

CCL Customer Experiences zEXPO Session October 2006

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Why Miami-Dade County needed the CCL Engine

Need to maintain continued support of legacy business flows of our various customers in Miami-Dade County including County departmental agencies such as the Police and Fire departments, the Criminal Justice Community, the Tax Collector, the Property Appraiser, GSA, Water and Sewer, Building and Zoning, and other critical agencies providing service the citizens of Miami-Dade County.

The legacy connectivity that is supported by our 3745 environment includes:

SDLC

70-90 SDLC multi-drop lines servicing 300-400 customer locations providing 5-6K SNA devices. Customers also included here include Police municipalities, State, and other County agencies that don't necessarily have IP connectivity into Metronet. This communications provides service for thousands of dumb terminals, printers, SNA servers, and other resources.

SNI

SDLC dedicated line to State of Florida for Criminal Justice Community.

TOKEN-RING

Three token-ring backbones. Two exist in our most critical government buildings and supports roughly 50 controllers with 1500 user devices.

The applications or data flow through certain SNA resources include:

LU6.2	Four LU6.2 implementations by Criminal Justice Community
RJE	Remote job entry
SNA Servers	Providing 3270 display and 3270 printer services
VRU	Automated Voice Response Units

The migration plan to the CCL environment included:

SDLC

Retirement of certain customer locations, relocation of drops from retired lines to migrated lines to a final configuration supporting 30 SDLC multi-drop lines supporting more than 100 customer locations.

SNI

SDLC dedicated line to State of Florida for Criminal Justice Community.

TOKEN-RING

Three token-ring backbones that still exist in our most critical government buildings.

Benefits of this implementation

The opportunity to retire communication links yet still maintains support of a subset of critical links for the following:

- a) Plan "B" for locations with IP networks.
- b) Plan "A" for locations with no IP connectivity to Metronet.
 - a. Police municipalities
 - b. Other state and governmental agencies.
- c) Only option to support our SNI (network-to-network) connection.

Reclaiming computer room space

The existing current equipment (3745, Bytex), is replaced by much smaller equipment (Cisco) which will allow us to reclaim space and power resources in our computer room.

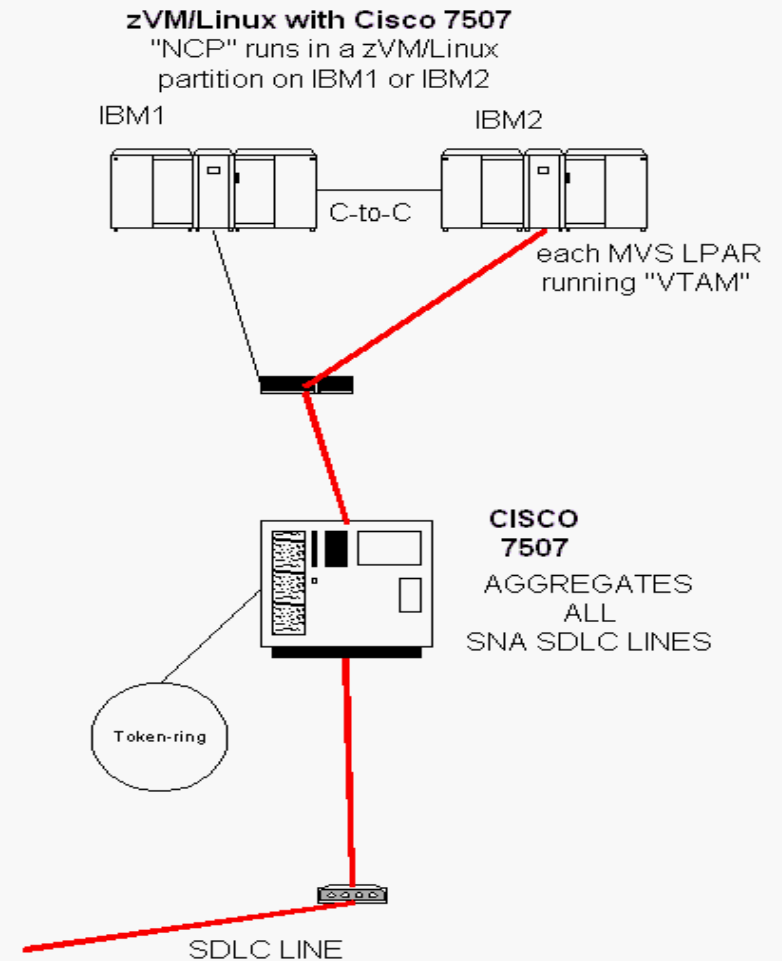
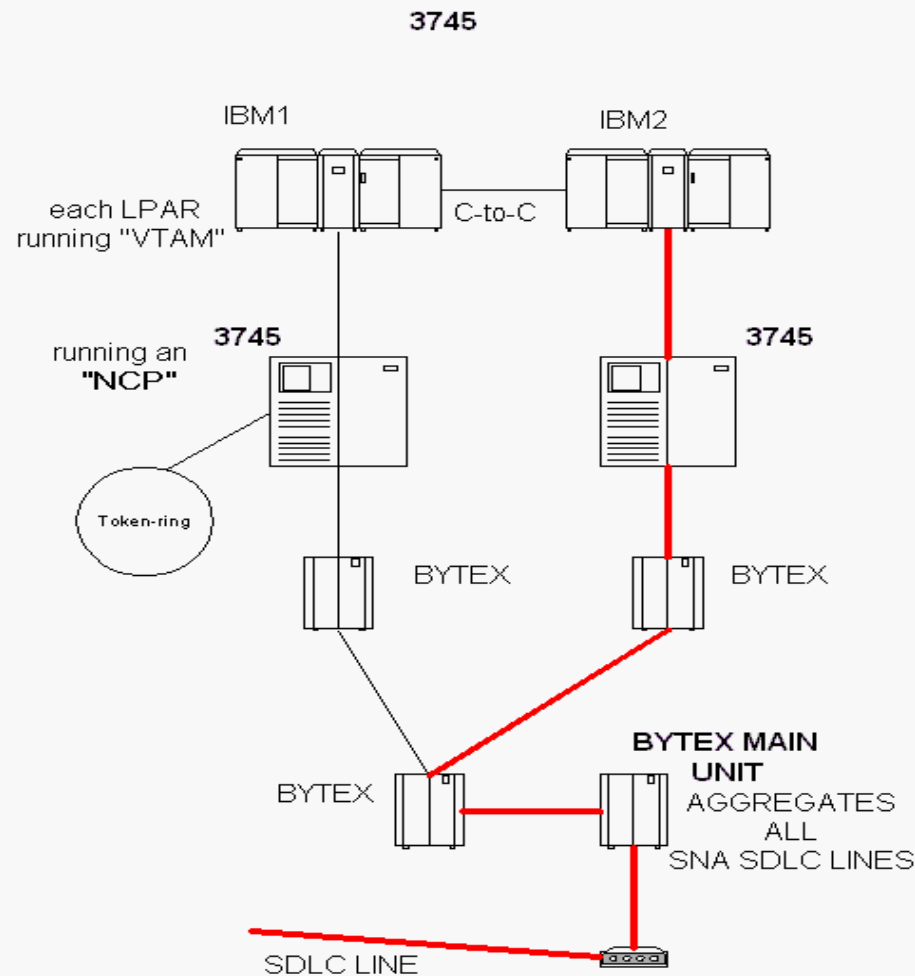
No need to upgrade or replace equipment at remote locations

