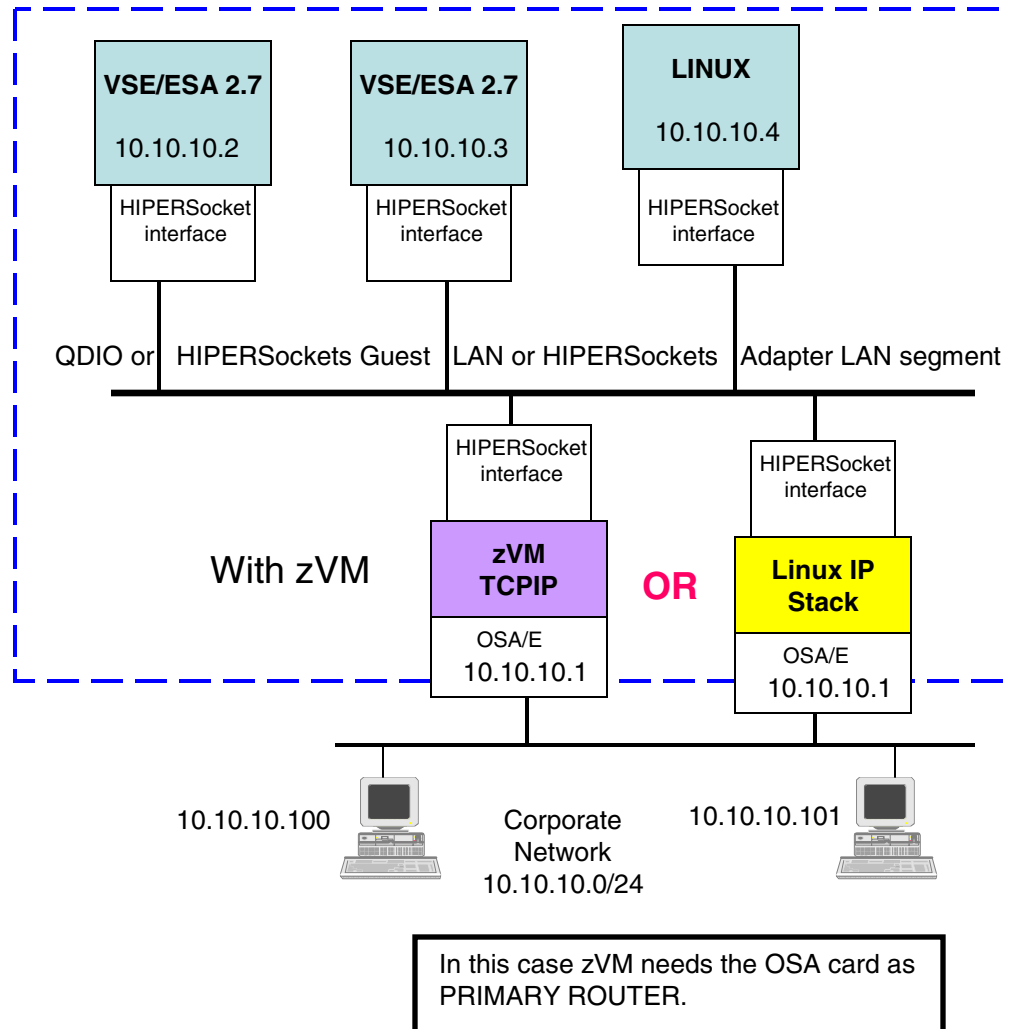
You can define some sub channel addresses of one of the OSA/E cards for use by zVM/TCPIP for TN3270 Access. Otherwise a 3174 / 2074 device is required for non-SNA 3270 device access.

The nature of VSWITCH makes PRI-ROUTER vs. NON-ROUTER not an issue. As the Guest Machines initialize their virtual NICs in a Layer 3 environment the information is also added to the OSA/E by the VSWITCH function.

Interface To The World !
Which Stack?

