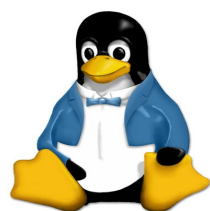




Software Group - Enterprise Networking Solutions

# An Introduction to the Communication Controller for Linux<sup>®</sup> on zSeries<sup>®</sup> Version 1 Release 1



CCL V1R1

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# IBM Communication Controllers - the foundation of SNA application access to the IBM mainframe since 1974



*The SNA application portfolio has been developed during the last 30 years. It is very unlikely that SNA applications will disappear overnight.*



**1982:**  
The IBM 3725  
**Communication  
Controllers**  
(NCP V4R3.1)



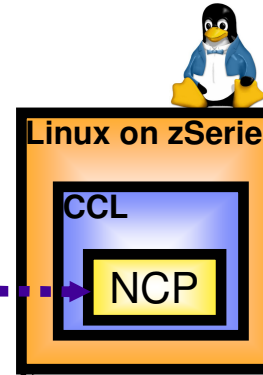
**1974:**  
The IBM 3705  
**Communication  
Controller**

**1985:**  
The IBM 3720  
**Communication  
Controllers**  
(NCP V5R4)

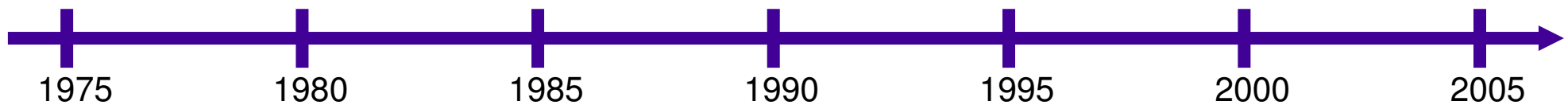
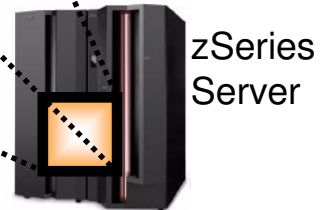


**1988:**  
The IBM 3745  
**Communication  
Controller** (NCP V7R3+)  
and the IBM 3746  
Multiprotocol Controller

Move with no or minor changes to the NCP definitions.



**2005:**  
The IBM  
**Communication  
Controller** for Linux  
(CCL) on zSeries  
(NCP V7R5+)



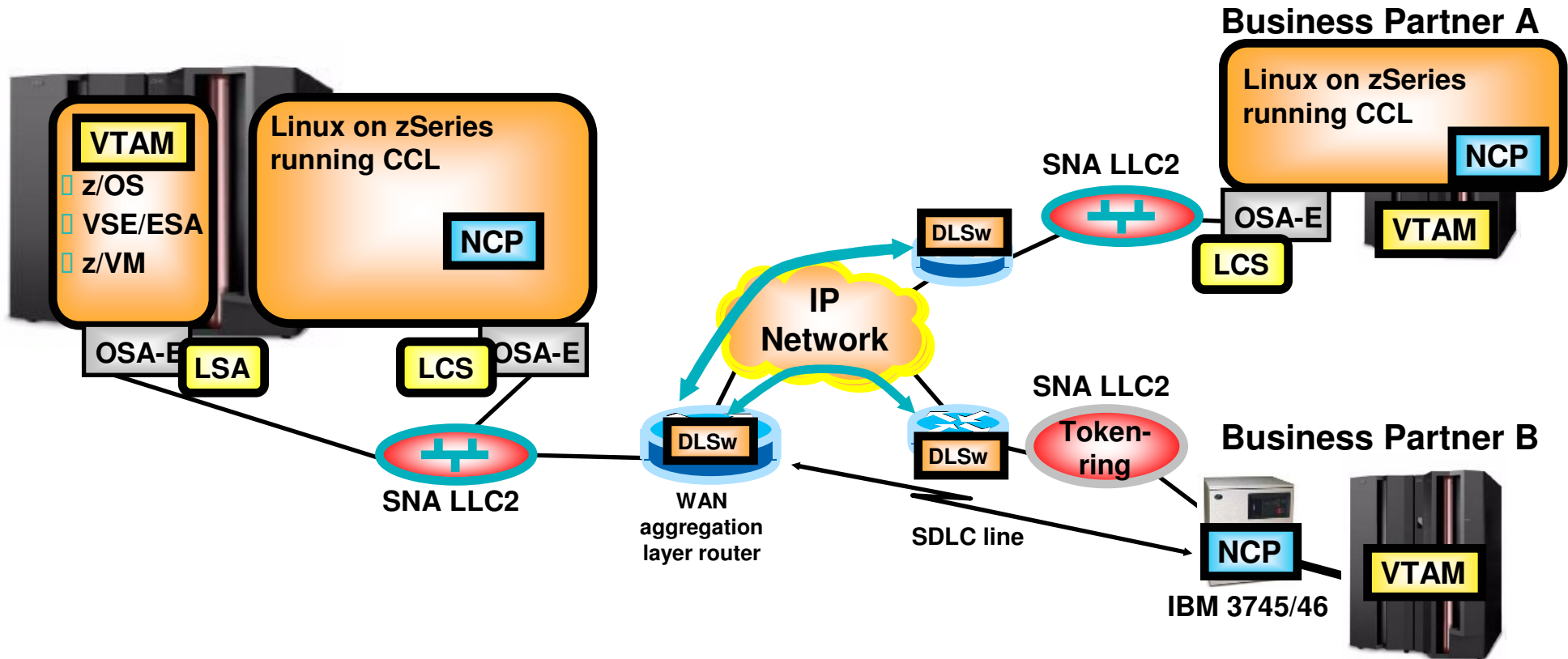
## Do we still need a Network Control Program (NCP) in 2005?