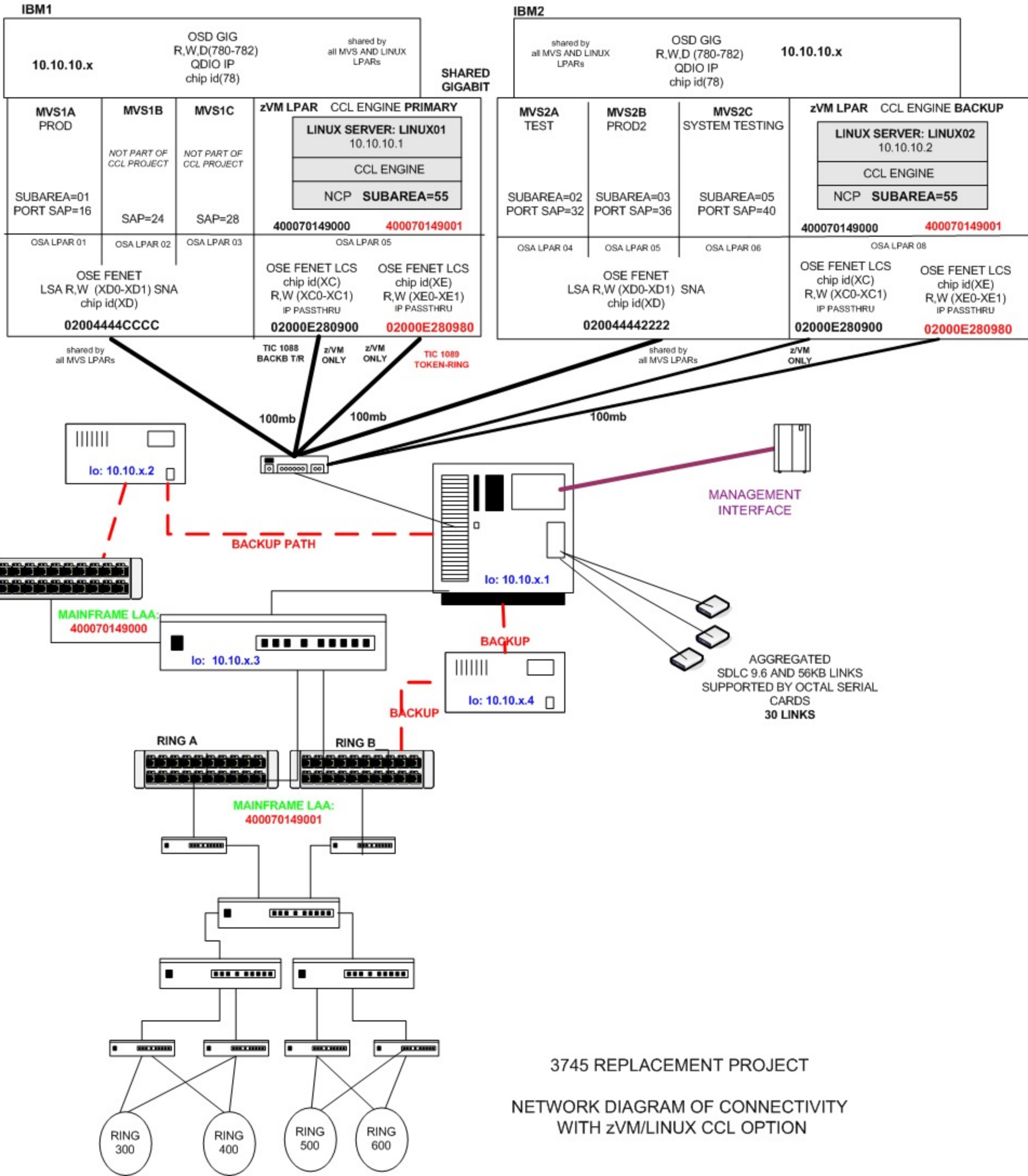
The ability to implement this solution avoided the need to upgrade communication equipment at the remote locations. We have many different county agencies with their own budgets, and not necessarily able to influence their spending. Therefore, this solution provided an optimal environment where we were able to transport SNA over IP using DLSW. This avoided the need for these agencies to provide IP routers at the remote locations to transport the SNA traffic.