Which Stack?

zVM with zSeries Hardware



zVM or a Linux stack can be a Router for a QDIO or HIPERSockets Guest LAN or a HIPERSockets adapter LAN.

Some differences are:

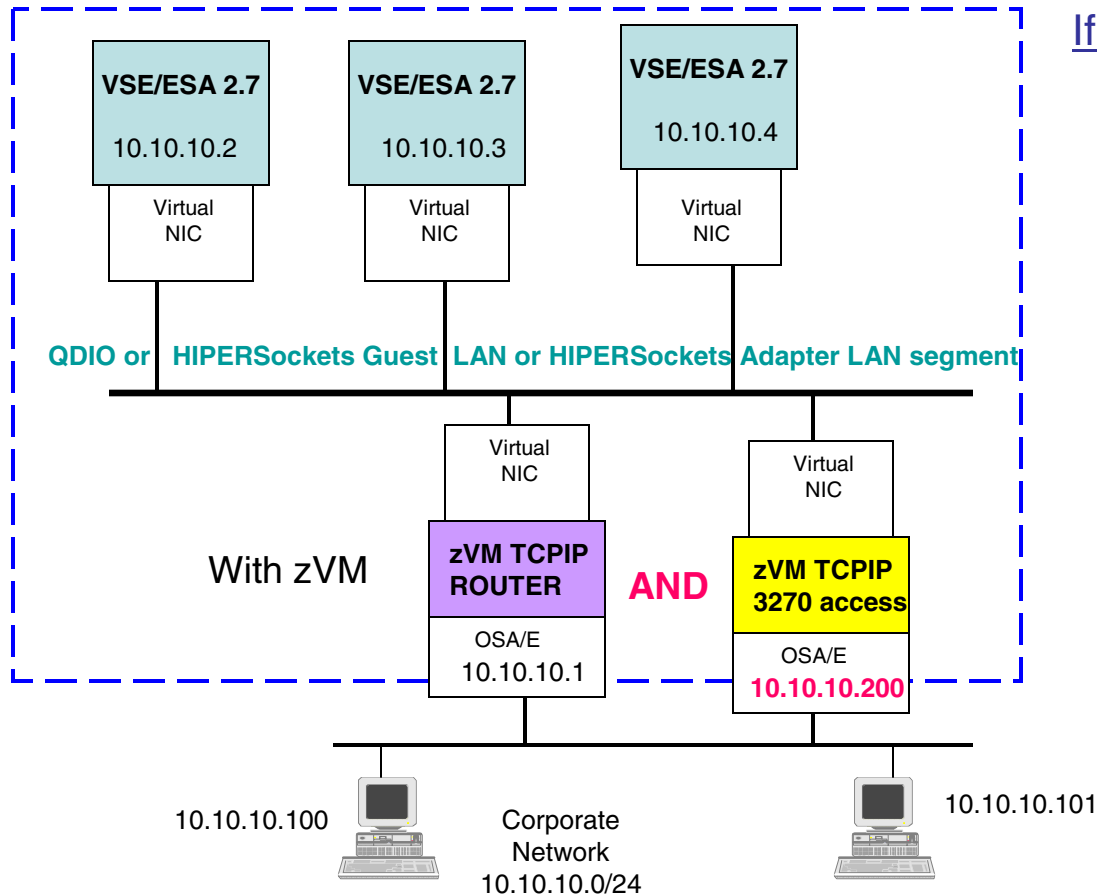
The zVM/TCPIP stack can provide 3270 Connectivity to zVM for system programming activities, where the Linux stack can not. MPROUTE is built into zVM for dynamic routing protocols another package has to be added to Linux.

The Linux stack can provide a firewall like IPTABLES , functions like NAT, IP Aliasing that zVM does not have.

The trend now is use VSWITCH, have a zVM stack for TN3270 connectivity and have ROUTERS/Firewalls external to the zVM virtual network.

Two (Or more) zVM Stacks!

zVM with zSeries Hardware



If using one stack as a ROUTER

In this case zVM stack with HOME address of 10.10.10.1 is the ROUTER for the VSE/ESA machines.