- **The IBM 3745/46 hardware was withdrawn from marketing in September 2002.**
  - ▣ The hardware is currently still supported and serviced by IBM.
  - ▣ The NCP software was not withdrawn and it is still currently supported and serviced by IBM.
  
- **The Network Control Program (NCP) runs on the IBM 3745/46 hardware and is an integral part of a traditional SNA network infrastructure:**
  - ▣ Boundary functions for peripheral devices such as ATMs, terminal controllers, PC-based servers, etc.
  - ▣ SNA Network Interconnection (SNI) functions for SNA-based business partner communication.
  
- **Networking technologies to help remove dependency on an NCP have been made available, but implementing some of those technologies can be both time consuming and costly:**
  - ▣ Moving boundary functions to other platforms, such as VTAM, can be an administrative challenge.
  - ▣ Upgrading to newer SNA architecture levels, such as Advanced Peer to Peer Networking (APPN), High Performance Routing (HPR), and eventually Enterprise Extender (EE), requires solid SNA skills, SNA network topology changes, and detailed coordination of network definitions across both an internal network and business partner networks.
  
- **Not all zSeries operating systems that today are using the services of an NCP have appropriate alternative technologies available:**
  - ▣ Only z/OS supports Enterprise Extender. VSE/ESA, z/VM, and TPF do not support EE technology.
  - ▣ SNI still requires at least one NCP.
  
- **SNA applications are still abundant and many of those SNA applications will most likely exist for years to come.**

