

# IBM 3746 Nways Multiprotocol Controllers Models 900 and 950

December 2, 1997  
(Revision 4)



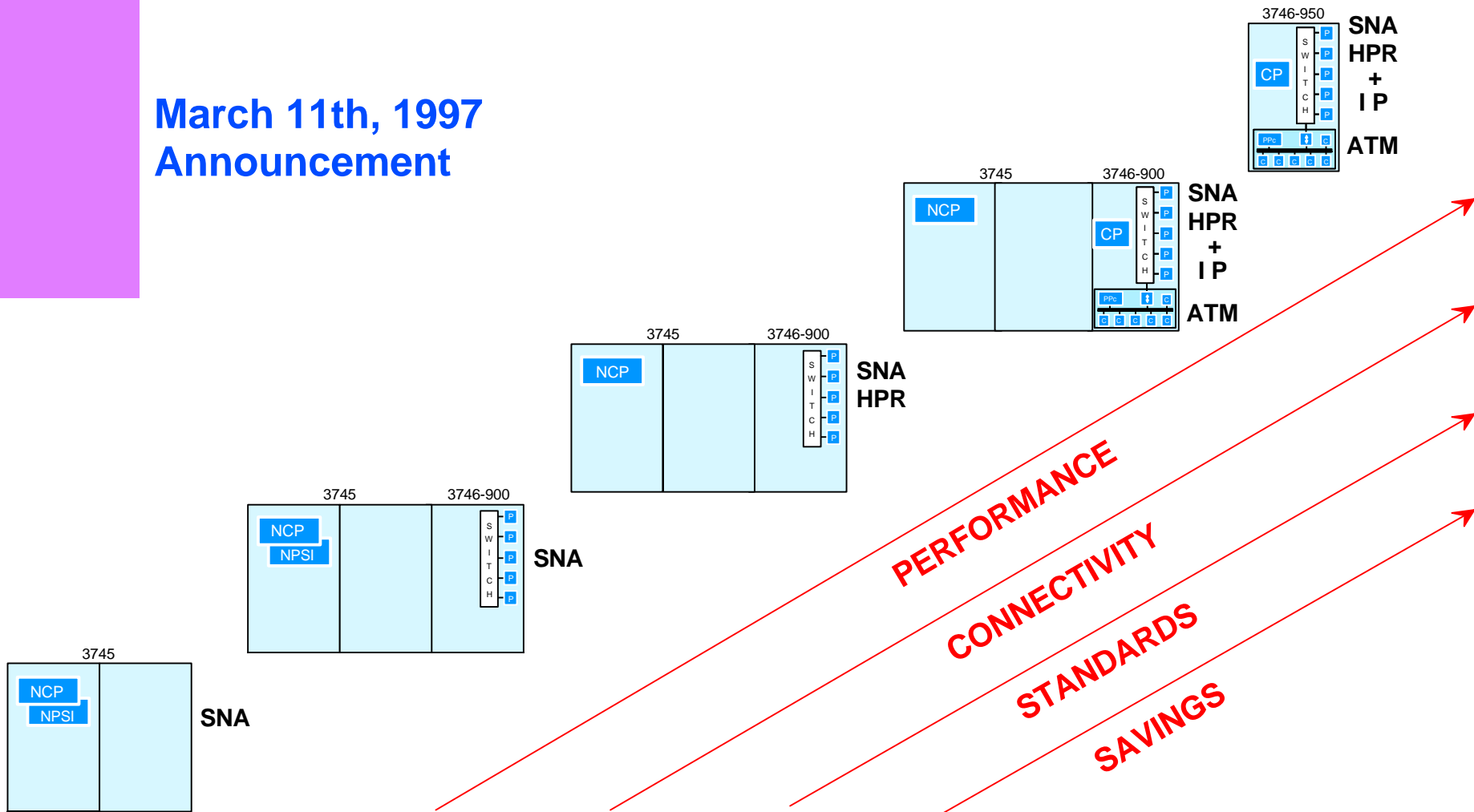
## Technical View

**A.Delsol**  
*IBM France*

# IBM 3746-950 and 3746-900 Network Node



March 11th, 1997  
Announcement



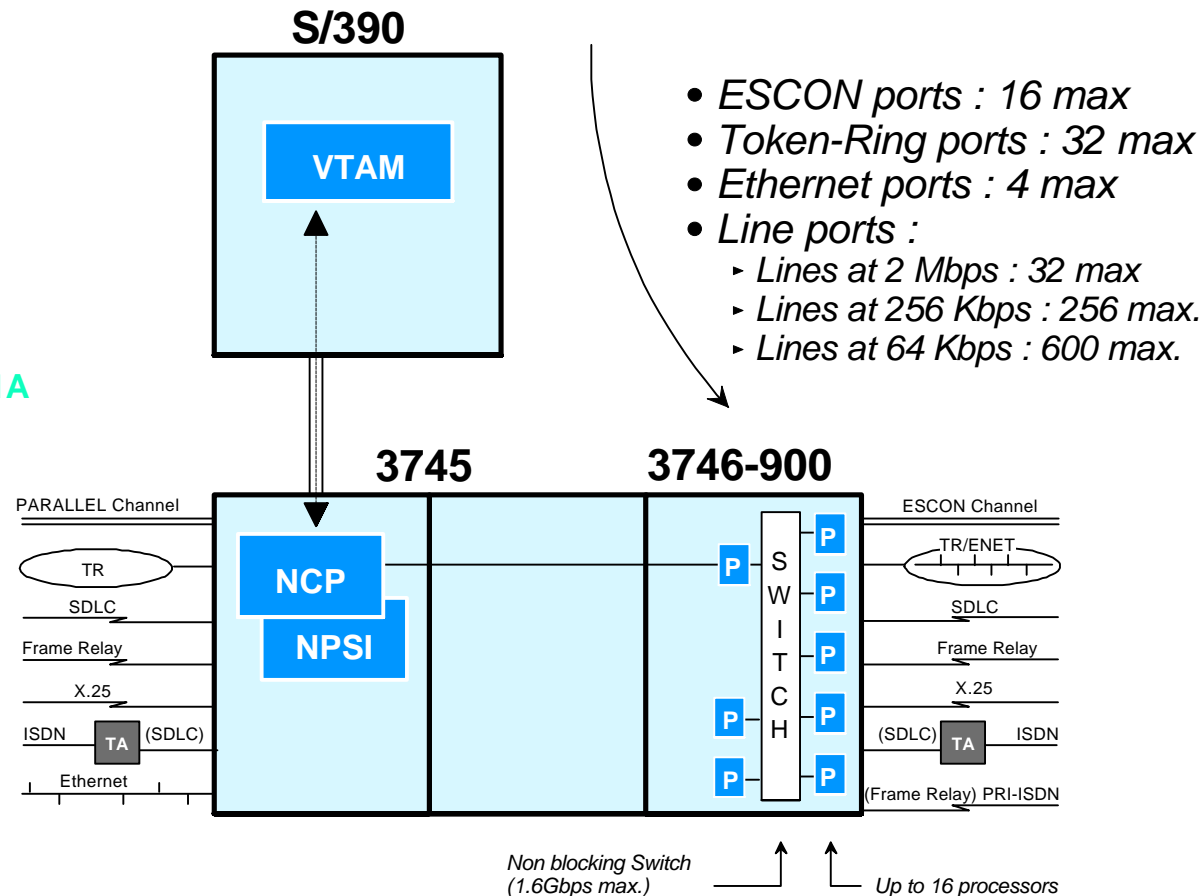
# Contents



- *The 3746 Expansion Unit Model 900*
- *The 3746 Nways Controllers*
- *Integration of 3746 Nways Controllers in an SNA network*
- *The 3746 Nways Controller IP Router*
- *An example of staged evolution from 3745 to 3746-950*
- *3746-900 and 3746-950 Adapters*
- *3745 and 3746 Controllers : details of X.25, Frame Relay and ISDN supports*
- *The 3746 Nways Controllers & Parallel Sysplex*
- *3746 Nways Controller Connectivity*
- *Data flow control : CIR & BRS*

# 3746-900 Expansion Unit (using single 3745 CCU)

IBM 3745  
17A, 21A, 31A  
(1 CCU)



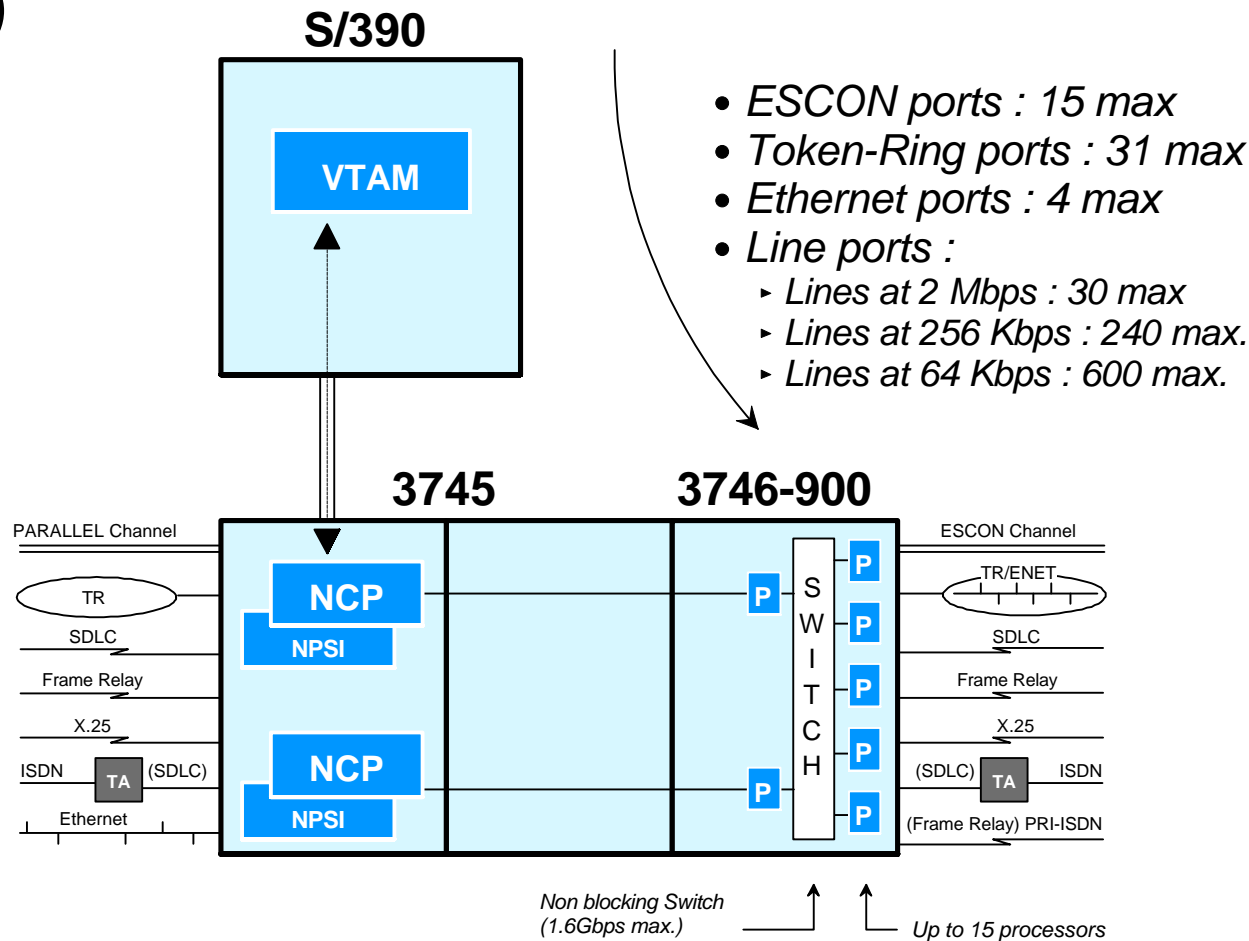
**Note :** NCP communicates with VTAM via a parallel channel, connected to the 3745, and/or an ESCON channel, connected to the 3746-900 unit.

- **X.25 support by the 3746-900 expansion unit :**
  - With NCP 7.3 and NPSI 3.8, X.25 support of SNA and non\_SNA
  - With NCP 7.4, support of SNA/X.25 (QLLC) high performances (without NPSI)

# 3746-900 Expansion Unit (using dual 3745 CCU)



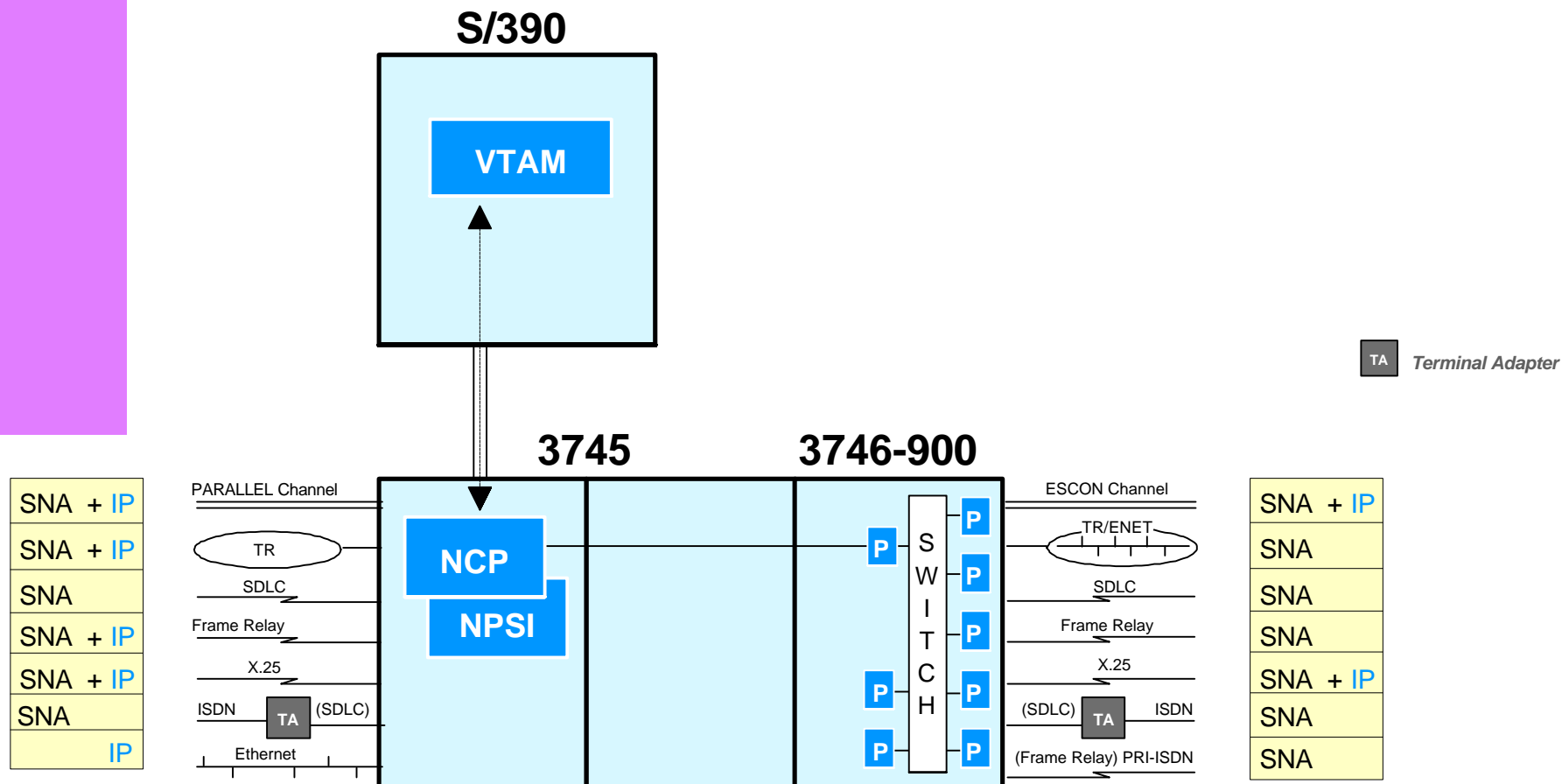
IBM 3745  
41A, 61A  
(2 CCUs)



**Note :** NCP communicates with VTAM via a parallel channel, connected to the 3745, and/or an ESCON channel, connected to the 3746-900 unit.

- **X.25 support by the 3746-900 expansion unit :**
  - With NCP 7.3 and NPSI 3.8, X.25 support SNA and non\_SNA
  - With NCP 7.4, support of SNA/X.25 (QLLC) high performances (without NPSI)

# SNA and IP support for resources under NCP Control

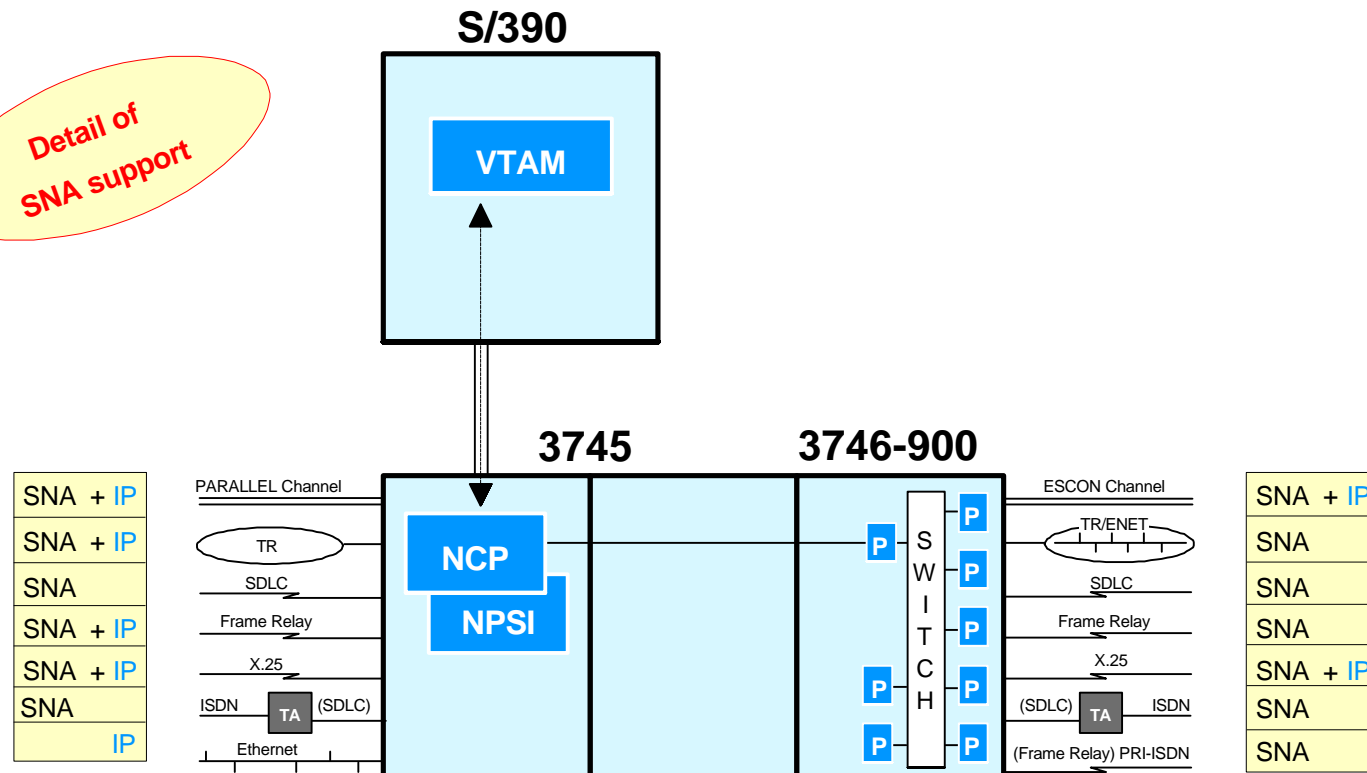


**Note :** "Native" IP support, over parallel and ESCON channels, is supported with TCP/IP MVS IBM (V3 R1 + PTF or V3R2) .  
 IP over X.25 uses the GATE function of NPSI, which is controlled by TCP/IP (MVS or VM) IBM (IP/X.25 traffic must go up to the S/390, or through it).

# SNA and IP support for attachments under NCP Control



Detail of SNA support



SNA + IP
SNA + IP
SNA
SNA + IP
SNA + IP
SNA
IP

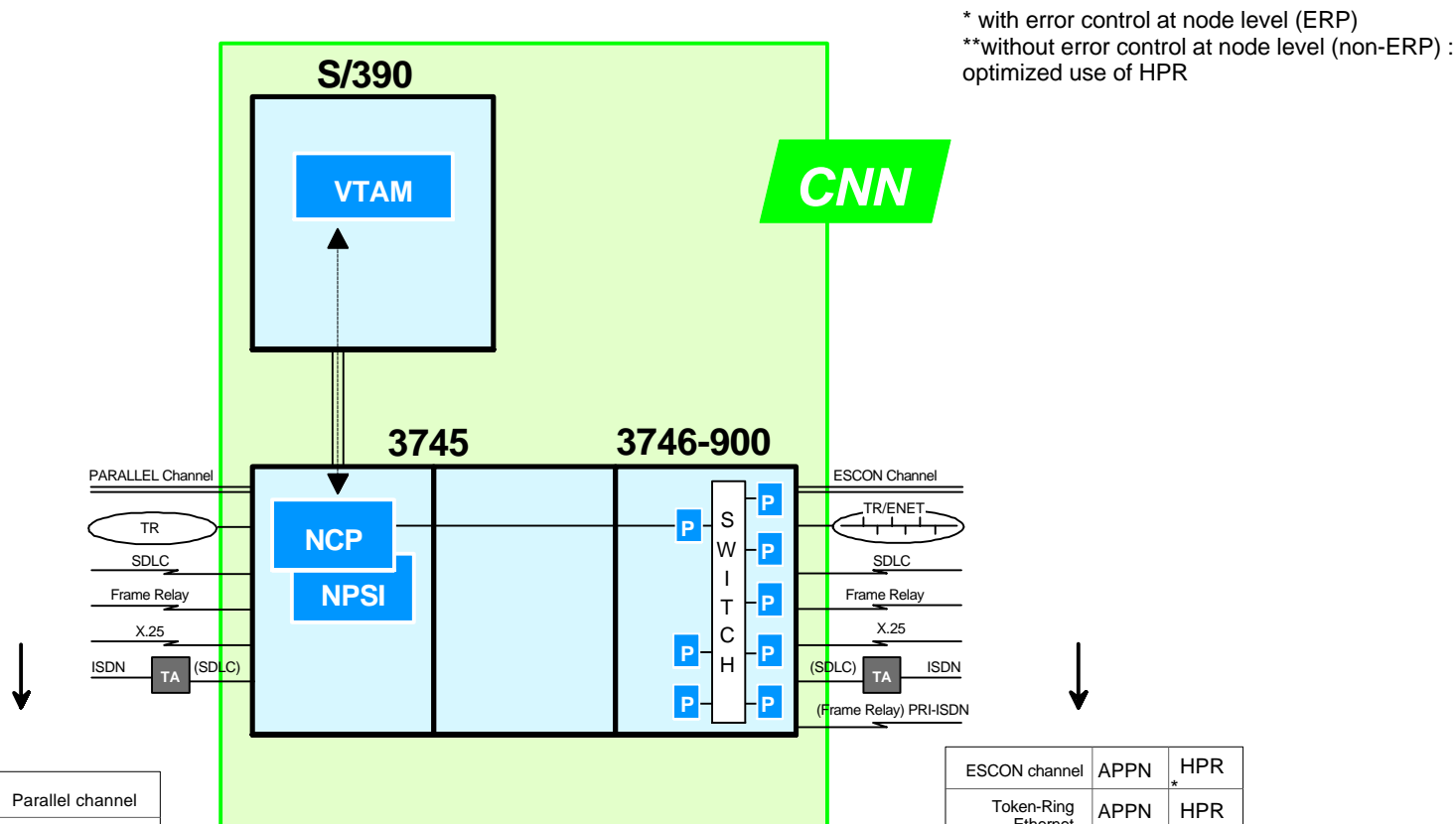
SNA + IP
SNA
SNA
SNA
SNA + IP
SNA
SNA

SNA SUBAREA	APPN	HPR*	IP	Parallel channel
SNA SUBAREA	APPN	HPR**	IP	Token-Ring
SNA SUBAREA	APPN	HPR*		SDLC
SNA SUBAREA	APPN	HPR**	IP	Frame Relay
SNA SUBAREA	APPN		IP	X.25
SNA SUBAREA	APPN	HPR*		ISDN (SDLC)
			IP	Ethernet

ESCON channel	SNA SUBAREA	APPN	HPR*	IP
Token Ring Ethernet	SNA SUBAREA	APPN	HPR**	
SDLC	SNA SUBAREA	APPN	HPR*	
Frame Relay	SNA SUBAREA	APPN	HPR**	
X.25	SNA SUBAREA	APPN	HPR*	IP
ISDN (SDLC)	SNA SUBAREA	APPN	HPR*	
ISDN (FR)	SNA SUBAREA	APPN	HPR**	

\*with error control at node level (ERP)  
 \*\*without error control at node level  
 (non-ERP) : optimized use of HPR

# VTAM / NCP Support for APPN and HPR



\* with error control at node level (ERP)  
 \*\*without error control at node level (non-ERP) :  
 optimized use of HPR

APPN	HPR*	Parallel channel
APPN*	HPR**	Token-Ring
APPN*	HPR	SDLC
APPN	HPR**	Frame Relay
APPN		X.25
APPN*	HPR	ISDN (SDLC)

ESCON channel	APPN	HPR*
Token-Ring Ethernet	APPN*	HPR**
SDLC	APPN	HPR*
Frame Relay	APPN*	HPR**
X.25	APPN	HPR*
ISDN (SDLC)	APPN*	HPR
ISDN (FR)	APPN*	HPR**

- a CNN (Composite Network Node) includes one VTAM and one or multiple NCPs
  - CNN supports HPR with VTAM 4.3 + NCP 7.3
- HPR provides
  - Transit function (ANR)
  - End point function (RTP) with VTAM 4.4



# NCP Version 7 Release 3



## Four major functions :

- **HPR support :**
  - Transit function (ANR)
  - In conjunction with VTAM 4.3 (CNN)
  - 3745 and 3746-900 : Channels, Token-Ring, SDLC, F/R
- **IP support :**
  - NCP 6.1 : IP over Ethernet
  - NCP 7.1 : IP over Token-Ring
  - NCP 7.3 : IP over F/R (RFC 1490)
  - NCP 7.3 + PTF : IP over parallel channel
  - NCP 7.3 + PTF : IP over ESCON channel

} 3745

} 3746-900
- **Frame Relay BAN :**
  - In conjunction with IBM 2210, 2216 and 6611 routers
  - On the 3745 : NCP 7.3
  - On the 3746-900 : NCP 7.3 and microcode change (ECA 138)
- **X.25 support for the 3746-900 :**
  - In conjunction with NPSI 3.8

**Availability :**

- NCP 7.3 and NPSI 3.8 : June 30, 1995

## Four major functions :

- **X.25 support decentralized to the 3746-900 CLPs :**
  - X.25 ODLC (Outboard Data Link Function)
  - Applies to SNA / X.25 (QLLC)
  - Very high performance improvement :
    - Speed multiplied up to 10 times
    - Up to 10 000 packets / sec (128 bytes per packet)
    - Unloads the 3745 CPU up to 90 %
    - Full utilization of X.25 lines : up to 2 Mbps
  - Suppression of NPSI
    - if X.25 traffic is only SNA (QLLC)
  - Compatible with NPSI 3.8
    - which remains necessary for non-SNA X.25 traffic
  - The same CLP can simultaneously support SDLC, Frame Relay, X.25 NPSI and X.25 ODLC on different lines
  - Requires the 5030 feature (X.25 Support) on the 3746-900

.../...

# NCP Version 7 Release 4 (2/2)



- HPR traffic is optimized on the Token-Ring attachments of the 3746-900 :
  - Error recovery is not done at node level, but end-to-end
  - The 3746-900 supports this non-ERP mode over :
    - Frame Relay : NCP 7.3
    - Token-Ring : NCP 7.4 + ECA 146 (microcode change level)
  - Interconnection with other non-ERP HPR nodes (eg CS/2, 2210, 2216)
- Internal frame switching between the 3745 and the 3746 :
  - NCP 7.4 + ECA 146 (microcode change level)
- New NCP V7 fee for the 3746-900 NN :
  - Tier C (no charge) replaces Tier A and Tier B
  - Tier C requires the 5022 feature (Network Node Processor)

**Availability :**

- MVS & VM : March 29, 1996
- VSE : June 28, 1996

# NCP Version 7 Release 5 (1/2)



Major functions : **Available**

- **3746-900 ISDN support for SNA flows**
  - Primary ISDN integrated coupler (30 B channels (64kbps), 1 D channel)
  - Frame Relay over B channels for data
  - Euro ISDN for signaling protocol on D channel
- **Duplicate TIC addressing for Subarea Connectivity (INN)**
  - Enable INN traffic
- **Hot standby supports for MLTGs**
  - Define a congestion threshold value for a standby link
- **APPN/HPR Border Node for non adjacent network**
  - with next VTAM release
- **APPN/HPR over 3746-900 X25 ODLC Support**
- **Frame Relay inoperative "error count" management upgrades**
  - Allows a configurable "error count" parameter enabling greater network control
- **Frame Relay BAN support for INN traffic on 3746-900**

**Availability :**

- *MVS, VM & VSE : November 29, 1996*

# NCP V7R5 - Service Level Update Package (SUP) 2/2



- Previous PTFs have been included
- New NCP and NPSI Tier Rules
  - for 3746-900 users
    - ie: 3745-41A/61A (Twin-Dual or Twin-Backup) : Tier 2 or higher
  - PRI-ISDN (LIC16) Enhanced functions
    - Automatic/Non-Disruptive Back-Up (B Channel) between 2 x 3746-900
    - Automatic/Disruptive Back-Up with remote routers (2210, 2216)
    - ISDN SNA PU4 support (3746-900 and 3745 with a TA (7820))
    - ISDN SNA subarea BAN support (3745-900 and 3745 TR attach to a 2210)

## SSP V4R5 - Service Level Update Package (SUP)

- Previous PTFs have been included
- Support of all NCP V7R5 new functions

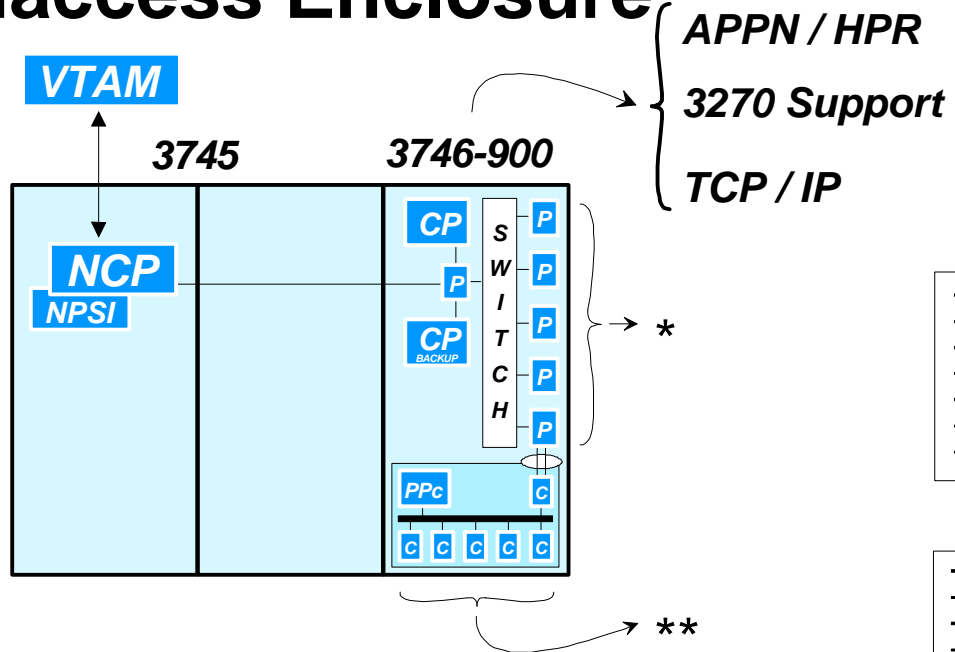
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# IBM 3746 Nways Controllers with Multiaccess Enclosure

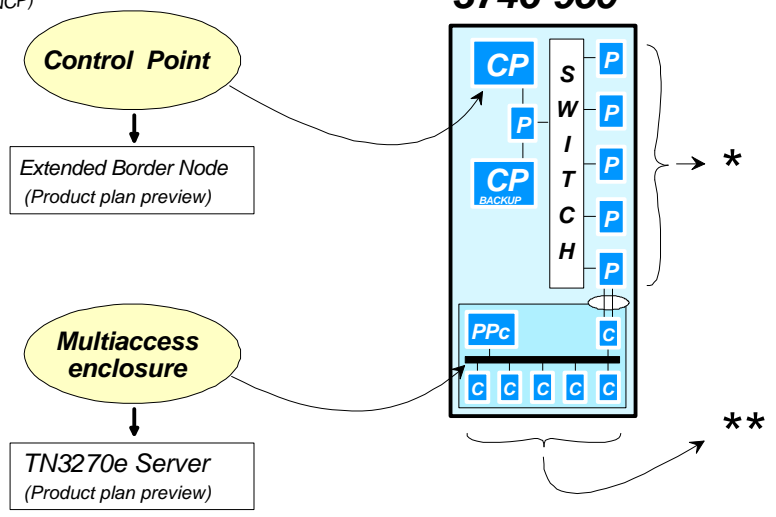
3746-900 with a Single 3745 CCU (17A, 21A, 31A)