Our migration of SDLC circuits, the biggest component of resources being migrated, has been done in most cases with the existing modem equipment.

MAINFRAME CONNECTIVITY - OLD AND NEW

CKoller
4/26/05





3745 REPLACEMENT PROJECT

NETWORK DIAGRAM OF CONNECTIVITY
WITH zVM/LINUX CCL OPTION

Implementing an LU6.2 connection:

The Cisco interface configuration:

```
interface Serial6/1/7
description 'SDLC LINE WITH LU6.2 '
no ip address
encapsulation sdhc
no keepalive
shutdown
ignore-dcd
serial restart-delay 0
sdhc role primary
sdhc vmac 4000.3174.7500
sdhc poll-pause-timer 200
sdhc address C1 xid-poll
sdhc partner 4000.7014.9000 C1
sdhc dlsw C1
```

Implementing an SNI connection:

In the NCP:

```
SNILINE      LINE TGN=1,MONLINK=CONT,ISTATUS=ACTIVE
SNIPU        PU  ADDR=04400036405677,BLOCK=(4096,8),NETID=XYZ
```

The Cisco interface configuration:

```
interface Serial1/0/0
description 'SNI LINK'
mtu 6000
no ip address
encapsulation sdhc
no keepalive
serial restart-delay 0
nrzi-encoding
sdhc vmac 4000.3740.3600
sdhc N1 16000
sdhc address 77
sdhc partner 4000.7014.9000 77
sdhc simultaneous full-datmode
sdhc dlsw 77
```

State Street

*** Business Drivers and Objectives ***

1) Remove end of life hardware & cost savings.

- Remove 7 3745 platforms
- Remove 4 Bytex platforms & service contracts
- Remove 5 Escon directors
- Remove stand alone CNT (channel extension) network & service contracts
- Consolidate from two token ring environments per location to one
- Remove 4 NCP licenses
- 4,000 square foot computer room raised floor space reduction

2) Allow for z/Linux and z/VM exposure and accomplish a real production improvement.

- Allowed for project plans and many areas to get involved with building out a z/VM and z/Linux environment
- Adapt to or conform the Open System Standards to leverage the mainframe normal OS build out to address all system needs (backup, maint, storage, operations, service levels, capacity,)

State Street

*** Process ***

1) Proof of concept

- created a lab environment
- verified that CCL V1.0 could be installed on REL 3 & SLES 8
- verified that we could link to a remote VTAM network via SNI SDLC and NTRI
- verified that a CCL could be connected to two VTAMs at the same time for fail over
- verified that NTRI attached TN3270 gateways could come active