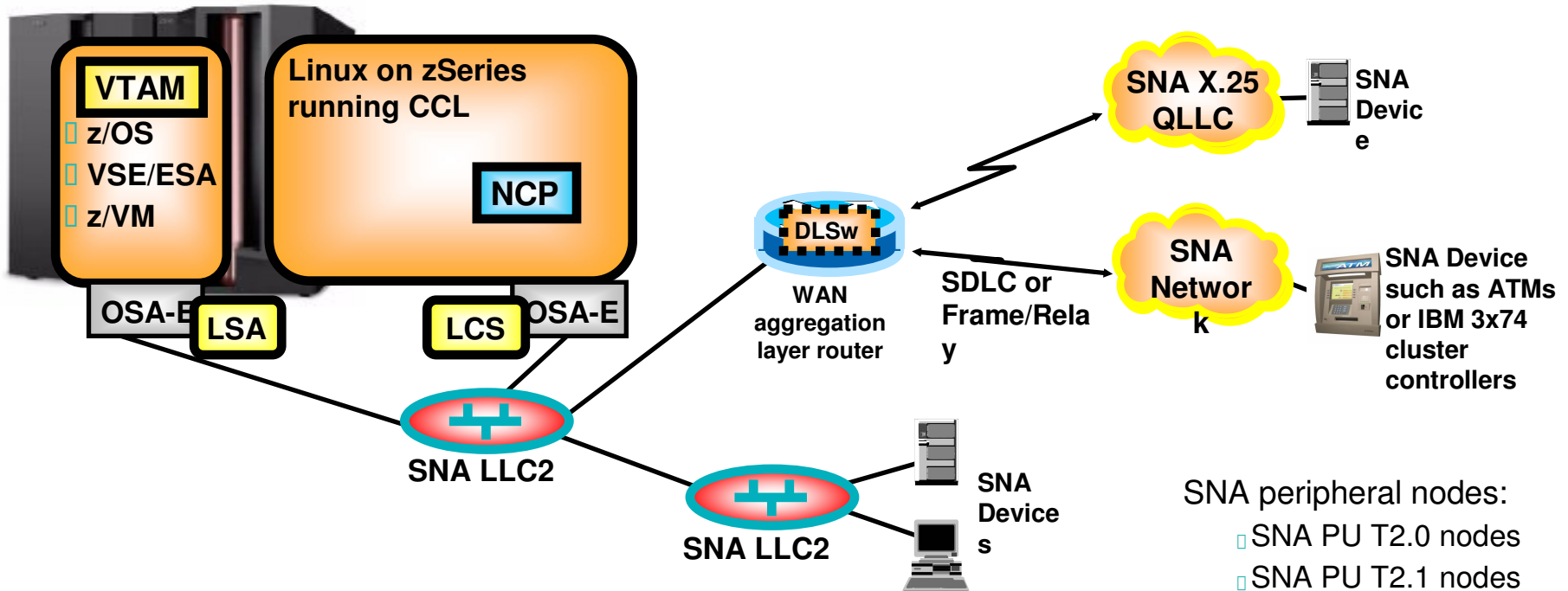


# CCL Release 1 - Preserve SNI connectivity to business partners (SNI/INN traffic)



- NCP SNI functions move to Linux on zSeries. Business partner may continue to use IBM 3745/46 technology or move to a CCL implementation also.
  - ▣ SNA traffic leaves/enters the Communication Controller for Linux on zSeries as SNA network flows (SNA LLC2) over an OSA adapter operating in LCS mode.
  - ▣ VTAM sees the NCP as a LAN-attached remote NCP over its LSA OSA adapter.
  - ▣ SNA traffic can be tunneled (typically DLSw) over an IP network to the business partner's location.
  - ▣ An SDLC line from the business partner's IBM 3745/46 can be terminated in a local wide area network aggregation layer router (a router with WAN network interfaces).
  - ▣ Has no impact on existing SNI topology.

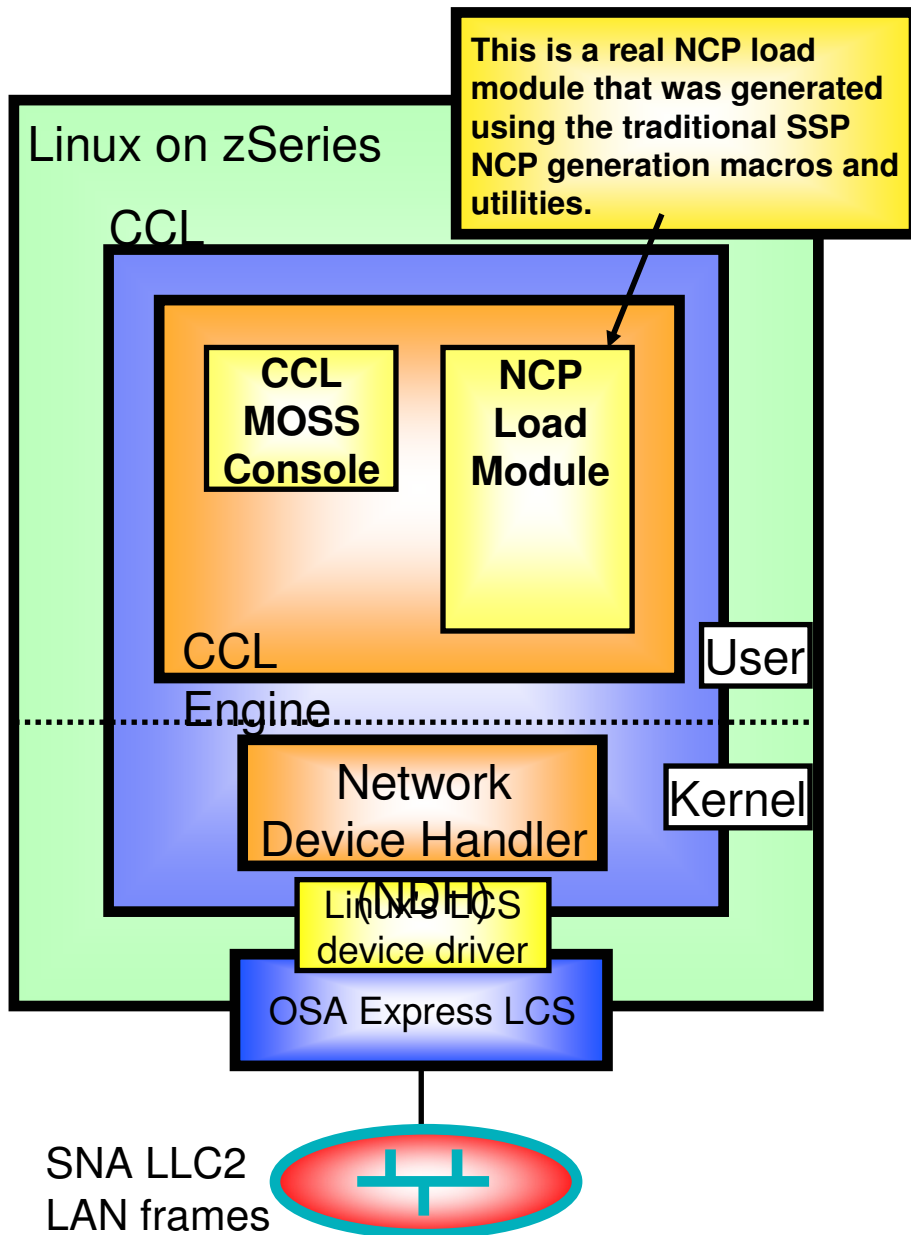
# CCL Release 1 - Preserve selected NCP boundary functions (BNN traffic)