- ESCON
  - Token Ring
  - Ethernet
  - SDLC
  - Frame Relay
  - PPP
  - X.25
- \* Available  
Availability 30/06/97

- ATM 155 Mbps
  - Token Ring
  - Ethernet
  - SDLC
  - Frame Relay
  - PPP
  - X.25
  - PRI-ISDN (FR and PPP)
  - ESCON
  - FDDI
  - Fast Ethernet
  - HSSI
- \*\* Availability 30/06/97  
Avail. 30/09/97  
Product plan preview

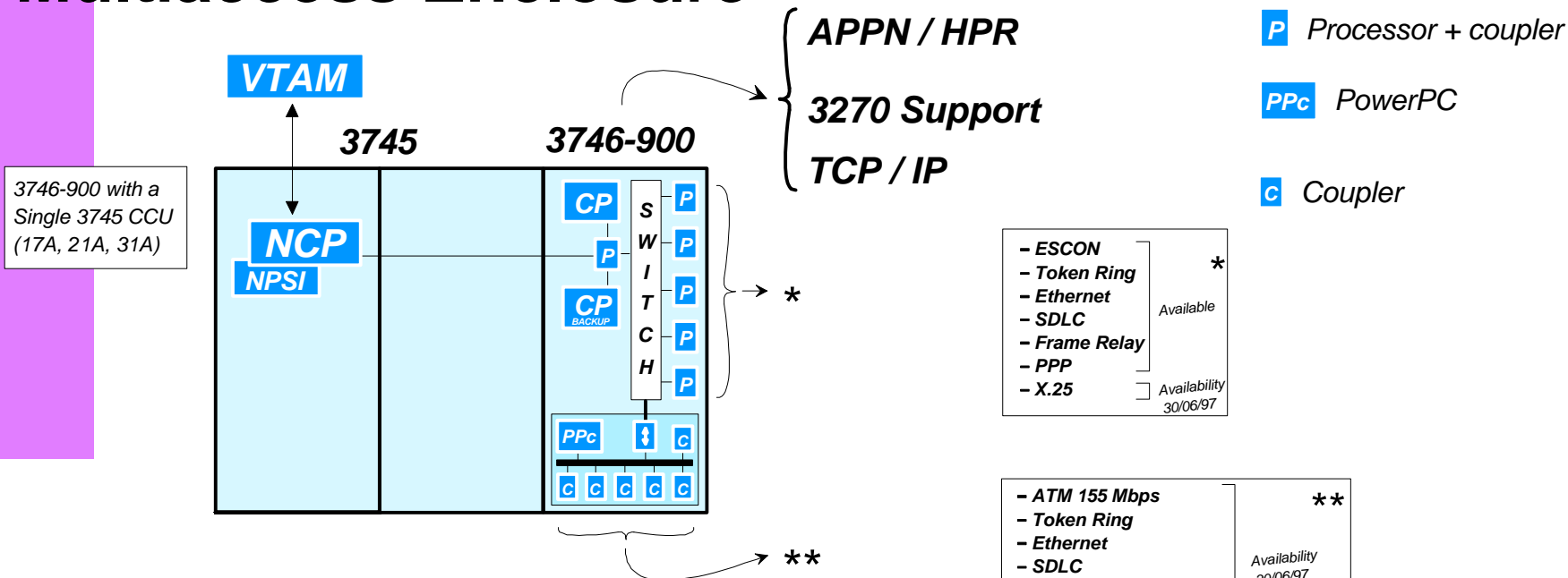
(Processor is independent from VTAM and NCP)



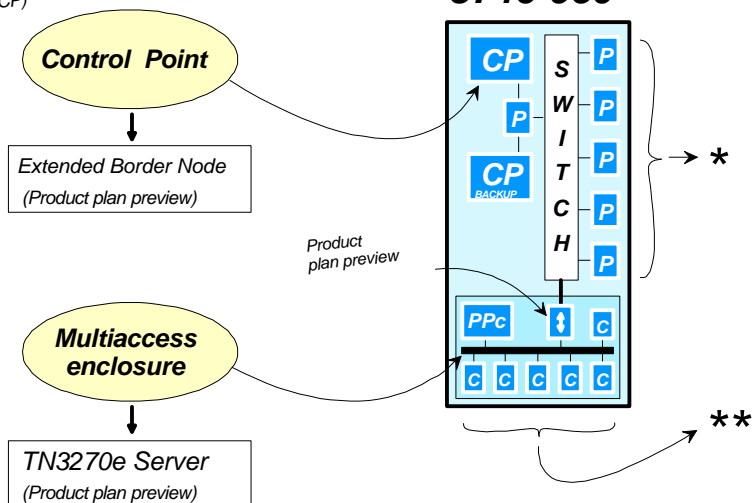
• **First version (30/06/97) :**

- Multiaccess Enclosure is connected to the 3746 Nways Controller by two Token-Ring attachments
- The node is distinct from the 3746, from an APPN/HPR as well as from an IP point of view

# IBM 3746 Nways Controllers with Multiaccess Enclosure



(Processor is independent from VTAM and NCP)



- ATM 155 Mbps \*\*
- Token Ring \*\*
- Ethernet Availability 30/06/97
- SDLC Availability 30/06/97
- Frame Relay Availability 30/06/97
- PPP Availability 30/09/97
- X.25 Availability 30/09/97
- PRI-ISDN (FR and PPP) Product plan preview
- ESCON Product plan preview
- FDDI Product plan preview
- Fast Ethernet Product plan preview
- HSSI Product plan preview

## • Product Plan Preview :

- Multiaccess Enclosure will be directly connected to the 3746 Nways "Switch"
- Together with the 3746, it will constitute a single node from an APPN/HPR as well as from an IP point of view



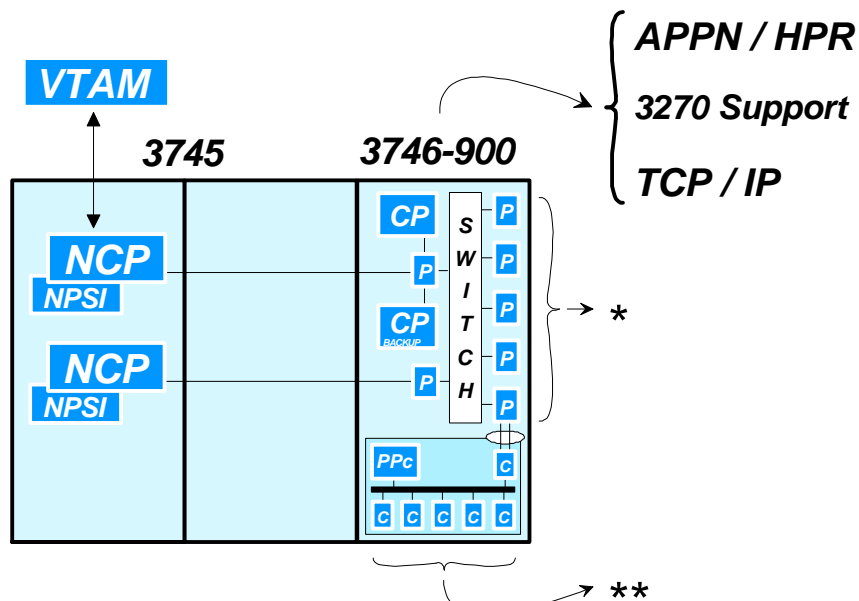
# IBM 3746 Nways Controllers with Multiaccess Enclosure

**P** Processor + coupler

**PPc** PowerPC

**C** Coupler

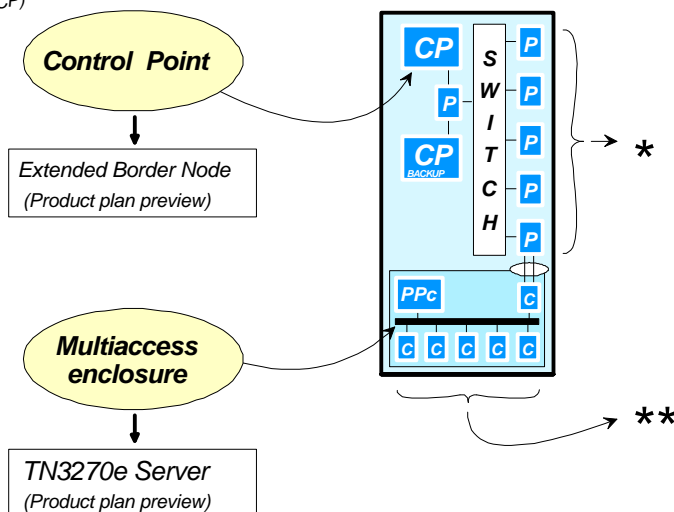
3746-900 with a Twin 3745 CCU (41A, 61A)



- ESCON
  - Token Ring
  - Ethernet
  - SDLC
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  - X.25
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- ATM 155 Mbps
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Avail. 30/09/97  
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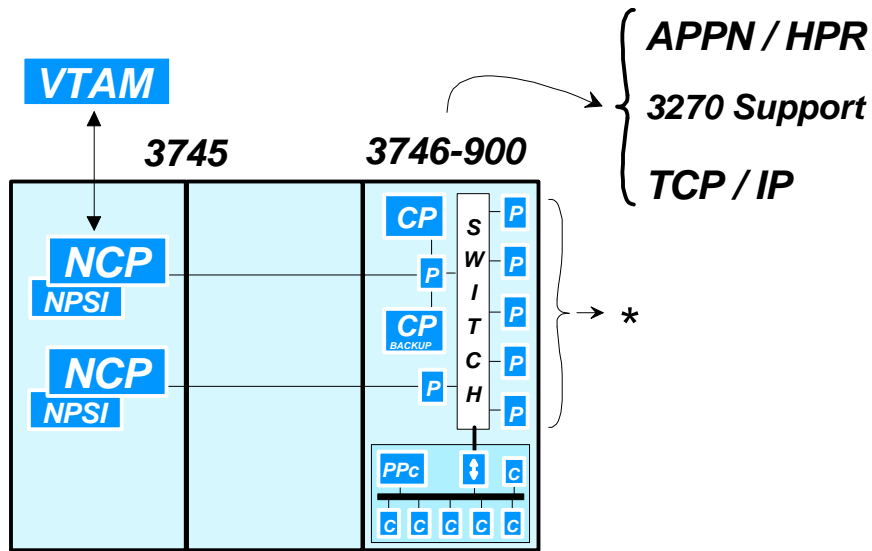


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# IBM 3746 Nways Controllers with Multiaccess Enclosure

3746-900 with a Twin 3745 CCU (41A, 61A)

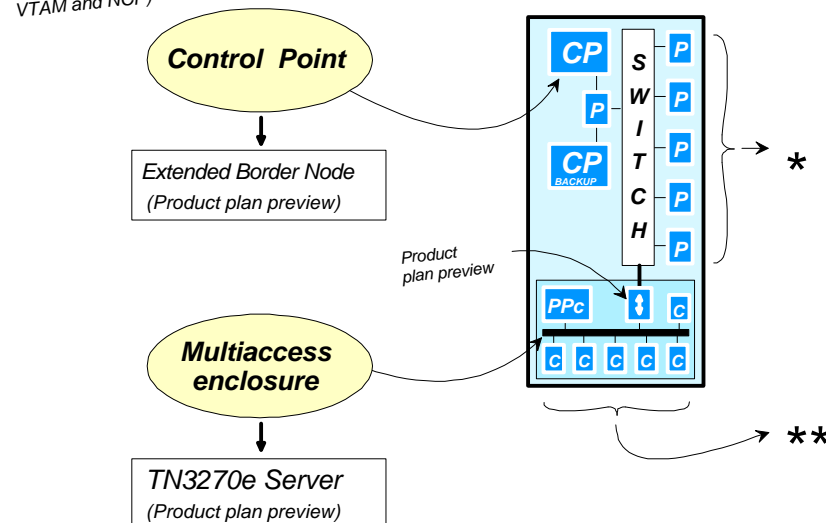


- P** Processor + coupler
- PPc** PowerPC
- C** Coupler

- ESCON
  - Token Ring
  - Ethernet
  - SDLC
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  - PPP
  - X.25
- Availability 30/06/97

- ATM 155 Mbps
  - Token Ring
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  - X.25
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  - ESCON
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  - Fast Ethernet
  - HSSI
- Availability 30/06/97
- Avail. 30/09/97
- Product plan preview

(Processor is independent from VTAM and NCP)



## • Product Plan Preview :

- Multiaccess Enclosure will be directly connected to the 3746 Nways "Switch"
- Together with the 3746, it will constitute a single node from an APPN/HPR as well as from an IP point of view

# Multiaccess Enclosure interfaces (1/2)



- **ATM**
  - Up to 2 adapters (1 port adapter) :
    - 155 Mbps multimode or 155 Mbps single mode
- **ESCON**
  - Up to 4 x 1 port adapters
- **PRI-ISDN (30 B + D)**
  - Up to 4 x 1 port adapters
- **Token-Ring (4 Mbps / 16 Mbps)**
  - Up to 6 x 2 port adapters
    - 1 adapter reserved for the connection to the 3746 Nways controller (first version)
- **Ethernet**
  - Up to 5 x 2 port adapters
- **V.35 / V.36**
  - 6 port adapters
    - 9.6 Kbps to 2.048 Mbps
- **X.21**
  - 8 port adapters
    - 9.6 Kbps to 2.048 Mbps
- **V.24 / EIA 232**
  - 8 port adapters
    - 9.6 Kbps to 64 Kbps

 *Total connectivity : 8 adapters*

# Multiaccess Enclosure interfaces (2/2)



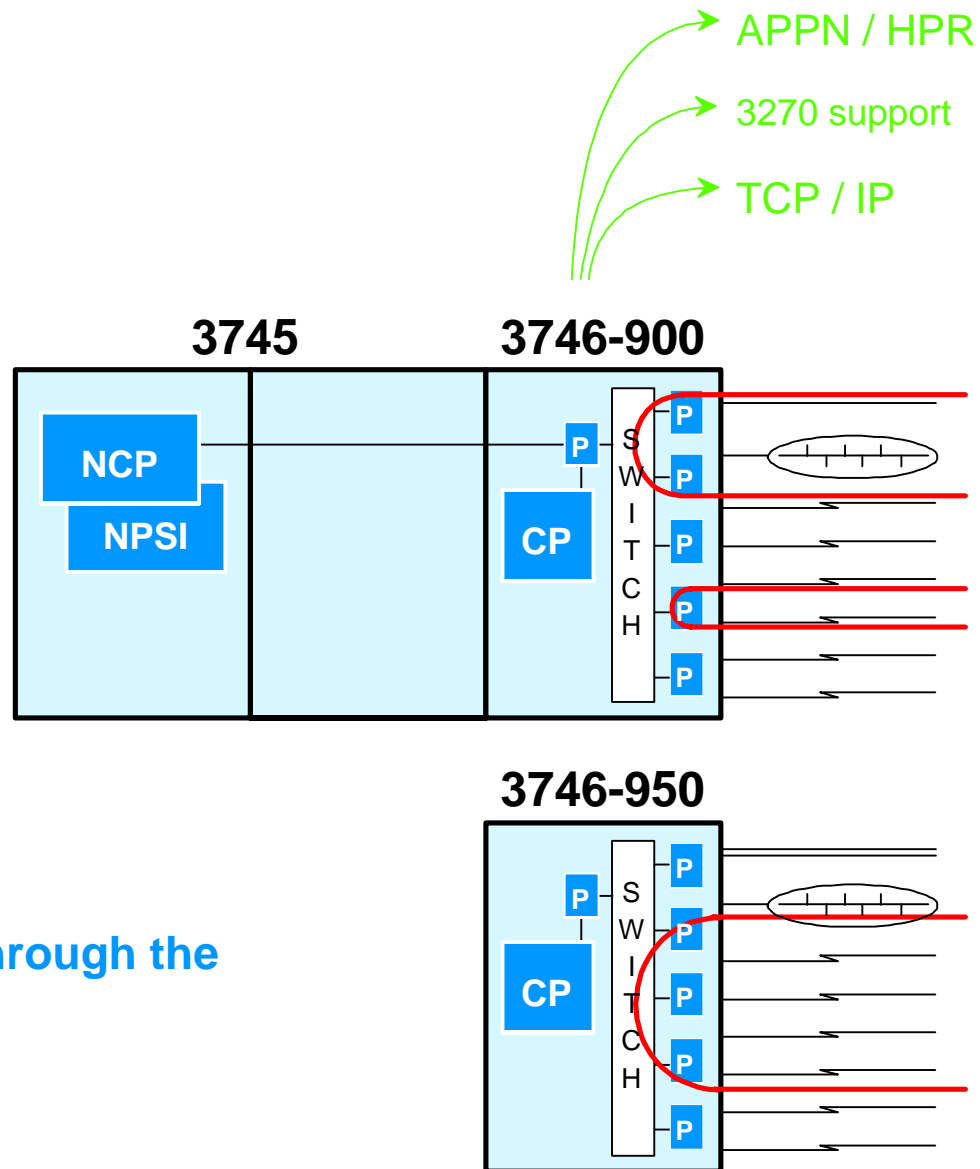
- **ATM**
  - LAN Emulation Client (ATM Forum)
  - Classical IP routing
- **ESCON**
  - Supports 3 channel attached methods
    - MPC+ (Multi-Path Channel)
    - LCS (LAN Channel Station)
    - LSA (Link Services Architecture)
  - Enables access to Host applications
    - VTAM/SNA
    - TCP/IP
  - Supports multiple Hosts/LPARs per 1 adapter
    - ESCON Directors
    - LPARS on EMIF Hosts
  - Hosts/LPARs supported per 1 adapter
    - 16 for HPR or IP traffic
    - 32 for APPN traffic
- **PRI-ISDN (30 B + D)**
  - Connectivity per 1 adapter
    - 30 B channels for data
    - 1 D channel for traffic routing
  - "Dial Back-up" support for Multiaccess Enclosure lines
  - "Dial on Demand" support
  - Support of Frame Relay and PPP
  - World Wide (T1/J1/E1) ISDN Standard

# IBM 3746 Nways Controllers



- **Traffic (SNA, HPR or IP) is carried directly through the adapter processors, via the "switch" :**
  - If the two attachments are connected to the same adaptor, traffic only transits by that adapter's processor
  - If the two attachments are connected to different adaptors, traffic directly transits through those adapters' processors via the "switch"
- **APPN, DLUR and HPR/RTP traffic :**
  - The Control Point processor is only needed at session establishment
- **IP traffic :**
  - Routing tables are centralized in a processor (CBSP2). A cache process enables the routing of IP datagrams without involving this processor, except for new destinations.

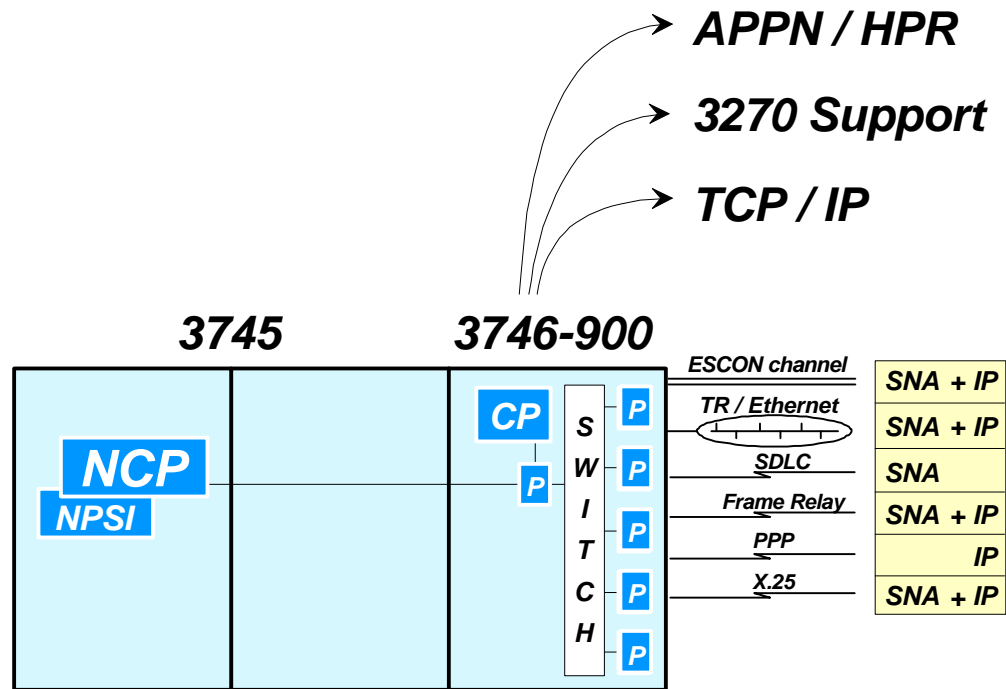
# IBM 3746 Nways Controllers - Traffic Routing



## Traffic data flows

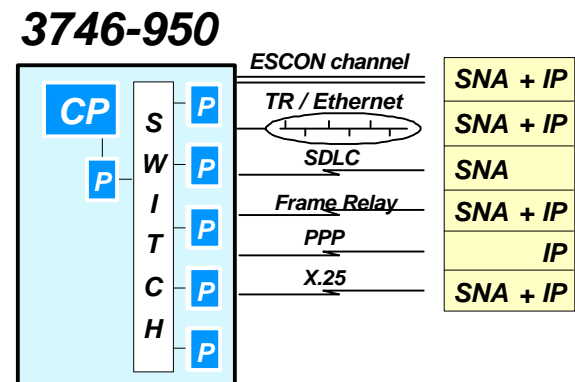
- within adapters
- adapter to adapter through the Connectivity switch

# SNA and IP support for attachments under CP Control



"SNA" = SNA(DLUR)  
APPN  
HPR

- SNA and IP over X.25 :
  - Availability 30/06/97

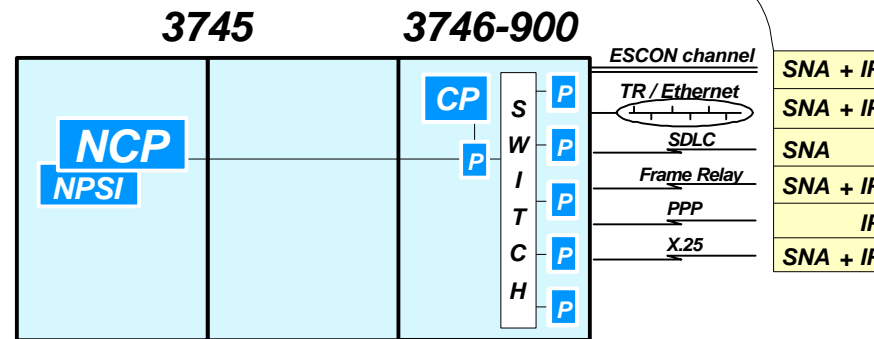


# SNA and IP support for attachments under CP Control



- SNA DLUR, APPN and HPR (ANR/RTP) over X.25 :
  - Availability 30/06/97
- HPR/MLTG over Token-Ring, Ethernet, SDLC, Frame Relay and X.25 :
  - Availability 30/06/97

		HPR			
ESCON channel		APPN	ANR*	RTP	IP
Token Ring / Ethernet	SNA DLUR	APPN	ANR*	RTP	IP
SDLC	SNA DLUR	APPN	ANR*	RTP	
Frame Relay	SNA DLUR	APPN	ANR**	RTP	IP
PPP					IP
X.25	SNA DLUR	APPN	ANR*	RTP	IP

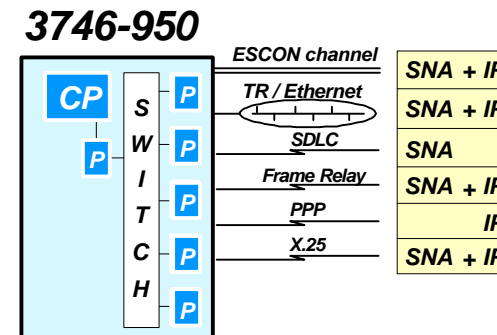


SNA DLUR { Support of dependent LUs in T2.0 and T2.1 nodes  
 → in particular, 3270 traffic

2 modes for the ANR routing of HPR :

- \* with error control at node level (ERP)
- \*\* without error control at node level (non-ERP)

→ Optimized use of HPR





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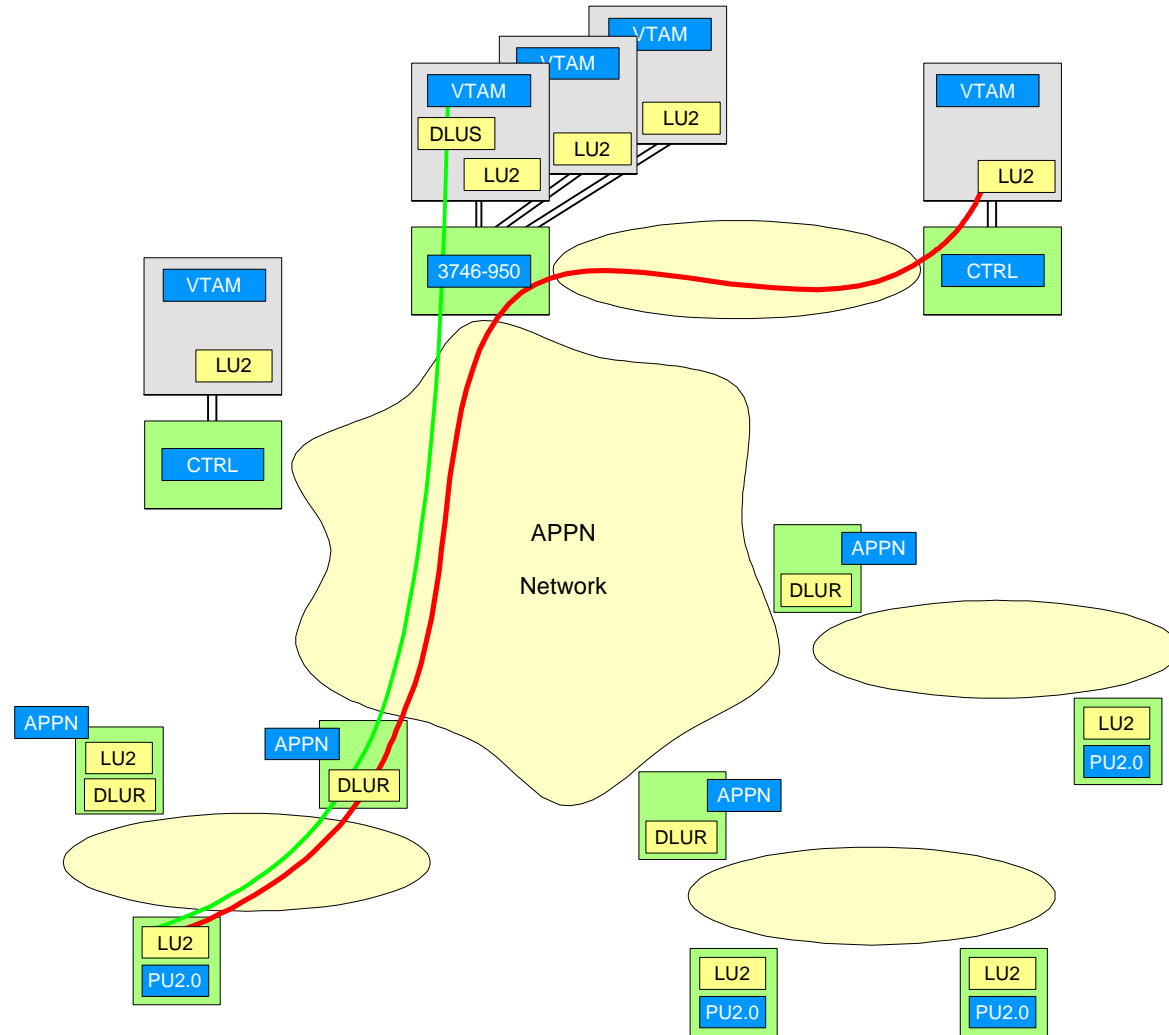
# Dependent LU support



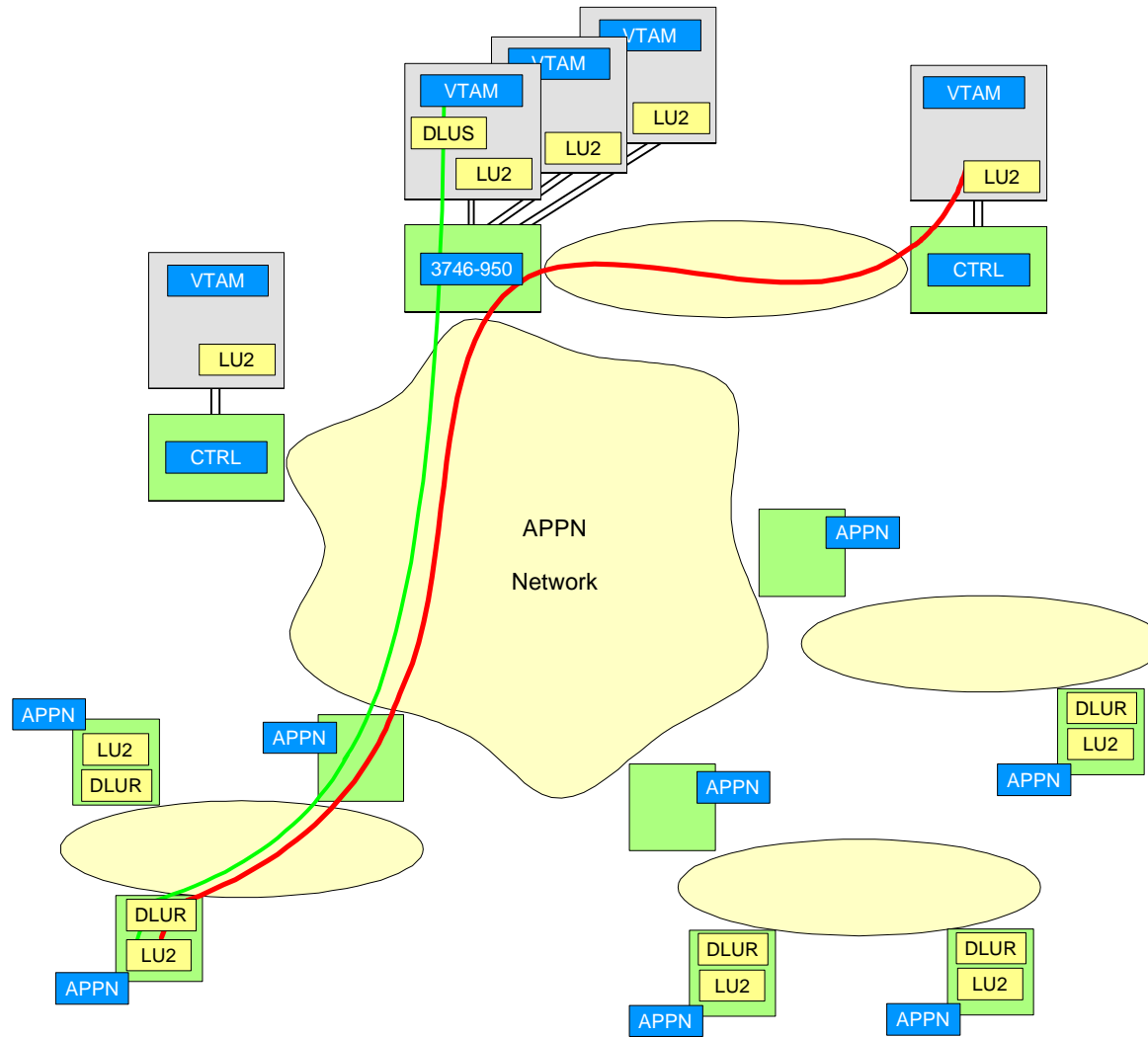
- **Dependent LUs :**
  - Depending on a VTAM
  - LU 0, LU 1, LU 2, LU 3 or LU 6.2
  - One single session, with a VTAM application
  - Residing in type 2 (PU2) or type 2.1 SNA nodes
- **Independent LUs :**
  - Only LU 6.2
  - Support several sessions, with one or more partner LU 6.2
  - Residing in type 2.1 nodes
- **Dependent LU traffic can be carried through an APPN network thanks to the DLUR function (Dependent LU Requester)**
- **The DLUR function works together with a DLUS function (Dependent LU Server), residing on a VTAM level 4.2 or above.**
- **The DLUR function is allowed several levels of freedom for its localisation :**
  - DLUR at server access level (3746-950) : with this option, the 3746-950 supports type 2 or 2.1 SNA nodes
  - DLUR at network access level (CS/2, 2217, 3746-950, 2216, 2210, ...)
  - DLUR at station level (3174 ...)