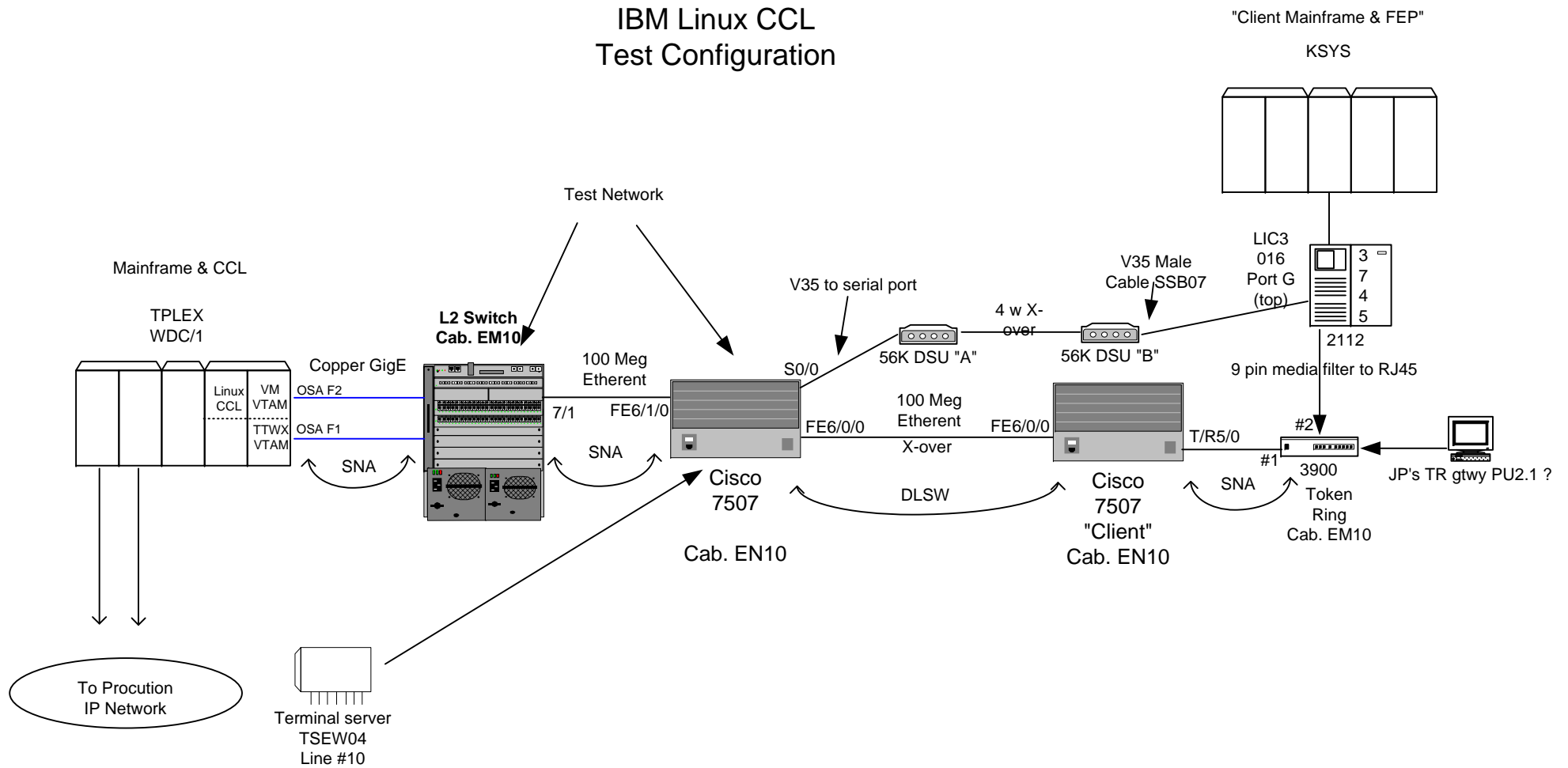
2) Current Network evaluation

- Contacted customers and business units for each link to evaluate the need for the link and to explore other ways for communications.
- Moved as many as possible to an Enterprise Extender links
- Others were converted to pure IP
- Some were phased out for non-use
- SNI gateway links via SDLC and NTRI remain
- NTRI attached TN3270 gateway PU's remain supporting 160,000 Lu's
- NTRI TN3270 print gateways and file server systems as well

3) Prod migrations

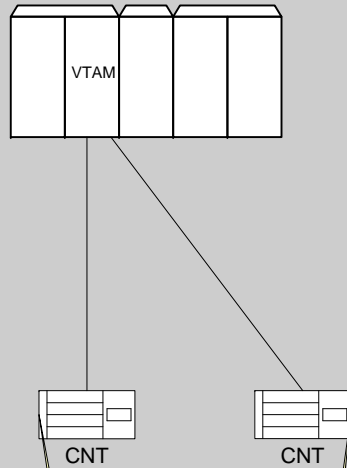
- CCL V1.2.0 ready
- Implemented on SLES 9 SP3 (two prod data centers on IFL's and DR on GPE)
- Re-verified proof of concept results and tested Vswitch capabilities
- Links were migrated to CCL with only customer notification (no changes to a remote end).
- We did request support for each migration from remotes for vary active a line/pu or cdrm and to test log-in or file transfers