- SNA wide area network links, such as SDLC, F/R, and SNA X.25 QLLC termination, moved from the IBM 3745/46 to a wide area network aggregation layer router that switches the SNA frames between the lines and the local SNA LAN
  - ▣ SDLC, Frame Relay, and SNA X.25 QLLC links are supported
    - The X.25 SNA support (QLLC) does not imply full NPSI support
  - ▣ NCP boundary function support includes standard availability functions such as SSCP takeover, support for duplicate MAC addressing, and XRF
  - ▣ NPA-LU, NtuneMON, and NRF are also supported
- Remote SNA LANs can be connected to the data center LAN by bridges or DLSw technology



# CCL structure and components



➤ **CCL** consists of both user-space and kernel-space functions:

- ▣ **CCL engine** emulates an IBM 3745-31A with 16 MB memory supporting an NCP load module and a MOSS console interface.
- ▣ The **MOSS console** is accessed through a standard Web browser.
- ▣ **Network Device Handler (NDH)** is a kernel extension that acts as the interface between an OSA port operating in LCS mode and the NCP Token-Ring Interface (NTRI).
  - The only supported network interface from an NCP perspective is an SNA TIC2 interface.
  - The actual LAN to which the OSA port is connected may be either token-ring or IEEE802.3 Ethernet (NDH will transform between the frame formats).

## ➤ NDH components

- ▣ NDH itself consists of two components:
  - A small source code isolation module that is built during installation of CCL
  - An object code only NDH module



# CCL and the MOSS console interface

Communication Controller for Linux on zSeries - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://[IP address]:2072/cgi-bin/sendDiskIplInfoPage.cg

IBM. CCL Name: SVTC72 NCP Name: C72SVT2 Machine Time: 01/25/2005 11:29:59 AM [logoff](#)

Communication Controller for Linux on zSeries

Status	X71	X72	LAR	IAR	Level	C-Latch	Z-Latch
Running	000000	000000	13E38A	13E38E	2	1	0

**Disk IPL Information**

CP Running: C72SVT2  
 Auto Dump/Load: Yes  
 Active Load Module: C72SVT2

Disk Contents:

Type:	Name:	Save:	Gen:	IPL:	IPL Alert:
Load Module	C72SVT2	01/23/2005 12:52:04 PM	01/19/2005 09:20:20 PM	None	None