# Dependent LU Requester at Network Access level



# Dependent LU Requester at Station level

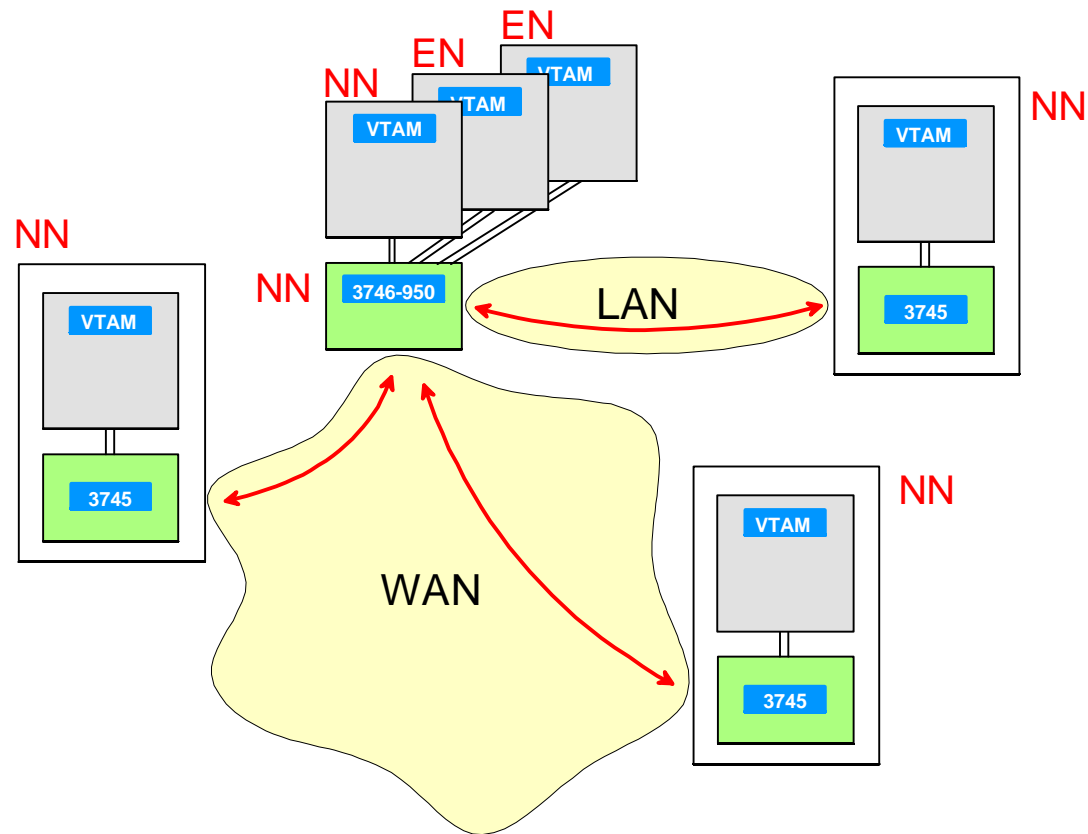


# VTAM and 3745 support



- The 3746-950 is an APPN Network Node (NN). It supports type 2.1 SNA nodes :
  - NN (Network Node APPN)
  - EN (End Node APPN)
  - LEN (Low Entry Network Node)
- Reminder : in an SNA subarea network :
  - A NCP (3725, 3720 or 3745) is a type 4 SNA node
  - A VTAM is a type 5 SNA node
- The 3746-950 does not communicate with type 4 or 5 SNA nodes
- The 3746-950 communicates with a VTAM, which operates as an APPN node (NN or EN) :
  - Minimum VTAM level : 4.3
- The 3746-950 communicates with a 3745 which operates as an APPN network node. This is not possible for a standalone 3745, but it is for a 3745 associated to a VTAM (Composite Network Node) :
  - Minimum VTAM level : 4.3
  - Minimum NCP level : 6.2

# VTAM and 3745 support



- Necessary levels :
  - VTAM 4.3 and NCP 6.2

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# The 3746 Nways Controller - IP Router

## Single Router Image

### IP routing on :

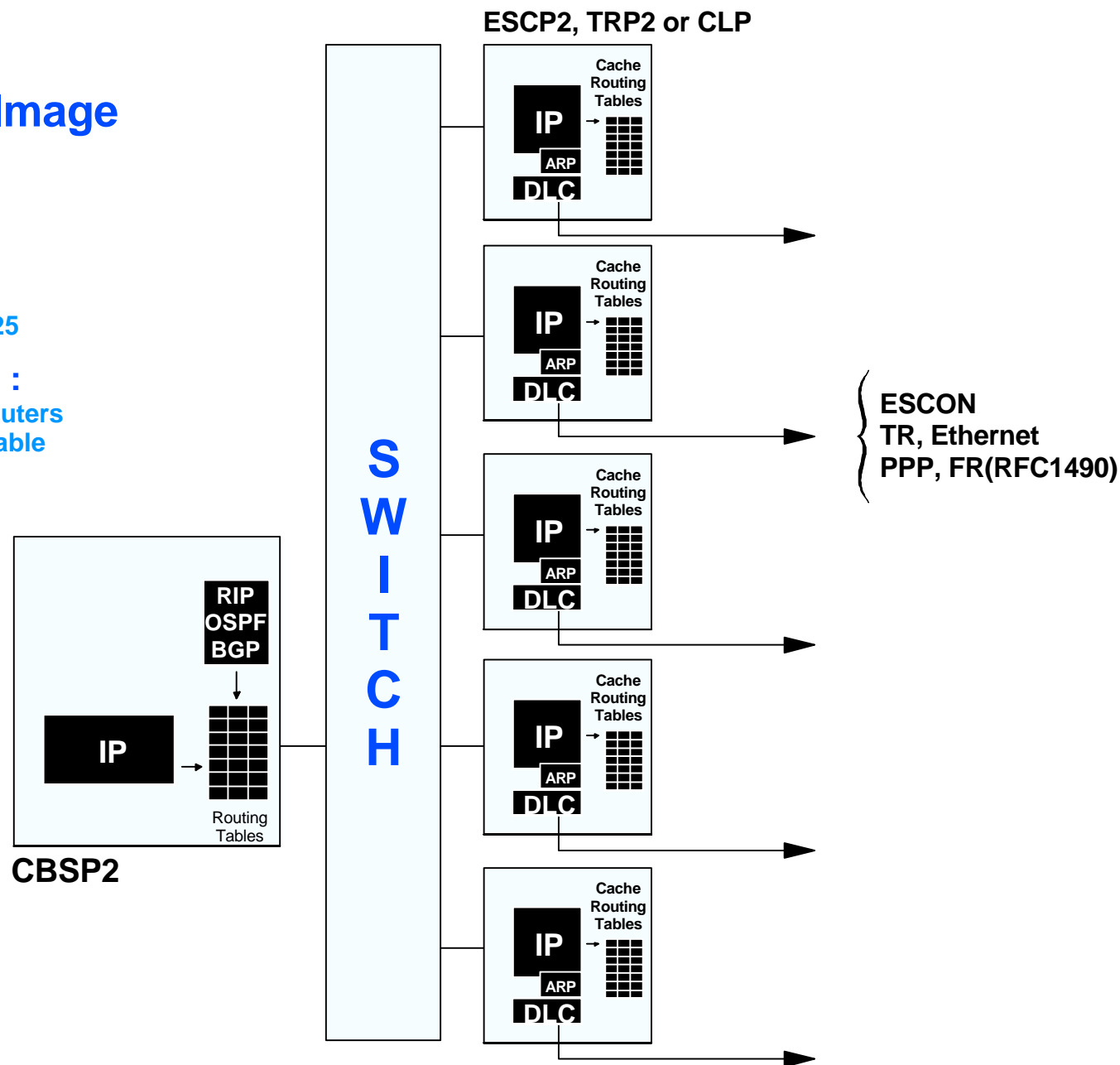
- ESCON
- Token Ring, Ethernet
- PPP, Frame Relay, X25

### Up to 16 Adapters :

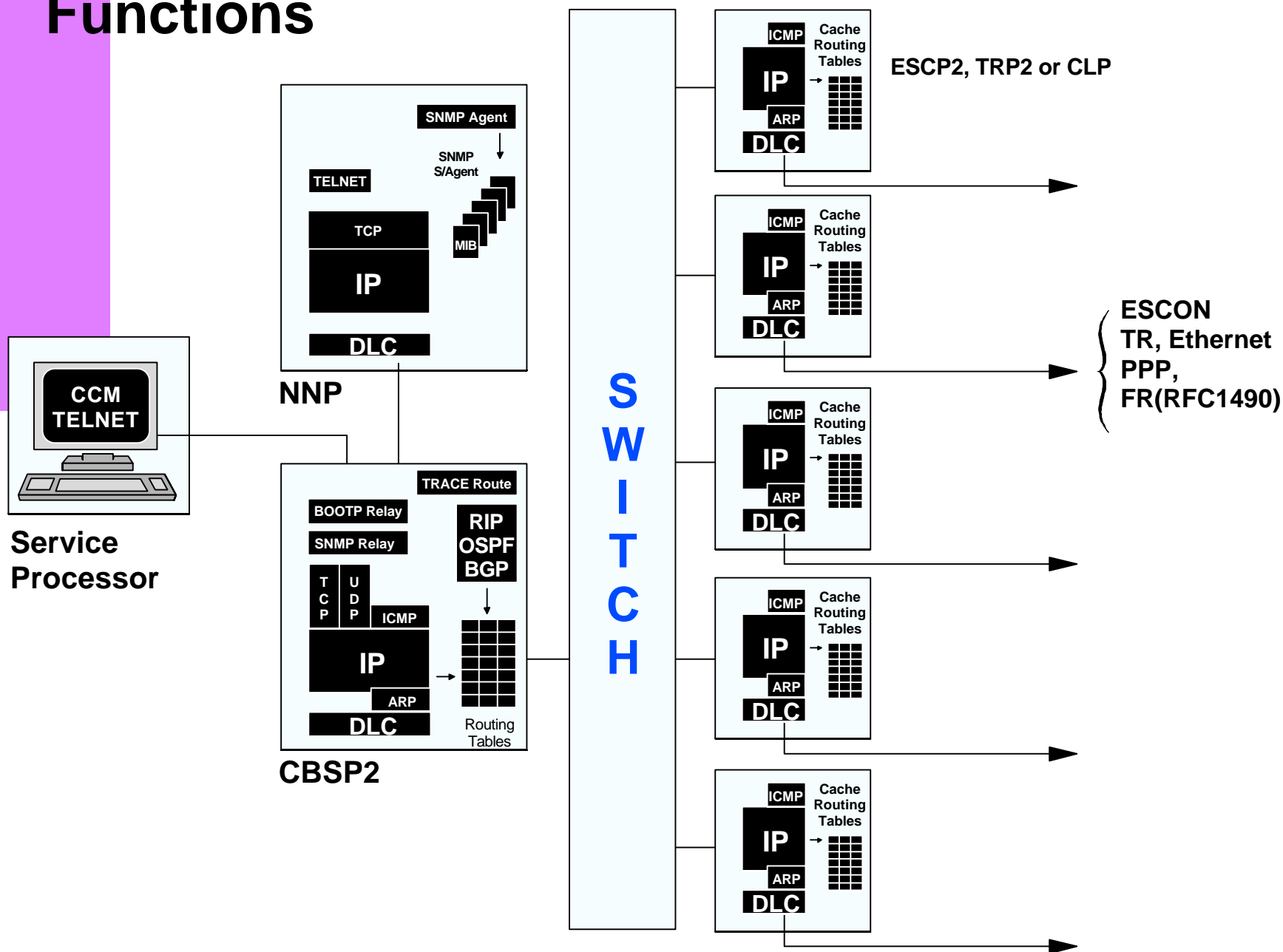
- 16 Independent IP Routers
- 16 CACHE Routing Table

### Protocols :

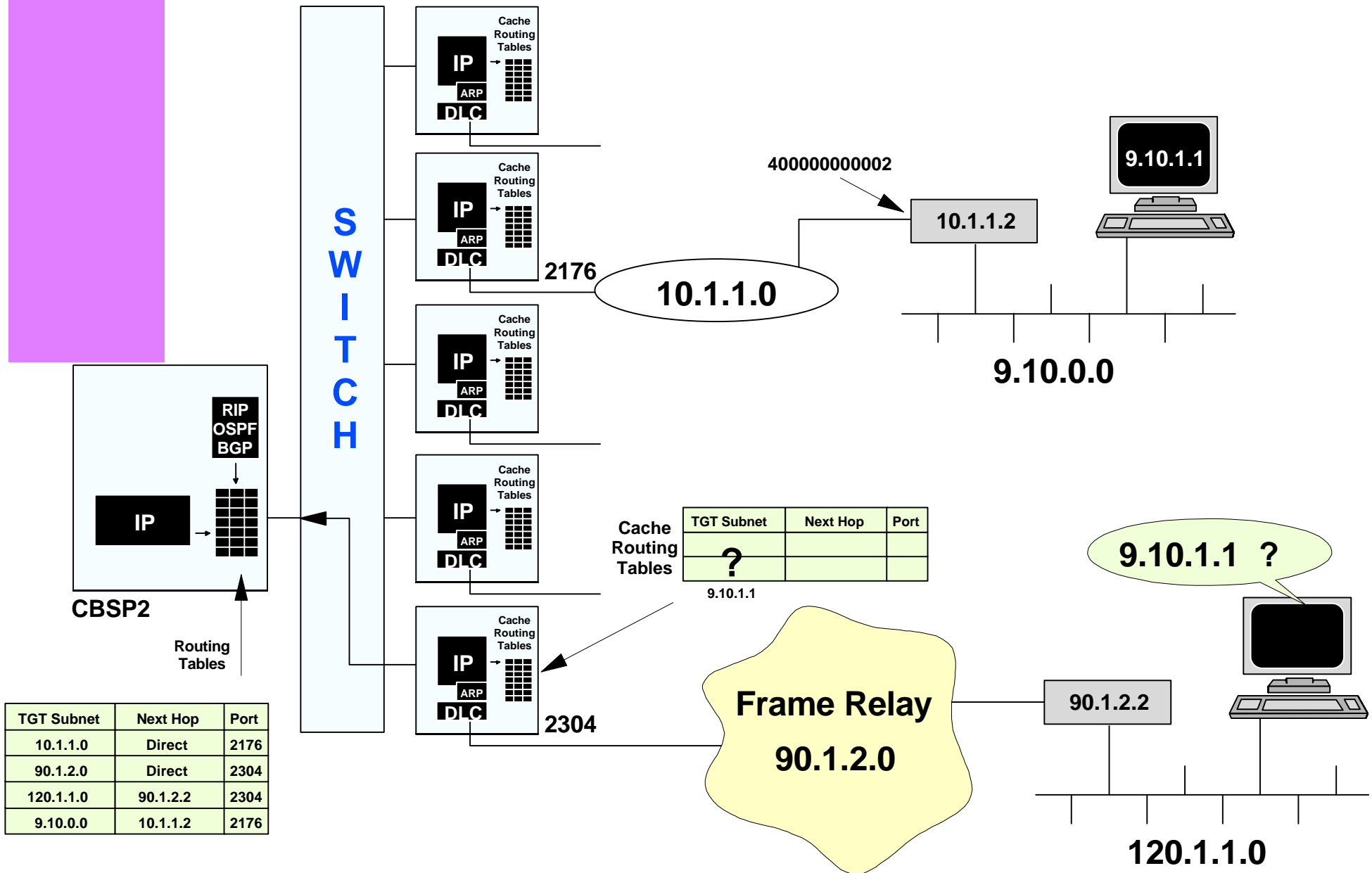
- RIP (V1)
- OSPF (V2)
- BGP (V4)



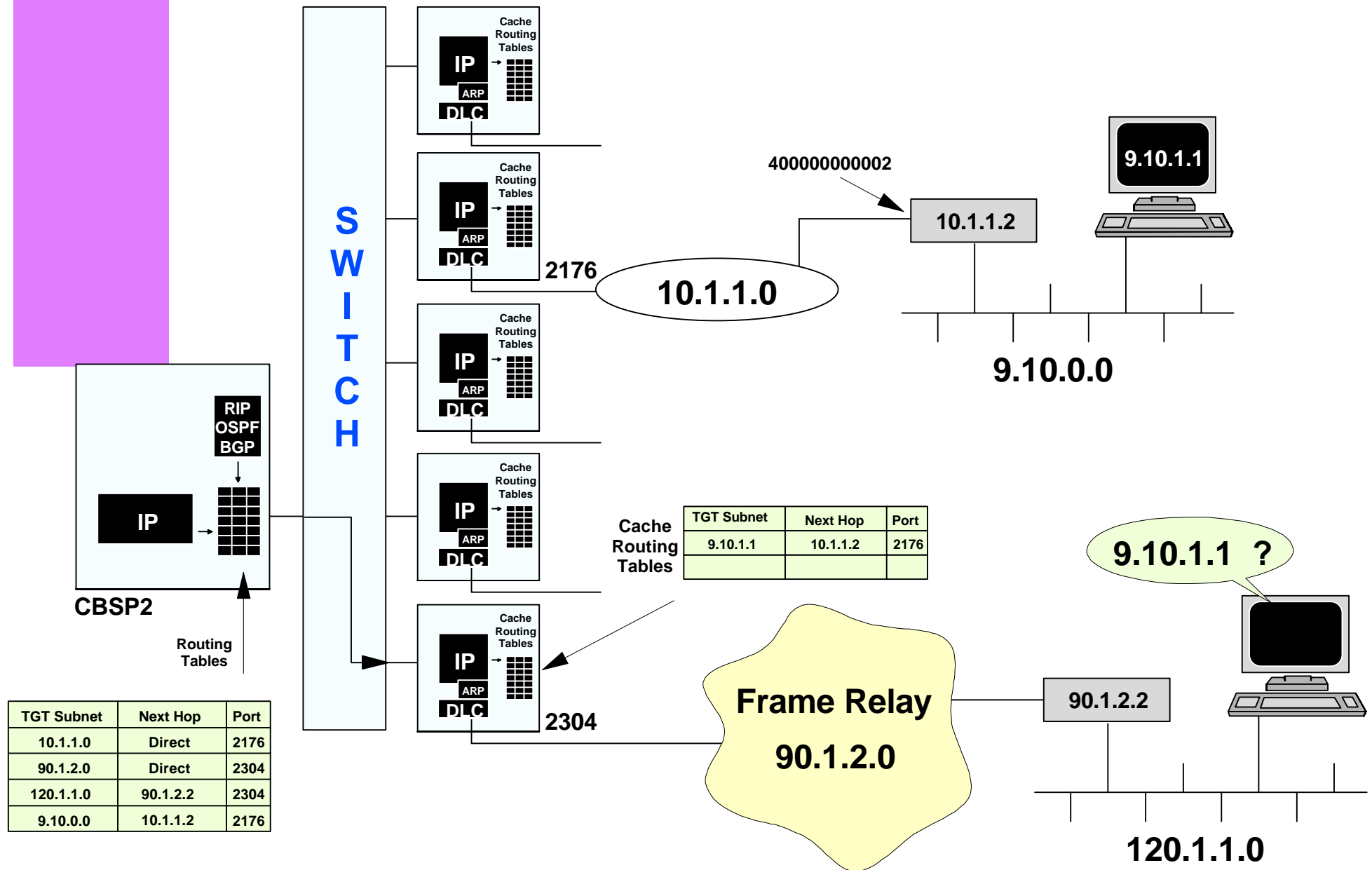
# IBM 3746 - IP Router (Telnet, SNMP) Functions



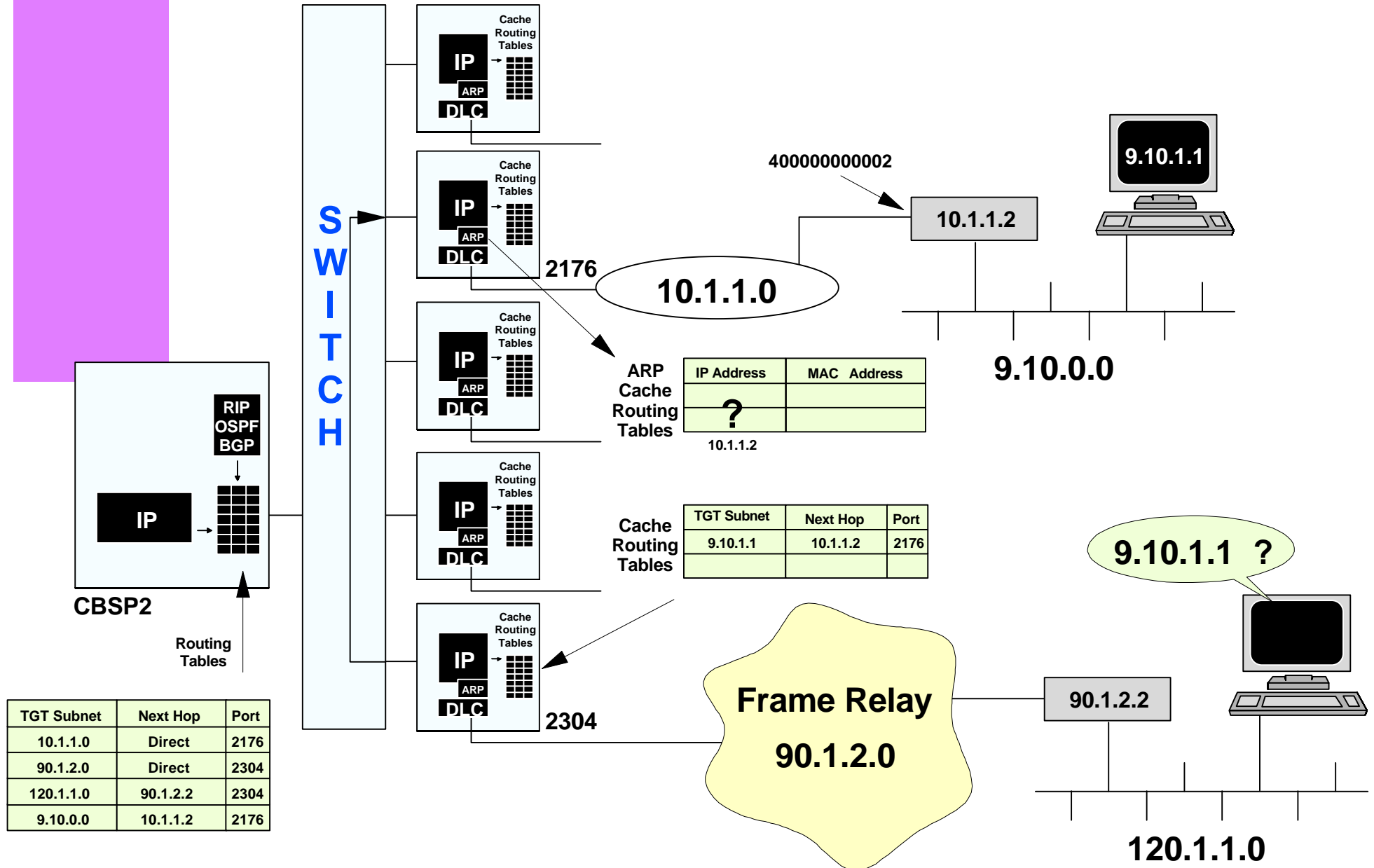
# IBM 3746 - IP Routing (1/5)



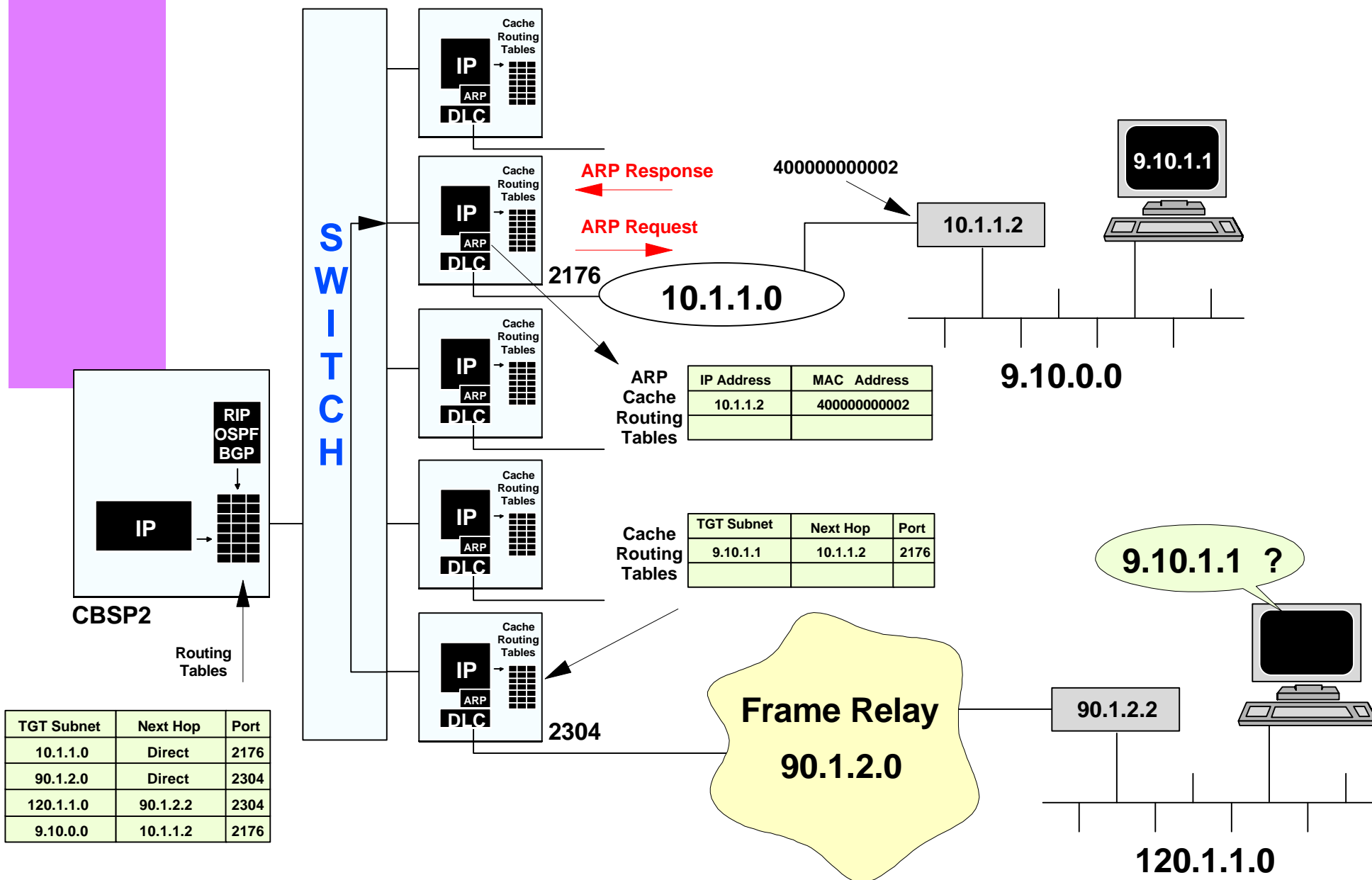
# IBM 3746 - IP Routing (2/5)



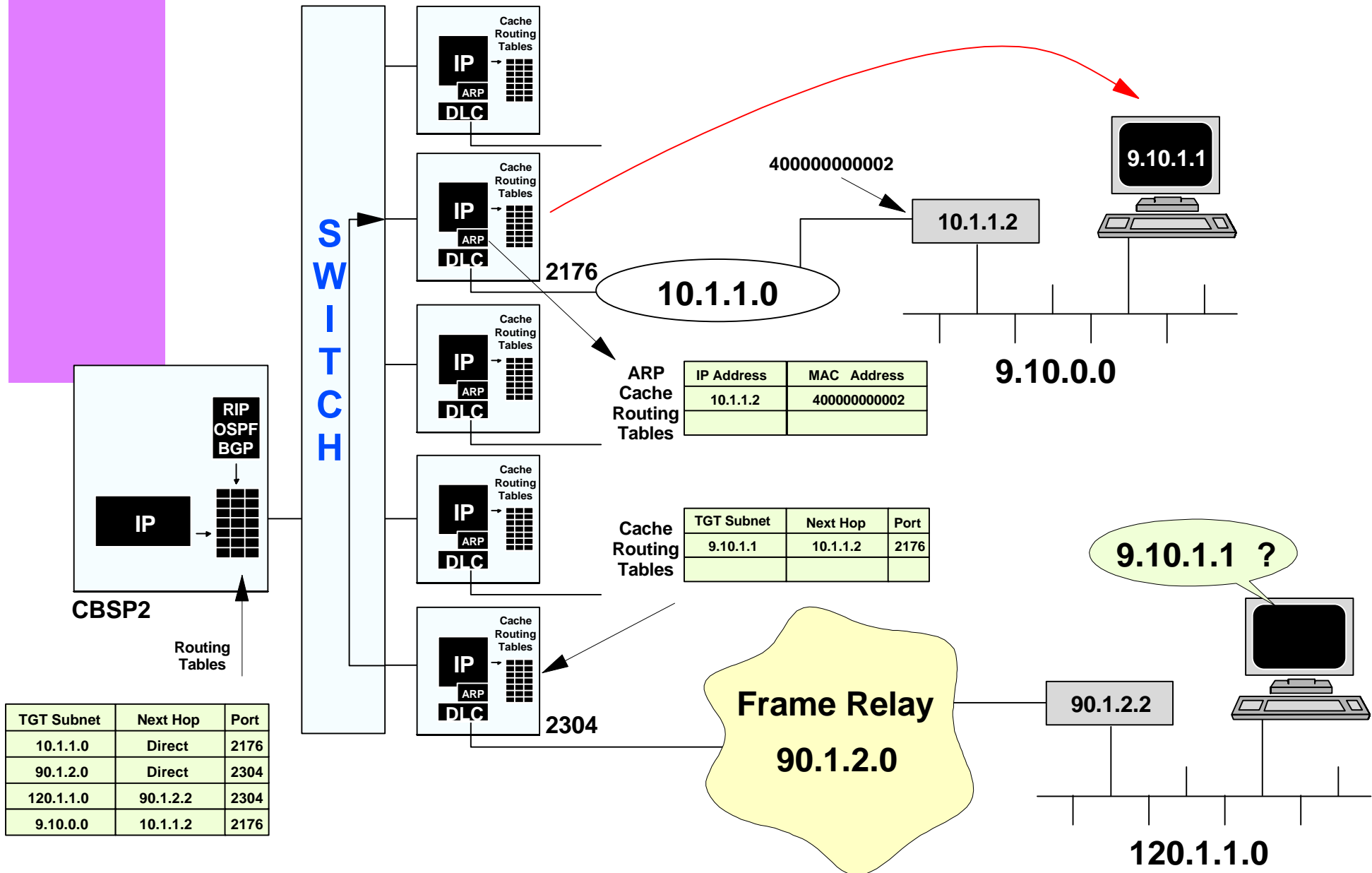
# IBM 3746 - IP Routing (3/5)