IBM Linux CCL Test Configuration

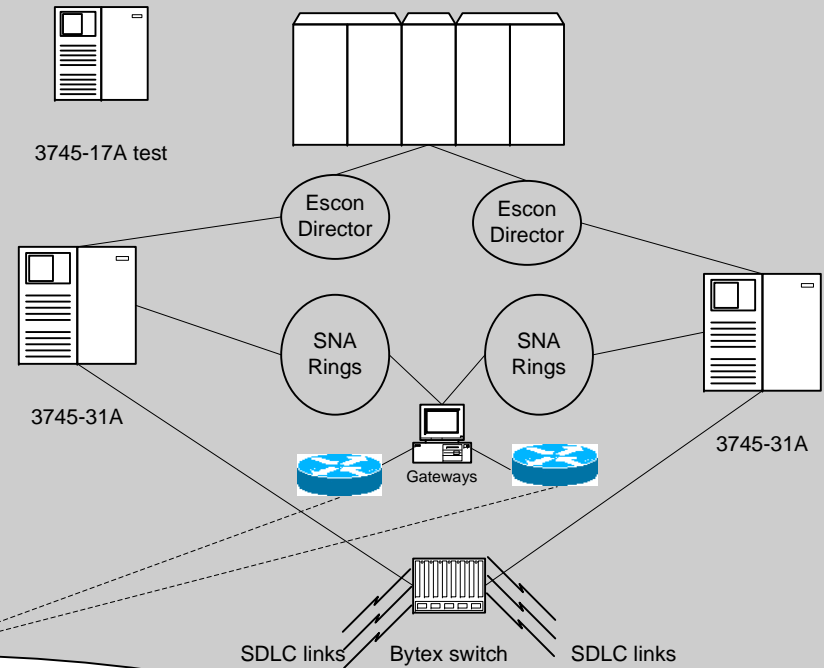


3745 Environment

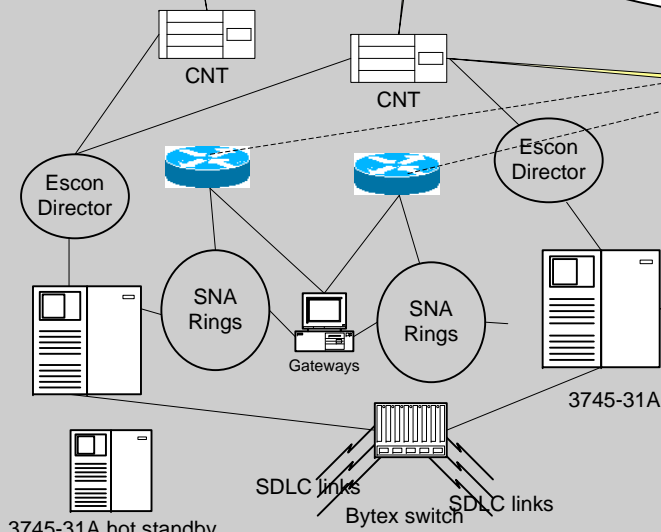
Data Center A



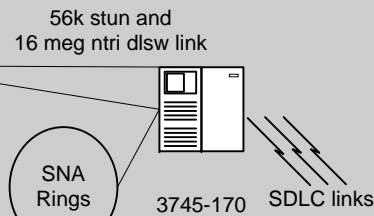
Data Center B



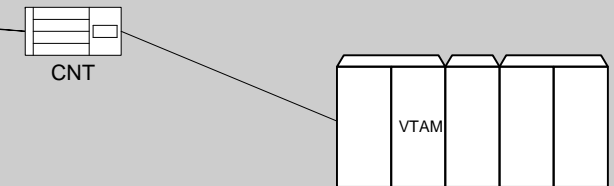
IP network



Network Concentrator Site



Sydney



Out of Region DR site

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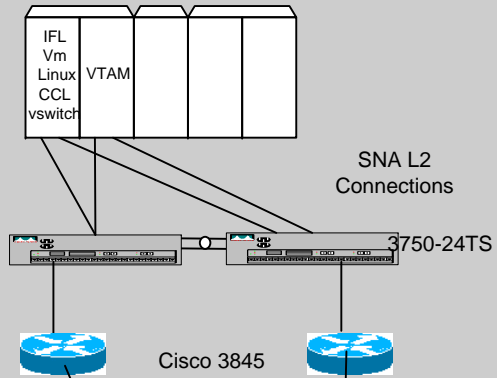
*** Benefits and conclusions ***

- 1) The 3745 platform has come to end of life ... the need for NCP has not ...
- 2) Improved BR and DR capabilities
 - Same data center and CCL for all link outages can be maintained.
 - Cross data center backup has become much easier.
 - Federally mandated out of region support has been improved.
 - Complying with DR testing requirements has been improved.
- 3) Conform to corporate goals to removed SNA from the transport layer where possible.
- 4) On schedule for migration, start to finish and power down the 3745s for 6 months total time.
- 5) All normal tools to monitor and manipulate NCP functions remain the same so network operators were able to pick right up.
- 6) Cost savings for hardware, software, floor space, maintenance, dedicated infrastructures have been begun to be realized.
- 7) The build out and project planning for z/VM and z/Linux helped bring many areas together.

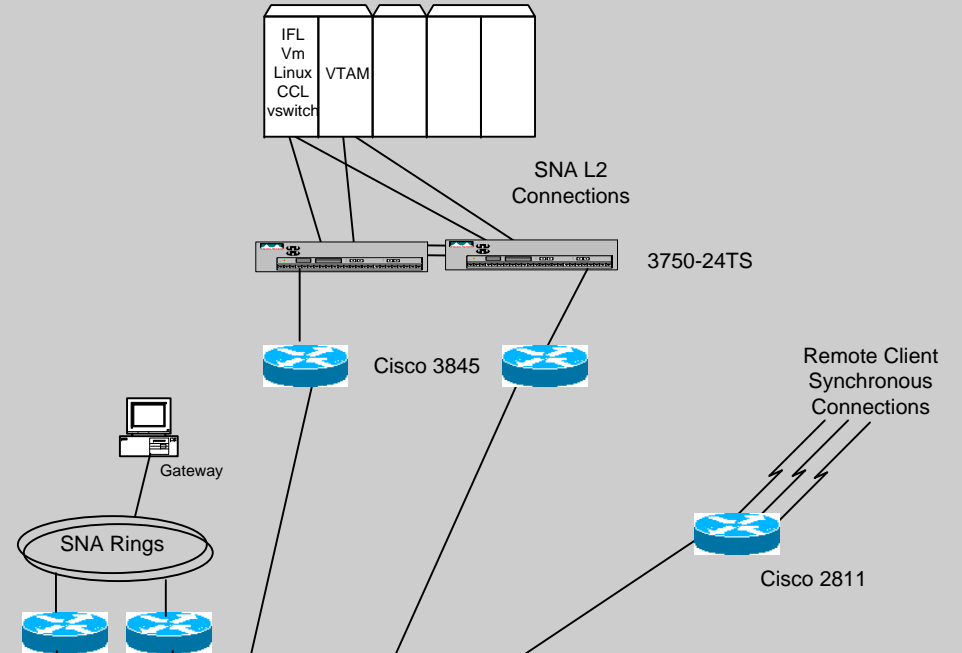
We are now are beginning to review other areas where z/VM and z/Linux with the virtualization they provide can benefit other business areas as well.

