IBM Software Group
Enterprise Networking and Transformation Solutions (ENTS)

IBM Distributed Communications Servers

A Technical Introduction

Alfred B Christensen, Raleigh,
North Carolina, USA
alfredch@us.ibm.com

October 2006

IBM Systems

Trademarks and notices

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

- Advanced Peer-to-Peer Networking®
- AIX®
- alphaWorks®
- AnyNet®
- AS/400®
- BladeCenter®
- Candle®
- CICS®
- DB2 Connect
- DB2®
- DRDA®
- e-business on demand®
- e-business (logo)
- e business(logo)®
- ESCON®
- FICON®
- GDDM®
- HiperSockets
- HPR Channel Connectivity
- HyperSwap
- i5/OS (logo)
- i5/OS®
- IBM (logo)®
- IBM®
- IMS
- IP PrintWay
- IPDS
- iSeries
- LANDP®
- Language Environment®
- MQSeries®
- MVS
- NetView®
- OMEGAMON®
- Open Power
- OpenPower
- Operating System/2®
- Operating System/400®
- OS/2®
- OS/390®
- OS/400®
- Parallel Sysplex®
- PR/SM
- pSeries®
- RACF®
- Rational Suite®
- Rational®
- Redbooks
- Redbooks (logo)
- Sysplex Timer®
- System i5
- System p5
- System x
- System z
- System z9
- Tivoli (logo)®
- Tivoli®
- VTAM®
- WebSphere®
- xSeries®
- z9
- zSeries®
- z/Architecture
- z/OS®
- z/VM®
- z/VSE

- Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.
- Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.
- Intel, Intel Inside (logos), MMX and Pentium are trademarks of Intel Corporation in the United States, other countries, or both.
- UNIX is a registered trademark of The Open Group in the United States and other countries.
- Linux is a trademark of Linus Torvalds in the United States, other countries, or both.
- Red Hat is a trademark of Red Hat, Inc.
- SUSE® LINUX Professional 9.2 from Novell®
- Other company, product, or service names may be trademarks or service marks of others.
- This information is for planning purposes only. The information herein is subject to change before the products described become generally available.
- All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

All performance data contained in this publication was obtained in the specific operating environment and under the conditions described and is presented as an illustration. Performance obtained in other operating environments may vary and customers should conduct their own testing.

Refer to www.ibm.com/legal/us for further legal information.

IBM Communications Server family of distributed products

- **Distributed Communications Server family**
  - There are 3 server products in the distributed Communications Server family:
    - IBM Communications Server for Linux (CS Linux)
    - IBM Communications Server for AIX (CS/AIX)
    - IBM Communications Server for Windows (CS/Windows)
  - CS Linux is really 2 products
    - Communications Server for Linux - supports Intel and pSeries P5 Linux platforms
    - Communications Server for Linux on System z V6.2.2
      - Renamed from "CS Linux on zSeries" V6.2, V6.2.1
      - Supports zSeries and System z9 (G5, 800,890,900,990, z9)
  - CS Linux and CS/AIX share the same code base
    - GUI, Command Line, and configurations are 99% the same
    - A Remote API Client provided with either product will work with either type of server (Linux or AIX)
      - NOTE: Remote API Client does not connect to CS/Windows. CS/Windows ships its own client, generally referred to as the "SNA API" client

- **Packaging for Communications Server for Linux, and Linux on System z V6.2.2**
  - One CD for Server
  - Second CD for Remote API Clients (AIX, Linux and Windows)
    - Remote API Client V6.3.0.1 provides HTTPS connections through a WAS server to CS Linux or CS/AIX servers
    - CS/AIX V6.3 will work with Remote API Client V6.3.0.1

- **90-day trial version for CS Linux and CS Linux on System z (i686,x86_64, pSeries, zSeries)**
  - Search for 6.2.2 release level (one CD image has both server and Remote API client): http://www.software.ibm.com/webapp/download/search.jsp?status=Active&q=communications+server
    - Servers have 90-day timebomb - Remote API clients have no timebomb and are GA level without any HTTPS support

