



WAVV in Chattanooga, Tennessee, April/May 2004

## How to use Linux on zSeries to integrate SNA and IP solutions

01-May-2004, 03:00 PM - 04:00 PM

Enterprise Networking Solutions, RTP, NC  
Strategy and Design  
Alfred B Christensen - [alfredch@us.ibm.com](mailto:alfredch@us.ibm.com)

© Copyright International Business Machines Corporation 2004. All rights reserved.



### How to use Linux on zSeries to integrate SNA and IP solutions



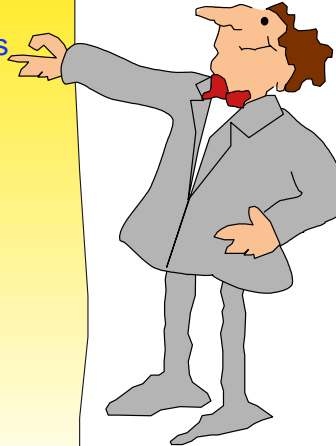
<b>Session:</b>	
<b>Date and time:</b>	01-May-2004, 03:00 PM - 04:00 PM
<b>Location:</b>	Chattanooga, Marriott, U3 - Meeting room 4
<b>Speaker:</b>	Alfred B Christensen, <a href="mailto:alfredch@us.ibm.com">alfredch@us.ibm.com</a>
<b>Abstract:</b>	<p>Communications Server on Linux for xSeries and zSeries provide SNA/IP integration solutions for networks and branch environments that contain an aging SNA infrastructure. These Linux based SNA solutions are important for all customers who wish to simplify their network infrastructure to a single IP network transporting both their SNA and IP application traffic. The recent announcement on the 3745/3746 left many wondering when IBM will terminate service on this product. Similarly, the OS/2 product in the branch office environment is nearing its end of life and this adds to the concern. z/OS supports Enterprise Extender technology to carry SNA traffic over IP networks directly between the branch and z/OS, but both VM and VSE lack native Enterprise Extender support. The CS on Linux offering implements among other functions, Enterprise Extender (EE) both on xSeries and on zSeries. This permits significant network infrastructure simplification with EE being used to carry SNA traffic between the Branch and the Data Center utilizing the latest technology in IP networks.</p>

© Copyright International Business Machines Corporation 2004. All rights reserved.

## Topics



- ✓ Introducing the Communications Server family
- ✓ The enterprise networking challenges and ways to address them using CS Linux
- ✓ Introduction and base connectivity
- ✓ CS Linux on zSeries solutions
  - ✓ TN3270 server
  - ✓ Enterprise Extender gateway
  - ✓ Application gateway
- ✓ Summary



© Copyright International Business Machines Corporation 2004. All rights reserved.

## Enterprise Networking Solutions: Communications Server product family



- The communications server family of products that are managed from a development perspective by Enterprise Networking Solutions in Research Triangle Park, North Carolina are:

- ▶ **Communications Server for z/OS - SNA and TCP/IP**
- ▶ **Communications Server for AIX - SNA**
- ▶ **Communications Server for Windows - SNA**
- ▶ **Communications Server for Linux (on Intel) - SNA**
- ▶ **Communications Server for Linux on zSeries - SNA**



- Both the Communications Server for Linux (on Intel) and the Communications Server for Linux on zSeries have been available as PRPQs for a while:
  - ▶ Communications Server for Linux PRPQ: 5799-RQA
  - ▶ Communications Server for Linux on zSeries PRPQ: 5799-RXL
- Communications Server for Linux on zSeries share the same code base as the Communications Server on AIX, Windows, and Linux on Intel
  - ▶ Solid base to start from

© Copyright International Business Machines Corporation 2004. All rights reserved.

# The enterprise networking challenges and ways to address them using CS Linux

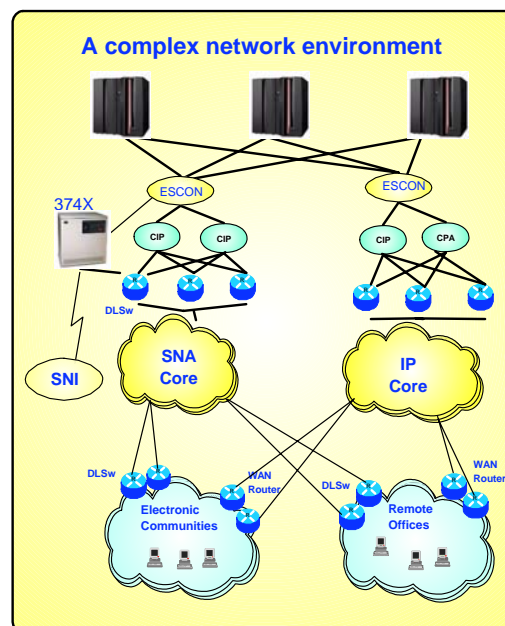
Copyright International Business Machines Corporation 2004. All rights reserved.



## Today's enterprise network: a mixed IP and SNA network infrastructure



- Branch applications are in many cases a mix of SNA and IP applications residing on workstations, branch processors, regional processors, and in the data center
- SNA and IP traffic flows are often carried over separate networks using a complex set of infrastructure components and technologies, that all need to be managed and maintained
- Some of the SNA network infrastructure components are nearing end-of-life
  - ▶ 3745 incl. SNI to business partners
  - ▶ Cisco CIP ESCON channel attachments
  - ▶ Token-ring hardware components
  - ▶ AnyNet
- Maintaining parallel network infrastructures is expensive
- Transforming all SNA applications to native IP applications is either a long-term strategy or in some cases not cost efficient



© Copyright International Business Machines Corporation 2004. All rights reserved.

# Branch transformation - network optimization and consolidation



<p>Existing enterprise using parallel networking infrastructure (SNA and TCP/IP)</p> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>▶ High total cost of ownership</li> <li>▶ Existing SNA networking products reaching end of life</li> <li>▶ Declining available skills in SNA development</li> </ul> <p><b>Reasons to stay</b></p> <ul style="list-style-type: none"> <li>▶ Looking to reduce IT spending</li> <li>▶ Limited IT budget cannot pay for high transformation cost</li> <li>▶ Looking for short-term benefits (preserve and optimize)</li> <li>▶ Business-critical applications run on SNA</li> </ul>	<p>Branch transformation offering from IBM</p> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>▶ Transform existing applications to e-business on demand (eBoD) applications             <ul style="list-style-type: none"> <li>– SNA network and applications</li> <li>– Existing business processes</li> </ul> </li> <li>▶ Drive the transformation towards e-business on demand</li> </ul>	<p>On demand enterprise using WebSphere</p> <p><b>Reasons to transform</b></p> <ul style="list-style-type: none"> <li>▶ Lower total cost of ownership</li> <li>▶ Removal of dependency on existing older products and skills</li> <li>▶ Take full advantage of the latest technologies</li> </ul> <p><b>Challenges</b></p> <ul style="list-style-type: none"> <li>▶ Most business applications are not fully WebSphere enabled at this point in time</li> </ul>
<p>Network optimization and consolidation offering from IBM</p> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>▶ Provide ways for immediate savings of IT costs while transforming to an e-business on demand model</li> <li>▶ Reduce level of risk by providing an intermediate step</li> </ul>		

© Copyright International Business Machines Corporation 2004. All rights reserved.