# IBM 3746 - IP Routing (4/5)



# IBM 3746 - IP Routing (5/5)



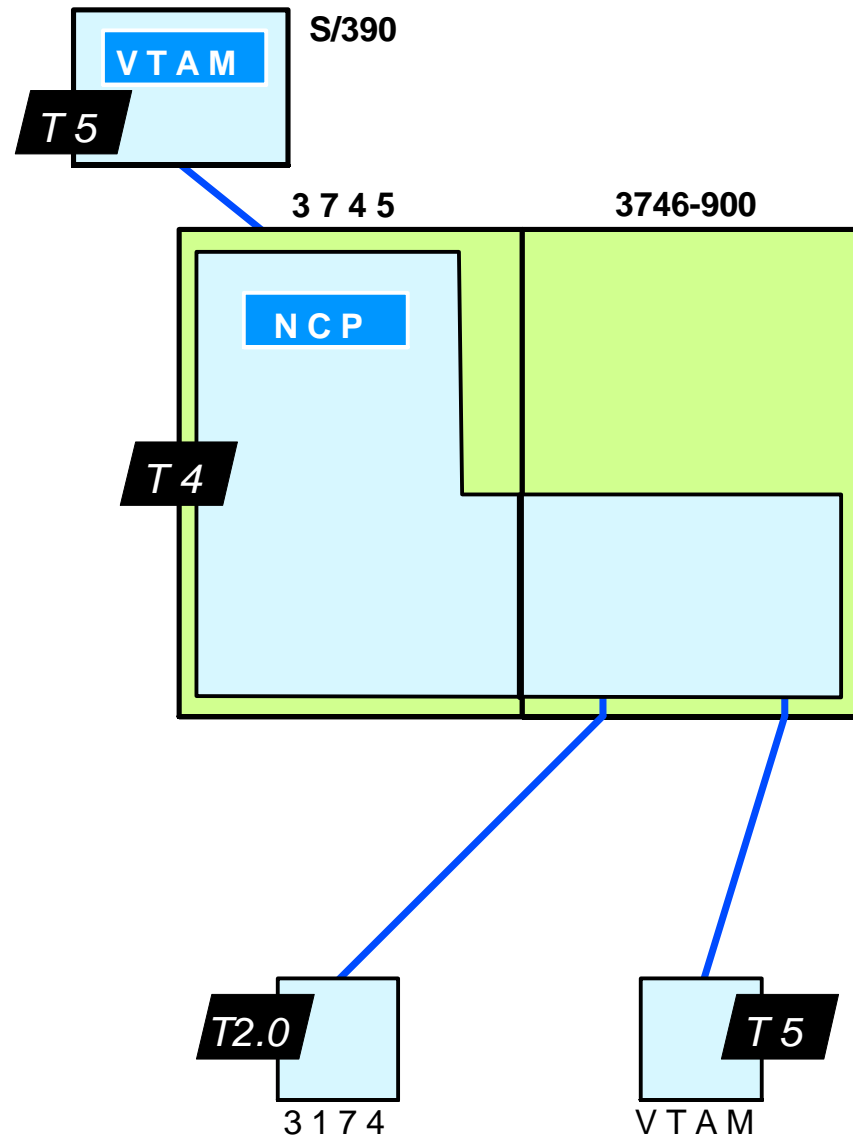
# Contents



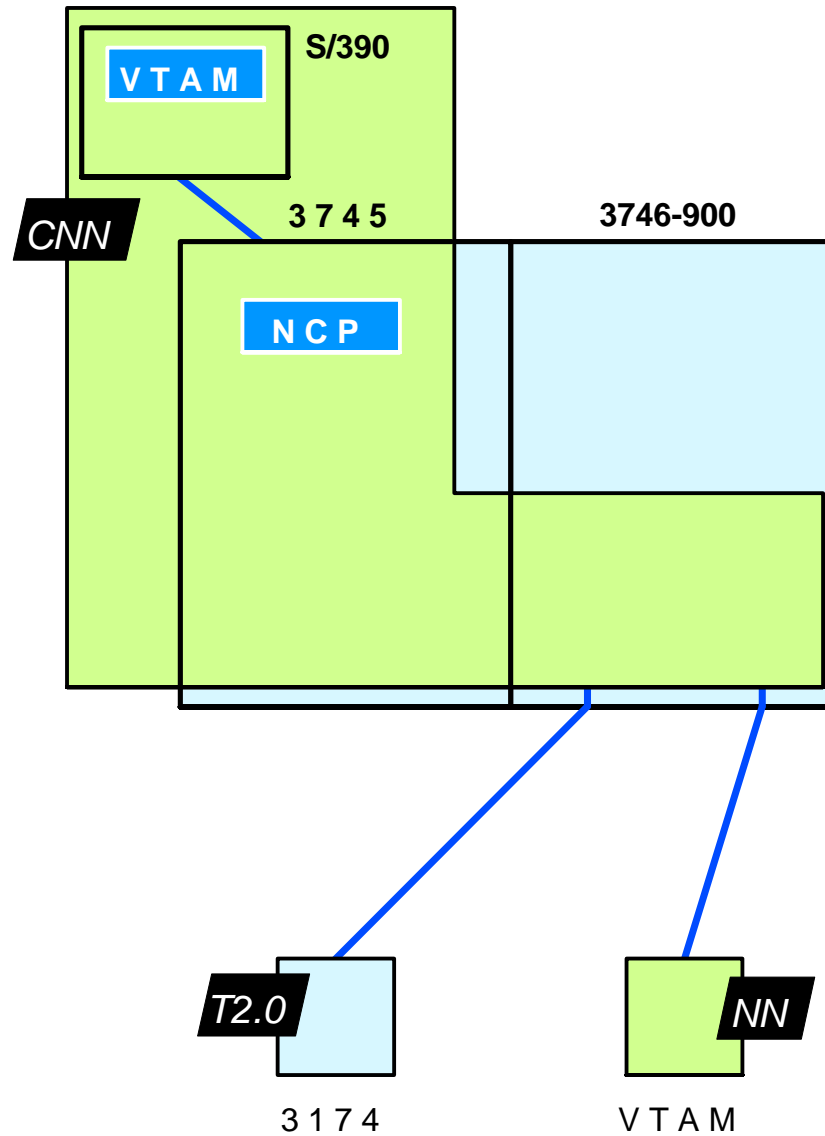
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- *3746 Nways Controller Connectivity*
- *Data flow control : CIR & BRS*



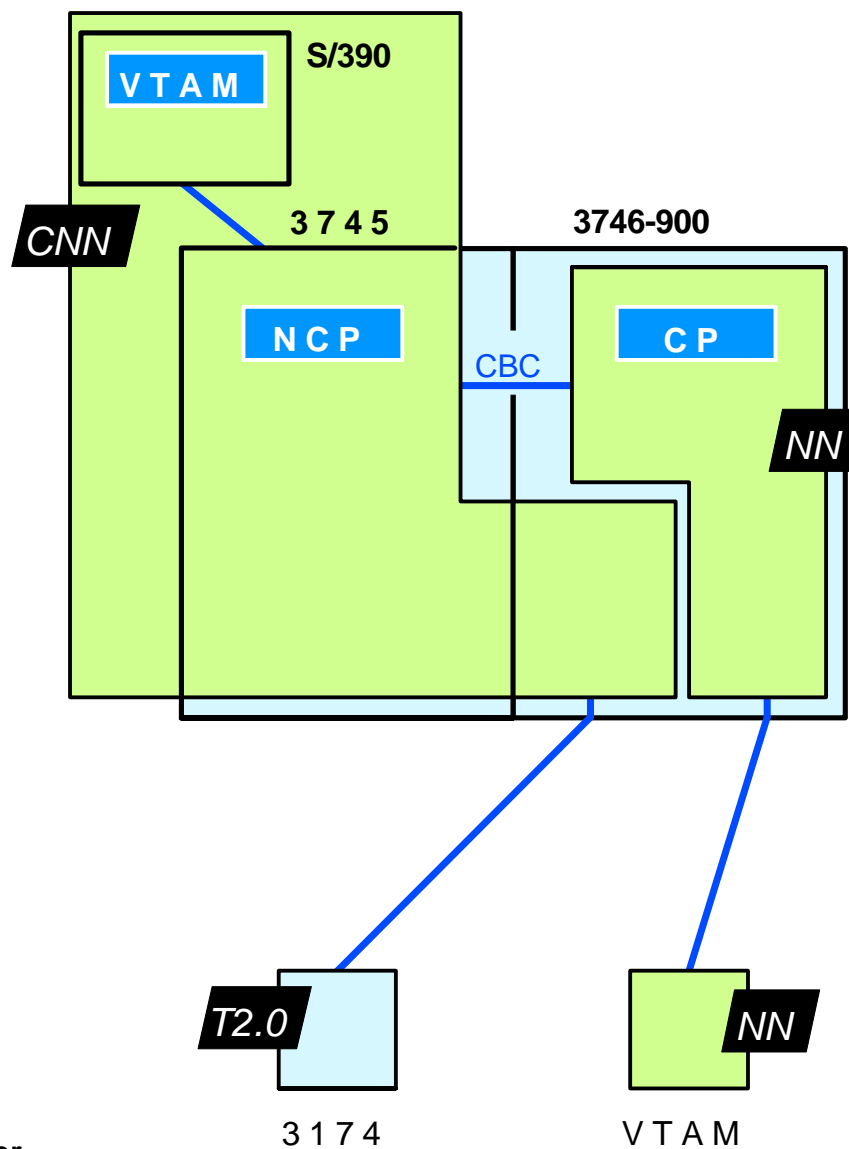
# Evolution from 3745 to 3746-950 (1)



# Evolution from 3745 to 3746-950 (2)

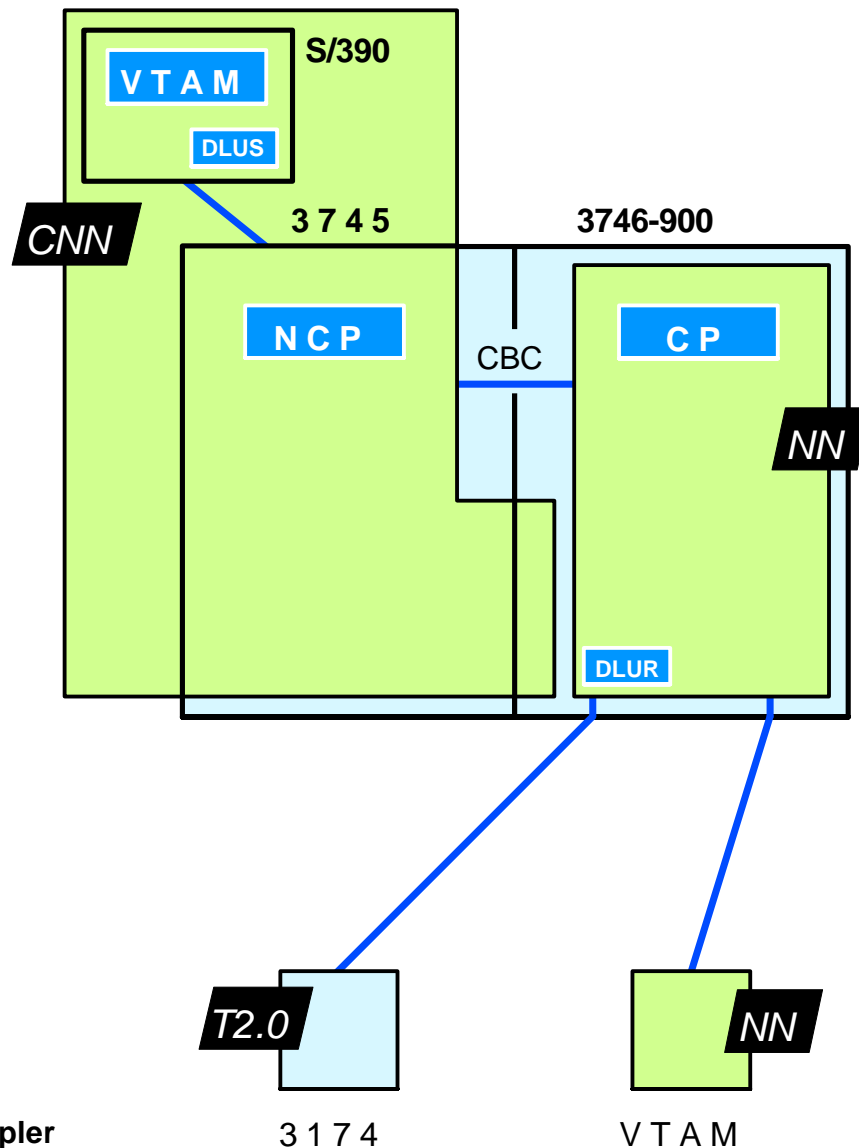


# Evolution from 3745 to 3746-950 (3)



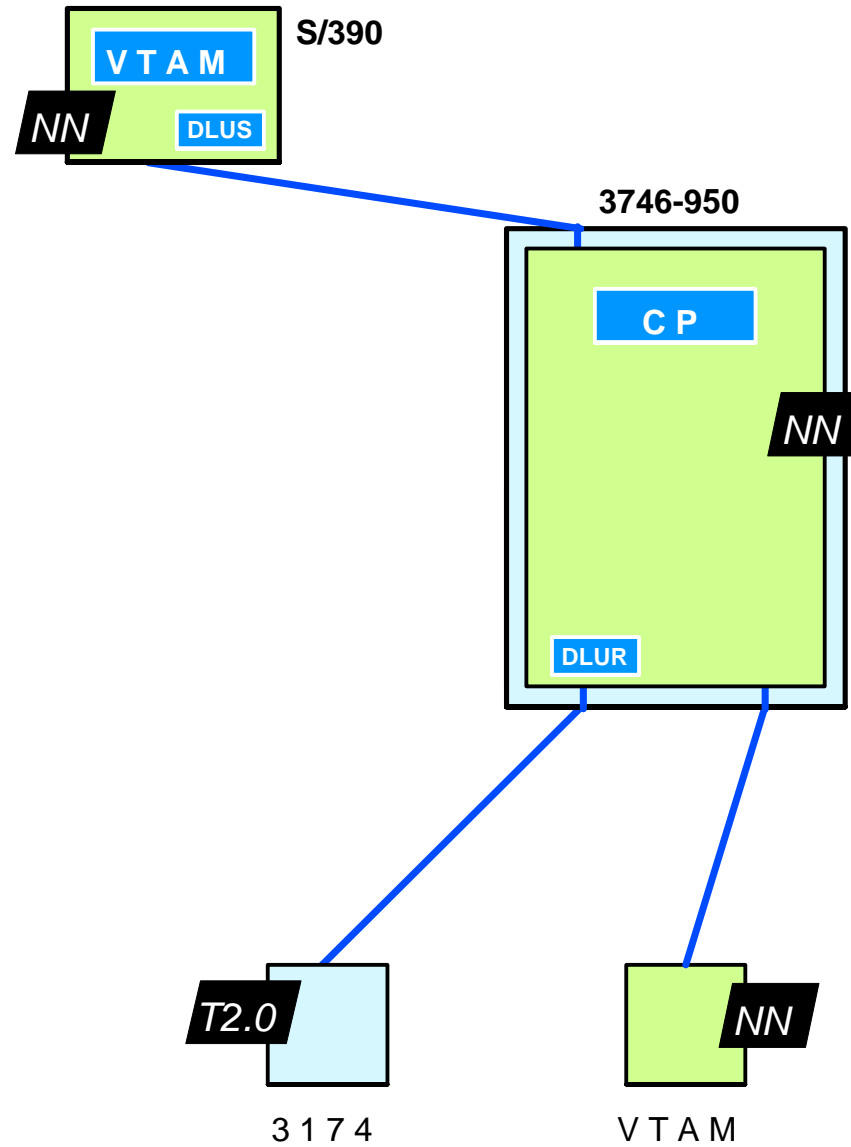
**CBC = Controller Bus Coupler**

# Evolution from 3745 to 3746-950 (4)

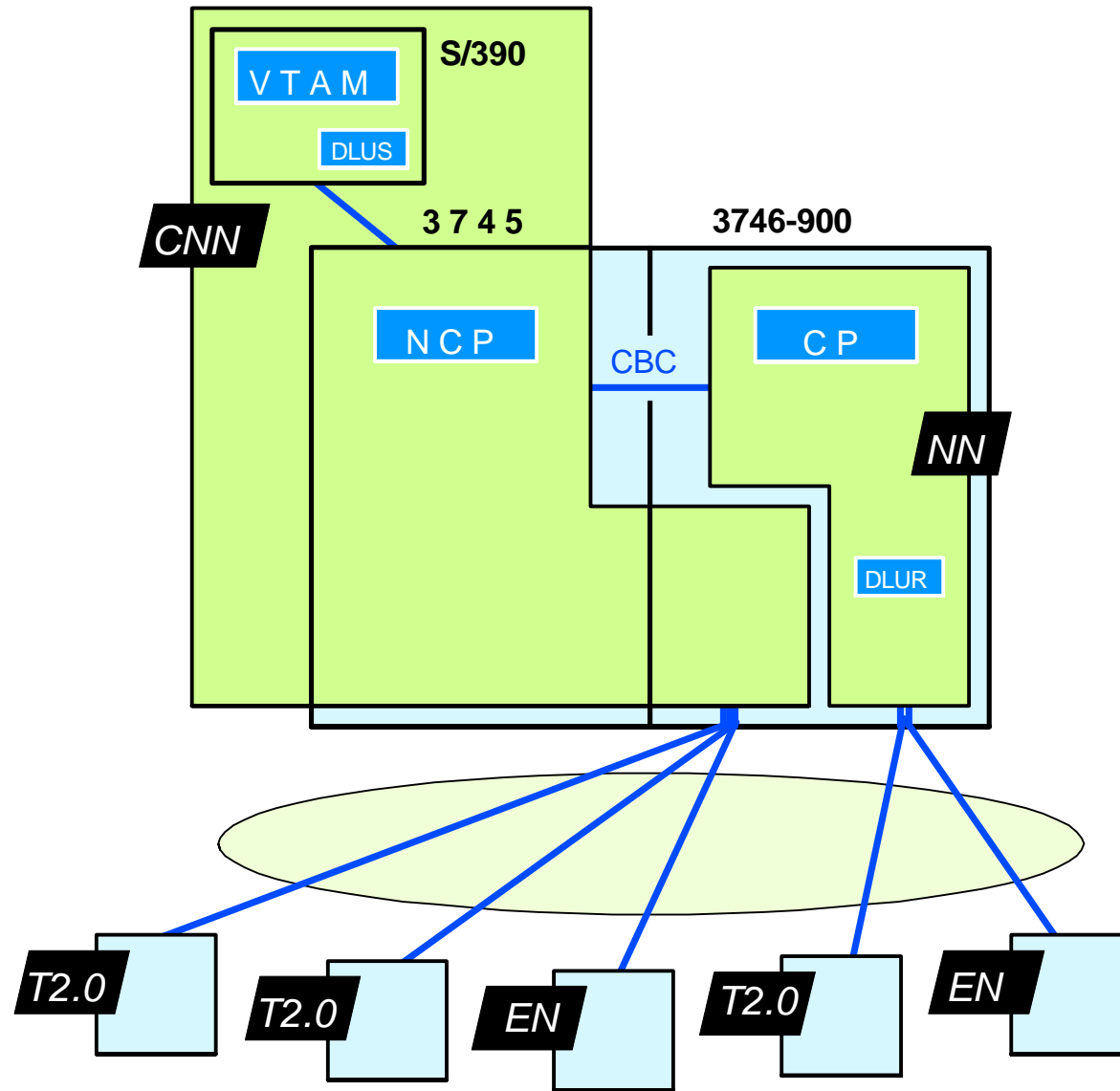


CBC = Controller Bus Coupler

# Evolution from 3745 to 3746-950 (5)



# Evolution from 3745 to 3746-950



- Migration of Token-Ring stations from NCP to 3746 CP

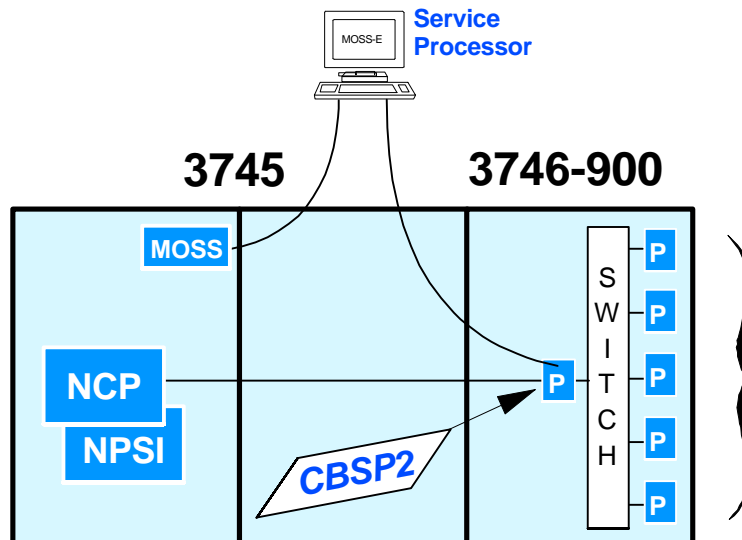
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- *Data flow control : CIR & BRS*

# IBM 3746-900 Processor Types

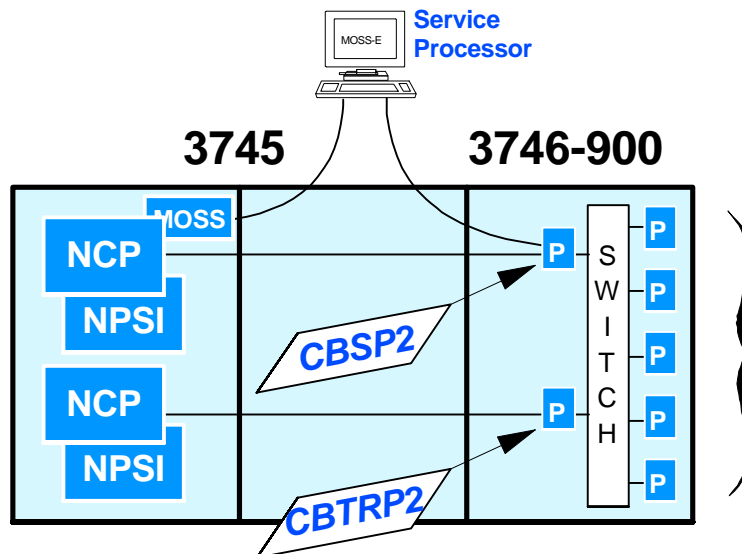
**3746-900 with a  
3745 Single CCU  
(17A, 21A, 31A)**



**Up to 16 processors**

- **ESCP2**  
(ESCON)
- **TRP2**  
(Token-Ring, Ethernet)
- **CLP**  
(SDLC, F/R, X.25, PRI-ISDN(F/R))

**3746-900 with a  
3745 Twin CCU  
(41A, 61A)**



**Up to 15 processors**

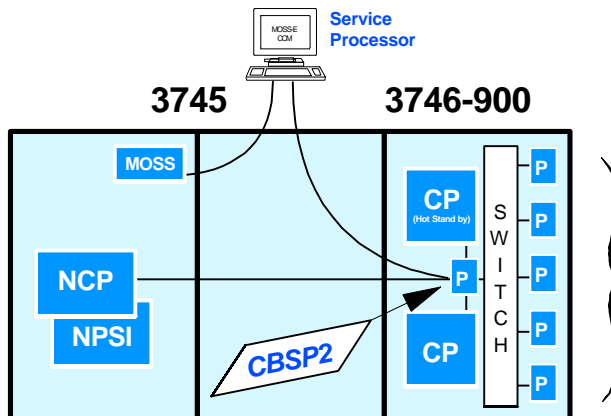
- **ESCP2**  
(ESCON)
- **TRP2**  
(Token-Ring, Ethernet)
- **CLP**  
(SDLC, F/R, X.25, PRI-ISDN(F/R))

- **CBSP2** : Controller Bus and Service Processor Type 2
- **CBTRP2** : Controller Bus and Token-Ring Processor Type 2
- **MOSS** : Maintenance and Operator Subsystem



# IBM 3746 Nways Controller - Processor Types

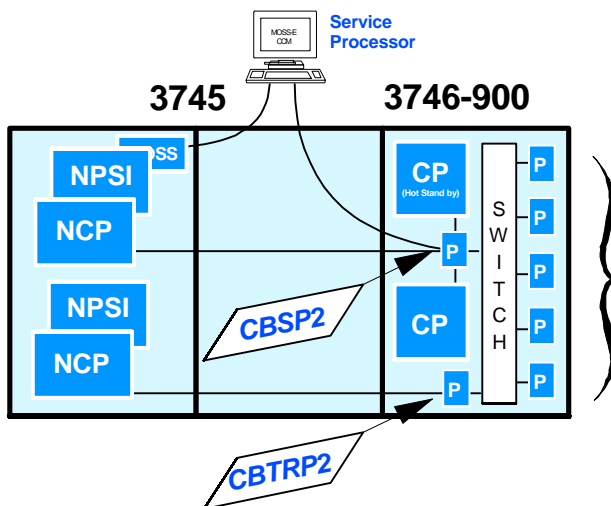
3746-900 with a 3745 Single CCU (17A, 21A, 31A)



Up to 16 processors

- ESCP2 (ESCON)
- TRP2 (Token-Ring, Ethernet)
- CLP (SDLC, F/R, X.25, PPP)

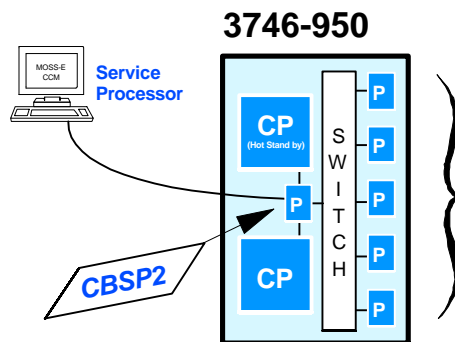
3746-900 with a 3745 Twin CCU (41A, 61A)



Up to 15 processors

- ESCP2 (ESCON)
- TRP2 (Token-Ring, Ethernet)
- CLP (SDLC, F/R, X.25, PPP)

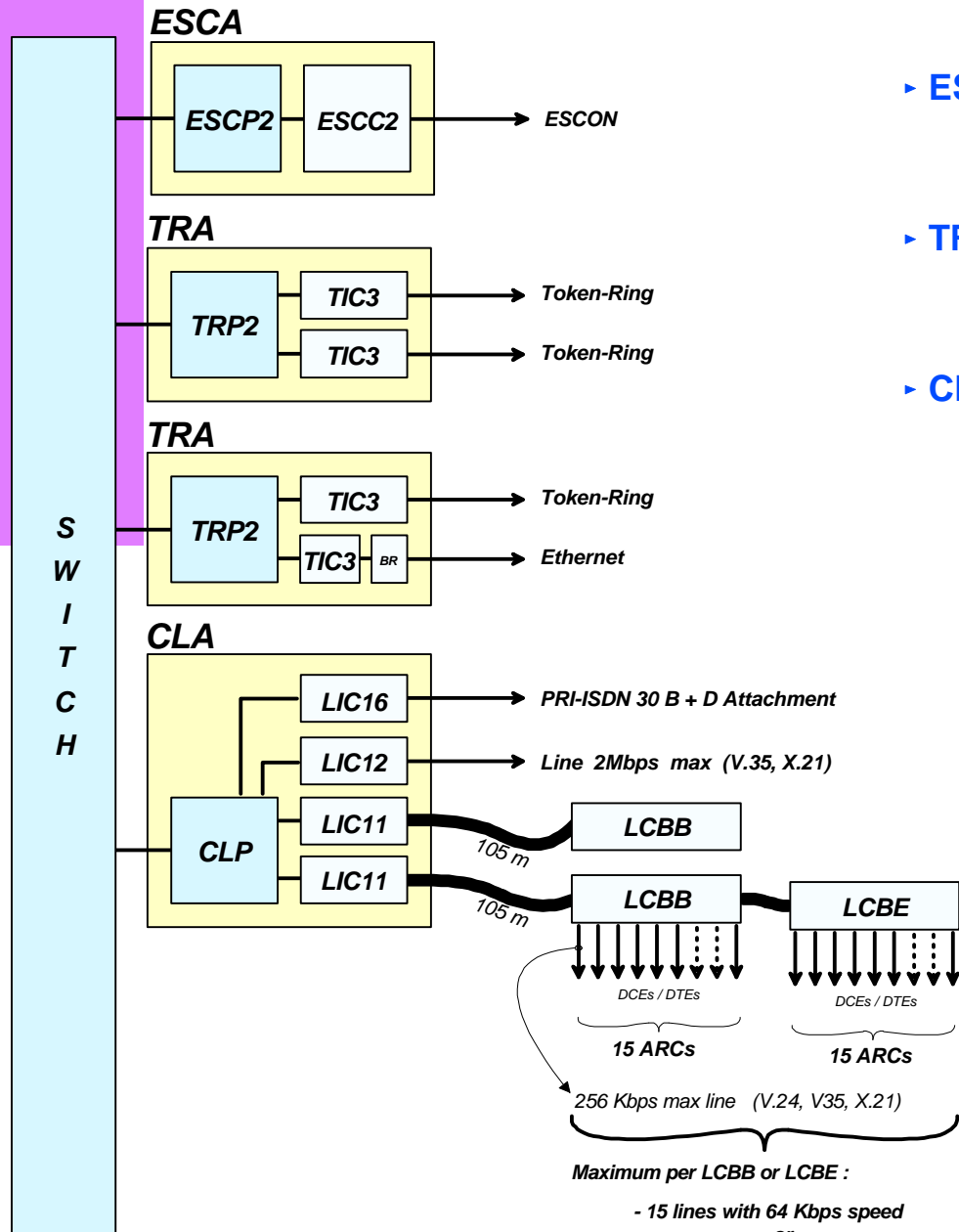
3746-950



Up to 16 processors

- ESCP2 (ESCON)
- TRP2 (Token-Ring, Ethernet)
- CLP (SDLC, F/R, X.25, PPP)

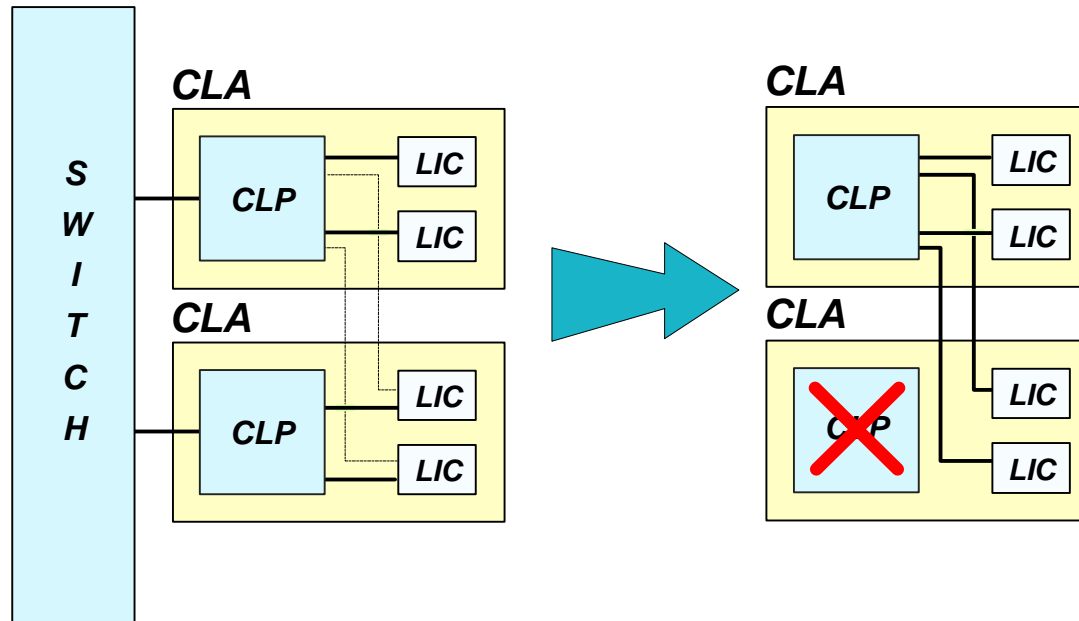
# IBM 3746 - Processors (ESCP2, TRP2, CLP)



- ▶ **ESCA :** **ESCON Channel Adapter**
  - **ESCP2 :** **ESCON Channel Processor Type 2**
  - **ESCC2\* :** **ESCON Channel Coupler Type 2\***
- ▶ **TRA :** **Token-Ring Adapter**
  - **TRP2 :** **Token-Ring Processor Type 2**
  - **TIC3 :** **Token-Ring Interface Coupler Type 3**
- ▶ **CLA :** **Communications Line Adapter**
  - **CLP :** **Communications Line Processor**
  - **LIC :** **Line Interface Coupler**
    - ▶ **LCBB :** **Line Connection Box Base**
    - ▶ **LCBE :** **Line Connection Box Extension**
    - ▶ **ARC :** **Active Remote Connector**

\* or ESCON Channel Coupler Type 1 (if installed)

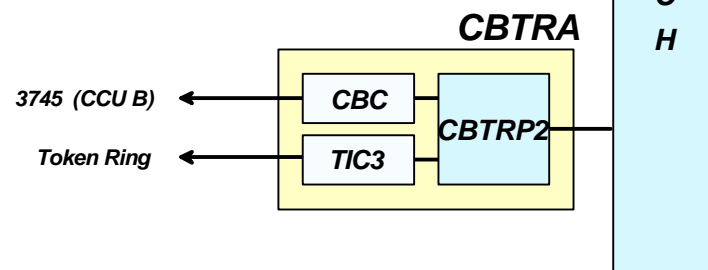
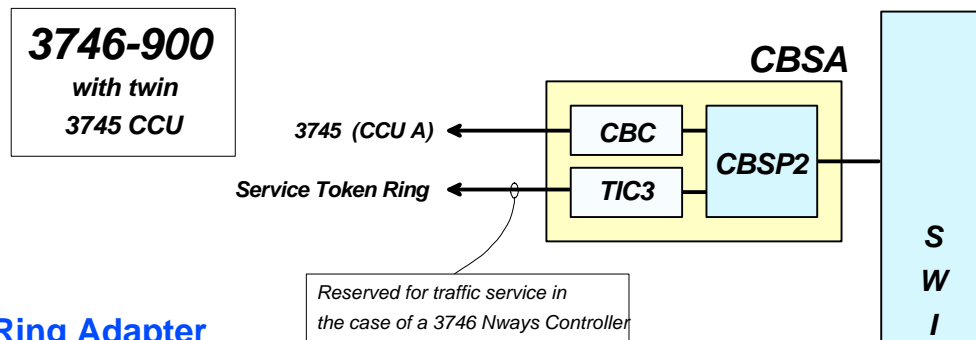
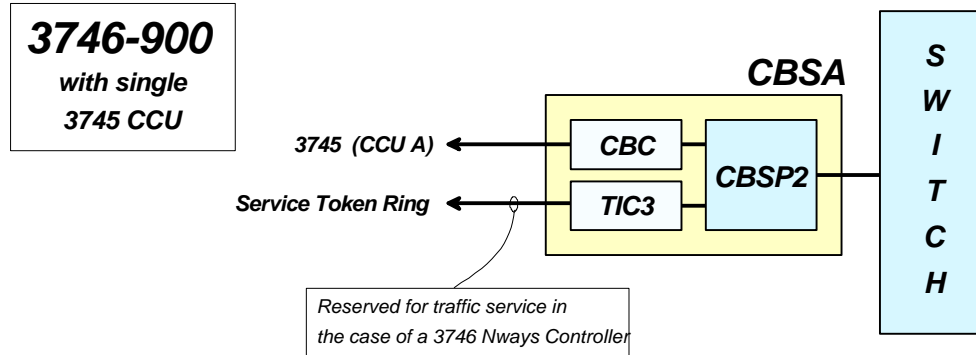
# IBM 3746 - CLP in Backup mode