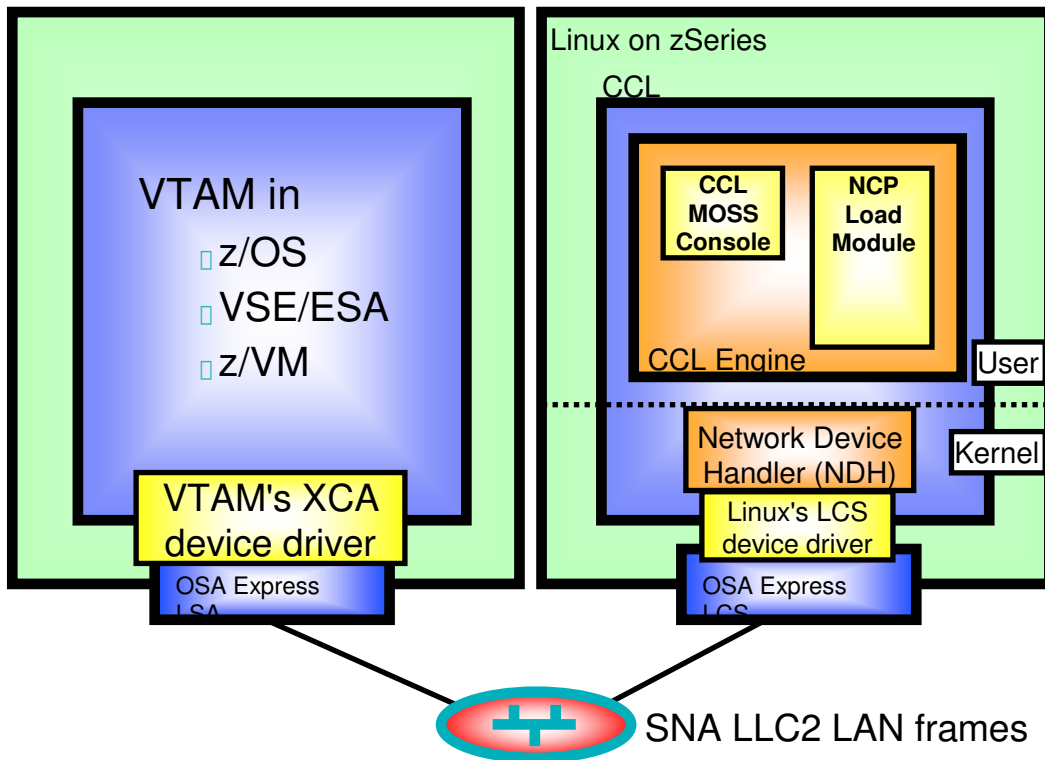
**Dump**

Purge Dump Change Dump/Load Change Active Load Module Rename Load Modules

Done



# CCL and VTAM communication



➤ VTAM sees the CCL NCP as a LAN-attached remote NCP through its XCA (eXternal Communications Adapter) interface, such as an OSA LSA interface

- ▣ VTAM may either be the owning host or a data host to the CCL NCP
- ▣ For VTAM to be the owning host, a VTAM PTF will be made available for VTAM to activate and own a CCL NCP through an XCA network interface:
  - New keyword on the XCA PU statement to allow VTAM to activate and own CCL NCP resources over an XCA interface
    - ▣ ALLOWACT=NO/YES

➤ No SNA subarea topology changes - VTAM is still a PU Type 5 and the NCP is a PU Type 4

- ▣ In most cases no changes to SNA subarea pathing definitions

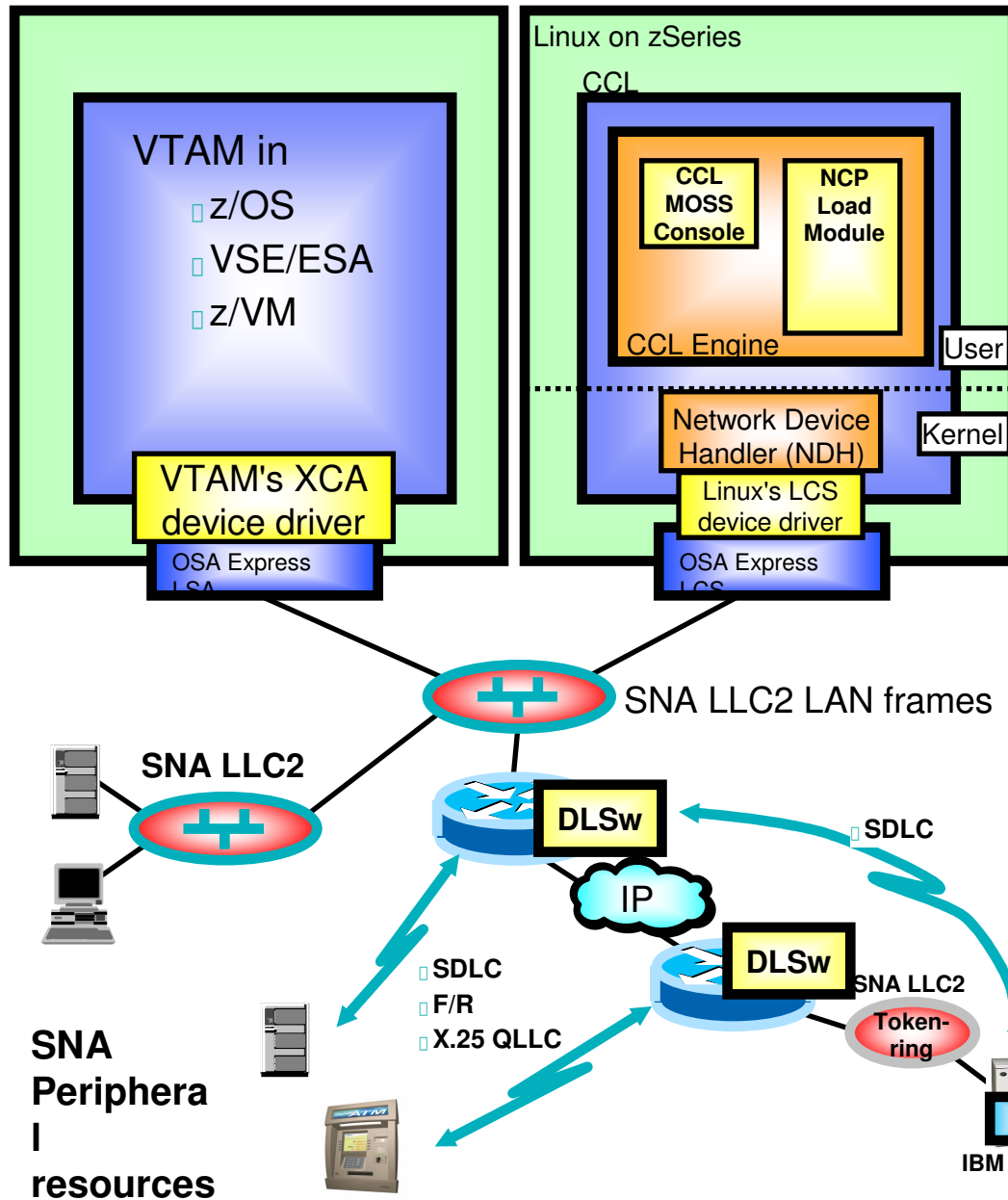
➤ None or minor changes to VTAM definitions and operations.