# Branch network access simplification using CS Linux for zSeries

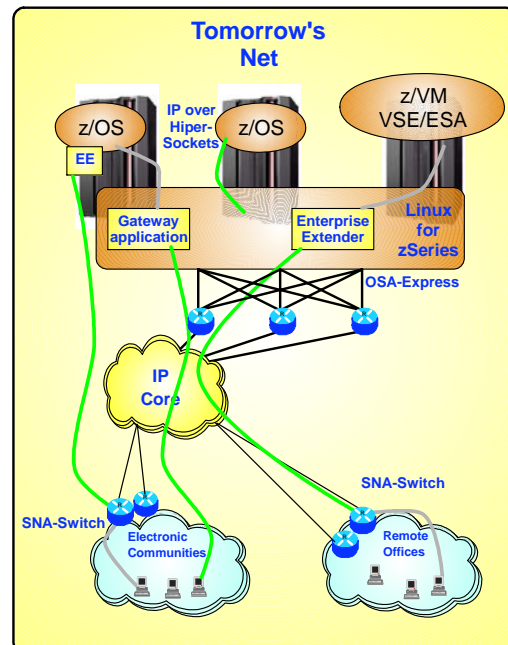


## ➤ Consolidation of branch SNA traffic

- ▶ Remove dependency on physical SNA wide area network completely to reduce network TCO
- ▶ Consolidate/migrate gateway server applications onto Linux for zSeries using downstream IP communication, but retaining upstream SNA communication with zSeries SNA applications
  - Business applications
  - Standard applications such as distributed TN3270 servers
- ▶ Use Enterprise Extender and other SNA functions to transport native SNA over an IP network:
  - Use Linux for zSeries as an intranet same-NETID Enterprise Extender enabler for zSeries operating systems that do not natively support Enterprise Extender
    - VSE/VTAM
    - VM/VTAM

## ➤ Consolidate at a regional level using Linux for zSeries on a z800 or Linux for Intel

- ▶ Upstream can be Enterprise Extender








© Copyright International Business Machines Corporation 2004. All rights reserved.

## SNA - IP network infrastructure simplification and optimization strategy elements



➤ A multi-step approach - eventually leading to confining SNA protocol stacks to the data center:

- ✓  CS Linux can help  
▶ Consolidate intranet **SNA 3270** traffic (LU1/SCS, LU2, LU3/DSC) into the data center using TN3270 client software (PCOM, HOD, OEM) connecting to TN3270 servers on zSeries - removing native SNA 3270 traffic from the WAN and reducing dependency on Token-ring, 374x or other channel-attached SNA controller (CIP) technology
- ▶ Move **middleware** communication off SNA where applicable: DB2 DRDA, MQ, etc. - can all be migrated to native IP communication without impact on database or messaging applications
- ✓  CS Linux can help  
▶ For **native SNA applications** in the branches/remote locations (LU0, LU6.2) use Enterprise Extender to transport the native SNA flows over an IP WAN network from the branch and into zSeries - initially retaining the SNA environment on the branch workstation and/or the branch server
- ✓  CS Linux can help  
▶ Migrate OS/2-based SNA branch server applications to Linux - initially retaining them in the branch on a Linux Intel platform using Enterprise Extender for the upstream to zSeries SNA communication
- ✓  CS Linux can help  
▶ Replace any workstation SNA protocol stack software with remote SNA API client software communicating with a remote SNA API server - optionally initially located on a Linux for Intel platform that then again uses Enterprise Extender for the upstream to zSeries SNA communication
- ✓  CS Linux can help  
▶ Finally, consolidate the Linux for Intel environment onto Linux for zSeries optionally supporting a TN3270 server, any remaining branch SNA applications, and the remote SNA API services - removing all SNA protocol stacks outside the data center

© Copyright International Business Machines Corporation 2004. All rights reserved.

## SNA - IP migration strategy Communications Server is about having a choice



➤ Communications Server on Linux for zSeries is very much about having an extended choice when deciding how to architect and where to implement the points of intersection between IP and SNA network flows:

- ▶ A choice of hardware platform that can be vendor independent
  - Linux runs on just about any hardware platform
  - The Communications Server product runs on multiple hardware platforms (Intel, pSeries, zSeries)
- ▶ A choice of operating system that can be vendor independent
  - Linux is open source and is not proprietary
  - No ties to any specific operating system vendor and that vendor's add-on solutions
  - The Communications Server product runs on multiple operating systems (AIX, Windows, Linux)
- ▶ A choice of placement that is not permanent, but flexible
  - Intersection points can initially be deployed in branch locations and, as use of SNA diminishes, be consolidated into regional centers and ultimately into the data center on zSeries



© Copyright International Business Machines Corporation 2004. All rights reserved.

## From a zSeries perspective: CS Linux on zSeries adds choice and capabilities



### ➤ From a z/OS operating system perspective:

- ▶ Alternatives to existing SNA - IP integration technologies on z/OS:
  - z/OS supports Enterprise Extender natively today and can transport SNA flows in/out of z/OS using Enterprise Extender IP flows - CS Linux on zSeries provides an alternative EE termination end-point on zSeries
  - z/OS also supports a rather advanced TN3270 server implementation that provides native IP connectivity from TN3270 clients right into z/OS - CS Linux on zSeries provides an alternative placement of the TN3270 server function on zSeries
- ▶ New capabilities to z/OS environments:
  - Linux-based gateway applications consolidated onto zSeries for optimal performance
  - Linux-based remote SNA API server providing the capability to collapse SNA protocol stacks all the way into zSeries

### ➤ From a z/VM operating system perspective:

- ▶ Alternatives to existing SNA - IP integration technologies on z/VM:
  - z/VM does today support a TN3270 server - CS Linux on zSeries provides an alternative placement of the TN3270 server function on zSeries for z/VM
- ▶ New capabilities to z/VM environments:
  - CS Linux extends the values of the Enterprise Extender technology to z/VM
  - Linux-based gateway applications consolidated onto zSeries for optimal performance
  - Linux-based remote SNA API server providing the capability to collapse SNA protocol stacks all the way into zSeries

### ➤ From a VSE/ESA operating system perspective:

- ▶ Alternatives to existing SNA - IP integration technologies on VSE/ESA:
  - VSE/ESA Version 1.5 does today support a TN3270 server - CS Linux on zSeries provides an alternative placement of the TN3270 server function on zSeries for VSE/ESA
- ▶ New capabilities to VSE/ESA environments:
  - CS Linux extends the values of the Enterprise Extender technology to VSE/ESA
  - Linux-based gateway applications consolidated onto zSeries for optimal performance
  - Linux-based remote SNA API server providing the capability to collapse SNA protocol stacks all the way into zSeries

© Copyright International Business Machines Corporation 2004. All rights reserved.

## CS Linux on zSeries Introduction and base connectivity

Copyright International Business Machines Corporation 2004. All rights reserved.