IBM Communications Server for Linux Version 6.2.2

- **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
  - Supports connection networks
- **High Performance Routing (HPR) including Enterprise Extender (EE, also known as 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)
  - Primary LU 0 support for the LUA APIs
  - Remote SNA client/server APIs using sna-cs service (port 1553) or HTTPS via Webservices on WebSphere
    - Client support on Windows, AIX (32 and 64 bit), Linux (Intel i686 and x86_64, Power ppc64, zSeries s390 and s390x)
  - APPC application suite (AFTP, APING, AREXEC, ATELL, ACOPY, and ANAME)
- **TN3270E server**
  - Including 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 (GUI interface)
  - Network Operator Facility (NOF) APIs - programmed administration
  - Internationalization
  - 31-bit and 64-bit support
  - Runs on both Red Hat and SuSE (both 2.4 and 2.6 kernel levels)
- **Network attachments for SNA**
  - Enterprise Extender (HPR over IP)
  - (V)CTC using MPC channel protocols (Linux as a PUT2.1 - APPN/ISR routing)
  - Native SNA (SNA LLC2) over shared LAN (Ethernet or token-ring)
  - SDLC and QLLC over vendor supported WAN cards (Intel only!)

CS Linux server is offered for the following hardware platforms and Linux distributions:

Architecture	Platform	SLES 8 (2.4 kernel)	RHEL 3 (2.4 kernel)	SLES 9 (2.6 kernel)	RHEL 4 (2.6 kernel)	SLES 10 (2.6 kernel)
i686	Intel, 32-bit	✓	✓	✓	✓	✓
x86_64	AMD64, EMT64			✓	✓	✓
ppc64	OpenPower or Power 5, 64-bit			✓	✓	✓
s390	zSeries, 31-bit	✓	✓	✓	✓	
s390x	zSeries, 64-bit	✓	✓	✓	✓	✓