CCL Implementation

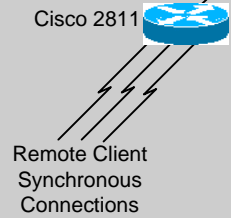
Data Center A



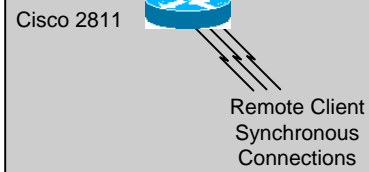
Data Center B



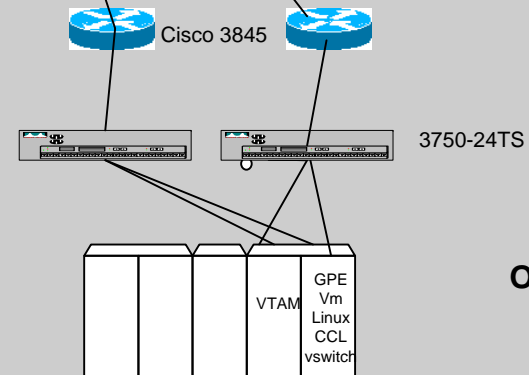
IP network



Network Concentrator Site



Sydney

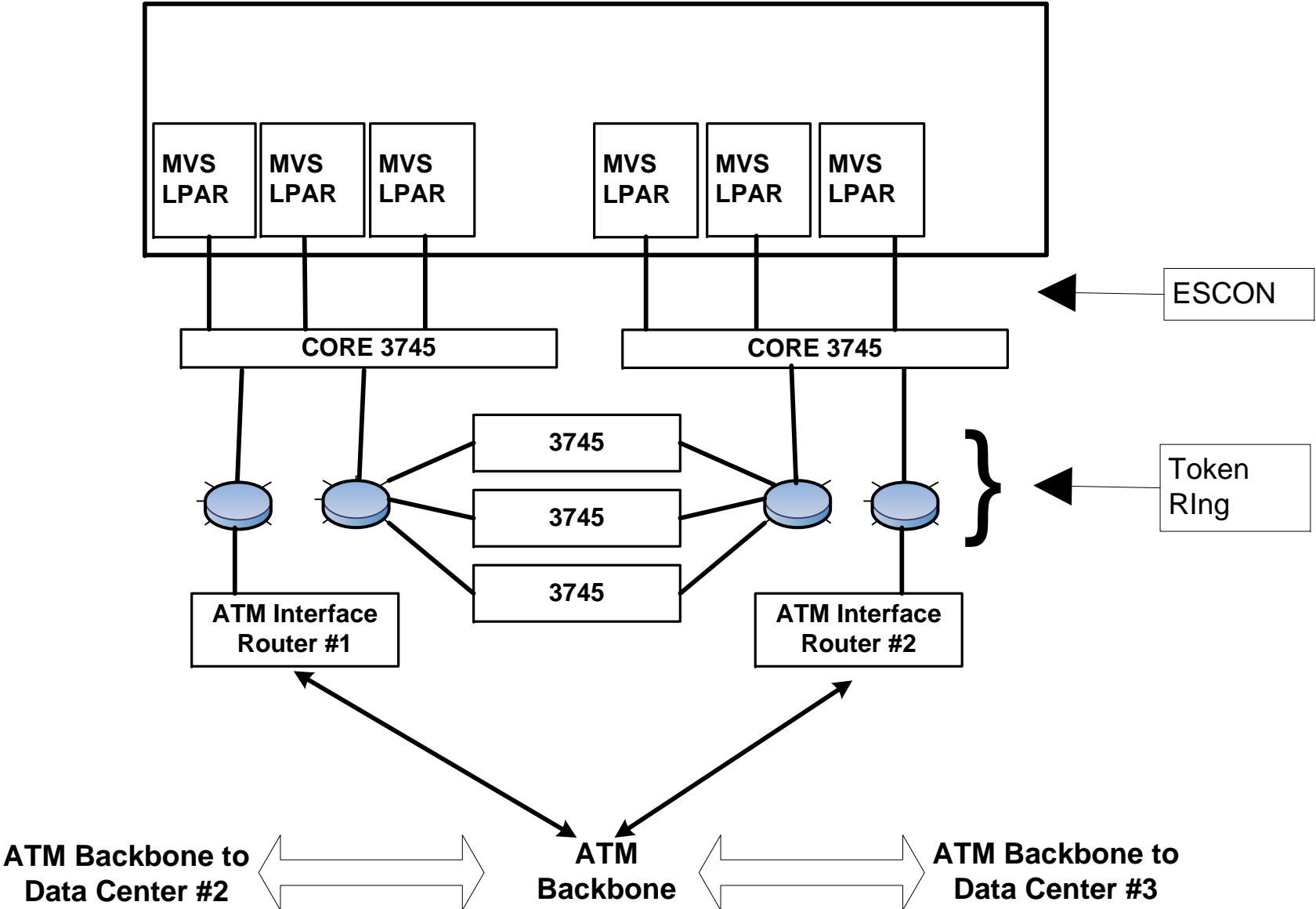


Out of Region DR site

Federal Reserve SNA environment when project began:

- 5 z900 & z990 processors across 3 data centers
- 65 MVS LPARs
- Pure Subarea SNA network (no APPN implemented at this time)
 - Internal DLSW network supporting offices across the country
 - A few SNI connections
 - Several hundred PU2 connections
 - DLSW connections to all 3 data centers
 - External DLSW network supporting financial institutions across the country
 - Several hundred SNI connections
 - Over a thousand PU2 connections
 - DLSW connections to all 3 data centers
 - Same-site LPAR-to-LPAR SNA communication via ESCON CTC
 - Cross-site LPAR-to-LPAR SNA communication via ESCON attachment to CISCO 7200 series CIP routers (Channel SNA) attached to ATM backbone network (routers use DLSW to transport SNA data between data centers)
 - Large PU2 dial network (being eliminated by another project)
- 16 3745s running 24 NCPs
 - 6 3745s (core) interconnect the data centers (6 NCPs)
 - ESCON to all LPARs
 - Path from LPARs to other 3745s
 - Path from LPARs and other 3745s to other data centers
 - 6 3745s support connections from the DLSW networks (9 NCPs)
 - Also supports directly attached token ring and ethernet servers within the data centers
 - Cloned in each data center (a single data center can support the entire SNA network)
 - 3 3745s support the dial network (6 NCPs)
 - 1 3745 supports our test lab environment

Current SNA Data Center



Problems Federal Reserve needed to address

- Replace aging equipment (3745 farm installed in 1993)
 - Significant increase in failure rate over the last two years
- Reclaim needed floor space
- Reduce operating expenses
- Of course, continue to support the business in a quality fashion

Federal Reserve technical requirements

- Eliminate ESCON from the environment
- Eliminate Token Ring wherever possible ... dying technology
- Simplify topology where possible
- Transparent migration from customer viewpoint
 - No change required at remote location
 - Continued support of large frame size transmission from remote devices
- Ability for both current and replacement technologies to coexist well together
- Scalable solution (both upward and downward as business needs dictate)

Why CCL?