# IBM Communications Server for Linux on zSeries

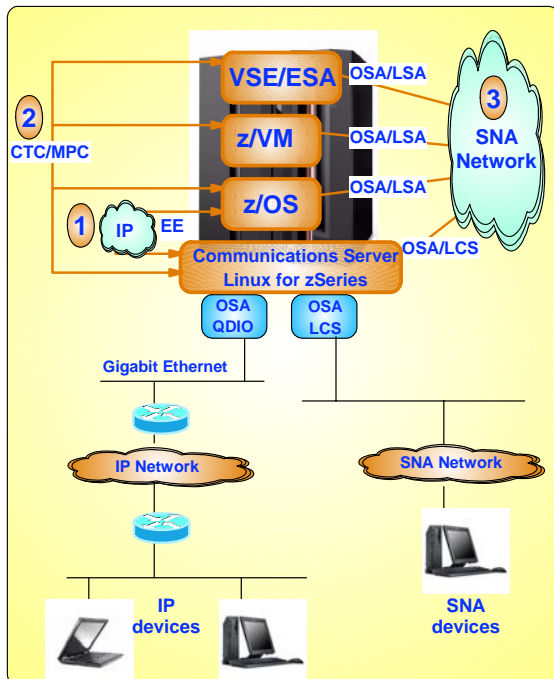


- > **Advanced Peer-to-Peer Networking (APPN) support**
  - ▶ APPN End Node (EN) or APPN Network Node (NN) support
  - ▶ Uses Dependent LU Requester (DLUR) for dependent LU access over an APPN network
- > **High Performance Routing (HPR) incl. Enterprise Extender (EE, aka. HPR over IP)**
- > **Branch Extender (BX) support**
  - ▶ Allows for APPN network topology simplification
- > **SNA API support**
  - ▶ CPI-C and APPC APIs for both dependent and independent LU6.2 - including extensions for both Java and C
  - ▶ Java Host Access APIs
  - ▶ LUA APIs (Request Unit Interface (RUI) and Session Level Interface (SLI)) for dependent LU functions (LU types 0, 1, 2, and 3)
  - ▶ Remote SNA client/server APIs (2Q2004)
  - ▶ APPC application suite (AFTP, APING, AREXEC, ATELL, ACOPY, and ANAME)
- > **TN3270E server**
  - ▶ Incl. SSL with client authentication and Express Logon support
  - ▶ Telnet redirector - allows telnet port mapping and/or telnet passthru from SSL to non-SSL
- > **Administration**
  - ▶ Motif-based administration
  - ▶ Network Operator Facility (NOF) APIs for programmed administration
  - ▶ Internationalization (2Q2004)
  - ▶ 31-bit and 64-bit support (2Q2004)
- > **Network attachments for SNA**
  - ▶ Enterprise Extender (HPR over IP)
  - ▶ (V)CTC using MPC channel protocols (Linux as a PUT2.1) (2Q2004)
  - ▶ Native SNA over shared LAN (Ethernet or Token-Ring)

**5799-RXL PRPQ  
available since  
12/2003. More  
functions to  
come 2Q2004.**

© Copyright International Business Machines Corporation 2004. All rights reserved.

# Linux for zSeries - overview over options for SNA attachment to z/OS, VM, and VSE



> SNA between Linux for zSeries and other zSeries operating systems:

- 1 - **Enterprise Extender (HPR over IP)**
  - For upstream to z/OS only
  - Dependent LUs: Linux DLUR - z/OS DLUS
  - Can use any IP-based connectivity between Linux and z/OS - including HiperSockets
- 2 - **APPN Host to Host (AHHC/ANNC over MPC)**
  - Connectivity: CTC MPC channel
  - For upstream to z/OS, z/VM, and VSE/ESA
  - Both endpoints must be defined as PU Type 2.1 nodes - may mean APPN-enabling z/OS, z/VM, and VSE/ESA, if not already done (z/VM and VSE/ESA as APPN NNs)
  - Dependent LUs: Linux DLUR - z/OS, z/VM, and VSE/ESA DLUS
- 3 - **SNA LLC2 over shared LAN (APPN, LEN, or subarea)**
  - Connectivity: Linux OSA LCS via shared LAN to OSA LSA
  - For upstream to z/OS, z/VM, and VSE/ESA
  - Linux attachment via LCS device driver and enhanced OSA Express microcode (zSeries only)
  - z/OS, z/VM, and VSE/ESA attachment via standard OSA LSA device driver
  - PUs may be PU Type 2.0 or 2.1

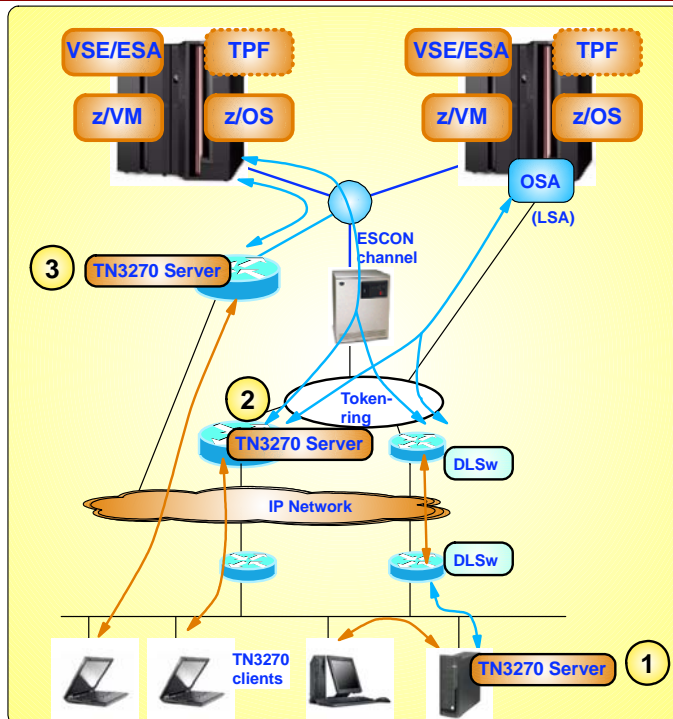
© Copyright International Business Machines Corporation 2004. All rights reserved.

# CS Linux on zSeries solution overview

Copyright International Business Machines Corporation 2004. All rights reserved.



## Typical distributed TN3270 server scenarios in an SNA subarea network environment today



> TN3270 servers are seen as PU type 2 nodes with dependent LU type 1, 2, or 3 devices.

- Defined in VTAM via a switched major node or an XCA major node

> Connectivity to VTAM is

- via an ESCON channel

- 37xx NCP (element addresses out of NCP's subarea)

- Channel-attached router such as Cisco 7500 CIP (element addresses out of VTAM's low address pool)

- via an OSA adapter operating in LSA mode

- Token-ring or Ethernet (element addresses out of VTAM's low address pool)

**1** TN3270 servers in branches

- Typically transports SNA LLCs over wide-area IP network via Data Link Switching
- SNA boundary functions done by NCP (37xx) or VTAM (OSA-LSA)

**2** TN3270 servers in regional or central data center

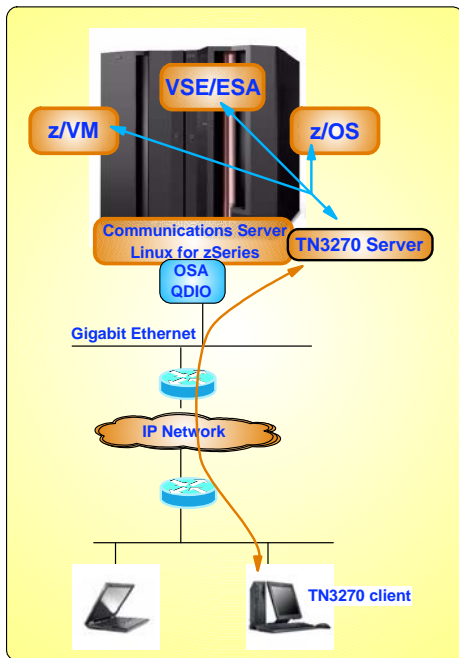
- Token-ring attached to NCP (37xx) or VTAM (OSA-LSA)

**3** TN3270 servers in channel-attached gateways

© Copyright International Business Machines Corporation 2004. All rights reserved.