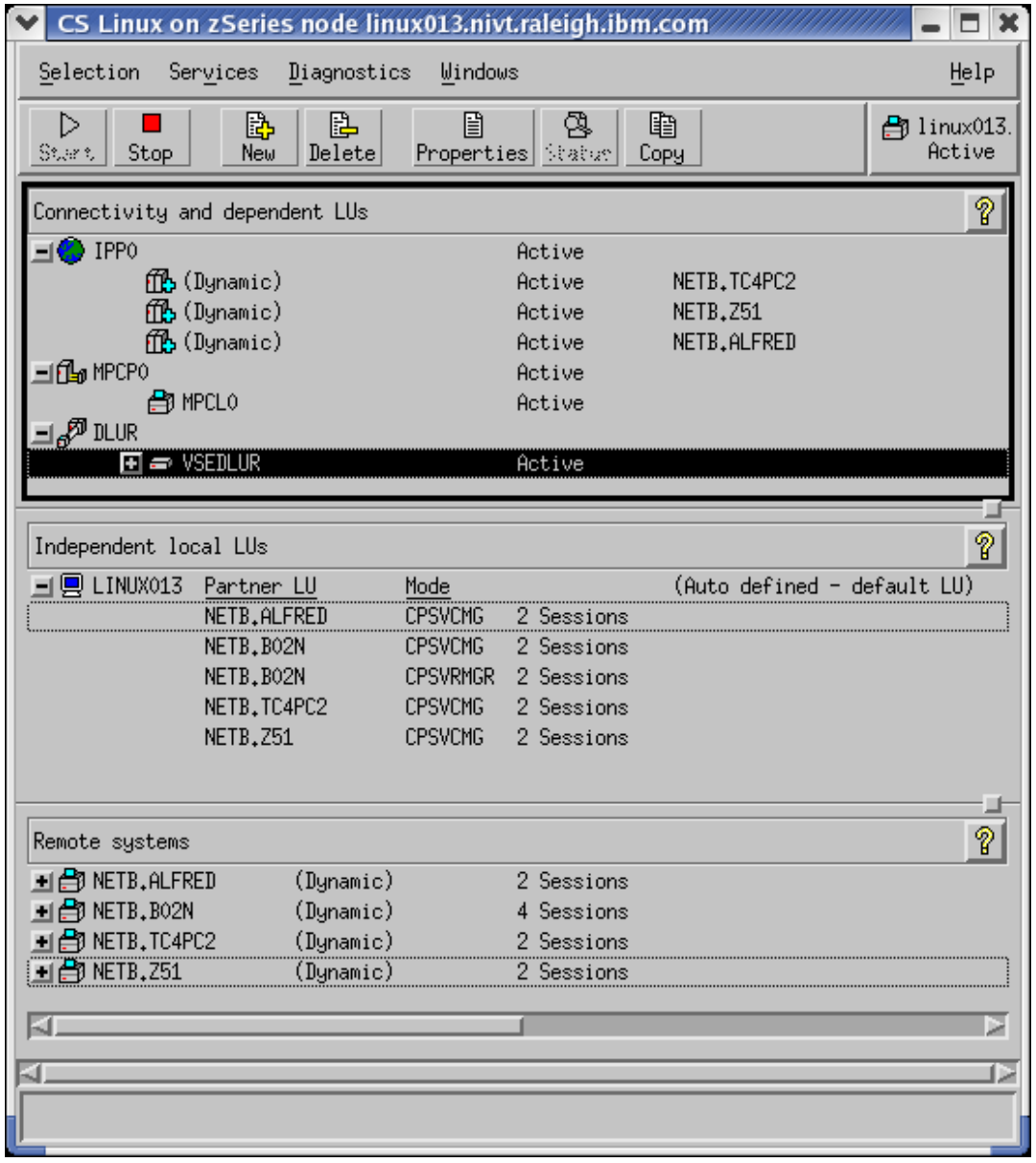
IBM Communications Server for Linux - functional overview

- **CS Linux and CS Linux on zSeries V6.2, released 2Q 2004, supported 2.4 Linux distributions**
  - RHAS 2.1, RHEL 3, SLES 8

- **CS Linux and CS Linux on zSeries V6.2.1 released 3Q, 2005**
  - Added support for 2.6 Linux distributions (RHEL 4, SLES 9)
  - Added support for pSeries Linux
  - Primary LU 0 support
  - HPR tuning parameters