- ▶ **CLA :** Communications Line Adapter
  - **CLP :** Communications Line Processor
  - **LIC :** Line Interface Coupler

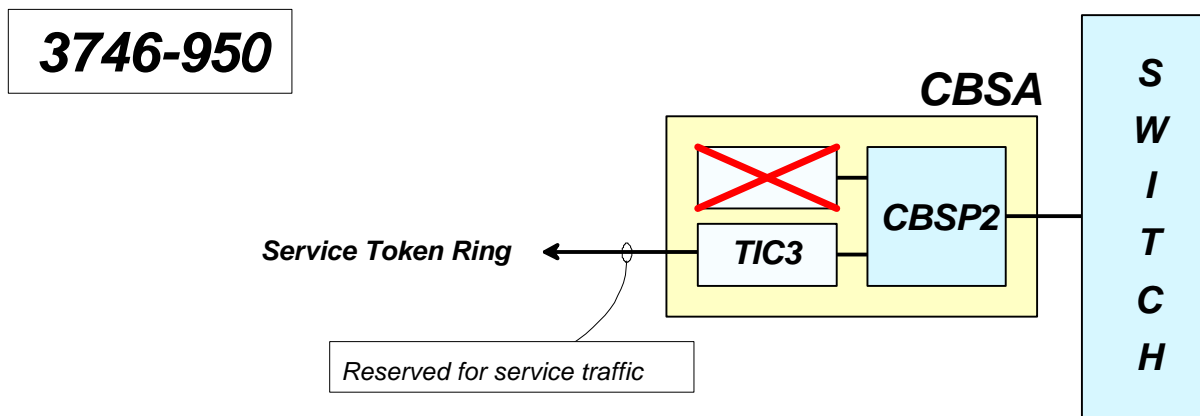
# IBM 3746 - CBSP2 and CBTRP2 Processors

## (3746-900)



- ▶ **CBTRA :**      **Controller Bus and Token-Ring Adapter**
  - **CBTRP2 :**    **Controller Bus and Token-Ring Processor Type 2 (same as TRP2)**
  - **CBC :**        **Controller Bus Coupler**
  - **TIC3 :**        **Token-Ring Interface Coupler Type 3**
- ▶ **CBSA :**        **Controller Bus and Service Adapter**
  - **CBSP2 :**    **Controller Bus and Service Processor Type 2**
  - **CBC :**        **Controller Bus Coupler**
  - **TIC3 :**        **Token-Ring Interface Coupler Type 3**

# IBM 3746 - CBSP2 Processor (3746-950)

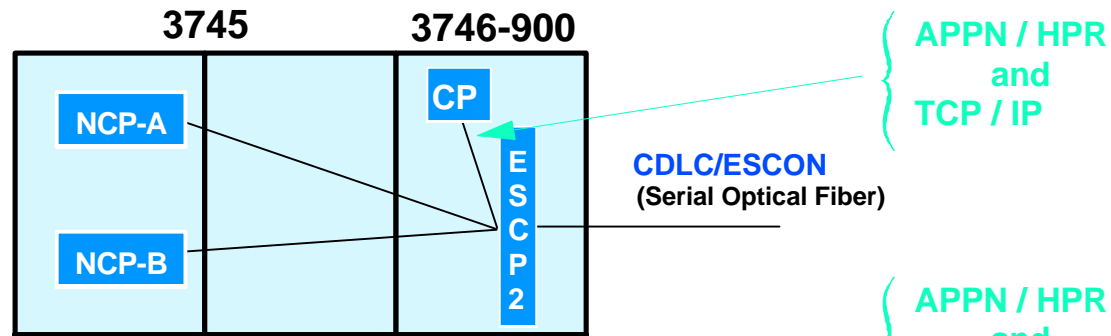


- **CBSA :**           **Controller Bus and Service Adapter**
  - **CBSP2 :**       **Controller Bus and Service Processor Type 2**
  - **TIC3 :**           **Token-Ring Interface Coupler Type 3**

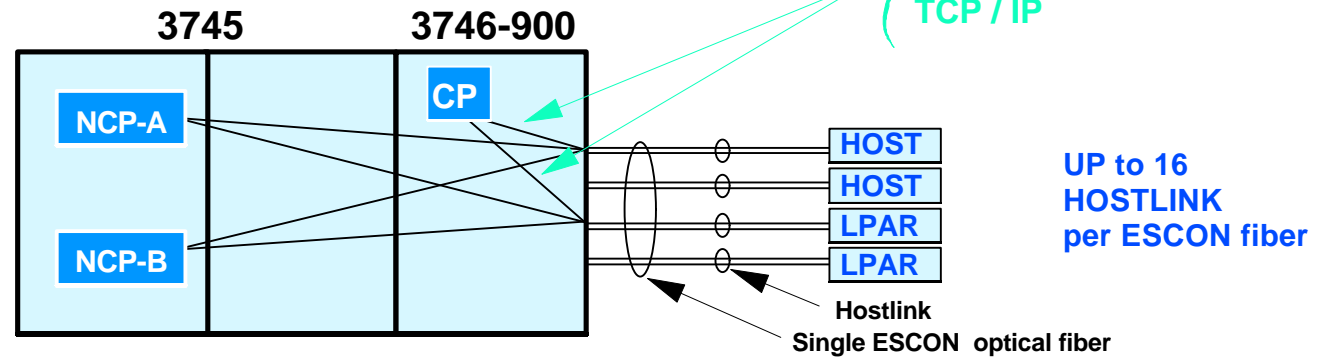
# ESCON Processor Sharing Rules



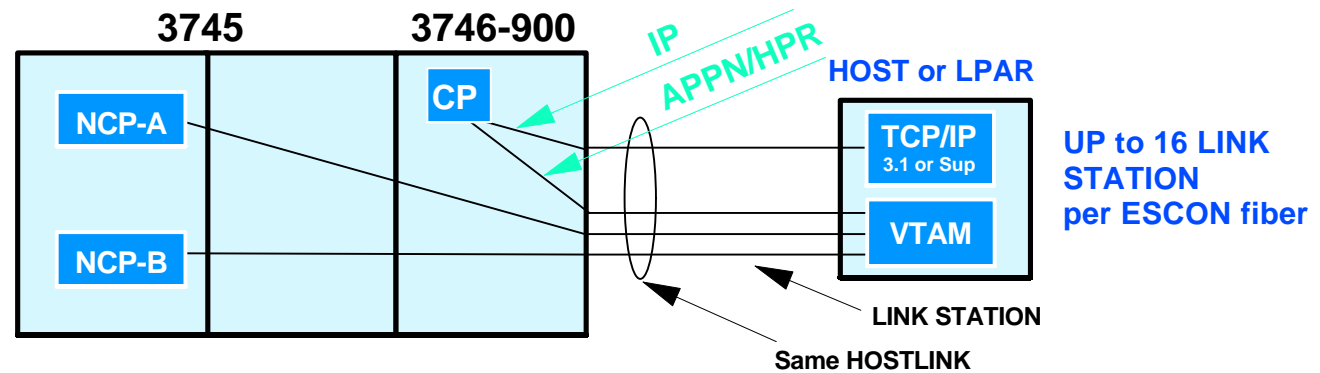
Sharing at Processor level and Coupler level



Sharing at Logical first level (HOSTLINK)



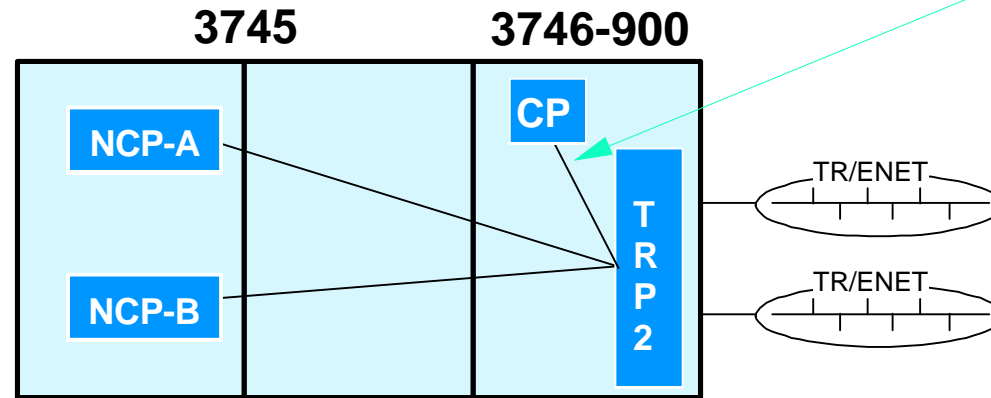
Sharing at Logical second level (LINK STATION)



# TR/Ethernet Processor Sharing Rules

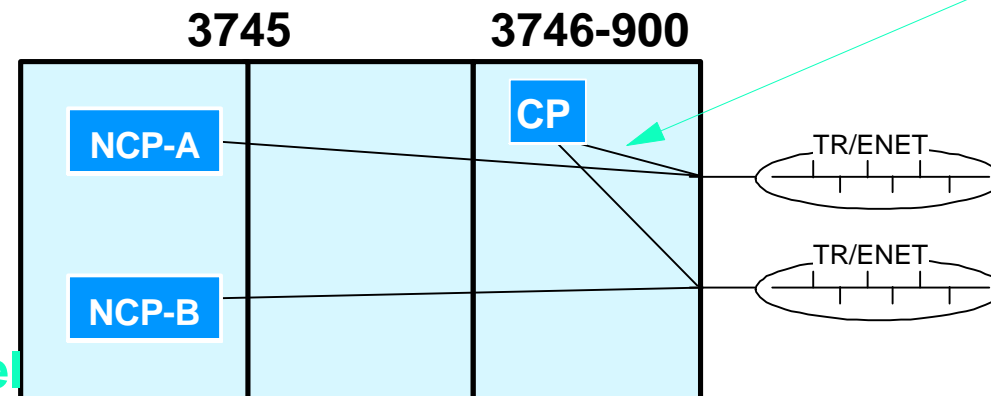


Sharing  
at  
Processor level



APPN / HPR  
and  
DLUR (3270 support)  
and  
TCP / IP

Sharing  
at  
Coupler/Port level

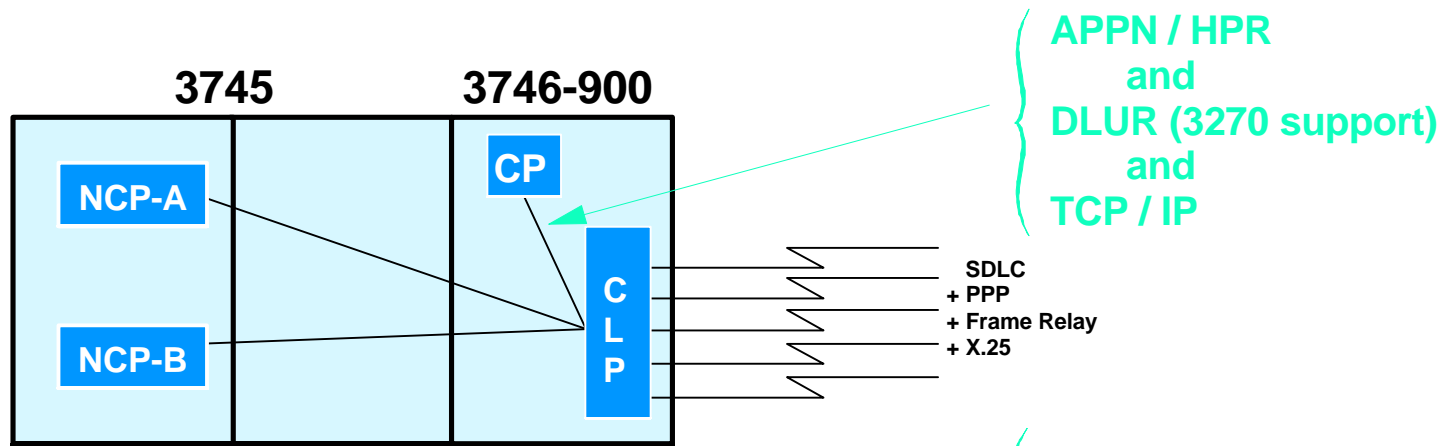


APPN / HPR  
and  
DLUR (3270 support)  
and  
TCP / IP

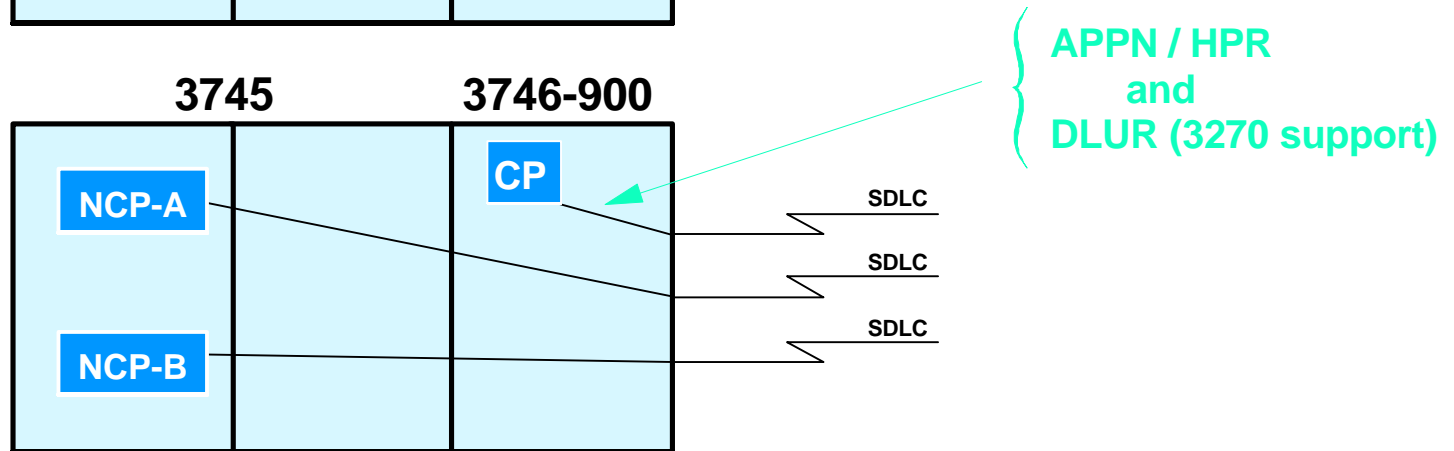
# CLP Processor Sharing Rules (SDLC, PPP)



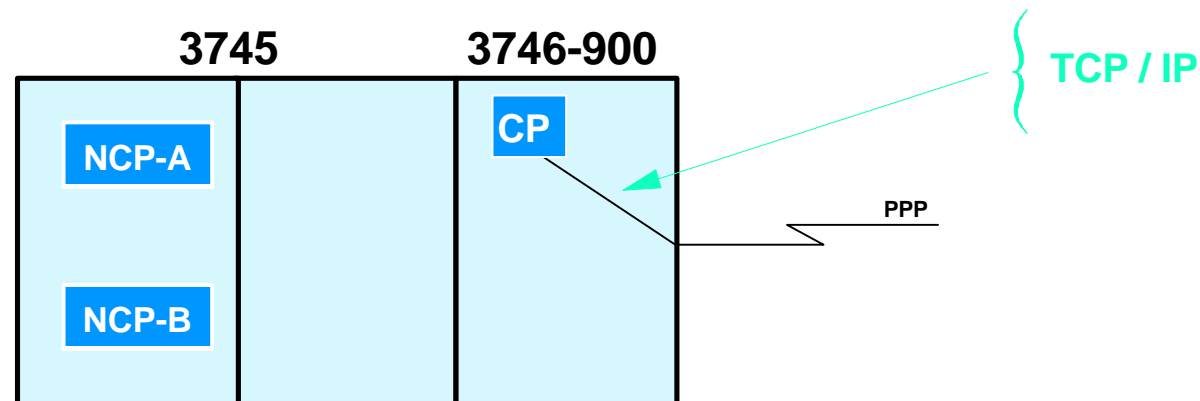
Sharing at Processor level



Sharing at SDLC line level



Sharing at PPP line level

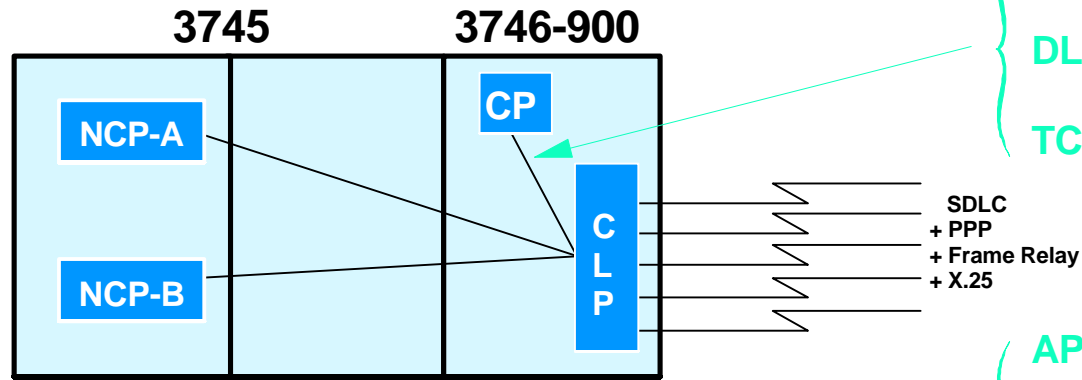




# CLP Processor Sharing Rules (FR)

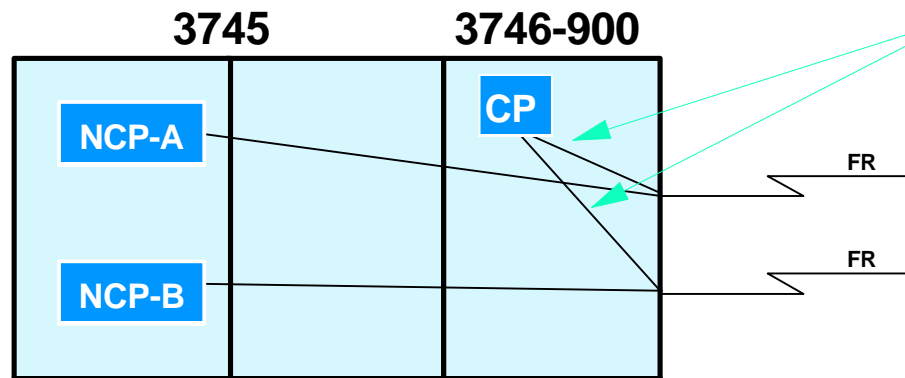


Sharing at Processor level



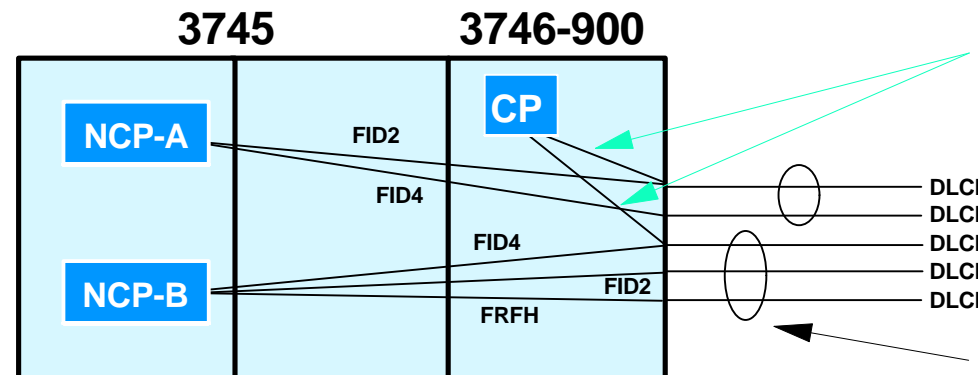
APPN / HPR  
and  
DLUR (3270 support)  
and  
TCP / IP

Sharing at FR line level



APPN / HPR  
and  
DLUR (3270 support)  
and  
TCP / IP

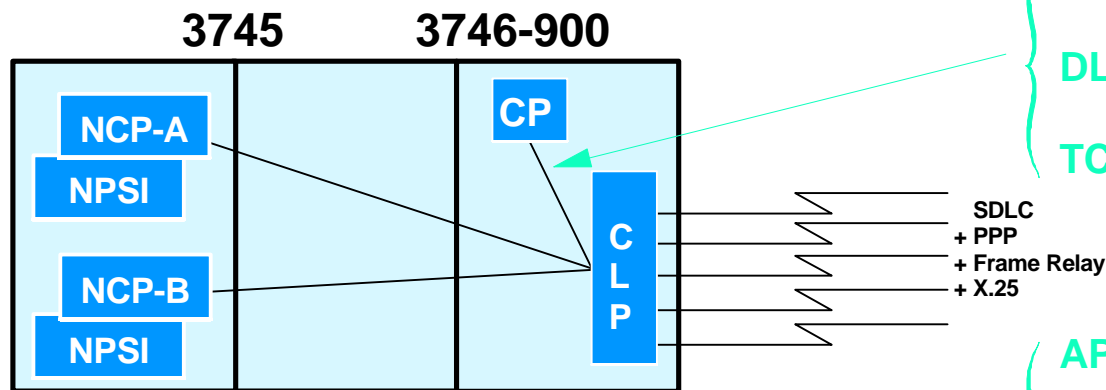
Sharing at DLCI level



APPN / HPR  
and  
DLUR (3270 support)  
and  
TCP / IP

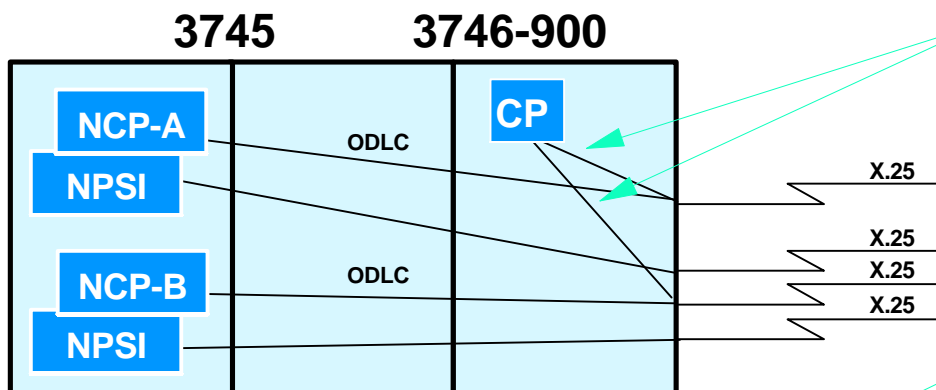
# CLP Processor Sharing Rules (X.25)

Sharing at Processor level



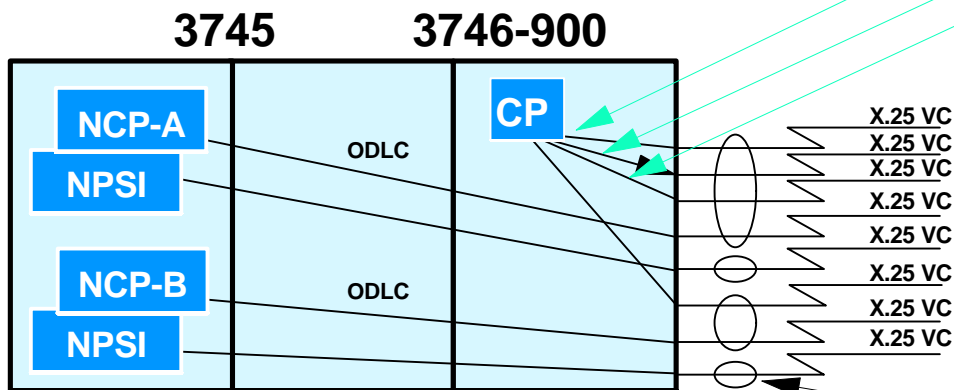
APPN / HPR and DLUR (3270 support) and TCP / IP

Sharing at X.25 line level



APPN / HPR and DLUR (3270 support) and TCP / IP

Sharing at X.25 VC level



APPN / HPR DLUR (3270 support) IP

Same X.25 line

# Contents



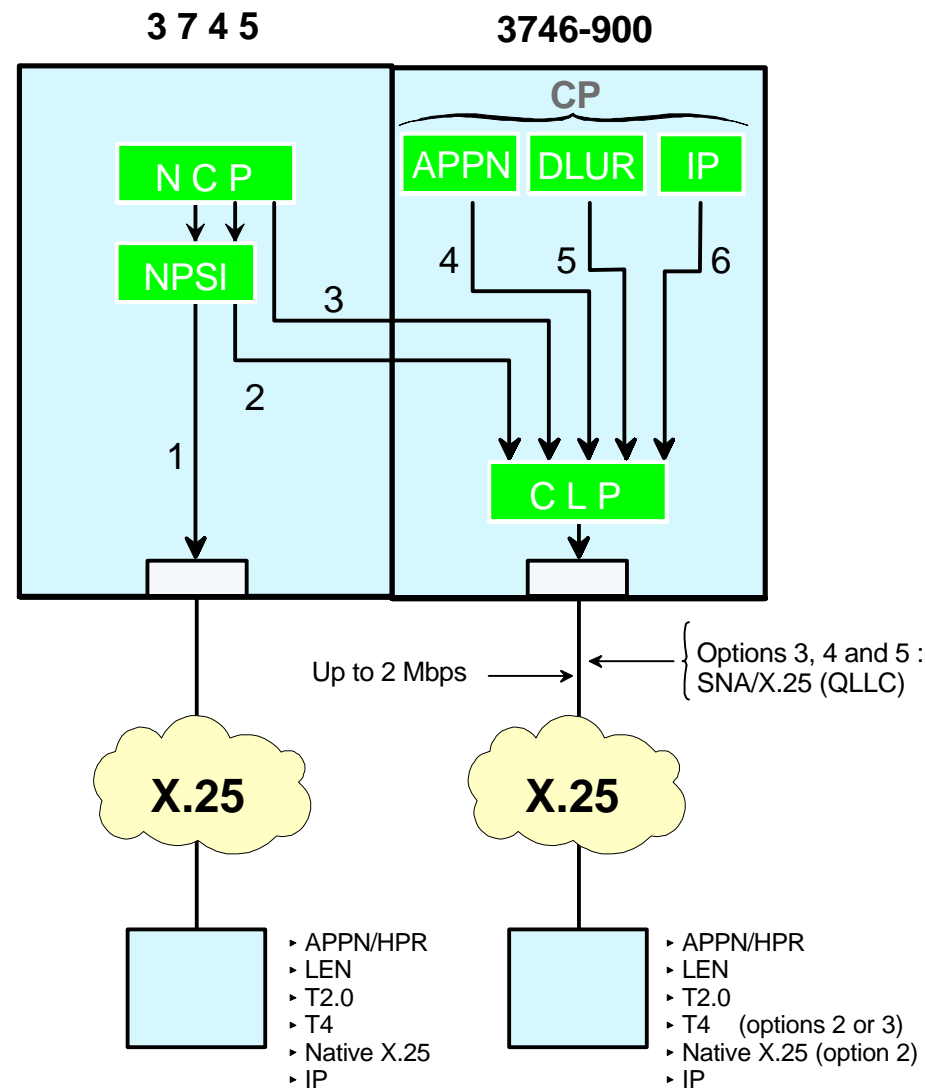
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# X.25 Support (1)

1. → Available (basic support NPSI)
2. → Available (NCP 7.3, NPSI 3.8)
3. → Available (MVS, VM, VSE)
  - NCP 7.4 + feature number 5030 (X.25 support) on the 3746-900
  - NPSI is not needed if X.25 is used only for SNA traffic (QLLC)

4. & 5. & 6.  
→ **Microcode D46130 (ECA 167)**

New  
6/97



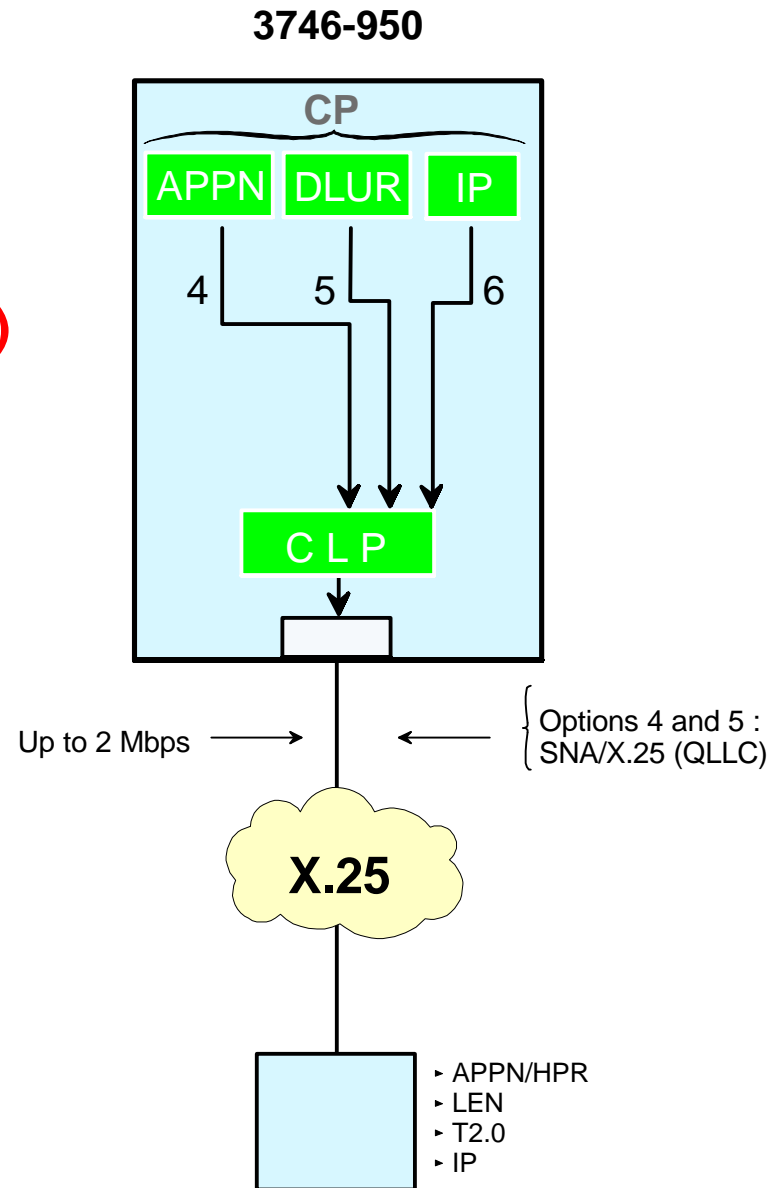
# X.25 Support (2)



4. & 5. & 6.

→ Microcode D46130 (ECA 167)

New  
6/97



# Frame Relay support



## 4 Functions

:

- **INN** (Intermediate Network Node)
- **BNN** (Boundary Network Node)
- **BAN** (Boundary Access Node)
- **FRFH** (Frame Relay Frame Handler)

## 3745 and 3746 can play 2 roles in a Frame Relay network

1. End Points (FR -DTE) with RFC1490 standard. It allows Multiprotocol transport on a single DLCI. Both format are supported :
  - RFC 1490 "Routed Format"  
*INN, BNN, APPN and HPR (with ERP) use LLC2 type of protocol as secured format*
  - RFC 1490 "Bridged Format"  
*BAN function (Boundary Access Node)*  
*All messages use 802.5 frames over the Frame Relay network.*  
*Local LAN addresses (MAC address ) are carried over the Frame Relay network.*
2. Switching Points (FR-DCE) provides Frame Relay Frame Handler (FRFH) function

1. SNA/HPR Traffic uses RFC1490 standard in both "Routed" or "Bridged" format

- **INN Traffic**

- PU4 to PU4 communication (3745/3746-900 and NCP)*

- **BNN Traffic**

- PU2 to PU2 communication*

- Type 2 to Type 2.1 (LEN) communication*

- **ISR APPN Traffic**

- Intermediate Session Routing = APPN base*

- **HPR Traffic (with ERP)**

- Error Recovery procedure at link level*

- **HPR Traffic (without ERP)**

- Error Recovery procedure done at HPR(RTP) End Points*

2. IP Traffic uses RFC1490 standard in "Routed" format



# RFC1490 - "Routed" Format (1/2)

1.

→ Available

- NCP 7.3 (HPR and IP)
- NCP 7.1 (other traffics)
- NCP 6.1 (INN)

2.

→ Available

- NCP 7.3 (HPR)
- NCP 7.2 (other SNA traffic but IP)

3.