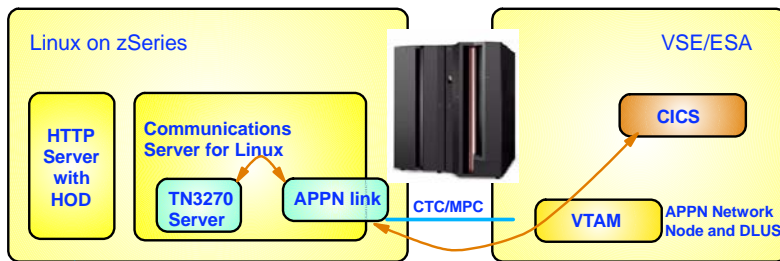
# Consolidating TN3270 servers into Linux for zSeries



- No or minimal changes to VTAM definitions of TN3270 server PUs and LUs
  - ▶ Continue to look like a PU type 2.1 (or 2.0) with dependent LUs of type 1, 2, and 3
  - ▶ USS table handling continues to be performed by the VTAM SSCP
  - ▶ Default application logon continues to be handled via existing VTAM definitions
- Configuration concepts for TN3270 server remains more or less as they were for the distributed TN3270 servers
- Connectivity to zSeries via Gigabit Ethernet and QDIO
- SNA connectivity between Linux for zSeries and z/OS, z/VM, or VSE/ESA via HiperSockets (EE to z/OS only), MPC Channel-to-Channel, or a shared LAN
- SNA collapsed into the data center
- In most configurations, the LU element addresses will come out of VTAM's high-order address pool
- No dependency on 37xx, CIP, or Token-ring hardware
- TN3270 server MIPS executed on zSeries IFL processors

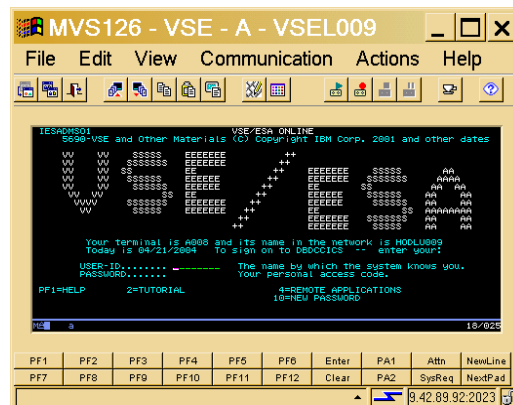
© Copyright International Business Machines Corporation 2004. All rights reserved.

# VSE/ESA and CS Linux on zSeries in combination with HOD



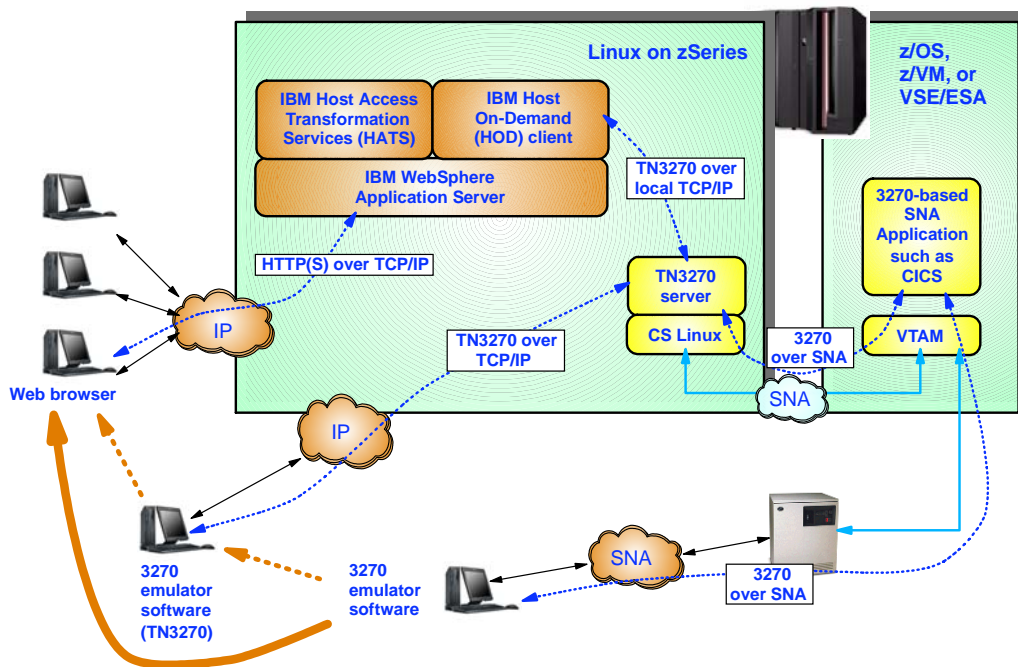
To avoid pre-installing 3270 emulator software on the workstation, an HTTP server serving a HOD client can be deployed on Linux and combined with the TN3270 server of CS Linux

- ▶ Web browser used to access a HOD client
- ▶ HOD client connects over TN3270/IP to TN3270 server in Linux
- ▶ TN3270 server in Linux uses DLUR to connect to DLUS in VTAM in VSE/ESA



© Copyright International Business Machines Corporation 2004. All rights reserved.

## 3270: one step further - CS for Linux on zSeries and IBM's Host Access Transformation Services



© Copyright International Business Machines Corporation 2004. All rights reserved.

## WebSphere Host Access Transformation Services and Communications Server for Linux on zSeries



When migrating 3270-based workstation solutions off an SNA network infrastructure, one can today bypass the intermediate step with TN3270 emulation software on each workstation:

- ▶ Use a universal client on the user workstation (a Web browser)
  - No additional workstation software deployment or management
  - All workstation environments that support a Web browser are supported by this solution
    - Windows, Linux, Mac OS, etc.
- ▶ Use HTTP(S) protocols to communicate with a central WebSphere Application Server environment that hosts the IBM Host Access Transformation Services
  - HATS uses HTTP(S) downstream to users
    - Firewall traversal simplified
  - HATS uses Host On-Demand (TN3270 client) upstream communicating with existing 3270-based SNA applications on z/OS, z/VM, or VSE/ESA
    - No changes to existing SNA applications
- ▶ HATS transforms the outbound 3270 data stream to HTML, and the inbound HTML to a 3270 data stream
  - Simple out-of-the-box transformation with no or minimal customization
  - Opportunity to modernize user dialog without redesigning and redeveloping host applications
- ▶ The WebSphere HATS technology can be deployed on Linux on zSeries in combination with Communications Server for Linux on zSeries:
  - IP network infrastructure all the way into zSeries (high-speed IP network connectivity using zSeries OSA-Express technology)
  - No or minimal configuration changes to z/OS, z/VM, or VSE/ESA SNA definitions
  - zSeries availability, scalability, capacity, and performance characteristics

© Copyright International Business Machines Corporation 2004. All rights reserved.

# Accessing VSE/ESA using CS Linux on zSeries and WebSphere Host Access Transformation Services



IESADMS01 VSE/ESA ONLINE  
5690-VSE and Other Materials (C) Copyright IBM Corp. 2001 and other dates

Your terminal is A005 and its name in the network is HATLU007  
Today is 05/01/2004 To sign on to DBDCCICS -- enter your:

USER-ID.....  The name by which the system knows you.  
PASSWORD.....  Your personal access code.

PF1=HELP 2=TUTORIAL 3=TO VM 4=REMOTE APPLICATIONS 6=ESCAPE(U)  
9=Escape(m) 10=NEW PASSWORD 12=LOGON

© Copyright International Business Machines Corporation 2004. All rights reserved.