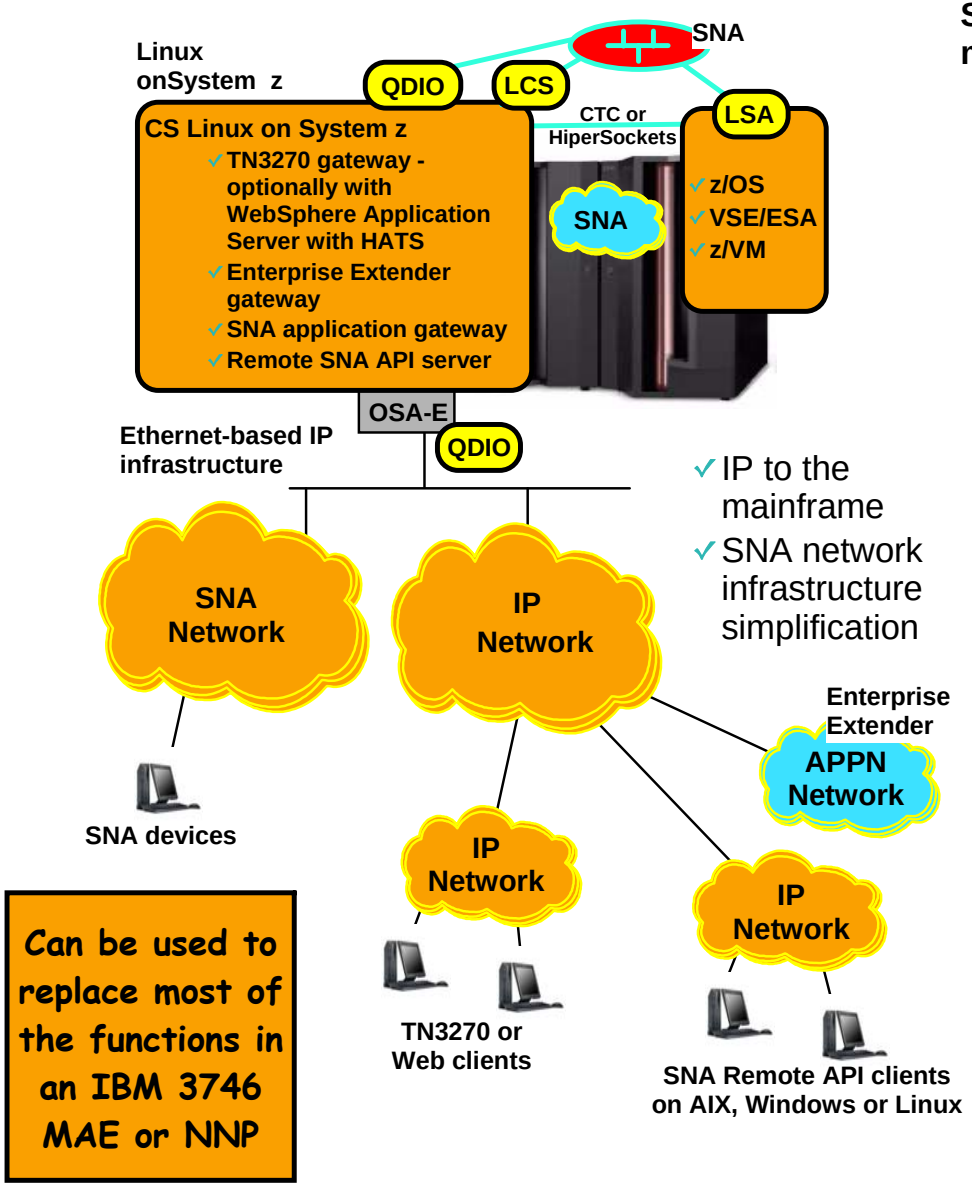
- **CS Linux and CS Linux on System z V6.2.2, released July 7, 2006**
  - Name change to "on System z" indicates new supported z platforms
  - Updated documentation
  - SLES 10 support
  - x86_64 client and server new platform support
  - Windows 64-bit Remote API new client support
  - Secure Remote API clients
    - HTTPS via Web services
    - Also shipped in CS/AIX V6.3
  - TN3270 Server enhancement to listen on specific interfaces,
  - New HPR timer parameters
  - SDLC and QLLC adapter interfaces for WAN card support.
    - Intel platform only

Motif-based configuration and monitoring interface to CS Linux



- **The configuration and monitoring tool (xsnaadmin) uses X-Windows to interface with the administrator**
- **When xsnaadmin begins, a window will pop up on your workstation (where your X-server is running) and you are presented with an initial overview panel like the one you see on this page.**
- **The very first time you start xsnaadmin, the window 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 subpanels:**
  - Connectivity and dependent LUs
  - Independent local LUs
  - Remote systems