- Totally compatible with our current operating environment
- Meets all business requirements
- Meets all technical requirements
- By running the same NCP code
 - Virtually all concerns for compatibility and protocol issues are eliminated
 - Virtually no training required for network operations or help desk staff
 - Minimal training required for network support staff
- Lower NCP license charges
 - CCL NCP is always a Tier-2 charge – most 3745s are a higher tier

Target SNA environment with CCL

- ESCON CTC replaced with SNA OSA adapters
- ESCON connections to CIP routers replaced with SNA OSA adapters
- 6 core 3745s / NCPs eliminated
- 6 3745s (9 NCPs) terminating SNA devices migrated to 9 CCL NCPs
- 1 3745 supporting test lab activities migrated to 1 CCL NCP
- 3 3745s (6 NCPs) supporting dial activity not addressed by the CCL migration
 - Eliminated due to change in business offering
- *** At end of project all 3745s will be off the floor
- *** At end of project 16 NCP licenses will be reduced to 10

Migration Approach – two phases (prepare for CCL, CCL Implementation)

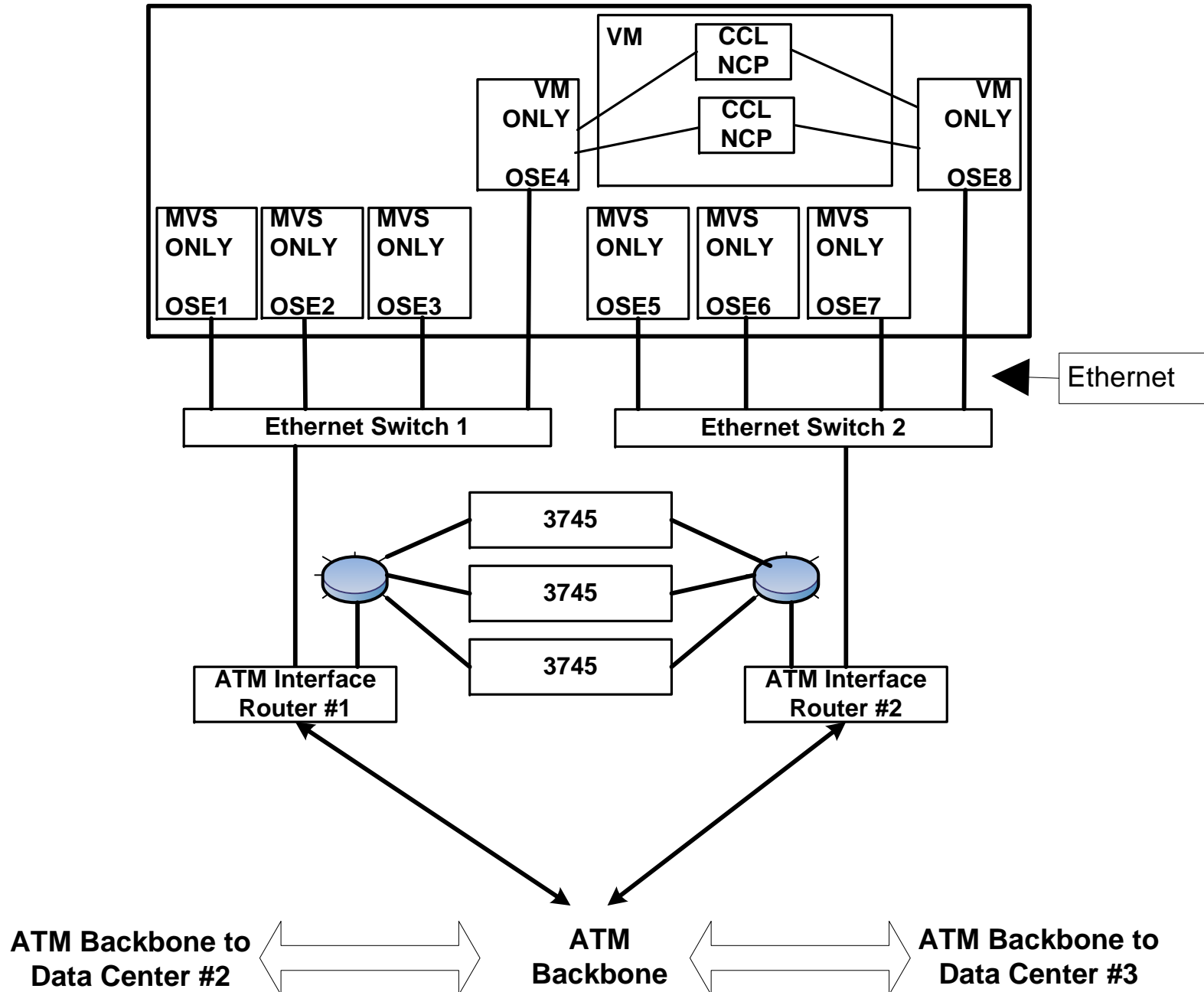
Prepare for CCL

- Install ‘Copper’ Ethernet SNA OSA adapters on all processors (interconnected by redundant ethernet switches)
 - 100 megabit speed on z900 processors
 - Gigabit speed on z990 processors
- Replace ESCON CTC connections with SNA OSA adapters for same-site LPAR-to-LPAR communication
 - Required SNA pathing changes to create multiple redundant routes between each pair of LPARs as the prior CTC only required a single SNA virtual route
 - Replaced VTAM CTC major nodes with XCA major nodes with a separate link station for each ‘partner’ LPAR
- Connect the ethernet switches to the CISCO 7200 routers (gigabit ethernet uplink)
- Connect 3745 token ring to the CISCO 7200 routers
 - Access path from the 3745s to the OSA adapters
 - Access to the cross-site DLSW
- Activate connections from LPARs to 3745s via OSA adapters
 - Required SNA pathing changes to create virtual routes directly from LPARs to 3745s bypassing the core 3745s
 - Required NCP gens to add link stations from NCPs to each LPAR
- Move cross-site LPAR-to-LPAR connections from CIP router ESCON links to the SNA OSA adapters
 - Moved link stations from CIP router XCA major nodes to OSA XCA major nodes
- ** Decommission core 3745s – all SNA communications now bypass these boxes