# Accessing VSE/ESA using CS Linux on zSeries and WebSphere Host Access Transformation Services



SYSTEM: VSE/ESA VSE/ESA 2.6 TURBO (01) USER: MSL1  
VM USER ID: MVS126 TIME: 13:31:20

d net,majnodes  
AR 0015 1C39I COMMAND PASSED TO ACP/VTAM

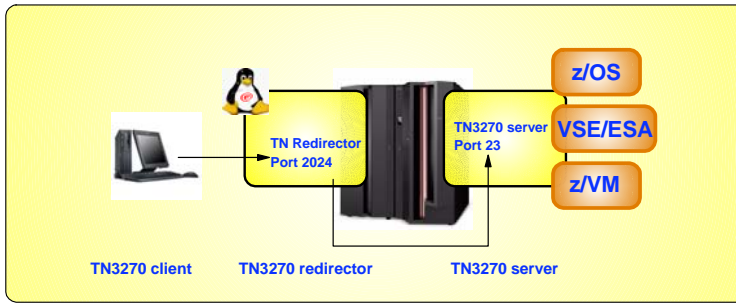
F3 0003 IST097I NOCDD DISPLAY ACCEPTED  
F3 0003 IST350I NOCDD DISPLAY TYPE = MAJOR NODES  
F3 0003 IST089I NOCDD VTAMSEG TYPE = APPL SEGMENT , ACTIV  
F3 0003 IST089I NOCDD ISTDY TYPE = PU T4/5 MAJ NODE , ACTIV  
F3 0003 IST089I NOCDD ISTDILU TYPE = CDRSC SEGMENT , ACTIV  
F3 0003 IST089I NOCDD ISTDJCP TYPE = ADJCP MAJOR NODE , ACTIV  
F3 0003 IST089I NOCDD ISTDY TYPE = CDRSC SEGMENT , ACTIV  
F3 0003 IST089I NOCDD ISTDW TYPE = SW SNA MAJ NODE , ACTIV  
F3 0003 IST089I NOCDD APPL1A TYPE = APPL SEGMENT , ACTIV  
F3 0003 IST089I NOCDD LOCAL1A TYPE = LCL 3270 MAJ NODE , ACTIV  
F3 0003 IST089I NOCDD ISTDY TYPE = TRL MAJOR NODE , ACTIV  
F3 0003 IST089I NOCDD B02LSNA TYPE = LCL SNA MAJ NODE , ACTIV  
F3 0003 IST089I NOCDD DSIAPPL1 TYPE = APPL SEGMENT , ACTIV  
F3 0003 IST089I NOCDD VSESMN TYPE = SW SNA MAJ NODE , ACTIV  
F3 0003 IST314I NOCDD END

==>

1=HLP 2=CPY 3=END 4=RTN 5=DEL 6=DELS 7=RED 8=CONT 9=EXPL 10=HLD 12=RTRV

© Copyright International Business Machines Corporation 2004. All rights reserved.

# TN3270 redirector



The TN3270 redirector acts as a TN3270 proxy server

- Relays the connection and the TN3270 protocol between the real client and the real TN3270 server

The CS Linux TN3270 redirector support allows for:

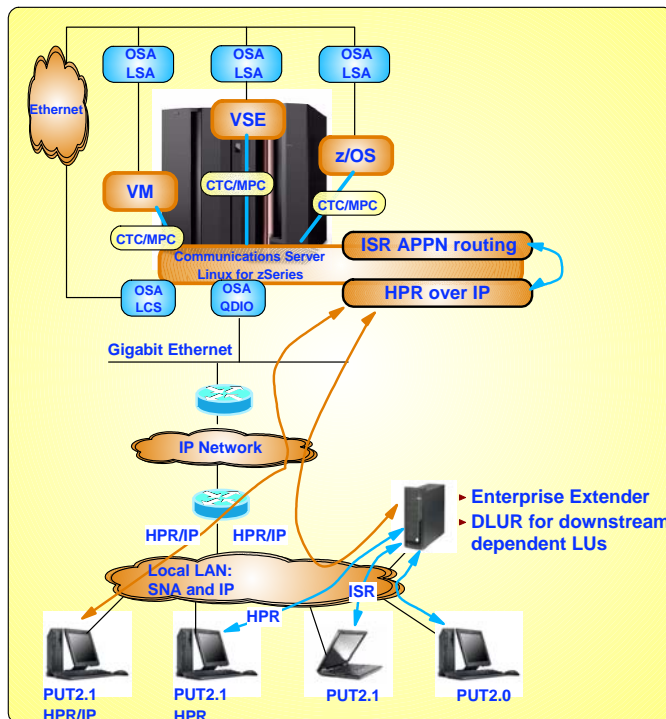
- Changing port number
  - Example: coming through firewalls with filtered port, and then redirecting to real TN3270 server port
- Allowing for SSL termination outside the real TN3270 server
  - SSL connection from client to the CS Linux TN3270 redirector
  - non-SSL connection from the CS Linux TN3270 redirector to the real TN3270 server on z/OS, z/VM, or VSE/ESA

From a z/OS, z/VM, and VSE/ESA perspective all clients come from the TN redirector host (all from same source IP address).

- LU name assignment in TN3270 server cannot be based on client source IP address or host name

© Copyright International Business Machines Corporation 2004. All rights reserved.

# Linux for zSeries as same NETID Enterprise Extender gateway to z/OS, z/VM, and VSE/ESA



Linux for zSeries can act as an Enterprise Extender gateway to other zSeries operating systems that do not support or are not configured for EE

SNA LLC traffic reduced to branch LAN and zSeries

- No dependency on 37xx, CIP, or Token-ring hardware
- Common wide area network IP infrastructure

Network connectivity to zSeries via Gigabit Ethernet and QDIO

zSeries operating systems must be APPN enabled

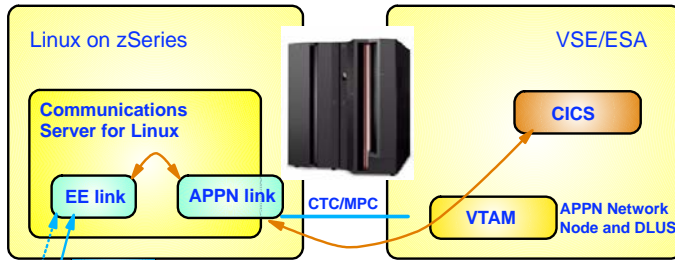
- ISR APPN routing over:
  - a CTC MPC link
  - OSA LCS via shared LAN to OSA LSA
- HPR routing over IP (to z/OS only)

All immediate downstream and upstream nodes must be within the same SNA NETID

- CS Linux does not support APPN boundary functions or session services extensions

© Copyright International Business Machines Corporation 2004. All rights reserved.

# VSE/ESA and Enterprise Extender gateway on Linux on zSeries



To use the CTC/MPC connectivity between Linux and VSE/ESA, VSE/ESA VTAM must be configured as an APPN Network Node

### Workstation configuration options:

- ▶ SNA LLC2 flows to a local EE gateway, such as a Cisco SNA Switch router or an IBM Communications Server on the local LAN (IP flows from the local EE gateway upstream)
  - DLUR functions performed by EE gateway
- ▶ EE flows directly from the workstation using a product such as IBM's PCOM or IBM Communications Server for Windows (IP flows all the way to the workstation)
  - DLUR functions performed by local workstation

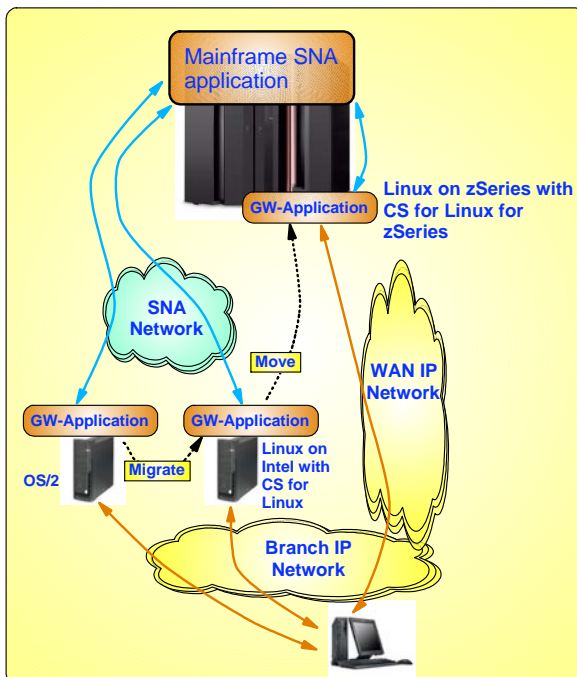


© Copyright International Business Machines Corporation 2004. All rights reserved.