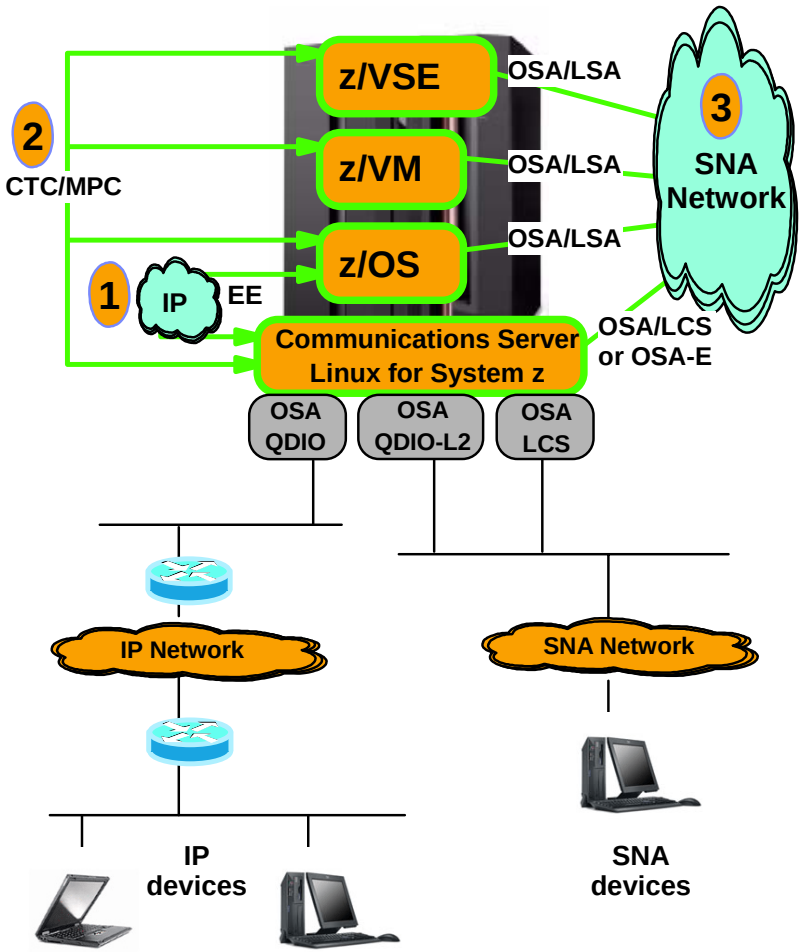
IBM Communications Server for Linux on System z - overview



CS Linux on System z offers SNA/IP integration technologies on System z, but with no or minimal changes to the traditional mainframe OS environment.

1. Enterprise Extender same-NETID gateway functions
   - Using APPN/ISR routing to/from VTAM and EE downstream
   - EE gateway to z/OS, VSE/ESA, or z/VM VTAM
2. TN3270 server on System z
   - Supports TN3270 access to z/OS, VSE/ESA, and z/VM
   - Can be combined with WebSphere Application Server and Host Access Transformation Services
   - IP all the way to System z
   - No or minimal change to VTAM definitions if consolidating existing distributed TN3270 servers
3. TN3270 SSL offload - using the TN3270 redirector
4. APPN Network Node or Branch Extender node in an APPN network infrastructure
   - Replacing IBM 3746 MAE or NNP
   - Consolidate downstream HPR pipes
   - Does not support EBN functions
5. SNA gateway for consolidation of multiple downstream SNA PUs
6. SNA application platform for Web-based access to SNA applications
7. Remote API services for secure remote SNA application access without having SNA protocol stacks on distributed AIX, Windows and Linux (xSeries, System p and System z) nodes