→ Available

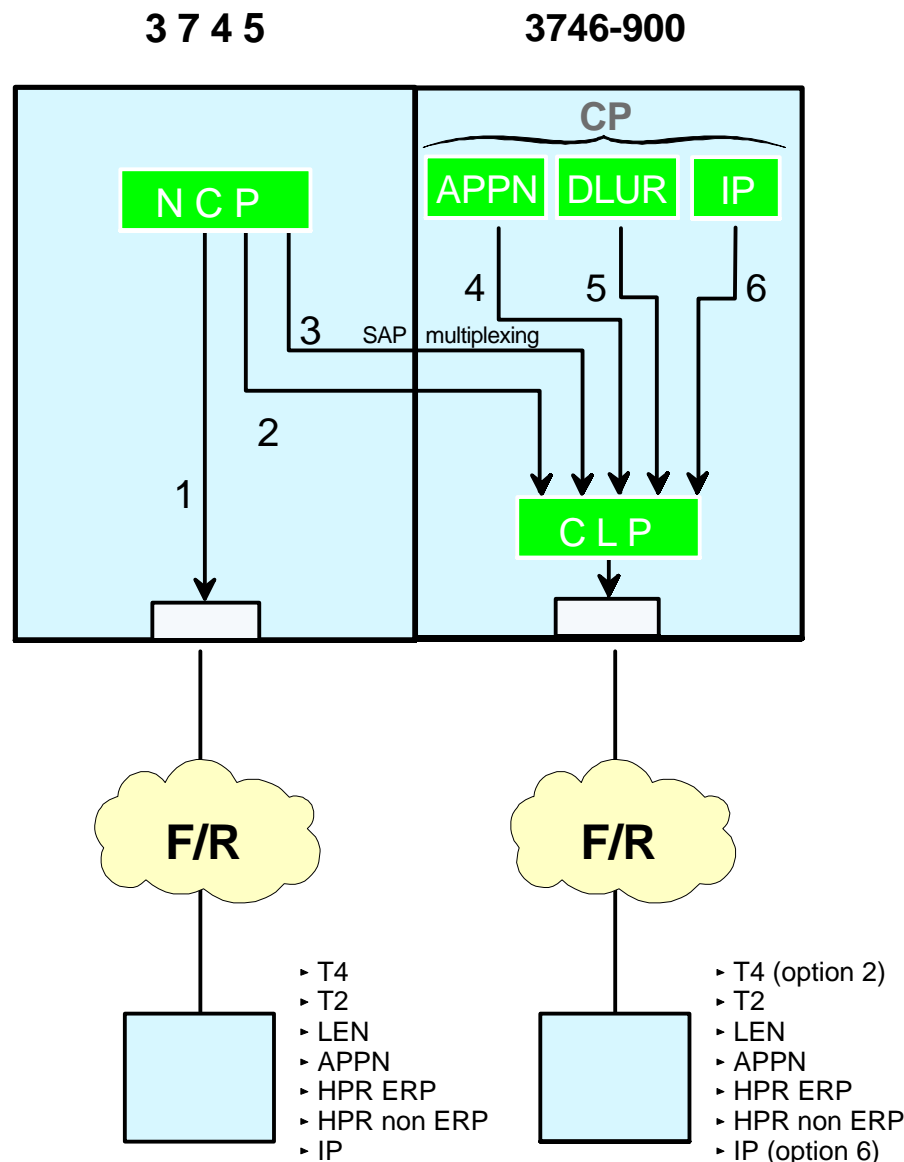
- NCP 7.3 + microcode ECA 138

4. & 5. & 6.

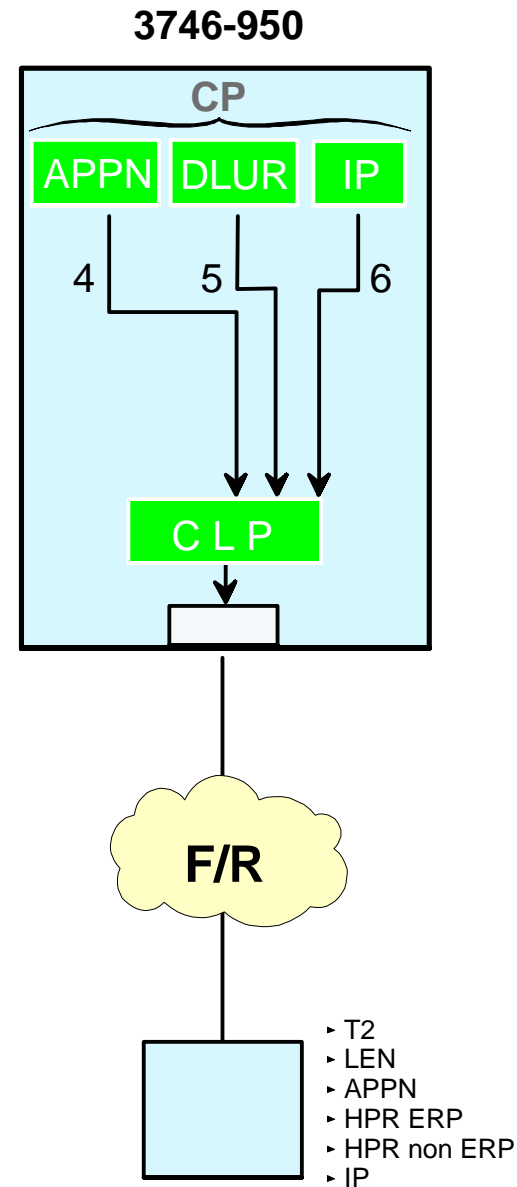
→ Available

- microcode ECA 159 (HPR and IP)

\* in options 1, 2 and 3, APPN is supported by NCP/VTAM Composite Network Node



# RFC1490 - "Routed" Format (2/2)



4. & 5. & 6.

→ Available

- ▀ microcode ECA 159 (HPR and IP)

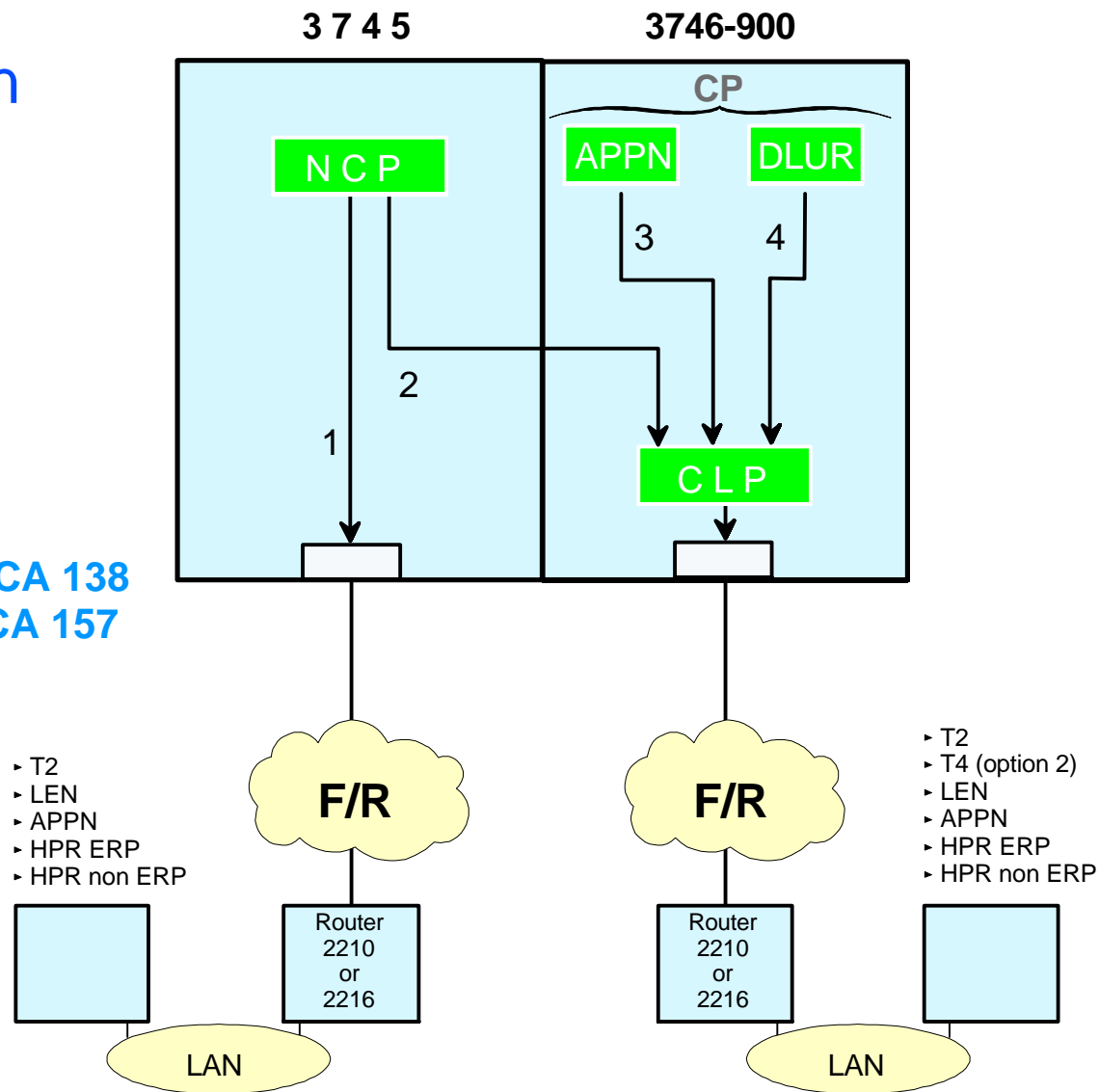
# RFC1490 - "Bridged" Format (1/2)

## BAN Function

1. → Available
  - NCP 7.3

2. → Available
  - NCP 7.3 + microcode ECA 138
  - NCP 7.5 + microcode ECA 157 (INN flows)

3. & 4. → Available



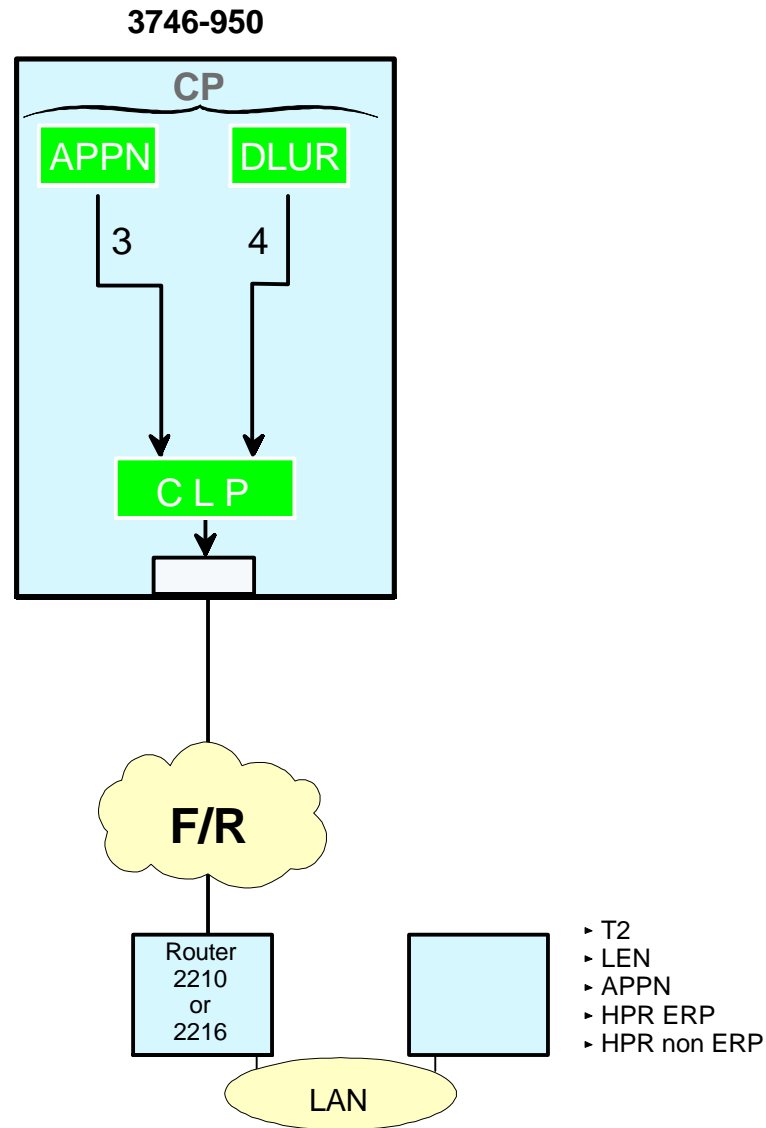
\* APPN connections over paths 1 and 2 are supported by NCP/VTAM Composite Network Node

# RFC1490 - "Bridged" Format (2/2)



## BAN Function

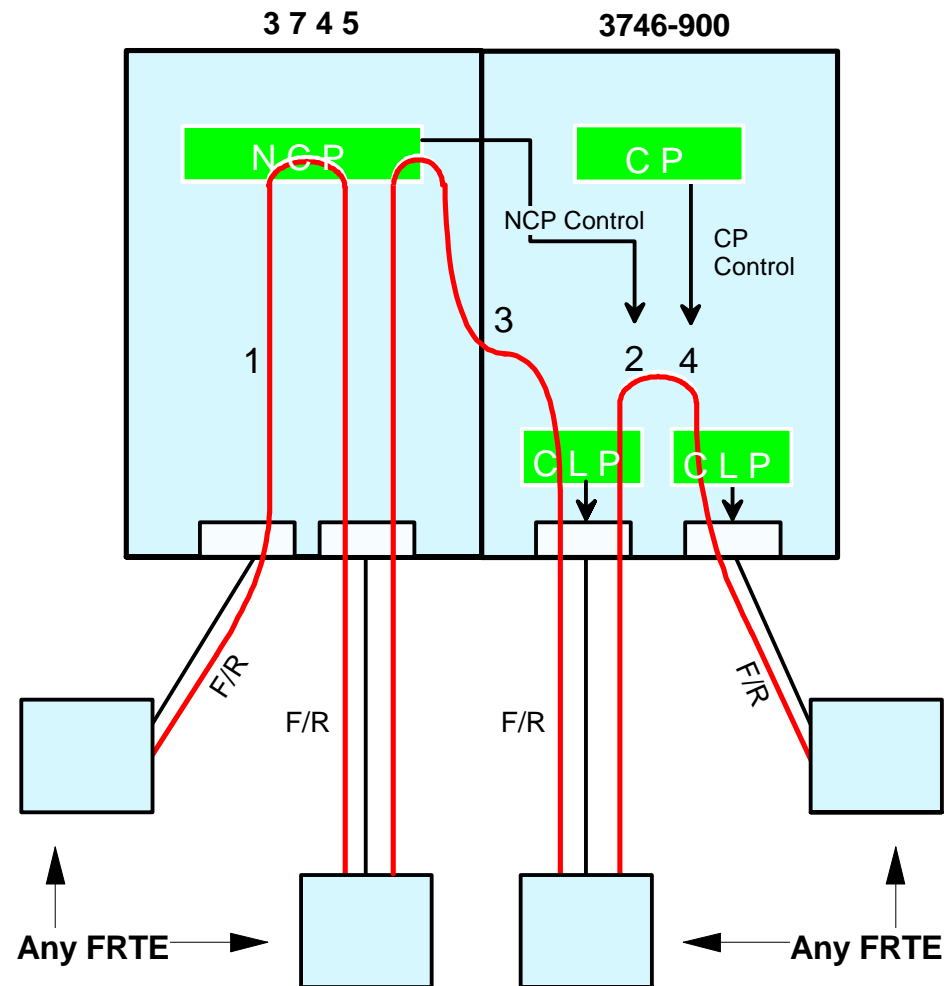
3. & 4.  
→ Available



# Frame Relay FRFH Support (1)

1. → Available
  - NCP 6.2
2. → Available
  - NCP 7.2
3. → Available
  - NCP 7.4 + microcode D22560D - ECA 146
4. → Microcode D46130 (ECA 167)

New  
6/97



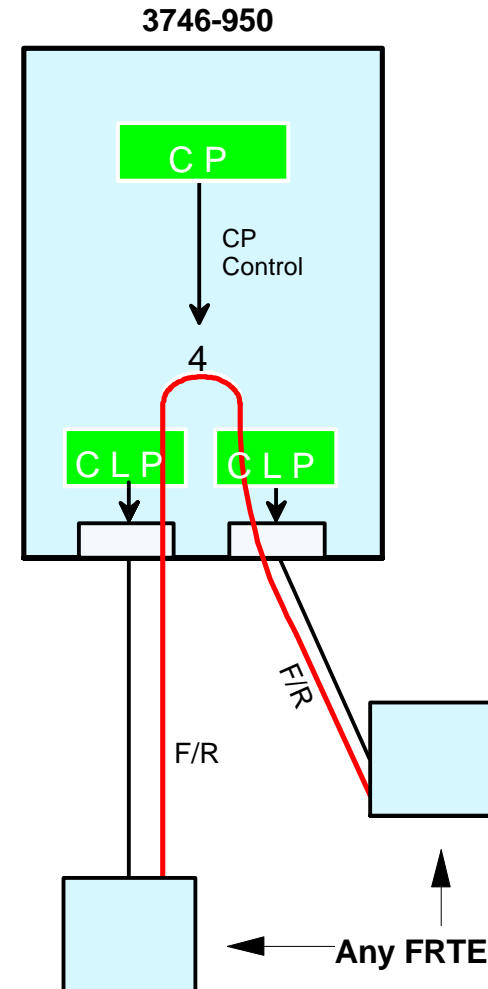
# Frame Relay FRFH Support (2)



4.

→ Microcode D46130 (ECA 167)

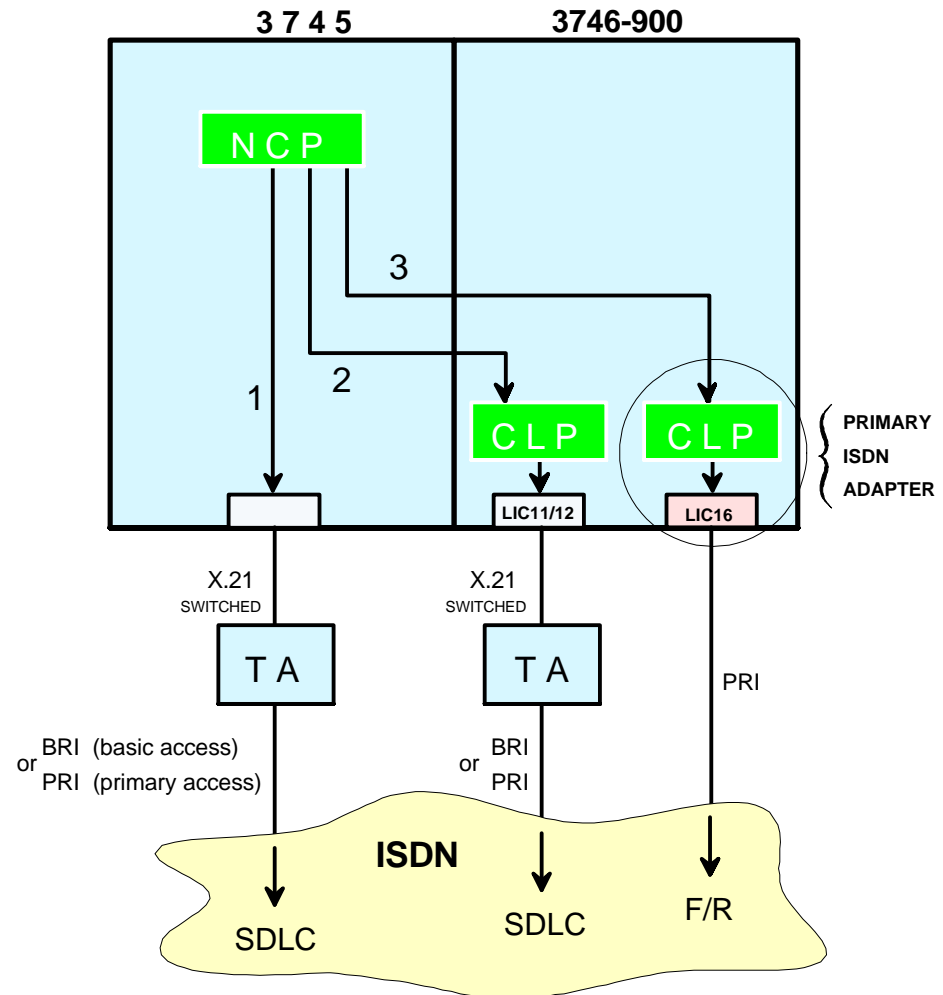
New  
6/97



# IBM 3746-900 - ISDN support



1. → Available
2. → Available (NCP 7.2 + microcode D22510K - ECA 142)
3. → Available (NCP 7.5 + microcode D46120 - ECA 159)



TA : ISDN terminal adapter. For instance,  
 ▶ IBM 7820 (basic access)  
 ▶ HITACHI-TA (primary access)

# Contents



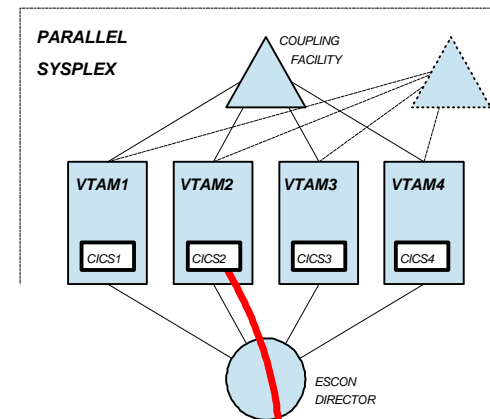
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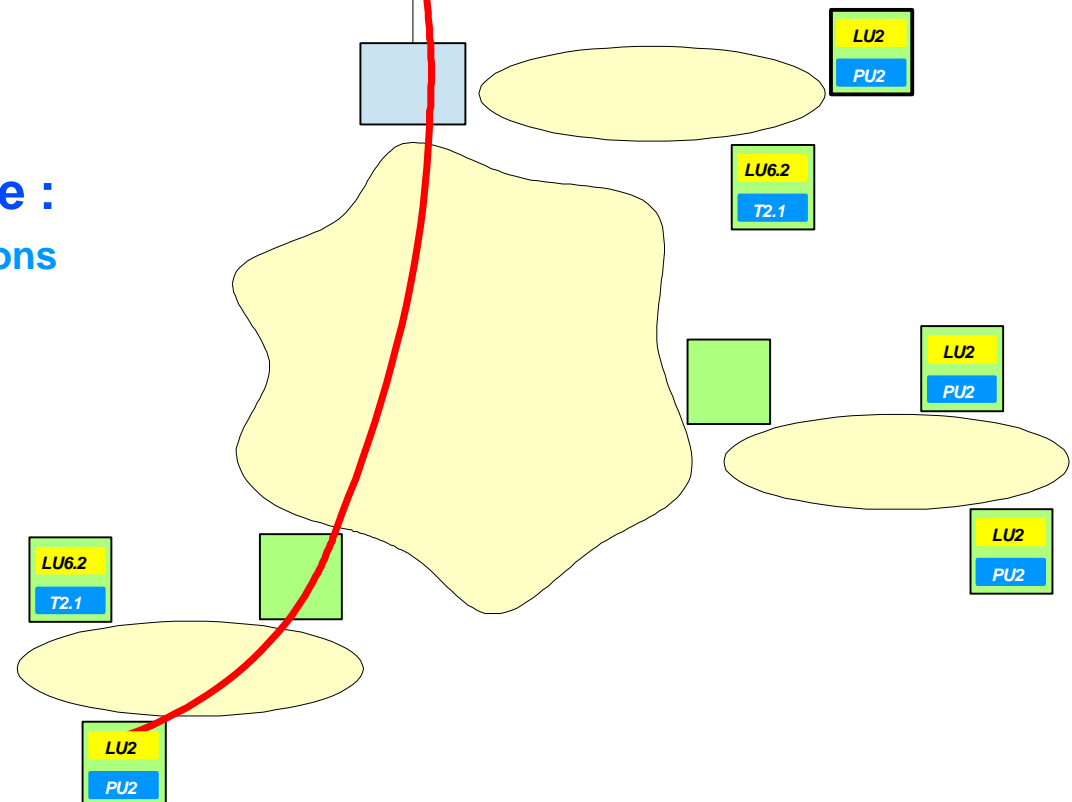
# S/390 Parallel Sysplex



- ▶ **Coupling facility : sharing of data, control**
  - Dedicated processor (9674) in production
  - LPAR option for tests (on 9021-711 or CMOS 9672)
  - Availability through multiple CFs
- ▶ **2 to 32 processors :**
  - MVS/ESA SP Version 5
  - ES/9000 9121-511 or 9021-711
  - CMOS 9672



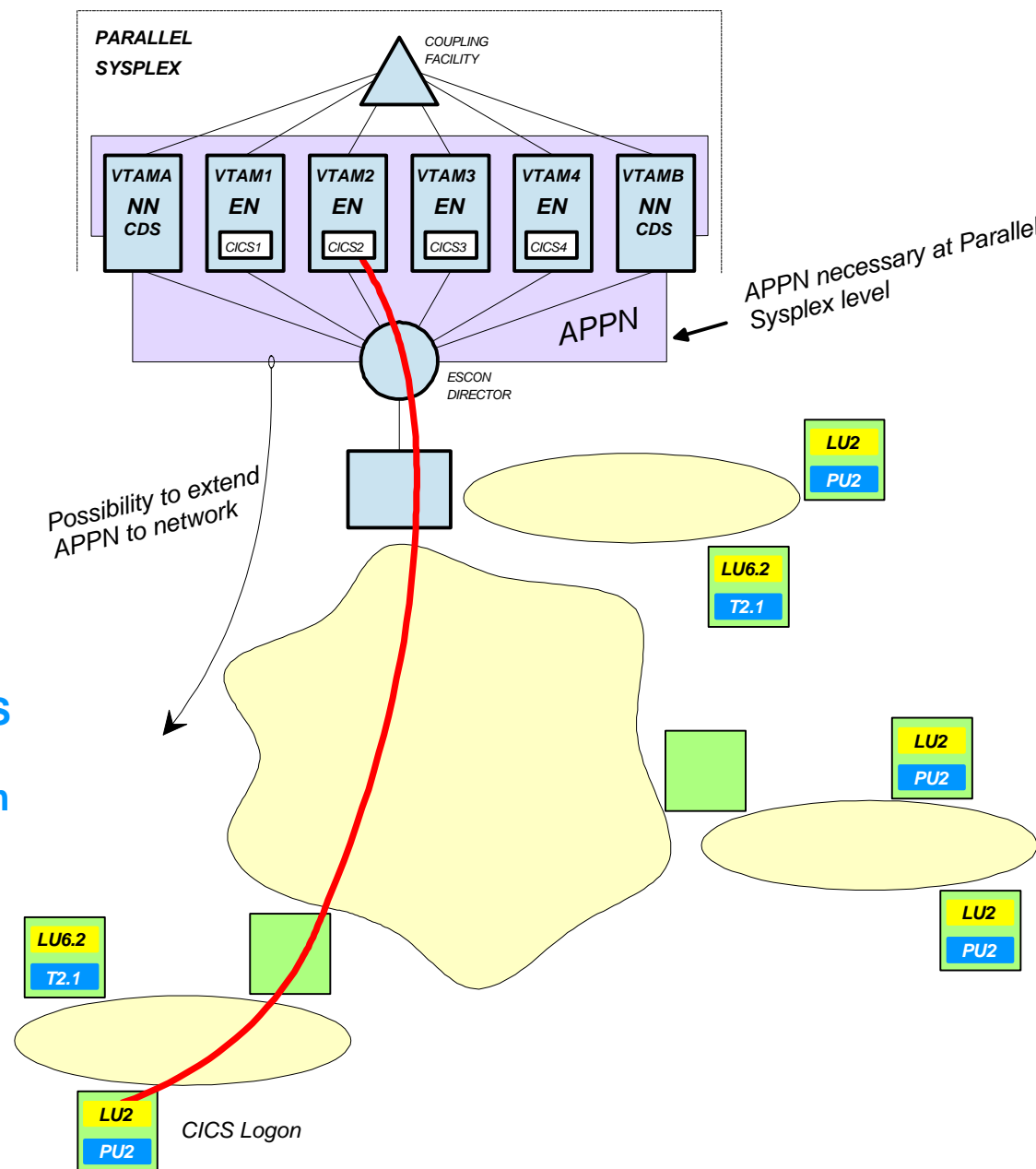
- ▶ **Parallel processing architecture :**
  - Compatibility with existing applications
  - Processing capacity
  - Modular expansion
  - Cost reduction
  - Availability



# S/390 Parallel Sysplex : Generic Resources (1/2)

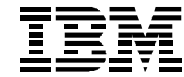


- ▶ NN : Network Node
- ▶ EN : End Node
- ▶ CDS : Central Directory Server



- ▶ **Single system image :**
  - User connects to generic CICS name, not worrying about the CICS system that will host him

# S/390 Parallel Sysplex : Generic Resources (2/2)



▶ The VTAM NN can choose among 3 different applications :

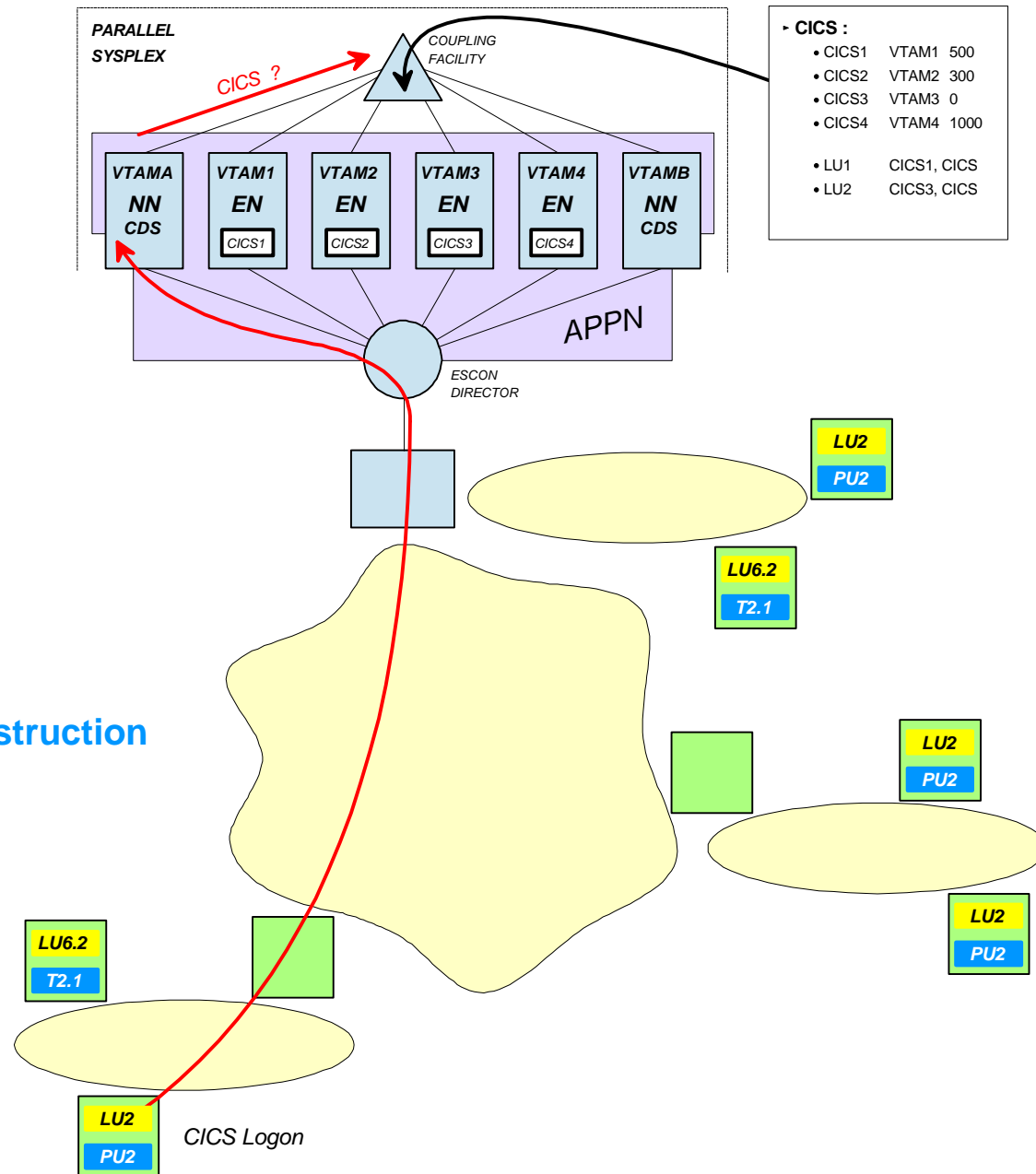
- Balancing of VTAM sessions
- MVS 5.2 Work Load Manager
- VTAM Generic Resource Exit

▶ Parallel Sessions (LU 6.2) :

- Information stored at CF level

▶ Session initialization :

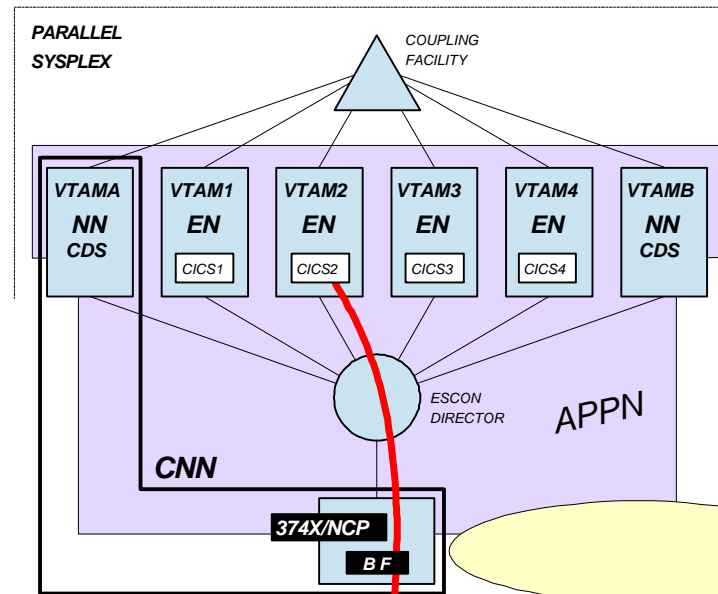
- The VTAM NN receiving the instruction requests information stored in the "Coupling Facility"