# Customer-written SNA application gateway programs on OS/2



➤ Customers migrating off OS/2 can take advantage of the CS Linux SNA API capabilities.



### Example:

A customer-specific application that runs on OS/2 and acts as a gateway between users in a branch and SNA applications on the mainframe:

- ▶ upstream: SNA LU0 or LU6.2
- ▶ downstream: TCP/IP

A first step is to rewrite the application to run on Linux instead of OS/2 - potentially initially deploying the gateway application on Linux for Intel in the branch. The SNA APIs that are provided by CS Linux are the same APIs as provided by CS OS/2.

- ▶ CS Linux provides multiple SNA programming interfaces - including:
  - CPI-C for LU6.2
  - APPC for LU6.2
  - LUA (for LU0, 1, 2, and 3)

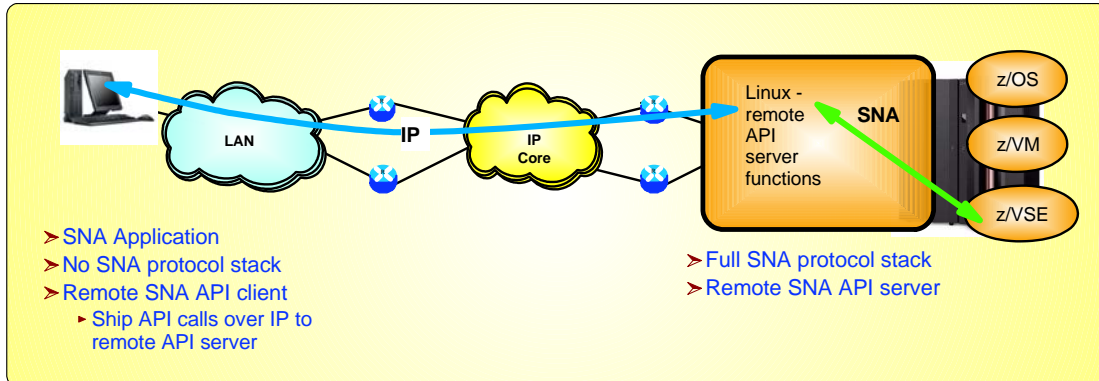
If initially deploying on Linux for Intel, a second step is to consolidate the gateway application into Linux on zSeries collapsing the SNA network segment to being within the zSeries environment.

© Copyright International Business Machines Corporation 2004. All rights reserved.

## Remote SNA API client/server technology



- > The remote SNA API support allows SNA application programs to reside on nodes that do not implement a full SNA protocol stack.
- > The SNA API calls are intercepted by a shim layer that ships the calls over a TCP connection to a remote SNA API server where the actual SNA API calls are executed.
- > This technology provides a solution for SNA application programs that need to remain in remote locations - without requiring SNA protocol stacks on those remote nodes.
  - Removing the need for SNA stack configuration skills, management, and operations procedures outside the data center where the remote SNA API servers may be collapsed to
- > This technology also provides built-in availability and load-balancing to a pool (a domain) of remote SNA API servers
  - A remote SNA API client is not limited to use a single remote SNA API server
- > There is no charge for installing the remote SNA API client - usage is covered by per-user server charge

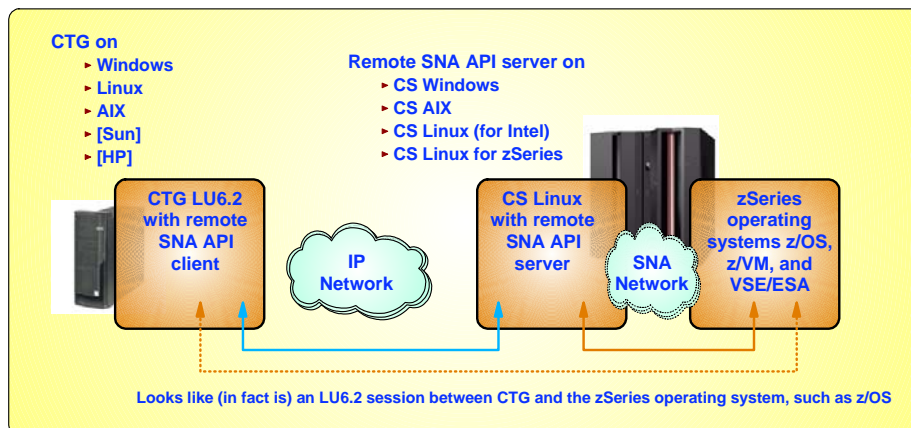


© Copyright International Business Machines Corporation 2004. All rights reserved.

## Migrating off AnyNet technology for SNA over IP



- > z/OS V1R7 is the last release where z/OS will include the VTAM AnyNet component.
  - The strategic replacement for AnyNet is Enterprise Extender
- > CICS Transaction Gateway today uses AnyNet
  - CTG ships with its own imbedded TCP62 (AnyNet) drivers for SNA APPC communication
  - An Enterprise Extender implementation in some cases where CTG is used, may be seen as having a too-large footprint from a TCO perspective
  - CTG plans later this year to ship with the CS Linux remote API client software that will allow it to communicate over an IP network to a CS Linux remote API server – removing the dependency on Anynet



© Copyright International Business Machines Corporation 2004. All rights reserved.

# Summary and reference information

Copyright International Business Machines Corporation 2004. All rights reserved.



## Summary



- Customer interest in SNA functions on Linux in general is high:
- Simplifying the network infrastructure has a direct impact on TCO
  - ▶ Reduced SNA software licenses
  - ▶ Reduced network hardware costs
  - ▶ Reduced line costs (no parallel networks)
  - ▶ Reduced cost of SNA management software
  - ▶ Reduced operations cost
  - ▶ Reduced total WAN capacity
  - ▶ Reduced overall complexity (consolidating onto Linux)
- SNA skills are on the decline – the less dependency on SNA in the wide area network, the better
  - ▶ Consolidating SNA skills into the data center
- Worries among many customers about 374x hardware spare part availability
  - ▶ The faster a migration off 374x technology can be done, the better
- There are many mainframe applications left that remain SNA based
  - ▶ Very much welcome is a set of solutions that can address the network infrastructure challenges customers have today with existing SNA networks without requiring them to change the mainframe applications in coordination with changes to the SNA network

**Solutions are available today and more will become available during 2004!**

© Copyright International Business Machines Corporation 2004. All rights reserved.

## Consolidating distributed TN3270 servers onto Linux for zSeries



CS Linux TN3270 server and TN3270 redirector

### > Consolidate from:

- ▶ Channel- or Token-ring attached TN3270 servers
- ▶ Microsoft SNA Servers or Host Integration Servers
- ▶ Various OEM distributed TN3270 server solutions
  - Apertus, OpenConnect, Attachmate, Novell, etc.
- ▶ CS AIX
- ▶ CS OS/2



Easy, high-value transition

### > Benefits of consolidation onto Linux for zSeries:

- ▶ Replace heterogenous, proprietary solutions with Linux-based solution
- ▶ Centralize configuration and management
- ▶ Consolidate many distributed TN3270 server instances into fewer server instances on zSeries
- ▶ No or minimal change to z/OS, z/VM, or VSE/ESA SNA definitions
- ▶ IP flows all the way into the data center and into zSeries
  - Wide area network infrastructure simplification (no or reduced SNA skills needed in wide area network)
  - Gigabit Ethernet (QDIO) capacity connectivity to zSeries
- ▶ Secure TN3270 all the way into zSeries (no passwords in the clear outside the data center or the zSeries)
  - Cryptographic operations performed by zSeries IFL engines

© Copyright International Business Machines Corporation 2004. All rights reserved.