SNA connectivity options to CS Linux on System z

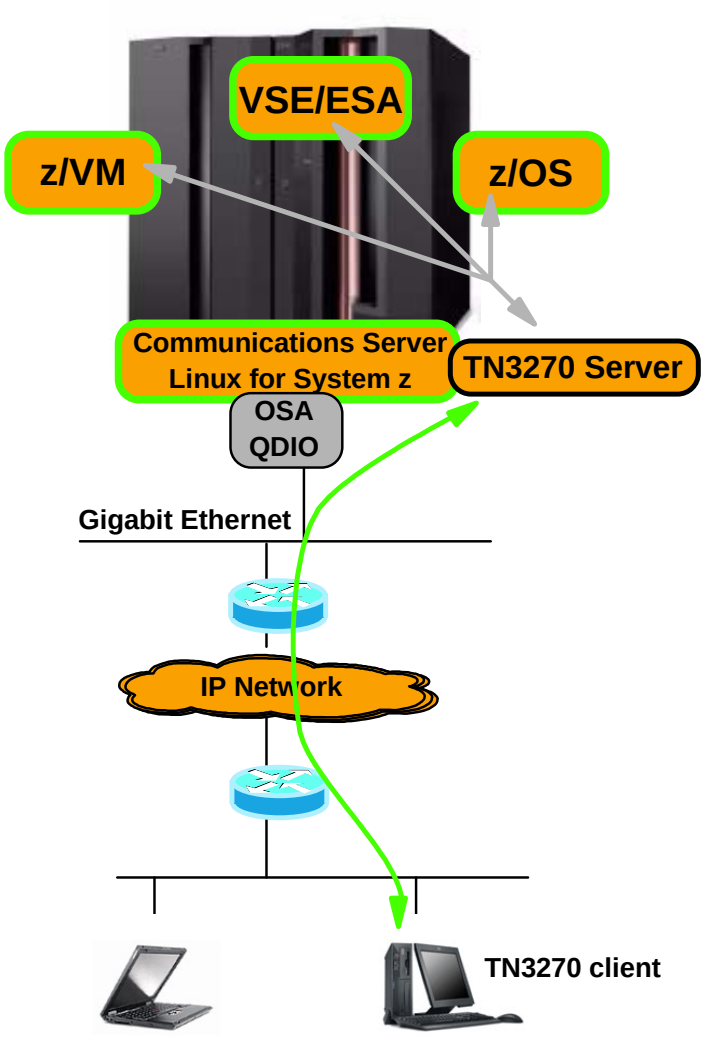


1. **Enterprise Extender (to z/OS or downstream).**
   - z/OS needs to be EE-enabled in order for this option to work.
   - Physical connectivity to z/OS may be via HiperSockets
   - z/OS is the only mainframe operating system that supports EE (besides Linux). z/VM, z/VSE, and TPF do not support EE connectivity.
   - Downstream can be any EE-capable node

2. **An MPC (Multi Path Channel) CTC (Channel to Channel) channel driver supports APPN Node-to-Node Communication over a CTC (virtual, EMIF, or real channel-to-channel).**
   - Use of this option requires both endpoints of the channel to be PU type 2.1 nodes, which means existing mainframe environments that have not enabled APPN support in VTAM will have to do some APPN enablement to communicate with CS Linux for System z using this option.
   - Only meaningful for up-stream connectivity to VTAM

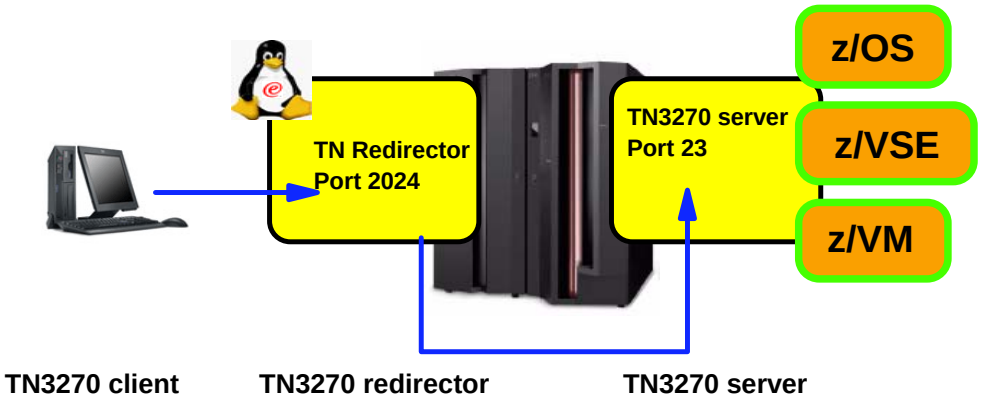
3. **SNA LLC2 over shared LAN - via an OSA port operating in QDIO layer-2 mode or via an OSA port configured in LCS mode.**
   - The QDIO layer-2 mode option depends on OSA-Express microcode upgrades (z800, z900: 3.50 - z990: 5.50). There are no plans to ship this support for pre-zSeries models.
   - Works for OSA-2 as-is (in non-shared TCP/IP passthru mode, not in any shared mode). Works for pre-zSeries models also.
   - Use of this option allows the mainframe operating system to view CS Linux as one of three SNA node types:
     - Peripheral node (a plain PU type 2.0)
     - LEN node (a PU type 2.1)
     - APPN node (a PU type 2.1)