Either stack can provide 3270 access to zVM

3270 access is the primary mission of the zVM stack with the HOME address of 10.10.10.200.

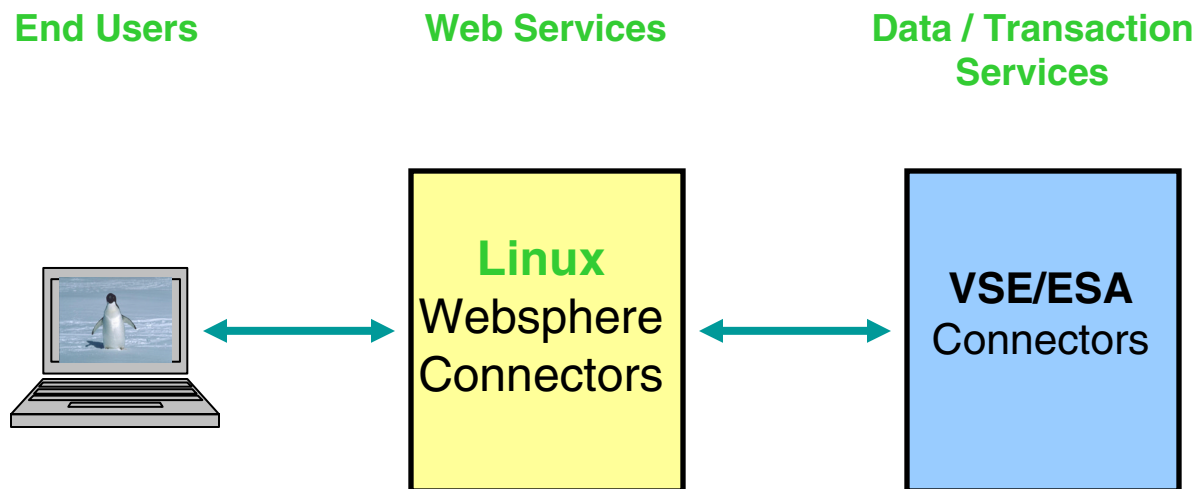
Then two zVM stacks allow a system programmer to take down the ROUTER stack and still have 3270 access from a remote site.

In this case zVM 10.10.10.1 needs the OSA card as PRIMARY ROUTER, 10.10.10.200 does not. So 10.10.10.1 and 10.10.10.200 can each be given a set of sub channel addresses On the same OSA card. No need of multiple cards.