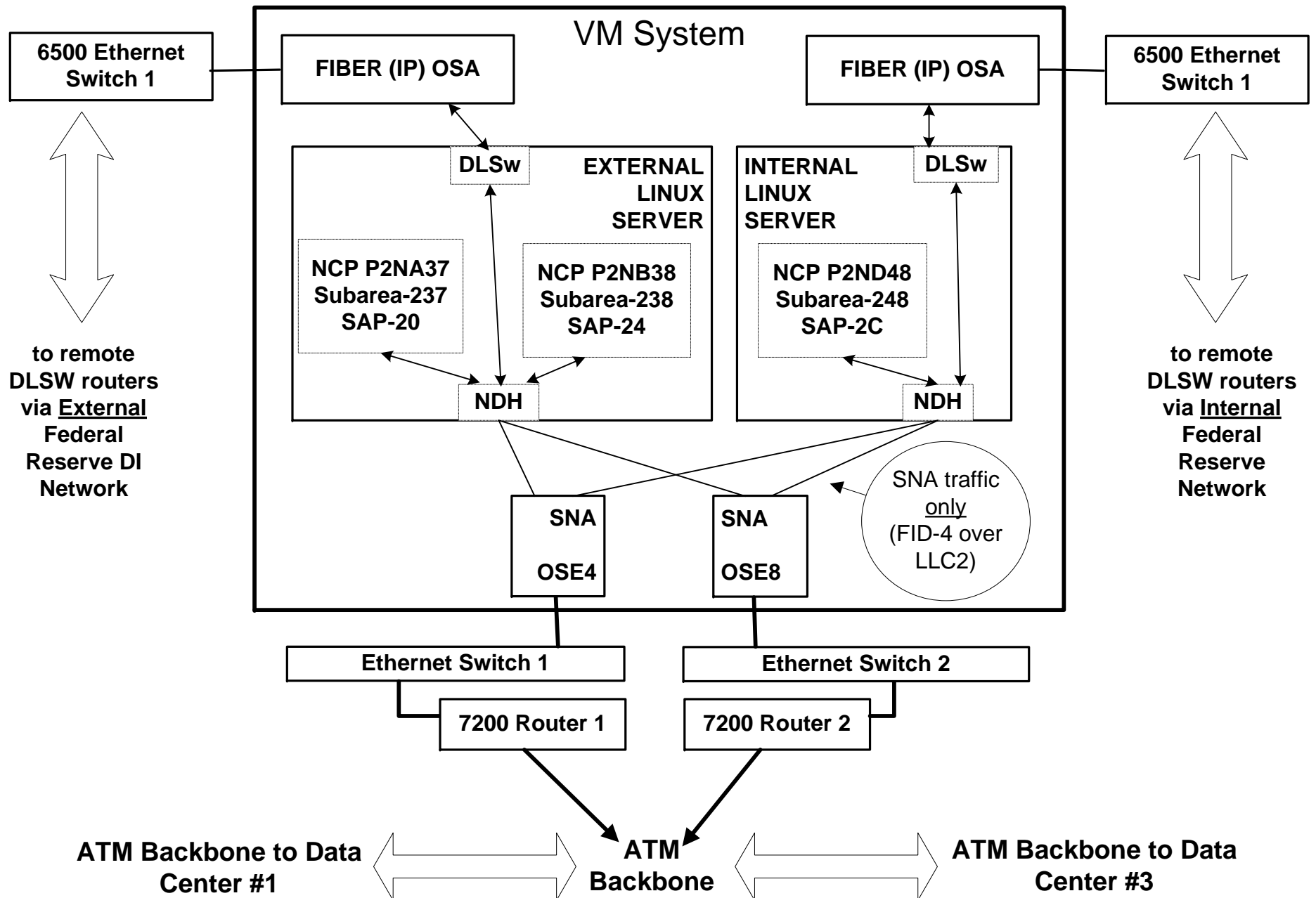
Now ready for CCL Implementation

- Transfer NCP licenses from core 3745s to CCL environment at first data center (MES to alter tier level)
- Migrate connections from 3745 to CCL at first data center
 - Alter DLSW configuration in each remote router in the network
 - Add DLSW peer to CCL Linux system
 - Delete existing DLSW peer to router in this data center
 - For SNA servers in the data center
 - Disconnect 3745 Token Ring connection
 - Activate DLSW connection to CCL Linux system
- ** Decommission remaining 3745s at first data center
 - Transfer NCP licenses to CCL environment at the next data center (MES to alter tier level)
- Repeat the process for the remaining two data centers
- ** Decommission remaining 3745s
- ** Cancel excess NCP licenses

Typical Subarea SNA Connectivity



Data Center #2 CCL Production Environment (VM Only)



Challenges

<u>Challenge</u>	<u>Details</u>	<u>Solution</u>
XCA definitions	Due to size of our environment there are about 18,000 link stations, each with the MAC address and SAP number of the partner connection	Developed programs that take a 'connection matrix' as input and generate XCA major nodes (and NCP link stations) as output
Hard coded hardware MAC addresses	Every LPAR and NCP now contains the 'hardware' address of every other LPAR and NCP	Awareness. We must coordinate changes 'everywhere' when a new LPAR or NCP is added to the environment.
Segregation of internal and external DLSW (IP) networks	How do I connect both the internal and external DLSW networks to the VM/CCL environment without creating an IP security exposure?	Multiple Linux guests. One CCL/Linux with dedicated IP OSA to the External network and another CCL/Linux on the internal network. No common IP components. Linux supporting the external SNA network can only be reached by crossing through a firewall from the workstation requiring access (via SSH)
zVM acceptance zLinux acceptance CCL acceptance	First production implementation in our shop	It works – just have to convince everyone that simply because it is new to us does not mean it is bad or dangerous