Consolidating external TN3270 servers into Linux for System z



- **Minimal or no 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 servers remains similar to how they were for the distributed TN3270 servers**
- **In CS Linux 6.2.2, added support to listen on ports for specific interfaces.**
- **Connectivity to System z is IP and can be via Gigabit Ethernet and QDIO**
- **SNA connectivity between Linux for System z and z/OS, z/VM, or z/VSE 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**
  - Except for the peripheral node attachment option
- **No dependency on 37xx, CIP, CPA, or Token-ring hardware**
- **TN3270 server MIPS executed on System z IFL processors**

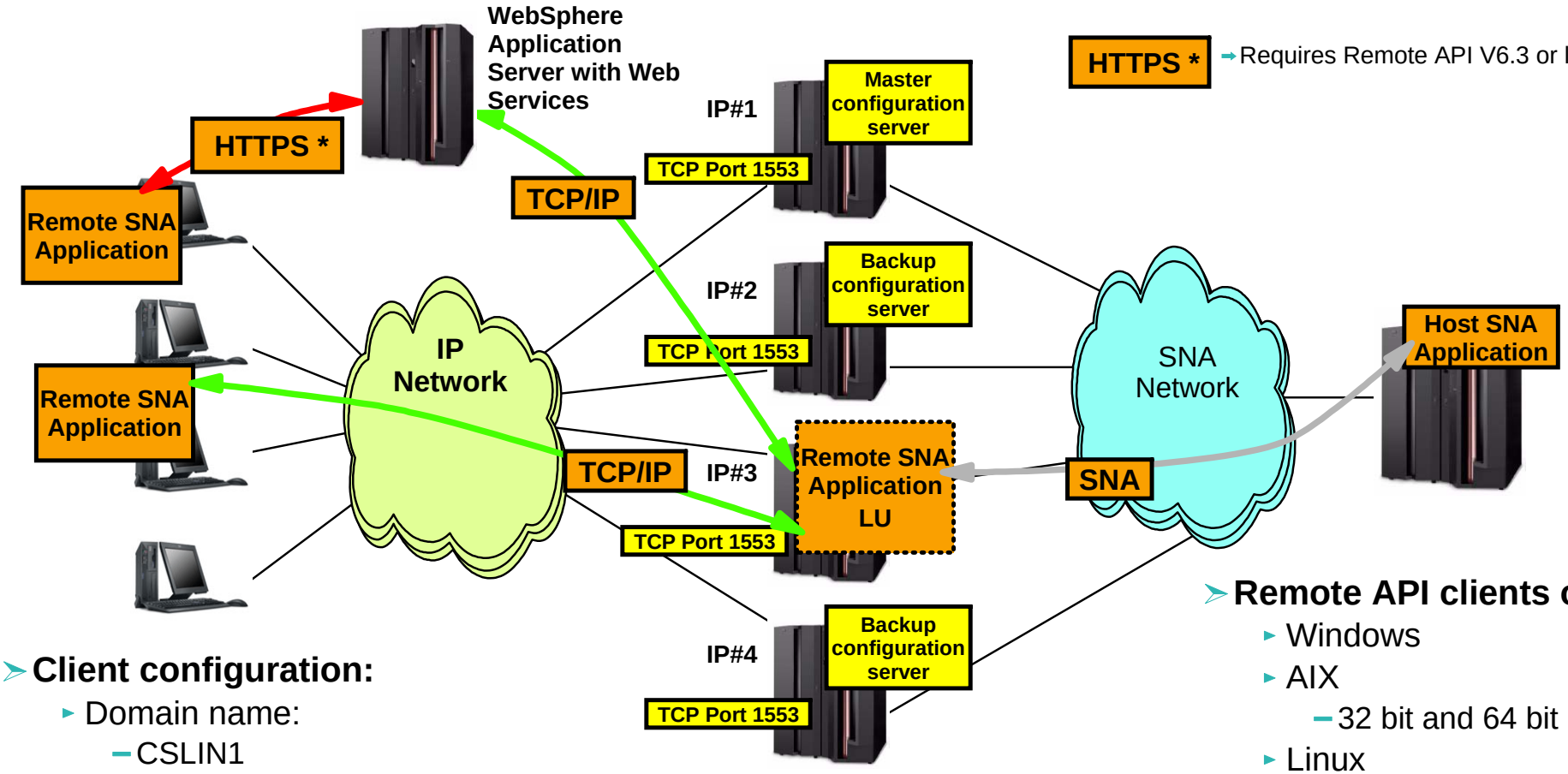
TN3270 redirector on Linux for System z



- **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
- **CS Linux V6.2.2 allows a port to be listening on a specific interface**

- **The CS Linux TN3270 redirector support allows for:**
  - Changing port number
    - Example: coming through firewalls with filtered port, 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 real TN3270 server on z/OS, z/VM, or VSE/ESA
      - Note: looses capability to do client authentication on z/OS based on client cetificate
- **From a z/OS 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, host name, or user ID derived from a client certificate

CS Linux Remote API clients with TCP/IP and HTTPS connections to server domain



CS Linux client/server domain: CSLIN1

- **Client configuration:**
  - Domain name:
    - CSLIN1
  - List of servers in the domain:
    - IP#1
    - IP#2
    - IP#3
    - IP#4

- **Remote API clients offered on:**
  - Windows
  - AIX
    - 32 bit and 64 bit
  - Linux
    - Intel i686
    - Intel x86_64
    - Power ppc64
    - zSeries s390
    - zSeries s390x

Communications Server for Linux on System z – product features – part one

NOTES