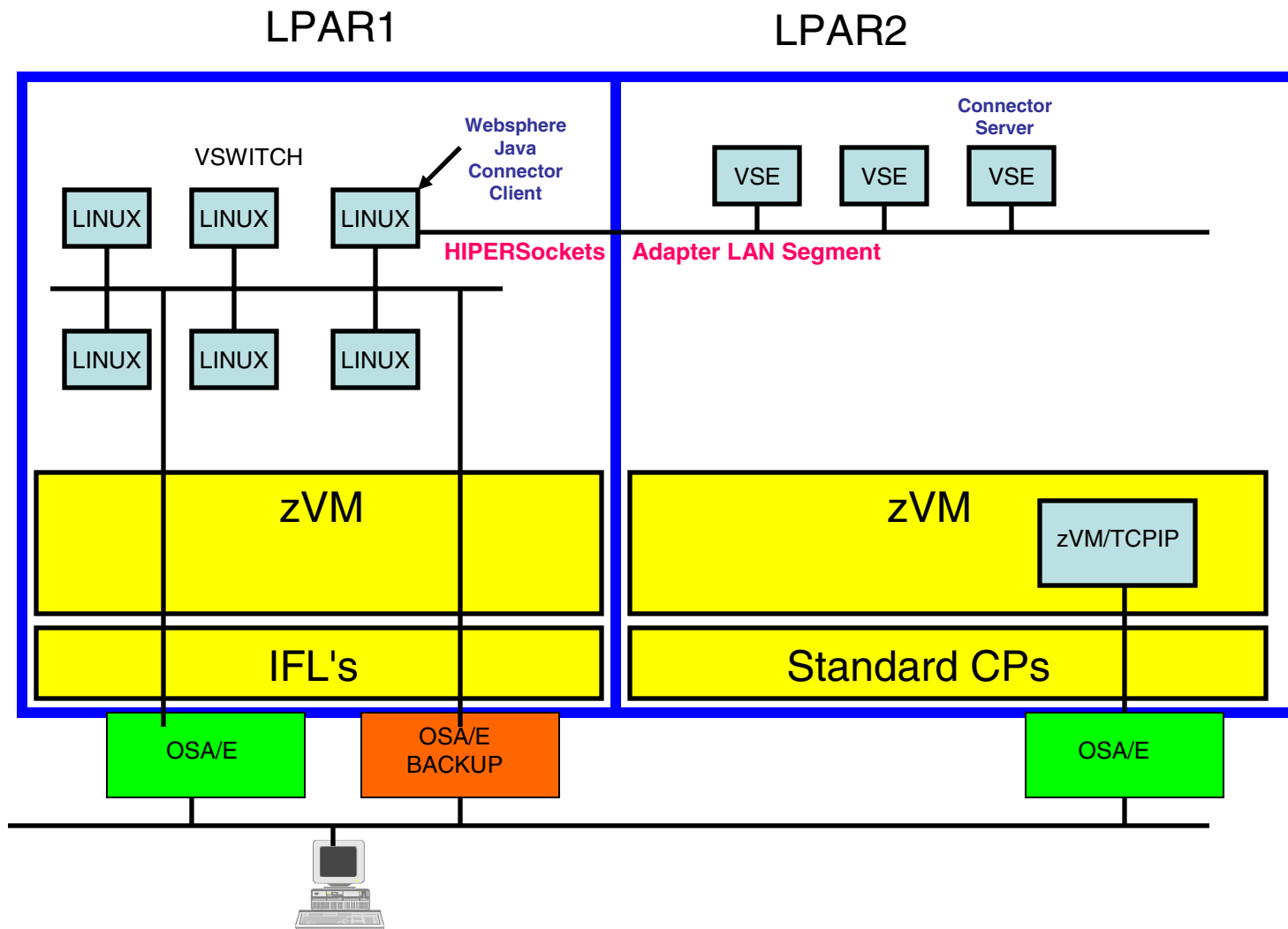
Connecting VSE To Linux

VSE/ESA

- The three tier e-Business structure to bring your VSE data to the web.



VSE, zSeries, VSE Connectors, zLinux One Example Of Multiple Guests



SNA ?

- The HIPERSockets adapter of the zSeries processors is an IP device only, no SNA support.
- An OSA/E card running in QDIO mode is an IP device only, no SNA support.
- Depending upon which zSeries processor is in use, a SNA capable OSA/E can be ordered. It will be an Ethernet 10/100T, 10/100/1000TX or Token Ring card that can be set to Express mode (**CHPID TYPE OSE**). It functions as LAN Channel Station (**LCS mode , 3172**). In this mode the card is SNA capable and requires you use OSA/SF to tailor the card. It can then operate as a XCA major node.
- All other OSA/E cards can only be QDIO mode (**CHPID TYPE OSD**) which is TCPIP only.

Summary

- The HIPERSockets adapter of the zSeries is the fastest inter-LPAR connection.
- zVM provides two Guest LANs QDIO and HIPER for intra-LPAR connections
- The VSWITCH provides 802.1Q support and removes the need to have an IP stack as a router.
- Latest Hardware/Software provide a multitude of IP connectivity options

There will be more than one way to set up your network, spend time planning.

- **VSE/ESA and LINUX on a zSeries connected via HIPERSockets adapter using VSE e-Business Connectors, is the way to bring your VSE data to the WWW.**