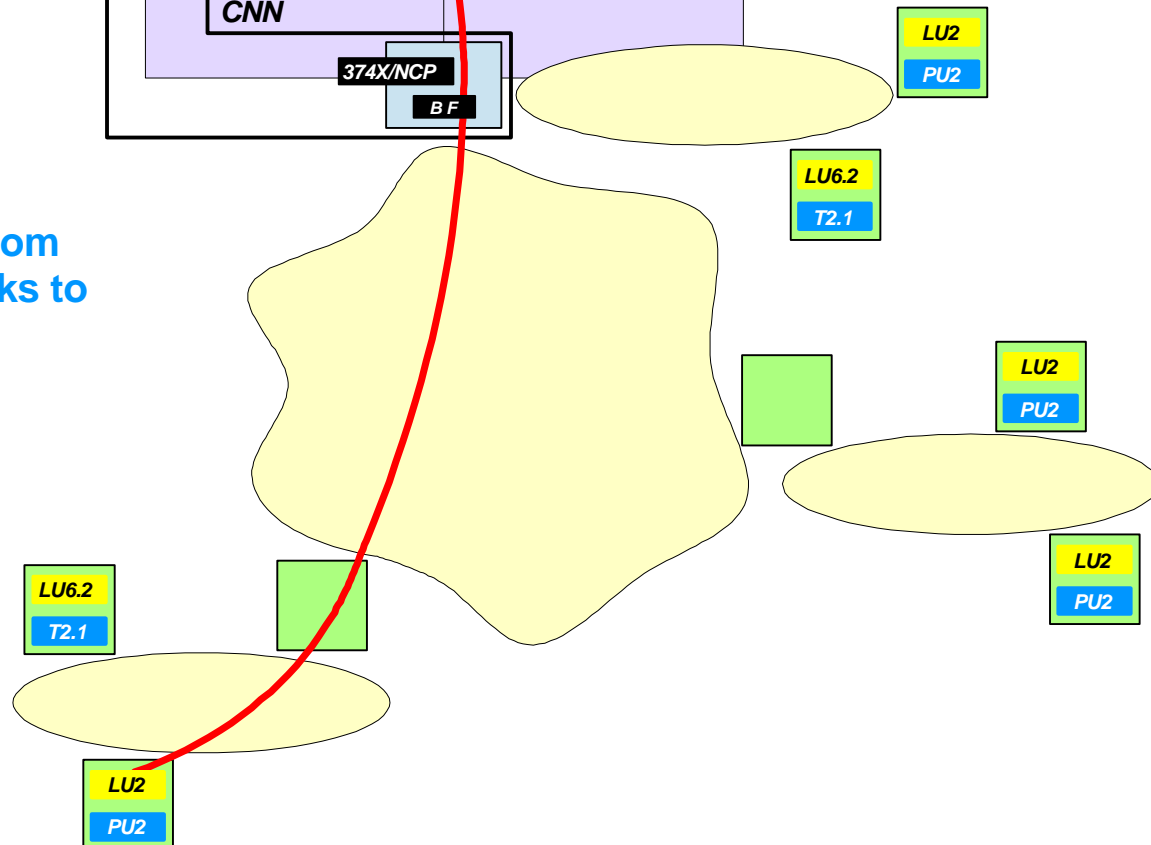
# Generic Resources : Dependent LU access (1/4)



- ▶ CNN : Composite Network Node (VTAM + 3745/NCP)
- ▶ BF : Boundary Function (through NCP or VTAM)



- ▶ Use of a 3745/6 NCP :
  - Data flow transits directly from terminal to application thanks to CNN function

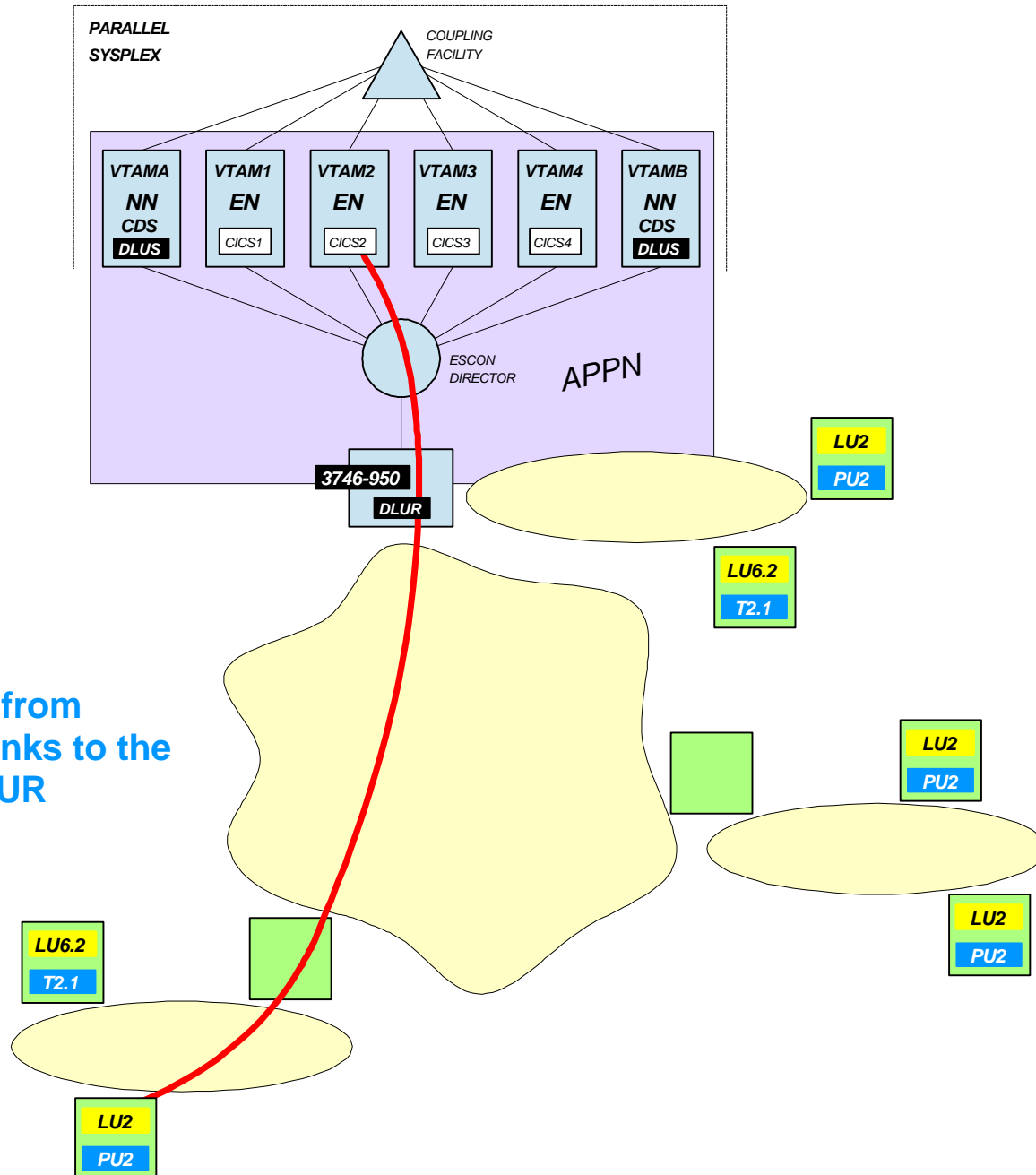


# Generic Resources : Dependent LU access (2/4)

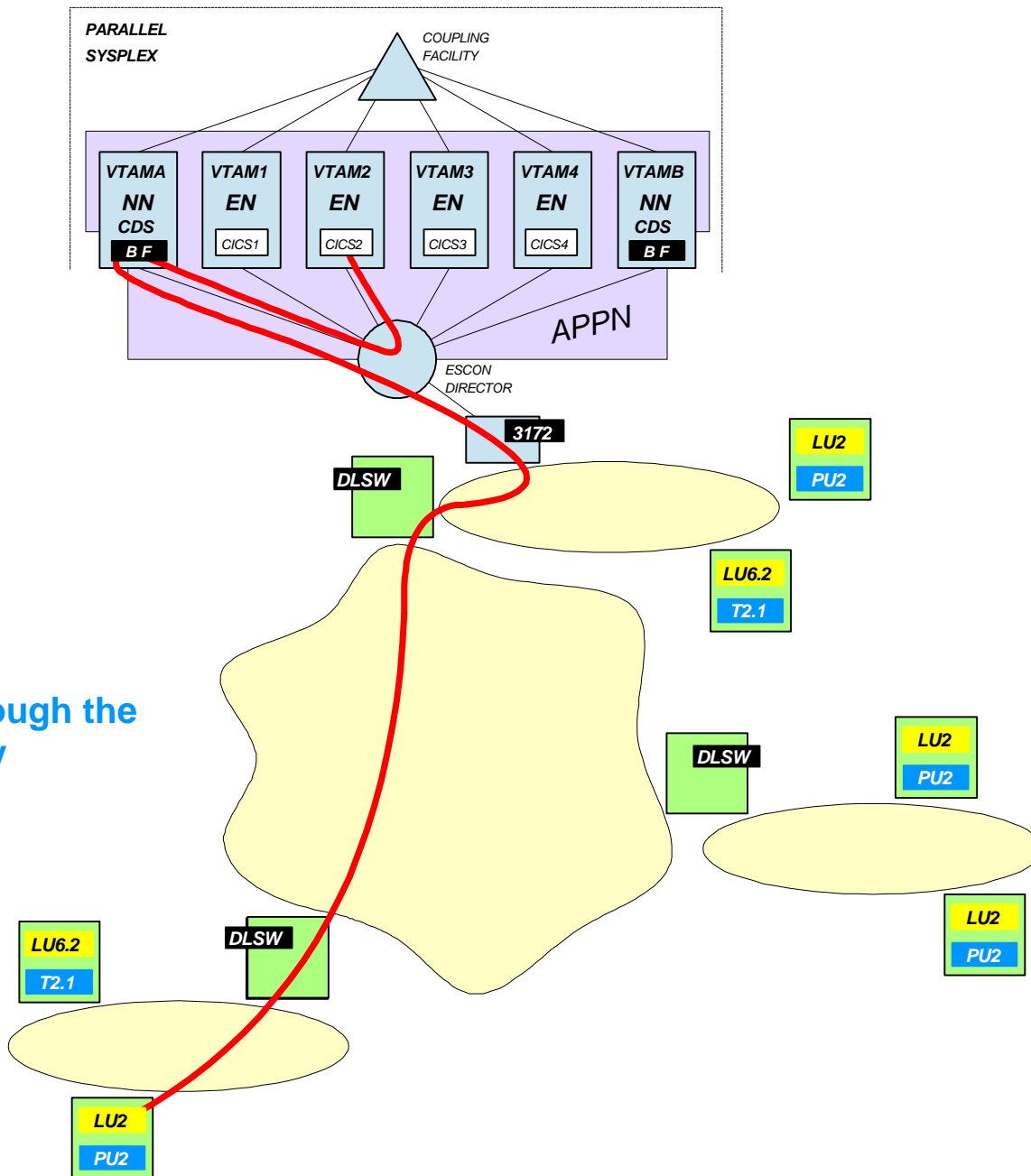


- ▶ DLUR : Dependent LU Requester
- ▶ DLUS : Dependent LU Server

- ▶ Use of a 3746 Nways Controller :
  - Data flow transits directly from terminal to application thanks to the 3746 Nways Controller DLUR function

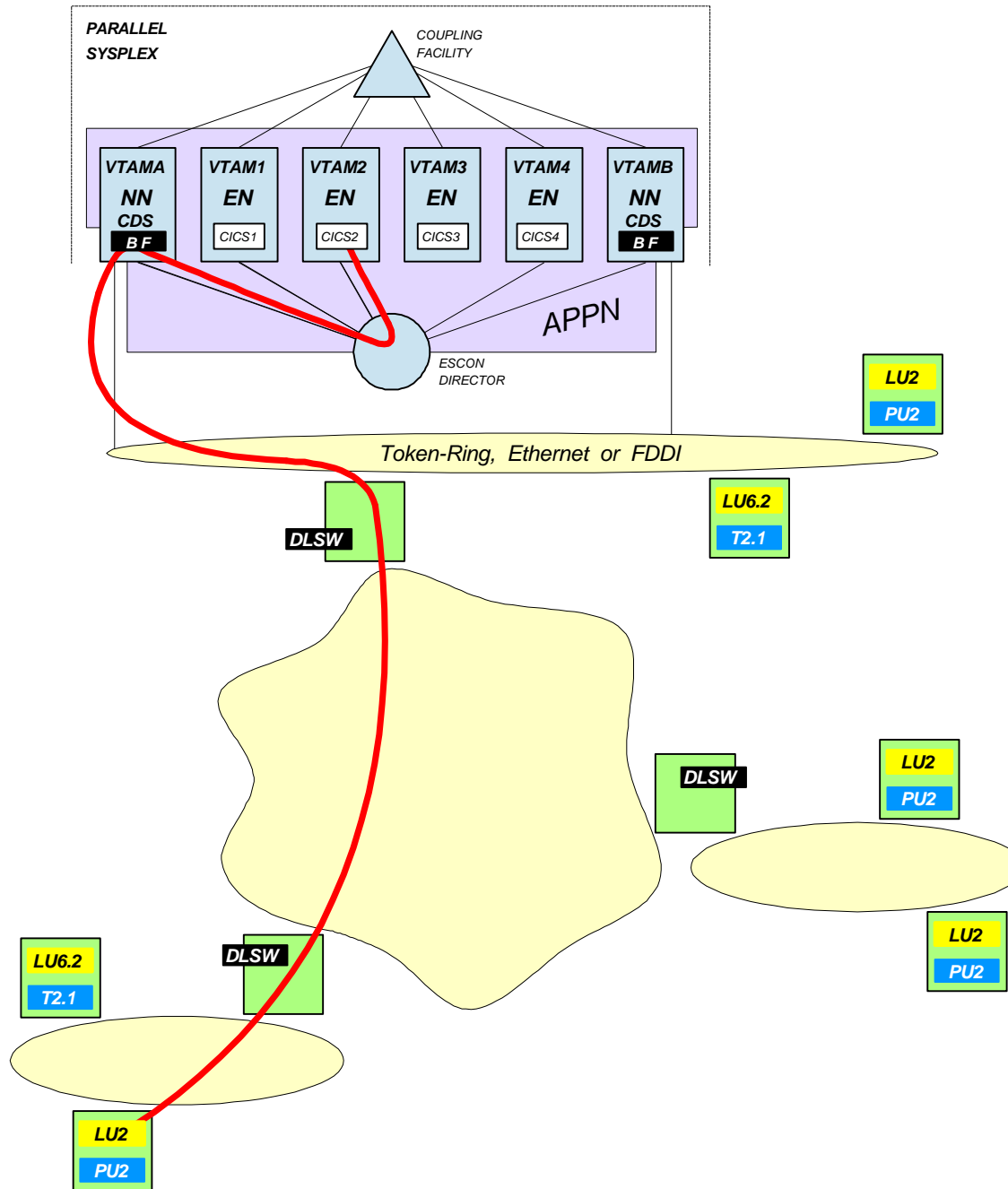


# Generic Resources : Dependent LU access (3/4)



- ▶ Use of a 3172 ICP (or equivalent router) :
  - Data flow needs to go through the initiating VTAM "boundary function"

# Generic Resources : Dependent LU access (4/4)



- ▶ Use of OSA adapters :
  - Data flow must go through initiating VTAM "boundary function"

# S/390 Parallel Sysplex : Multi-Node Persistent Sessions (1/5)

► **MNPS function available March 28, 1997 with :**

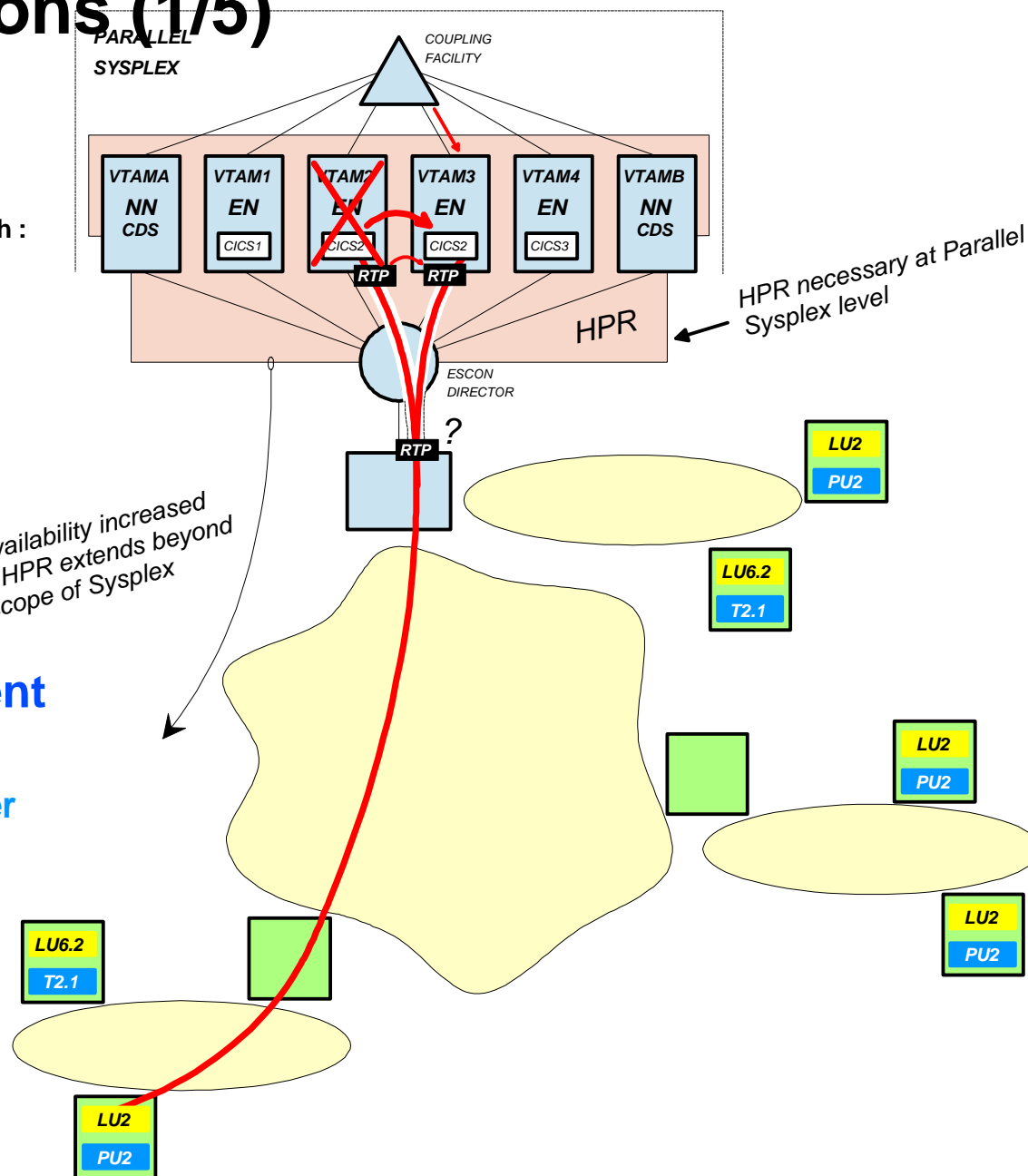
- VTAM V4 R4
- C/S for MVS/ESA R2
- OS/390 R3

► **HPR : High Performance Routing**

- RTP : Rapid Transport Protocol

► **MNPS (Multi-Node Persistent Sessions) Function :**

- In case a sub-system on another processor is restarted, VTAM sessions are maintained

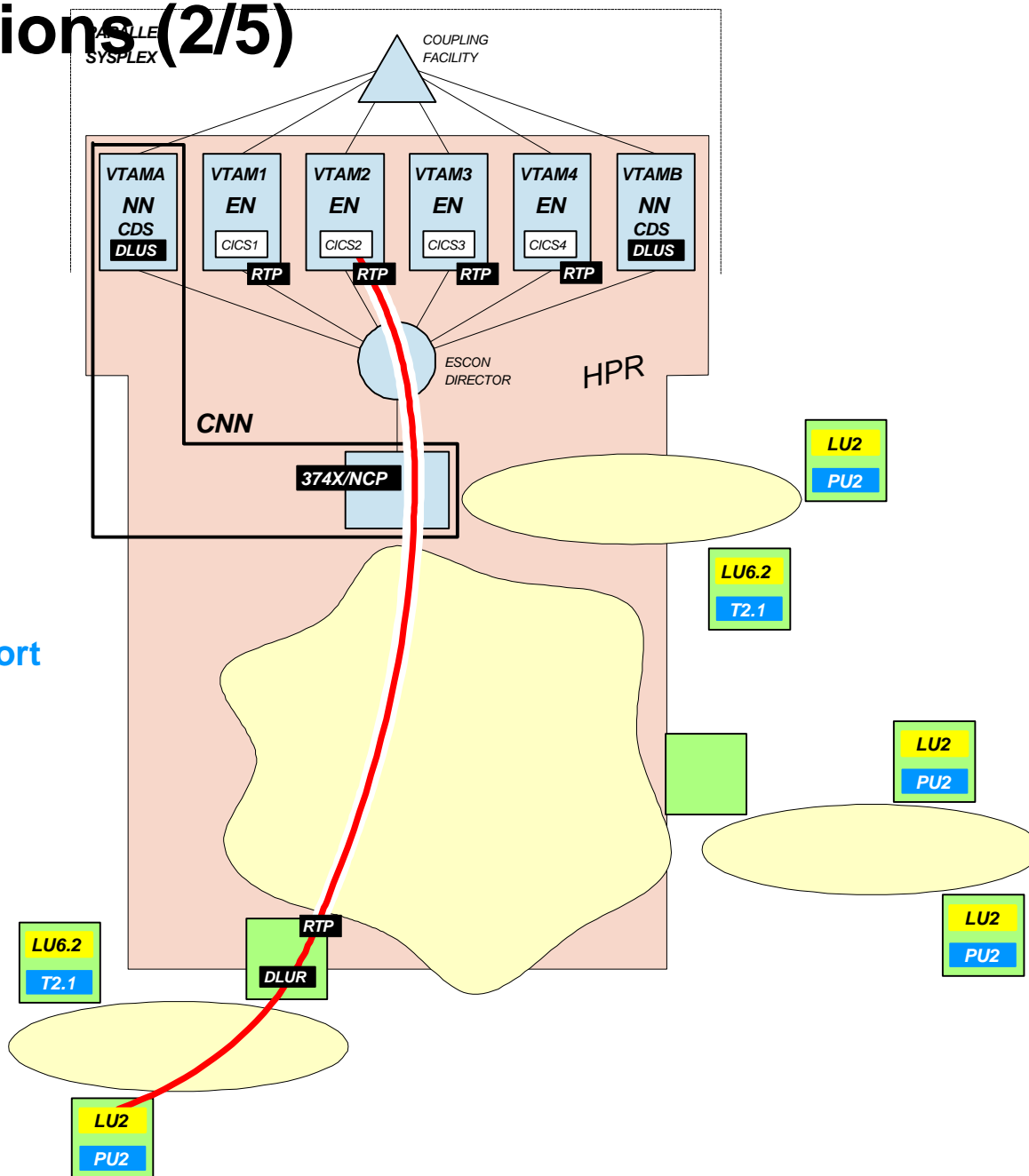




# S/390 Parallel Sysplex : Multi-Node Persistent Sessions (2/5)

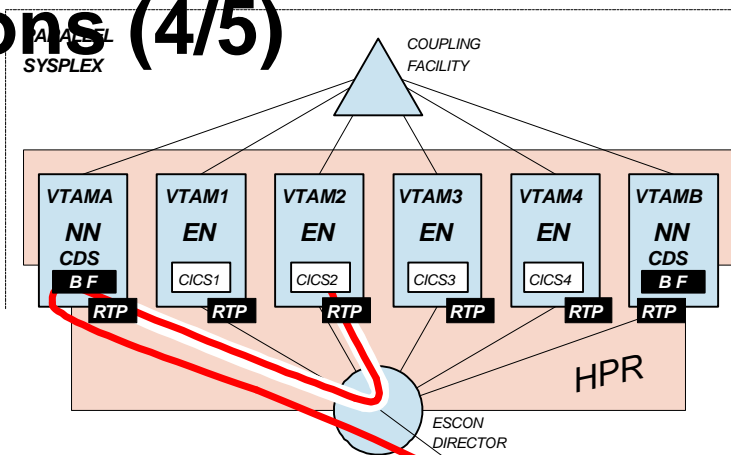
- ▶ CNN : Composite Network Node (VTAM + 3745/NCP)
- ▶ RTP : Rapid Transport Protocol

- ▶ Use of a 3745/6 NCP :
  - The 3745/6 NCP does not support RTP, although it supports intermediate HPR routing. RTP needs to be done outside the 3745/6.



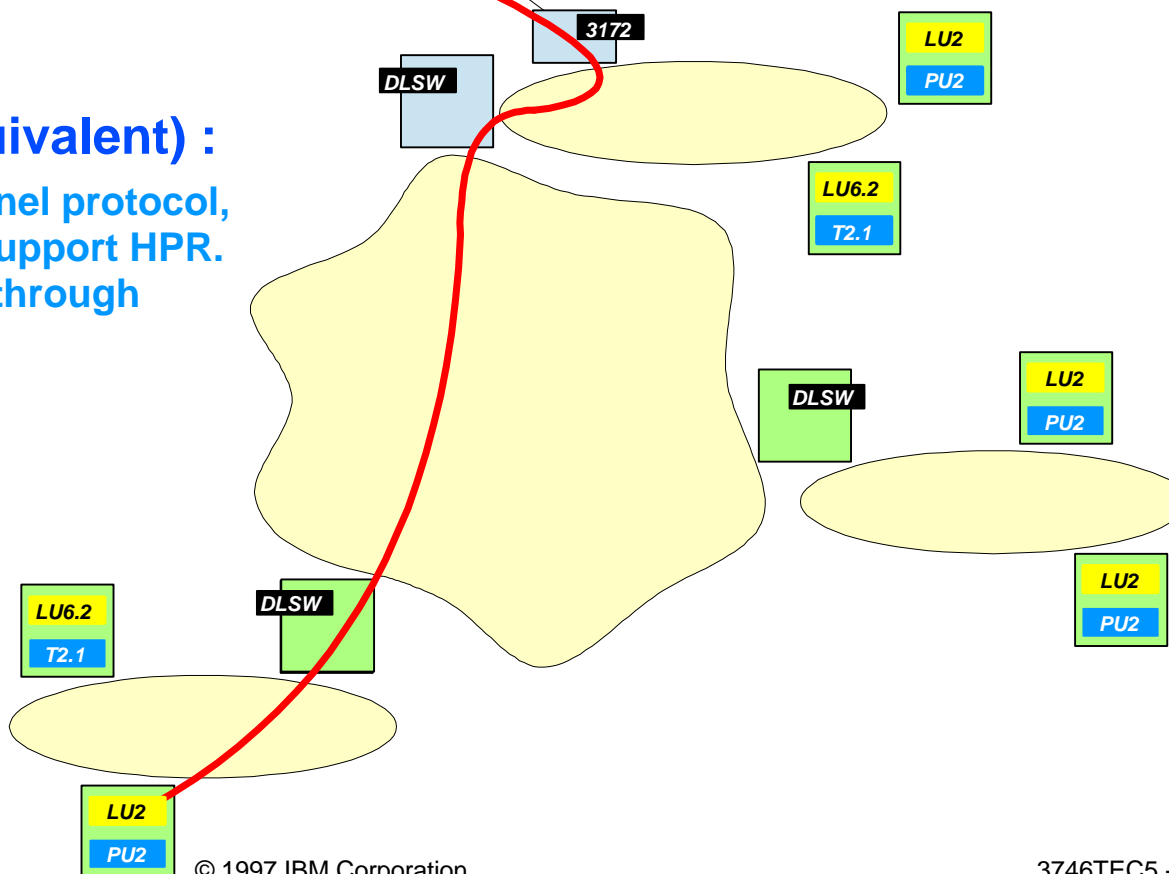


# S/390 Parallel Sysplex : Multi-Node Persistent Sessions (4/5)

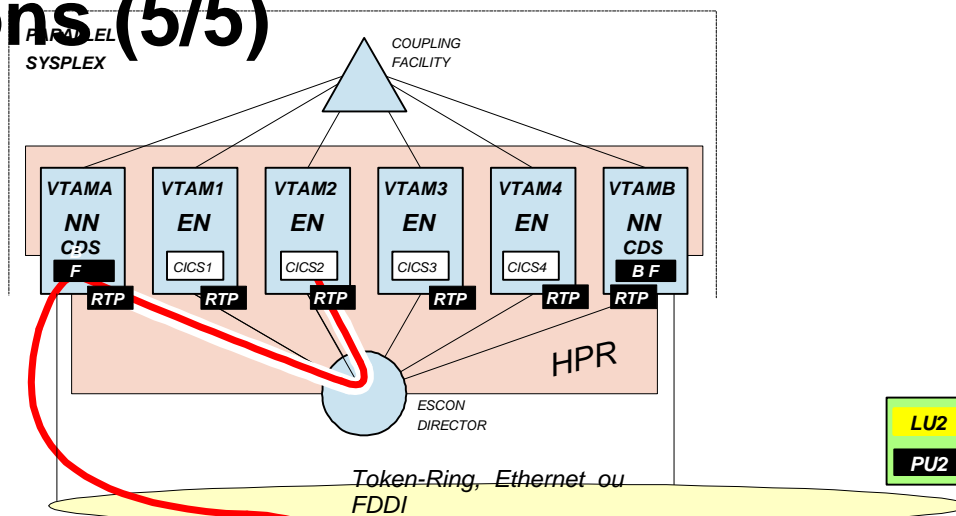


## ► Use of a 3172 ICP (or equivalent) :

- The 3172 ICP uses LSA channel protocol, over which VTAM does not support HPR. Data flow must therefore go through initiating VTAM NN.