- **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 that contain 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 non-disruptive 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 only where necessary (not on the entire user-to-host)

Communications Server for Linux on System z – product features – part two

NOTES

- **SSL data encryption scalability**
  - Ensures the data flowing between the Telnet server and Telnet emulator client is protected
  - Remote API encryption with the WAS server using HTTPS flows
- **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, allowing 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. This is 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

Communications Server for Linux on System z – product features – part three

NOTES

- **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 (Example: 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
  - zSeries 64-bit support
- **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

For more information....

URL	Content
http://www.ibm.com/servers/eserver/zseries	IBM eServer zSeries Mainframe Servers
http://www.ibm.com/servers/eserver/zseries/networking	Networking: IBM zSeries Servers
http://www.ibm.com/servers/eserver/zseries/networking/technology.html	IBM Enterprise Servers: Networking Technologies
http://www.ibm.com/software/network/commserver	Communications Server product overview
http://www.ibm.com/software/network/commserver/zos/	z/OS Communications Server
http://www.ibm.com/software/network/commserver/z_lin/	Communications Server for Linux on zSeries
http://www.ibm.com/software/network/ccl	Communication Controller for Linux on zSeries
http://www.ibm.com/software/network/commserver/library	Communications Server products - white papers, product documentation, etc.
http://www.redbooks.ibm.com	ITSO Redbooks
http://www.ibm.com/software/network/commserver/support	Communications Server technical Support
http://www.ibm.com/support/techdocs/	Technical support documentation (techdocs, flashes, presentations, white papers, etc.)
http://www.rfc-editor.org/rfcsearch.html	Request For Comments (RFC)