## Same NETID Enterprise Extender gateway to z/VM and VSE/ESA



Enterprise Extender and APPN gateway

### > Added capability:

- ▶ Enterprise Extender is the most efficient protocol to transport SNA flows over an IP network and is widely deployed by z/OS customers already
  - Based on High Performance Routing (HPR)
- ▶ z/VM and VSE/ESA do not support Enterprise Extender protocols but rely entirely on SNA-based connectivity, which uses lower capacity interfaces than those supported by IP on zSeries

### > Benefits of adding Enterprise Extender gateway capability:

- ▶ IP based network flows to the data center and zSeries for all types of SNA traffic including SNA program to program flows (that are not covered by the TN3270 protocol):
  - LU type 0 (SLUTYPEP, NJE, etc.)
  - LU type 6.2 (APPC, CPI-C)
- ▶ Enterprise Extender technology allows SNA traffic to take advantage of the dynamic nature of IP routing, enabling dynamic recovery from IP network topology changes to be extended to SNA workload.
- ▶ Enables zSeries operating systems that do not support Enterprise Extender technology to use SNA flows over an IP backbone network all the way into the data center or zSeries:
  - Wide area network infrastructure simplification
  - Gigabit Ethernet capacity connectivity to zSeries
- ▶ Enterprise Extender technology is already today deployed in large scale by many existing z/OS customers to simplify the backbone network infrastructure
- ▶ For zSeries operating systems that are already APPN enabled, use of Linux as an Enterprise Extender gateway will require no or minimal changes to existing configuration

© Copyright International Business Machines Corporation 2004. All rights reserved.



## Consolidating SNA application gateway programs to Linux for zSeries



Application gateway platform and remote SNA API server

- **Consolidate SNA application gateway programs from:**
  - ▶ OS/2
  - ▶ Windows
  - ▶ Various SNA implementations on Tandem, Stratus, SUN, HP, etc.
  - ▶ AIX
- **Benefits of consolidation onto Linux for zSeries:**
  - ▶ Replace heterogenous, proprietary solutions with Linux-based solution
  - ▶ Centralize configuration and management
  - ▶ Provide a migration path off OS/2 that will not tie the customer into yet another proprietary operating system platform
  - ▶ Stepwise deployment possible - greater deployment flexibility:
    - Deploy the gateway application on CS Linux initially
    - Consolidate the gateway application onto CS Linux for zSeries
  - ▶ IP flows all the way into the data center and into zSeries
    - Wide area network infrastructure simplification (no or reduced SNA skills needed in wide area network)
    - Gigabit Ethernet (QDIO) capacity connectivity to zSeries
  - ▶ Opportunity to remove all SNA protocol stacks in the network outside the data center
    - Significant network infrastructure simplification benefits

© Copyright International Business Machines Corporation 2004. All rights reserved.

## Augment the value of Linux for zSeries installations



- **Some of the most widely used applications on Linux for zSeries are:**
  - ▶ WebSphere Application Server
  - ▶ File and print sharing server (SAMBA)
  - ▶ Database server
- **Communications Server for Linux on zSeries offers zSeries installations new or increased value of Linux on zSeries:**
  - ▶ Consolidating distributed TN3270 servers without modification to existing VTAM definitions
  - ▶ A migration platform off OS/2 for SNA gateway applications
  - ▶ A consolidation platform for SNA gateway applications in general
  - ▶ Extend the value of Enterprise Extender to the zSeries operating systems that do not currently support Enterprise Extender
  - ▶ Allowing existing zSeries installations to protect their investment in their current SNA-based application portfolio, but at the same time allow them to reduce the overall cost of the networking infrastructure by simplifying it to become a single-protocol network based on IP, where the SNA network portion is consolidated into the data center.



© Copyright International Business Machines Corporation 2004. All rights reserved.

# Appendix

Copyright International Business Machines Corporation 2004. All rights reserved.



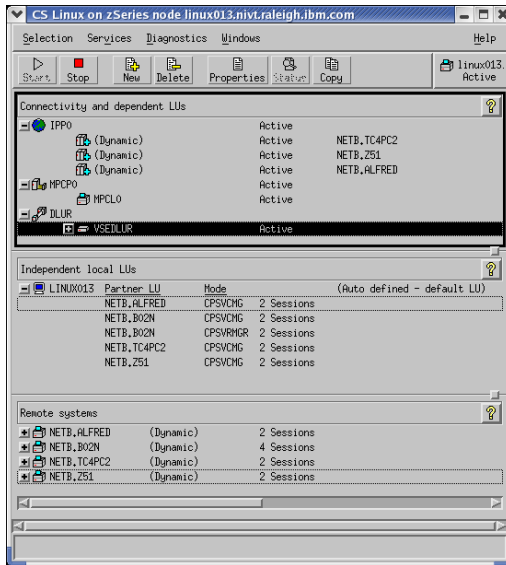
## Installation prerequisites



- Linux distributions:
  - ▶ RedHat Enterprise Linux 3 for S/390
  - ▶ RedHat Enterprise Linux 3 for zSeries
  - ▶ SuSE Linux Enterprise Server 8 for IBM Mainframes (SLES8)
  - ▶ SuSE Linux Enterprise Server 8 for IBM zSeries (SLES8)
- For each supported Linux distribution, you may need to install one or more optional RPMs (see the release notes file for details)
- CS Linux uses a component called "Linux Streams" - LiS. LiS must be at a specific level
  - ▶ Obtain LiS from the following URL:
    - <ftp://ftp.gcom.com/pub/linux/src/LiS/LiS-2.16.???.tgz>
  - ▶ The patch file is supplied with CS Linux for zSeries
  - ▶ Follow the detailed instructions in the release notes file for preparing for and installing LiS
- OpenMOTIF is required by the GUI administration functions
  - ▶ For RedHat Enterprise Linux 3 and for SuSE SLES8, you need to install the optional openmotif-2.2.2 RPM
- Java JDK is needed - the latest Java 1.4.1 SDK is recommended
  - ▶ For RedHat Enterprise Linux 3 you need to install the optional IBMJava2-SDK-1.4.1-1.0.s390.ibm RPM
  - ▶ For the other distribution you can download the SDK from <http://www.ibm.com/developerworks/java/jdk>
- If you plan to use SSL (with the TN3270 server), you will need to install a couple of optional RPMs
  - ▶ `compat-libstdc++-??` (level depends on distribution)
- When all prerequisites are resolved, then you can install CS Linux for zSeries

© Copyright International Business Machines Corporation 2004. All rights reserved.

# CS Linux configuration overview



When xsnaadmin starts up, you will be presented with an initial overview panel like the one you see on this page.

The first time, it will be quite empty. Later it will include information about the current configuration and status of individual components in that configuration.