## VTAM maintenance details:

- ▣ OS/390 and z/OS VTAM: APAR OA10425
- ▣ VSE/ESA VTAM: APAR DY46311
- ▣ z/VM VTAM: APAR VM63677



# CCL and downstream SNA connectivity



- Remote SNA lines need to be terminated in an aggregation layer router - a router with wide area network interface support such as a Cisco 3600 family router.
  - The DLSw software in the router will internally switch the SNA PDUs between the wide area network link and LAN LLC2 frames:
    - ▣ Ethernet
    - ▣ Token-ring
  - The NCP will see the remote resources as NTRI attached resources.
    - ▣ If migrating an NCP that today owns SDLC lines, the SDLC line definitions need to be changed to NTRI definitions.
  - All NCP functions for PU Type 2.0 or PU Type 2.1 nodes are supported in the CCL NCP environment - including XRF sessions.
- SNA INN or SNI resources**

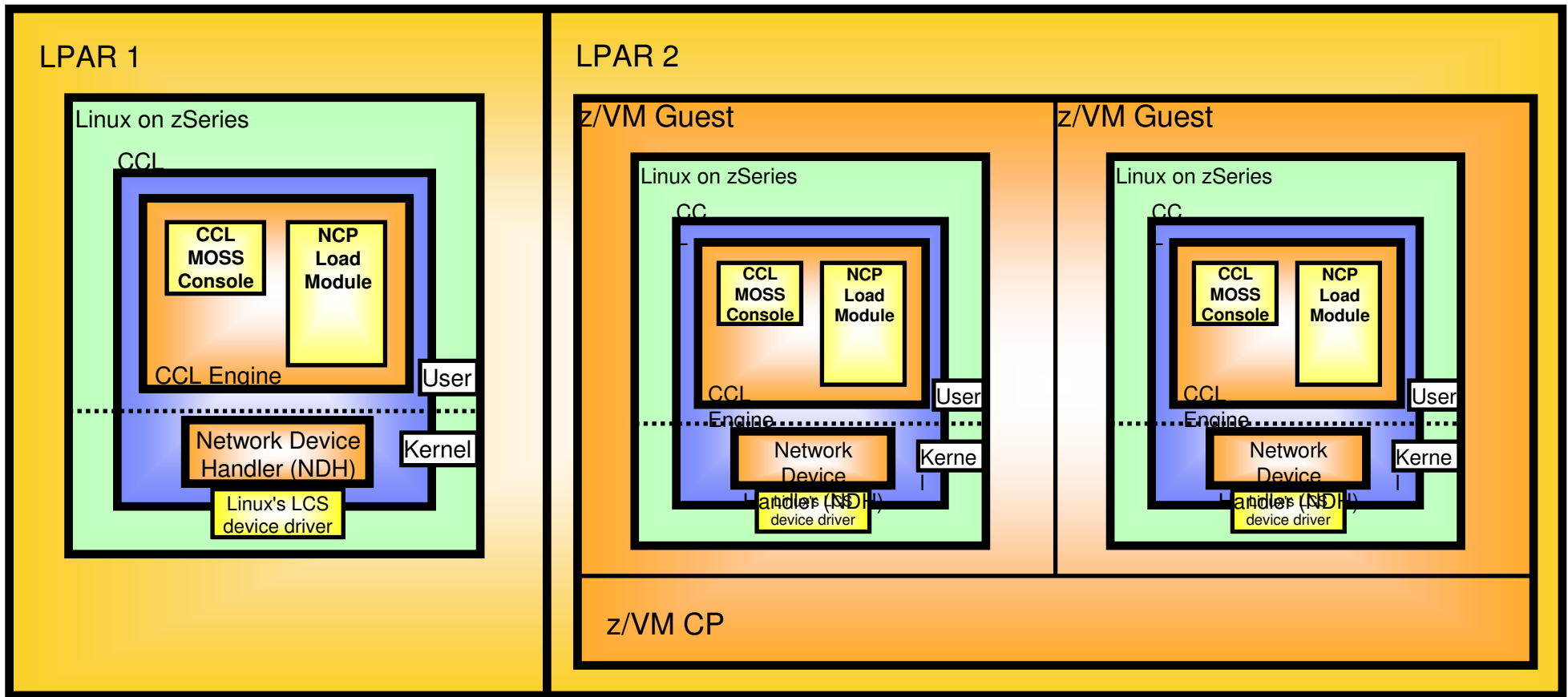


# Linux deployment model

## ➤ Linux deployment:

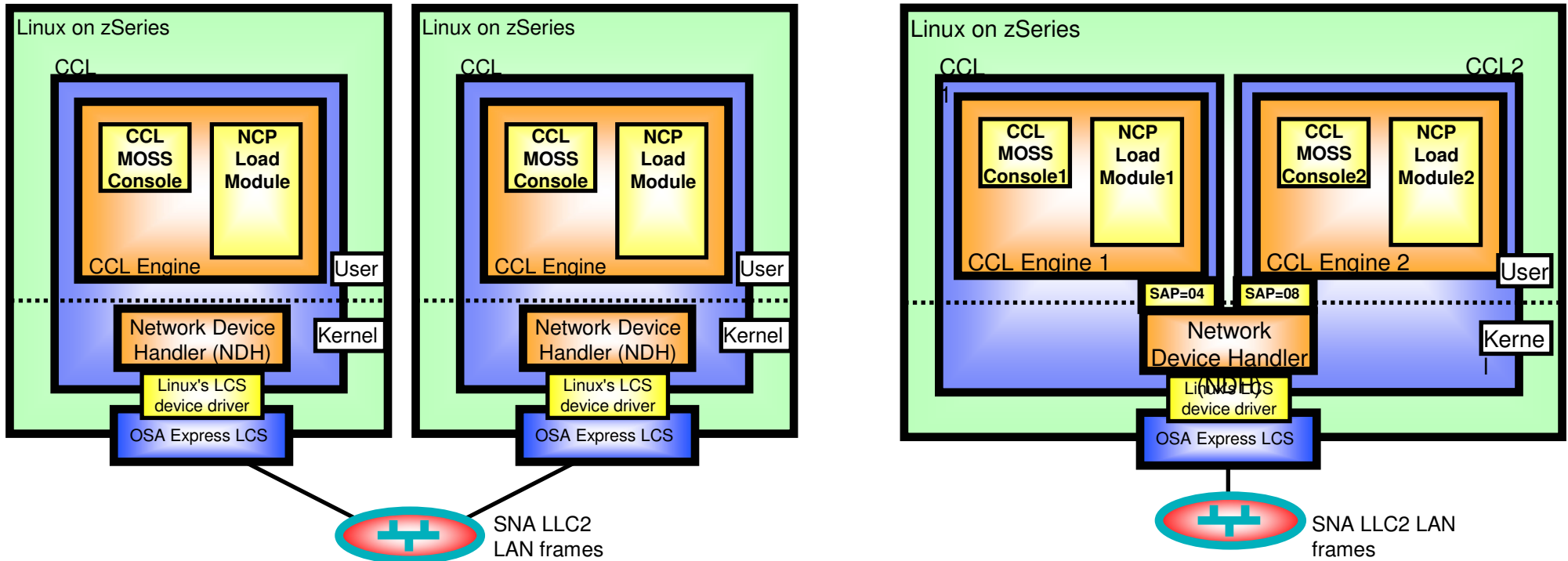
- LPAR mode - one Linux image in an LPAR (no requirement for z/VM)
- As a z/VM guest

zSeries Server





# Deployment models for multiple NCPs



- One CCL NCP per Linux image
  - ▣ Each NCP operates completely independent of other NCPs
  - ▣ Each NCP may run in Linux images that are guests under z/VM or individual LPARs

- Multiple CCLs per Linux image
  - ▣ One NCP per CCL
  - ▣ Each CCL has its own MOSS console
  - ▣ Multiple CCLs share one NDH instance
  - ▣ See OSA LCS port sharing rules later for details on using the same OSA LCS port by more NCPs

- ▣ No major difference in throughput
- ▣ Two Linux images may require more overhead (DASD, Memory, CPU) than one
- ▣ One Linux image may become a single point of failure