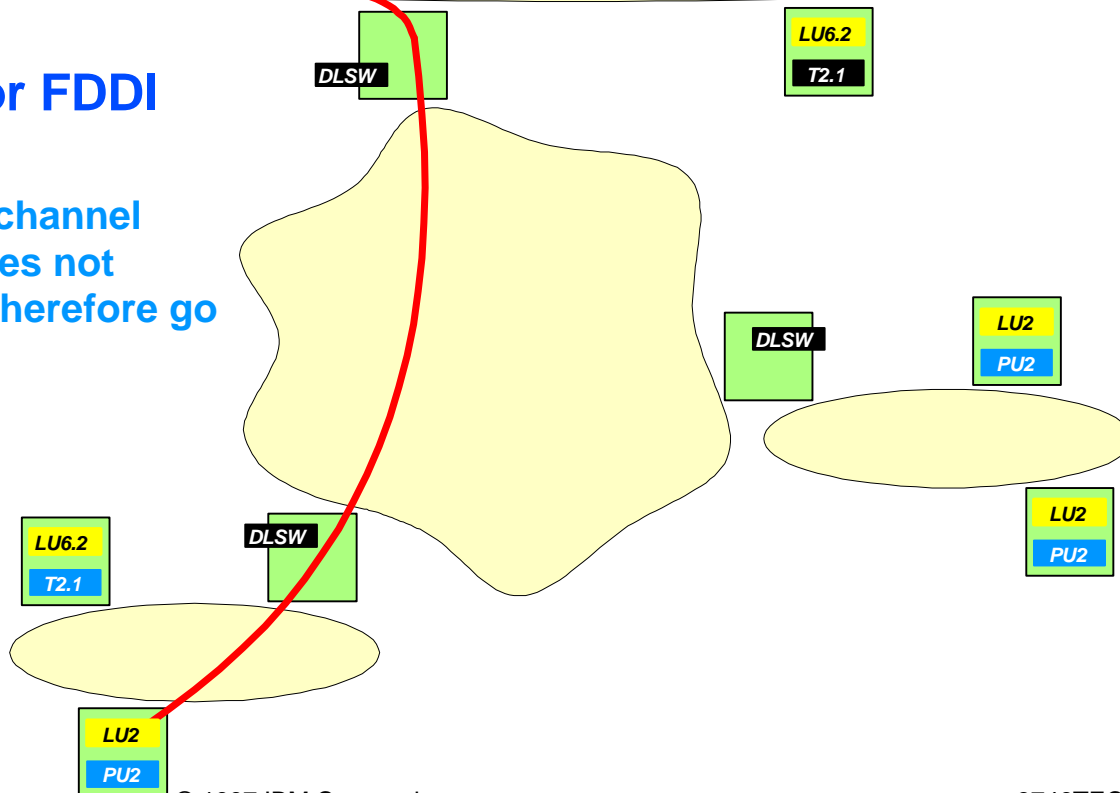


# S/390 Parallel Sysplex : Multi-Node Persistent Sessions (5/5)

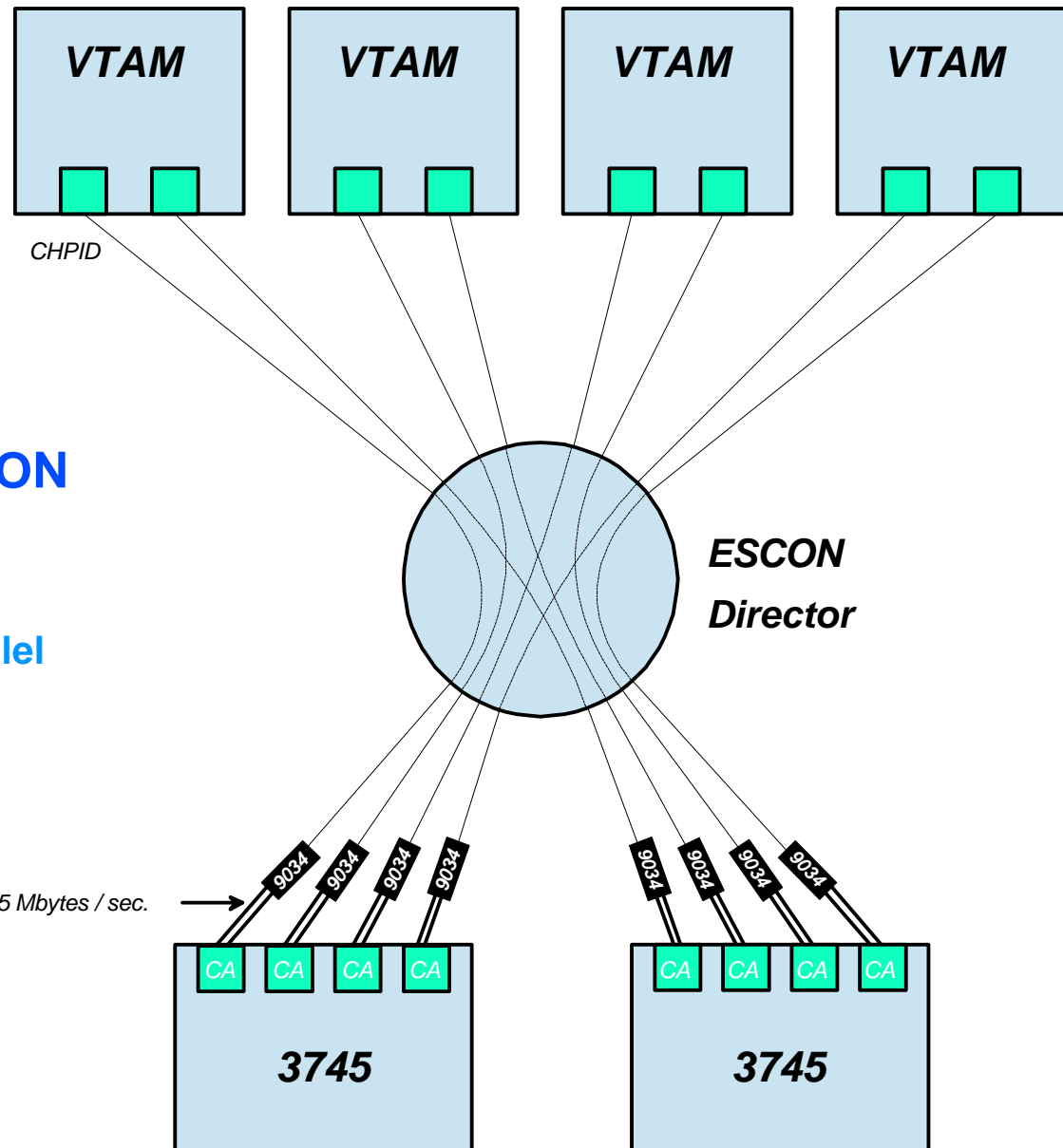


## ► Use of OSA TR, Ethernet or FDDI adapters :

- These OSA adapters use LSA channel protocol, over which VTAM does not support HPR. Data flow must therefore go through initiating VTAM NN.



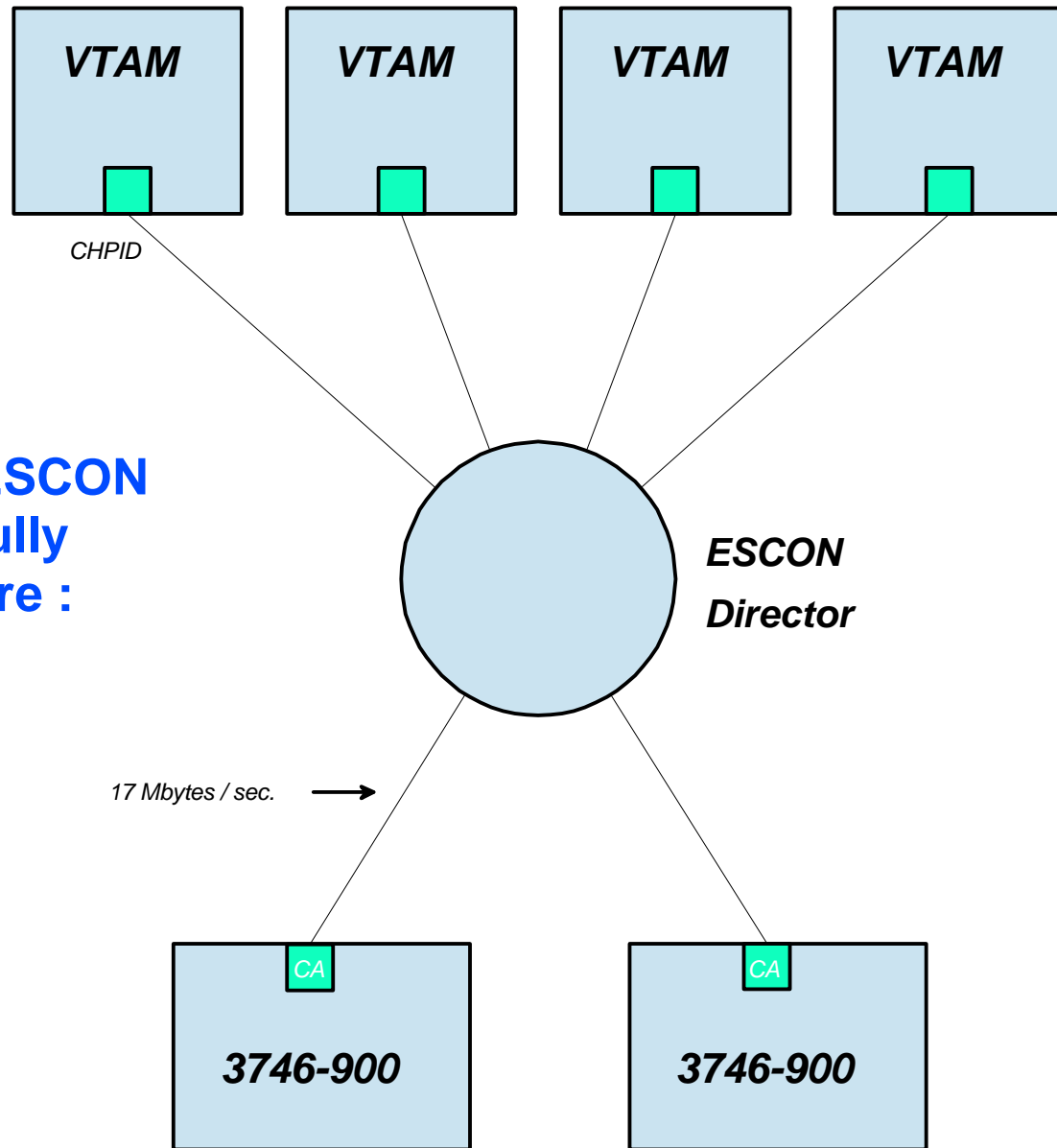
# ESCON with 3745 + 9034 configuration



► Connecting a 3745 to ESCON hosts implies use of 9034 converters :

- Performance is limited to parallel channels'
- Multiple channel attachments

# ESCON with 3746-900 configuration



► The 3746-900, with its ESCON attachments, benefits fully from ESCON architecture :

- Ease of cabling, functions, performances.

# Contents

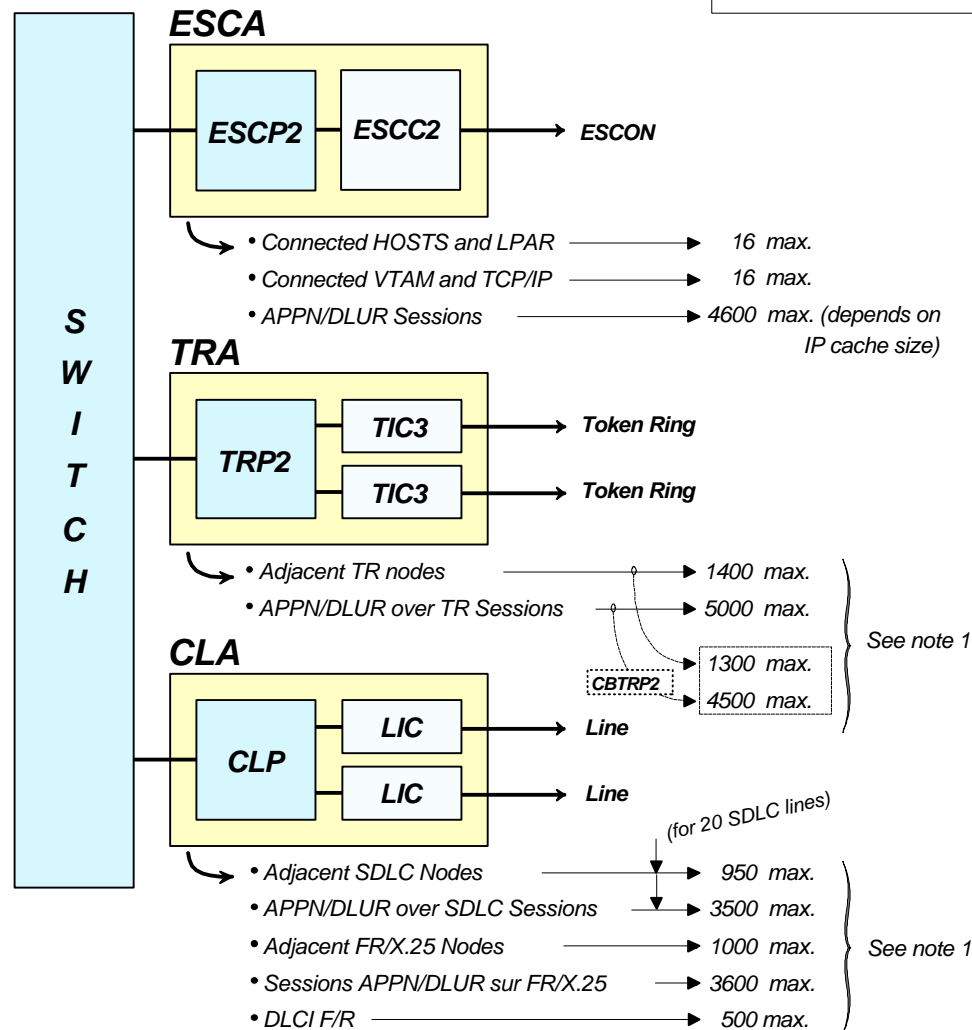


- *The 3746 Expansion Unit Model 900*
- *The 3746 Nways Controllers*
- *Integration of 3746 Nways Controllers in an SNA network*
- *The 3746 Nways Controller IP Router*
- *An example of staged evolution from 3745 to 3746-950*
- *3746-900 and 3746-950 Adapters*
- *3745 and 3746 Controllers : details of X.25, Frame Relay and ISDN supports*
- *The 3746 Nways Controllers & Parallel Sysplex*
- *3746 Nways Controller Connectivity*
- *Data flow control : CIR & BRS*

# IBM 3746-950 - Connectivity (1/2)



**Case 1 :**  
**IP is not used**



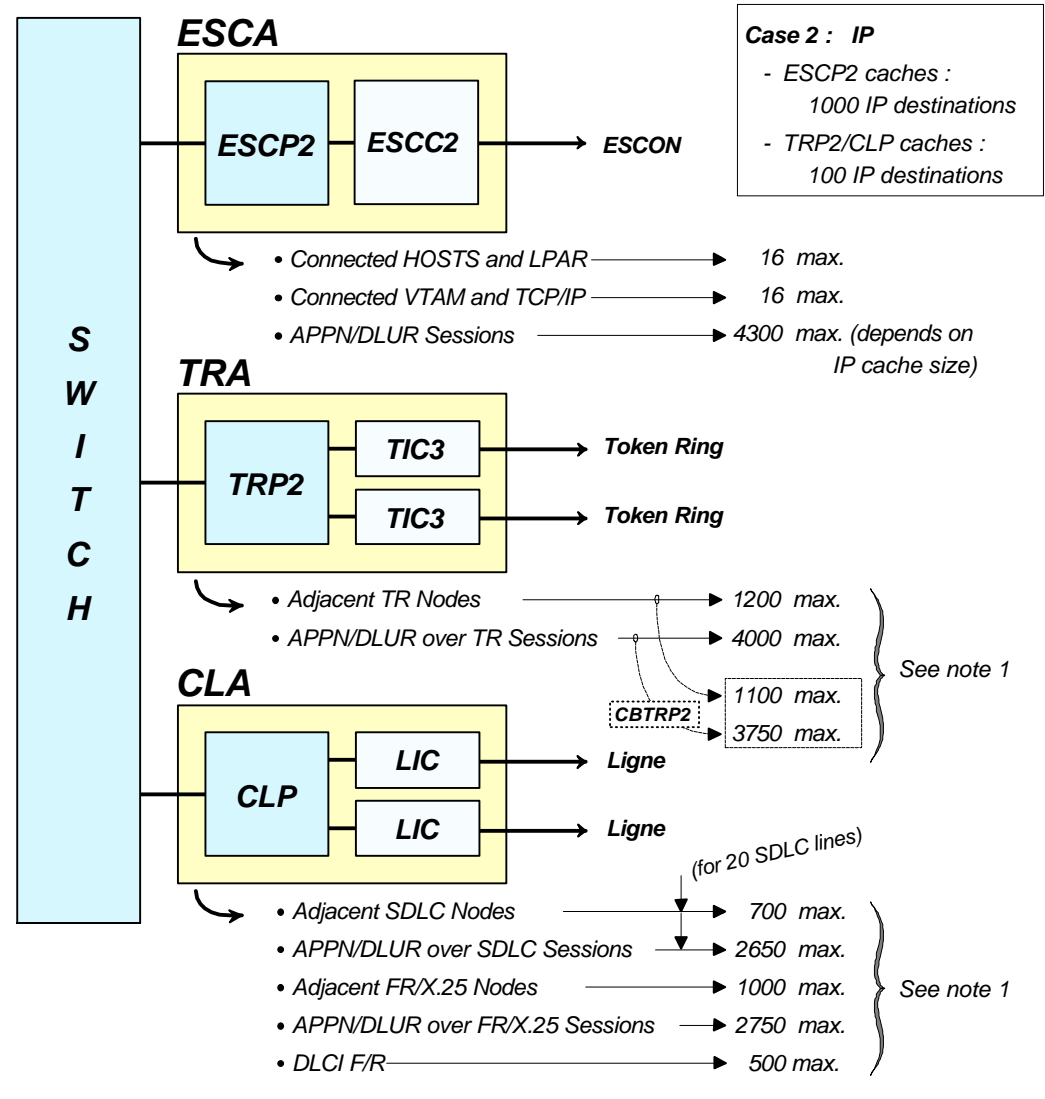
• **Note 1 :** These capacities, as well as IP cache size (and the number of CLP lines) are interdependent. The maximum amounts shown here cannot be obtained simultaneously on the same adapter :

- The number of adjacent APPN/HPR/DLUR nodes will only be maximum if the number of APPN/DLUR sessions = 0 (ANR traffic only)
- The number of APPN/DLUR sessions can only be maximum if the number of adjacent APPN/HPR/DLUR nodes = 1.

• **Note 2 :** From an adapter point of view, as well as on a global level, there is no limit to the number of ANR sessions, nor to the number of adjacent IP stations.



# IBM 3746-950 - Connectivity (2/2)



## 3746-950 Connectivity :

	30/06/97	Product plan preview
Max. <b>4000</b> nodes connection	→ <b>5000</b>	→ <b>5000+</b>
Max <b>12000</b> APPN/DLUR sessions	→ <b>15000</b>	→ <b>15000+</b>
Max. <b>120</b> active lines	→	→ <b>120+</b>
<b>5000</b> IP destinations		

# 3746-900 Connectivity

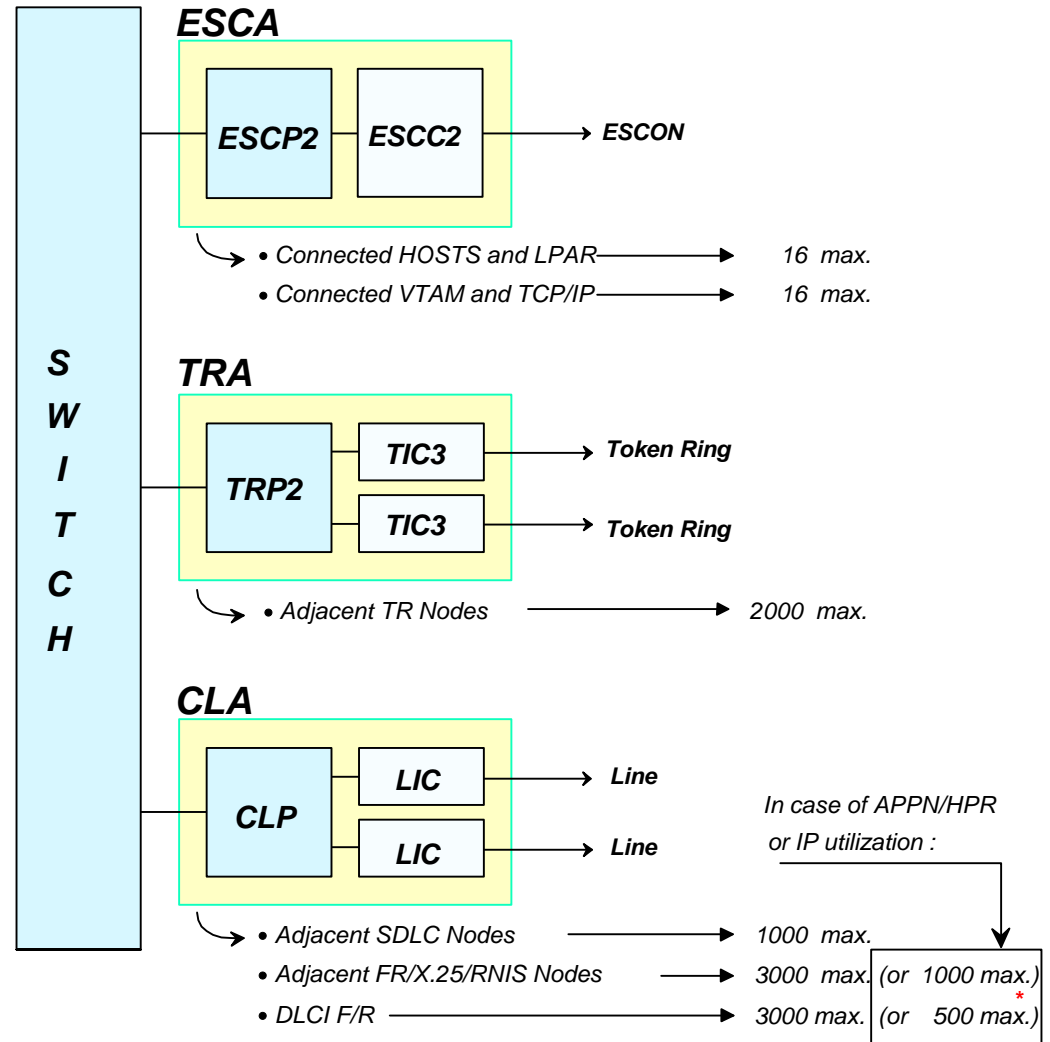


## • Case of a 3746-900 NN :

- Adapters are shared between NCP and CP processors : the numbers shown here give the possible total for both NCP + CP resources
- Furthermore, for resources under CP control, the same considerations as for a 3746-950 have to be taken into account (at each adapter level as well as globally)
- The APPN/HPR code can be loaded selectively for each adapter type.

If the code is loaded on the CLP, the global connectivity (NCP + CP) is decreased :

- Adjacent FR/X.25/ISDN nodes : 1000 max.
  - DLCI FR = 500 max.
- (see \*)



# Contents

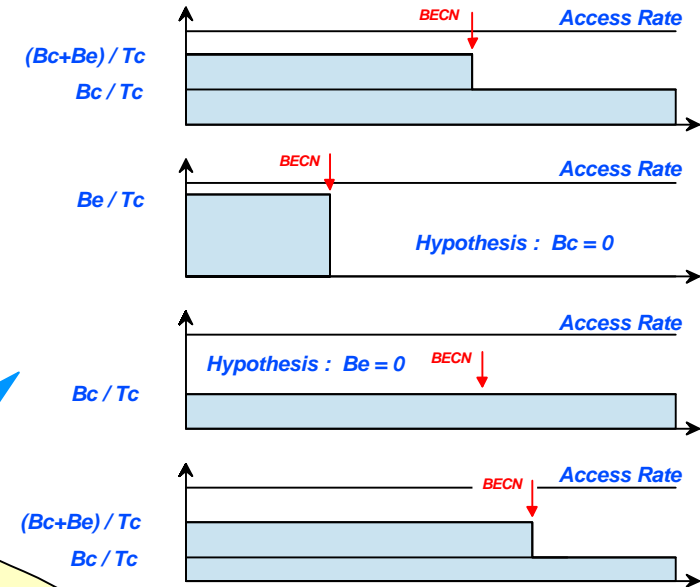
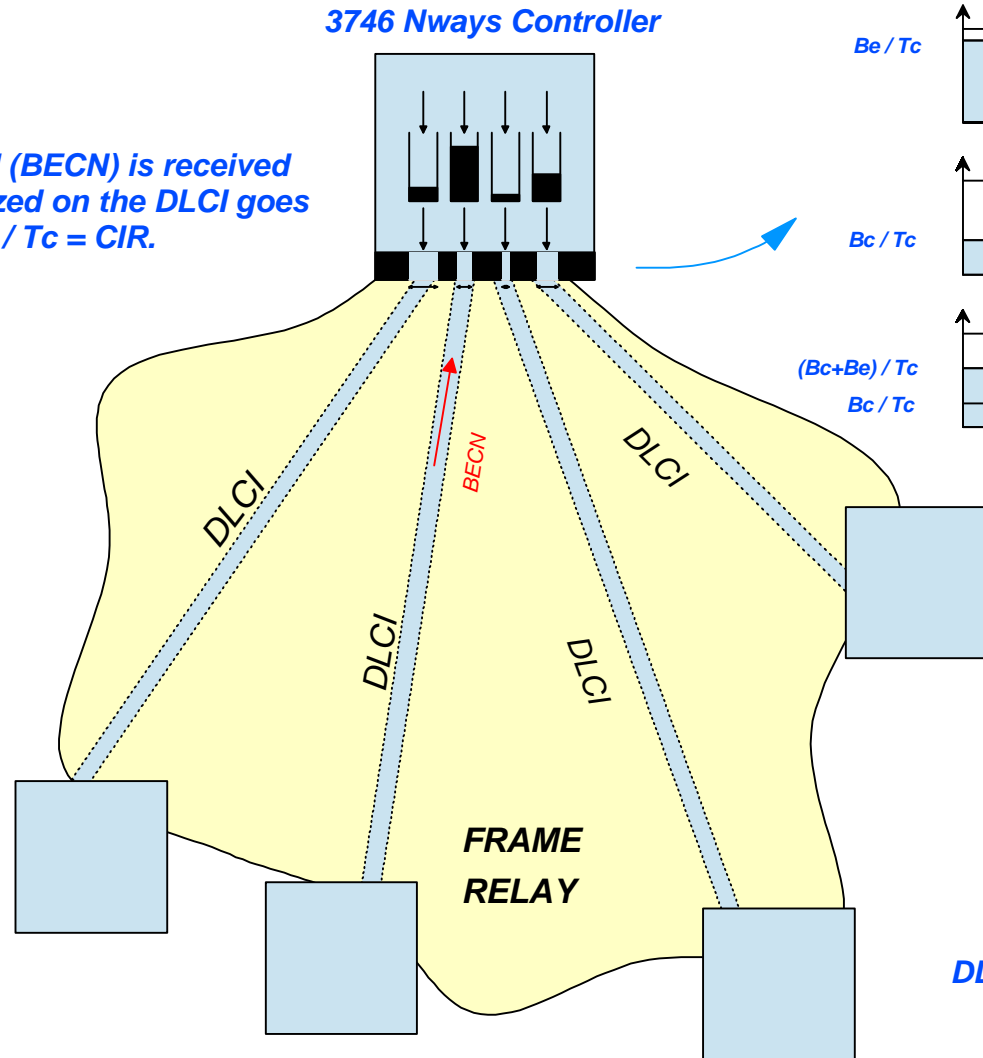


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# Committed Information Rate (1/2)



In case a congestion signal (BECN) is received on a DLCI, the flow authorized on the DLCI goes from  $(Bc + Be) / Tc$  to  $Bc / Tc = CIR$ .

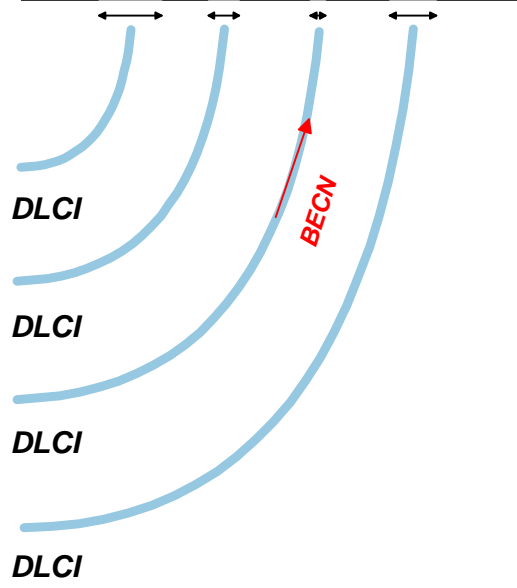
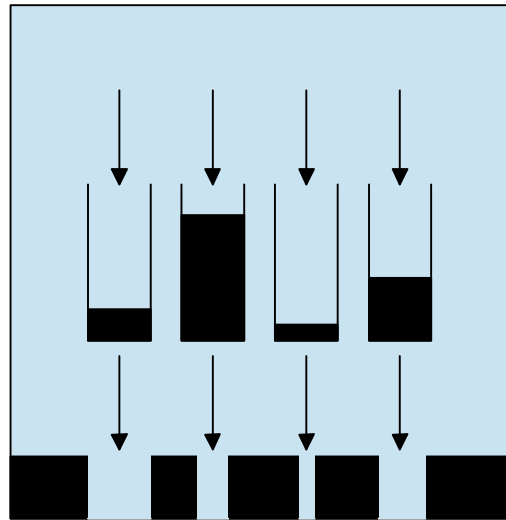


DLCI : Data Link Control Identifier

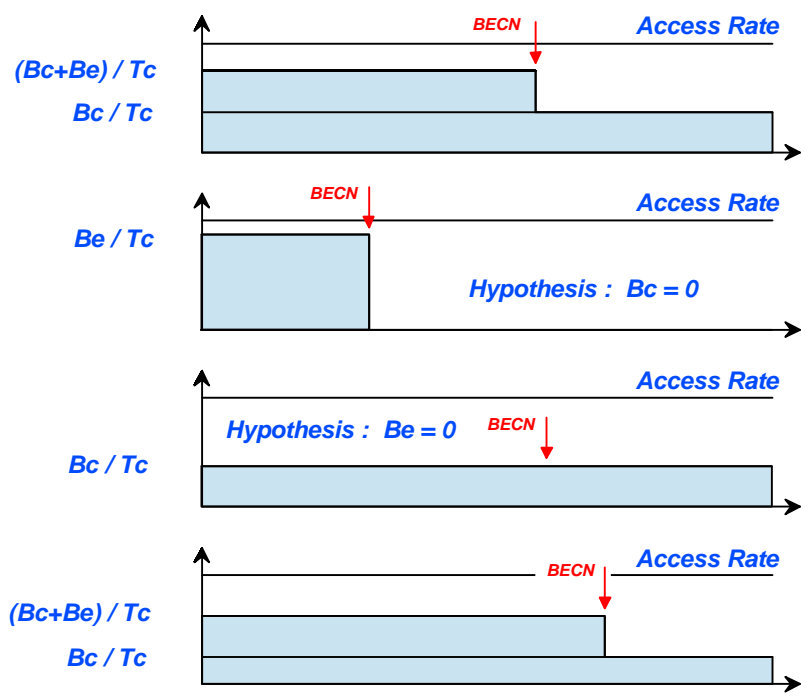
# Committed Information Rate (2/2)



3746 Nways Controller



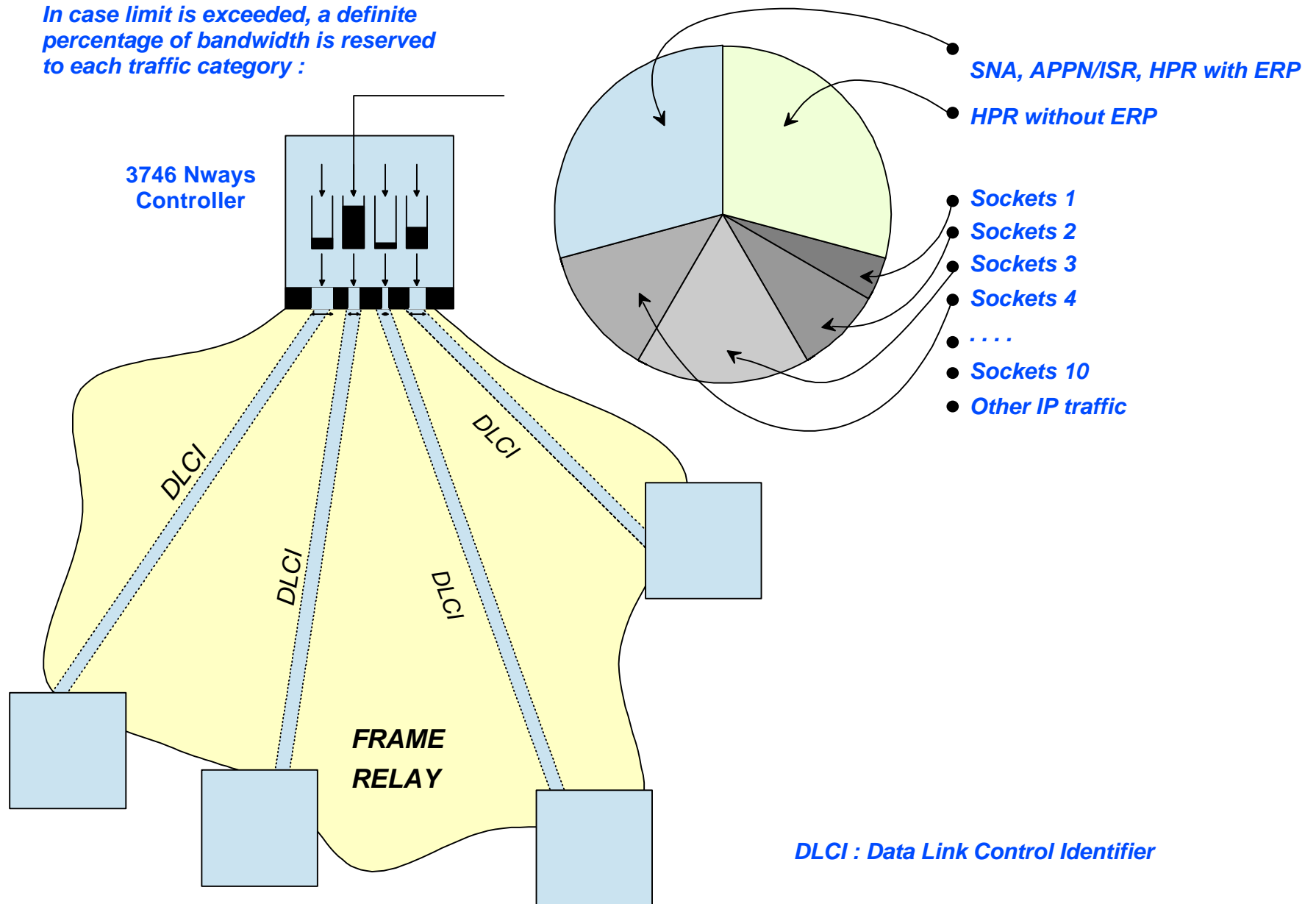
- $B_c$  : Committed Burst Size
- $B_e$  : Excess Burst Size
- $T_c$  : Committed Rate Measurement Interval
- CIR : Committed Information Rate
- $CIR = B_c / T_c$
- BECN : Backward Explicit Congestion Notification
- FECN : Forward Explicit Congestion Notification



# Bandwidth Reservation System



*In case limit is exceeded, a definite percentage of bandwidth is reserved to each traffic category :*



*DLCI : Data Link Control Identifier*