The panel is subdivided into three sub-panels:

- Connectivity and dependent LUs
- Independent local LUs
- Remote systems

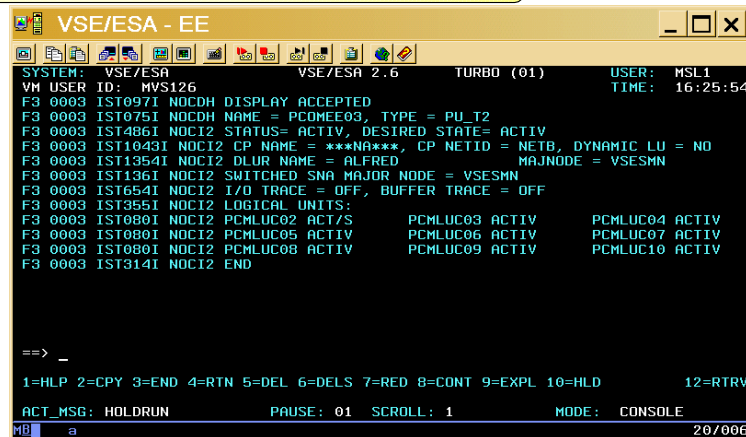
© Copyright International Business Machines Corporation 2004. All rights reserved.

# VSE VTAM definitions for a DLUR/DLUS switched major node



```
PCOME03 PU ADDR=01,PUTYPE=2,IDBLK=05D,IDNUM=00000,DISCNT=NO,*
MAXPATH=1,MAXOUT=3,ANS=CONTINUE,MODETAB=AMODETAB

PCMLUC02 LU LOCADDR=002
PCMLUC03 LU LOCADDR=003
PCMLUC04 LU LOCADDR=004
PCMLUC05 LU LOCADDR=005
PCMLUC06 LU LOCADDR=006
PCMLUC07 LU LOCADDR=007
PCMLUC08 LU LOCADDR=008
PCMLUC09 LU LOCADDR=009
PCMLUC10 LU LOCADDR=010
```



© Copyright International Business Machines Corporation 2004. All rights reserved.

## Communications Server for Linux on zSeries – part one



### ➤ **Advanced Peer-to-Peer Networking (APPN)**

- ▶ Brings APPN network node and end node support, with the benefits of peer networking - including simplified configuration, high availability, dynamic routing, and easier maintenance
- ▶ Branch extender to simplify APPN networks containing a large number of branch end nodes
- ▶ Offers a way for existing APPC and CPI-C applications to take advantage of peer networks
- ▶ Allows 3270 applications to flow over APPN networks, with dependent LU requester (DLUR) enablement

### ➤ **High-Performance Routing (HPR) and Enterprise Extender (EE)**

- ▶ Increases data routing performance and reliability
- ▶ Offers nondisruptive routing around network outages SNA gateway support
- ▶ Allows many SNA clients to access multiple zSeries computers through one or more physical connections
- ▶ Brings large computer resources to many users, while keeping adapter and line costs down
- ▶ Extends the reach of SNA applications over IP networks and provides the level of reliability and performance enjoyed by SNA users

### ➤ **TN3270E server**

- ▶ Allows TCP/IP users easy access to IBM 3270 applications and print services through TN3270E server
- ▶ Supports Secure Sockets Layer (SSL) authentication and encryption, providing secure access across the TCP/IP network

### ➤ **Telnet Redirector**

- ▶ Provides passthru TCP/IP host access to TN3270, TN3270E, TN5250 and VT clients
- ▶ Allows you to use Secure Sockets Layer (SSL) security checking where necessary, and not on the entire user-to-host

© Copyright International Business Machines Corporation 2004. All rights reserved.

## Communications Server for Linux on zSeries – part two



### ➤ **SSL data encryption scalability**

- ▶ Ensures that the data flowing between the Telnet server and telnet emulator client is protected

### ➤ **Client Authentication**

- ▶ Helps assure communication with the intended server
- ▶ More robust security for e-business

### ➤ **Application programming support**

- ▶ Provides an excellent platform for programming and application integration
- ▶ Extension of CPI-C to support Java applications as well as standard C-language applications
- ▶ Includes Host Access Class library (Host Access API) for Java that provides a core set of classes and methods that allow the development of platform-independent applications that can access host information at the data stream level.
- ▶ Provides LUA request unit interface (RUI) and session level interface (SLI) APIs, supporting dependent LU types 0, 1, 2, 3.
- ▶ Provides CPI-C and APPC APIs supporting both dependent and independent LU 6.2. This commonly used interface makes it easier to develop cross-platform applications.
- ▶ Provides node operator facility (NOF) API, which allows custom applications to be written to perform system administration tasks.
- ▶ Includes an APPC Application Suite, a set of applications that demonstrates the distributed processing capabilities of APPN networks, including AFTP, APING, AREXEC, ATELL, ACOPY, and ANAME.
- ▶ Remote SNA API client/server technology (2Q2004)

© Copyright International Business Machines Corporation 2004. All rights reserved.

## Communications Server for Linux on zSeries – part three



- **Advanced program-to-program communication (APPC)**
  - ▶ Delivers distributed processing capabilities by enabling different network nodes to share resources and tasks
  - ▶ Provides for peer-to-peer interaction and communication among various IBM and non-IBM systems
  - ▶ Supports multiple logical units and multiple concurrent links
  - ▶ Includes persistent verification to improve security
  
- **Common Programming Interface for Communications (CPI-C)**
  - ▶ Offers the function of APPC in a consistent form across multiple system platforms for CPI-C
  - ▶ Permits smooth movement of applications from one system platform to another (for example, from a Linux platform to a Communication Server for Windows platform)
  - ▶ Supports CPI-C, Release 2
  
- **Configuration, installation, and administration options**
  - ▶ Easy to install and configure
  - ▶ Easy-to-use Motif-based Administrative interface
  - ▶ Internationalization (2Q2004)
  - ▶ zSeries 64-bit support (2Q2004)
  
- **Problem determination and systems management**
  - ▶ Offers quick access to integrated problem determination functions
  - ▶ Allows problem determination and systems management functions to be performed under program control through the use of the NOF API
  - ▶ Facilitates management of remote servers; local operators need not be

© Copyright International Business Machines Corporation 2004. All rights reserved.

## Reference and contact information



- ✓ <http://www.ibm.com/software/network/commserver/>
- ✓ <http://www.ibm.com/software/network/commserver/os390>
- ✓ <http://www.ibm.com/software/network/commserver/windows>
- ✓ [http://www.ibm.com/software/network/commserver/z\\_lin](http://www.ibm.com/software/network/commserver/z_lin)
- ✓ <http://www.ibm.com/software/network/commserver/linux>
- ✓ <http://www.ibm.com/software/network/commserver/aix>

If you need assistance from CS for z/OS or Linux consultants who have experience designing and implementing network solutions for customers around the world, please contact April Singer at [singeraf@us.ibm.com](mailto:singeraf@us.ibm.com) or 919-254-6762. April will work with you to provide a billable services offering specific to your needs whether it be large or small.

© Copyright International Business Machines Corporation 2004. All rights reserved.

# Trademarks



➤The following terms are trademarks or registered trademarks of International Business Machines Corporation in the United States or other countries or both:

- AIX®
- CICS/ESA®
- DB2®
- e business(logo)®
- HiperSockets
- IBM®
- MQSeries®
- MVS
- MVS/ESA
- OS/2®
- OS/390®
- pSeries®
- S/390®
- System/390®
- ThinkPad®
- VM/ESA®
- VSE/ESA
- VTAM®
- WebSphere®
- xSeries®
- z/OS®
- z/VM®
- zSeries®

➤Microsoft, Windows, Windows NT, Windows 2000, and the Windows logo are registered trademarks of Microsoft Corporation in the United States, other countries, or both

➤Stratus is a registered trademark of Stratus Computer, Inc.

➤Tandem is a registered trademark of HP Corporation

➤Other company, product, and service names may be trademarks or service marks of others.

© Copyright International Business Machines Corporation 2004. All rights reserved.