# CCL requirement for zSeries hardware



## ➤ Processor support

- G5/G6, z800/z900, or z890/z990

## ➤ CP requirements (can be IFL engines on zSeries)

- Depends on workload
  - SNI throughput 14% higher than a fully loaded IBM 3745-61A uses roughly one CP
  - SNA boundary function workload throughput 72% higher than a fully loaded IBM 3745-61A uses roughly one CP

## ➤ OSA port requirement

- OSA-2 or OSA Express copper-based ports
  - IEEE802.3 Ethernet including 1000BaseT (10/100/1000 Mb)
  - Token-ring (4/16/100 Mb)

## ➤ Memory requirements

- Memory per CCL engine: 20 MB
- Usual memory requirements for Linux on zSeries
  - Memory: 256 - 512 MB memory (depending on distribution, packages, and kernel level)

## ➤ DASD requirements

- DASD for CCL: 50 MB
- DASD for CCL traces, dumps, logs, NCP load modules: 80 - 100 MB per CCL engine
- Usual DASD requirements for Linux on zSeries

–Approximate DASD space equivalent to two 3390-3 DASD volumes

- Use the Linux Logical Volume Manager (LVM) to group the volumes together

## CCL requirements for Linux on zSeries



### ➤ **CCL runs under Linux on zSeries - initially the following distributions will be supported for CCL R1:**

#### ▣ **SuSE**

–SuSE Linux Enterprise Server 8 for IBM zSeries and IBM S/390 (SLES8)

▣ Recommended level is Service Pack 4 (SP4)

–SuSE Linux Enterprise Server 9 for IBM zSeries and IBM S/390 (SLES9)

▣ This is a Linux 2.6 kernel distribution

▣ Recommended level is Service Pack 1 (SP1)

#### ▣ **Other distributions**

–We have tested with other Linux distributions and are working with distributors to incorporate an updated LCS device driver in their officially supported distributions.

–At this time, Red Hat has not yet shipped a Red Hat distribution that includes the updated LCS device driver

### ➤ **Both 31-bit and 64-bit mode distributions are supported**

### ➤ **There are specific package requirements to be met depending on the specific service level of the above distributions**

## NCP support by CCL R1



- **The CCL emulates an IBM 3745-31A with 16 MB memory**
  - Set MEMSIZE to 16MB on the BUILD statement to use all 16 MB
  
- **The following NCP levels can be used to generate an NCP for the CCL:**
  - NCP V7R5
  - NCP V7R6
  - NCP V7R7
  - NCP V7R8
  - NCP V7R8.1
  
- **SSP (System Support Program), NRF (Network Routing Facility), and NTuneMON at levels supported by the above NCP levels are also supported by CCL R1.**
  
- **Only NCP Token Ring Interface (NTRI) is supported by an NCP running in the CCL**
  - Any device that can attach to an NCP over a TIC2 interface should be able to attach to an NCP running in the CCL environment
  
- **The following native network attachments are specifically *not supported* by CCL:**
  - Channel resources
  - SDLC resources (use an aggregation layer router to bridge to LAN LLC2)
  - BSC resources
  - Start/Stop resources
  - Frame Relay resources (use an aggregation layer router to bridge to LAN LLC2)
  - EP resources in general
  - X.25 NPSI resources (for SNA X.25 QLLC; use an aggregation layer router to bridge to LAN LLC2)



# CCL requirements for OSA ports

- CCL R1 exchanges SNA network flows with the network over a Linux LCS device driver interface only:
  - For NCP to VTAM communication (VTAM attached to shared LAN via an OSA LSA port)
  - For downstream communication where aggregation layer routers switch SNA PDUs to/from wide area network connections or over IP networks (DLSw)
  
- Only OSA copper-based interface ports can be configured as LCS ports - not fiber-based ports
  
- OSA/SF is needed for locally administered MAC addresses on OSA ports and for maintenance of the OSA Address Table (OAT) when sharing OSA LCS ports between multiple Linux images.
  - Locally administered MAC addresses can alternatively be set via the Hardware Management Console

Processor type	Required MCL level	Ethernet (OSA Express FCs)	Token-Ring (OSA-2 and OSA Express FCs)
G5/G6		OSA Express FC 2340 Fast Ethernet (10/100 Mb) - 1 port/feature	OSA2 ENTR card FC 5201 (4/16 Mb) - 2 ports/feature (each port can also be configured as a 10 Mb Ethernet port)
z/800 or z/900	3.5	OSA Express FC 2366 Fast Ethernet (10/100 Mb) - 2 ports/feature	OSA Express FC 2367 (4/16/100 Mb) - 2 ports/feature
z/890 or z/990	5.50	OSA Express FC 1366 (upgraded) 1000BaseT (10/100/1000 Mb) - 2 ports/feature	OSA Express FC 2367 (4/16/100 Mb) - 2 ports/feature





ERROR: stackunderflow  
OFFENDING COMMAND: ~

STACK: