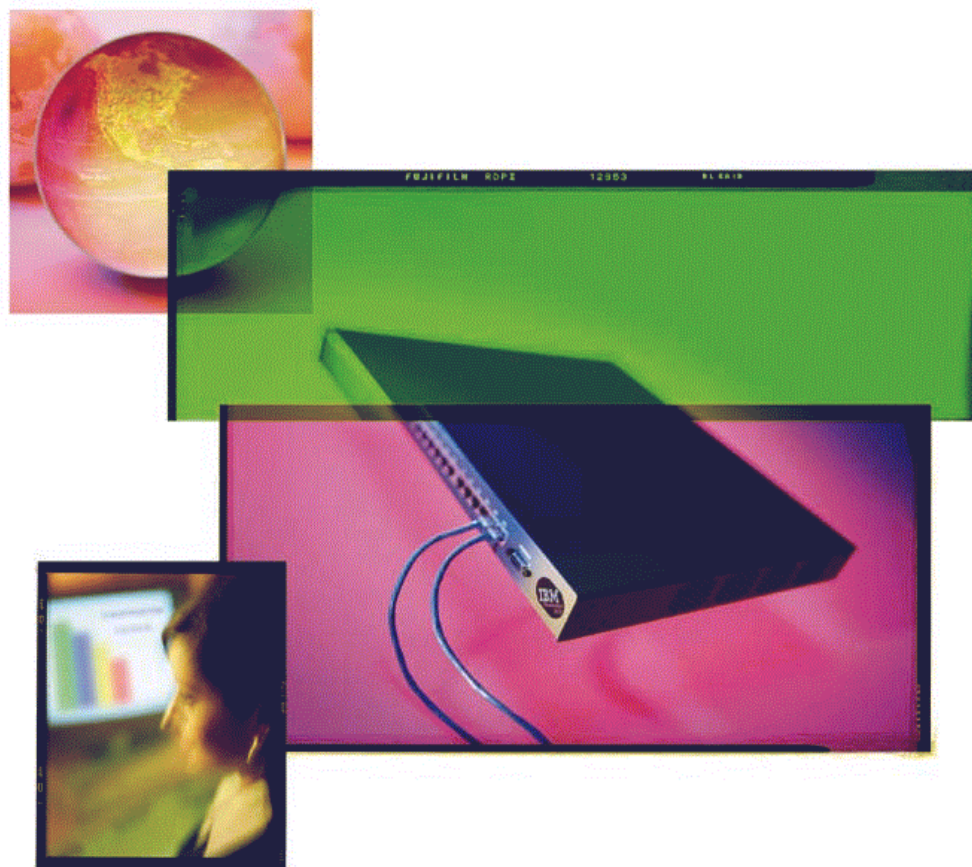


# IBM 3746 Nways Multiprotocol Controllers Models 900 and 950

January 12, 1998  
(Revision 5)



## Connectivity & Performance

# IBM 3746 - Box Connectivity



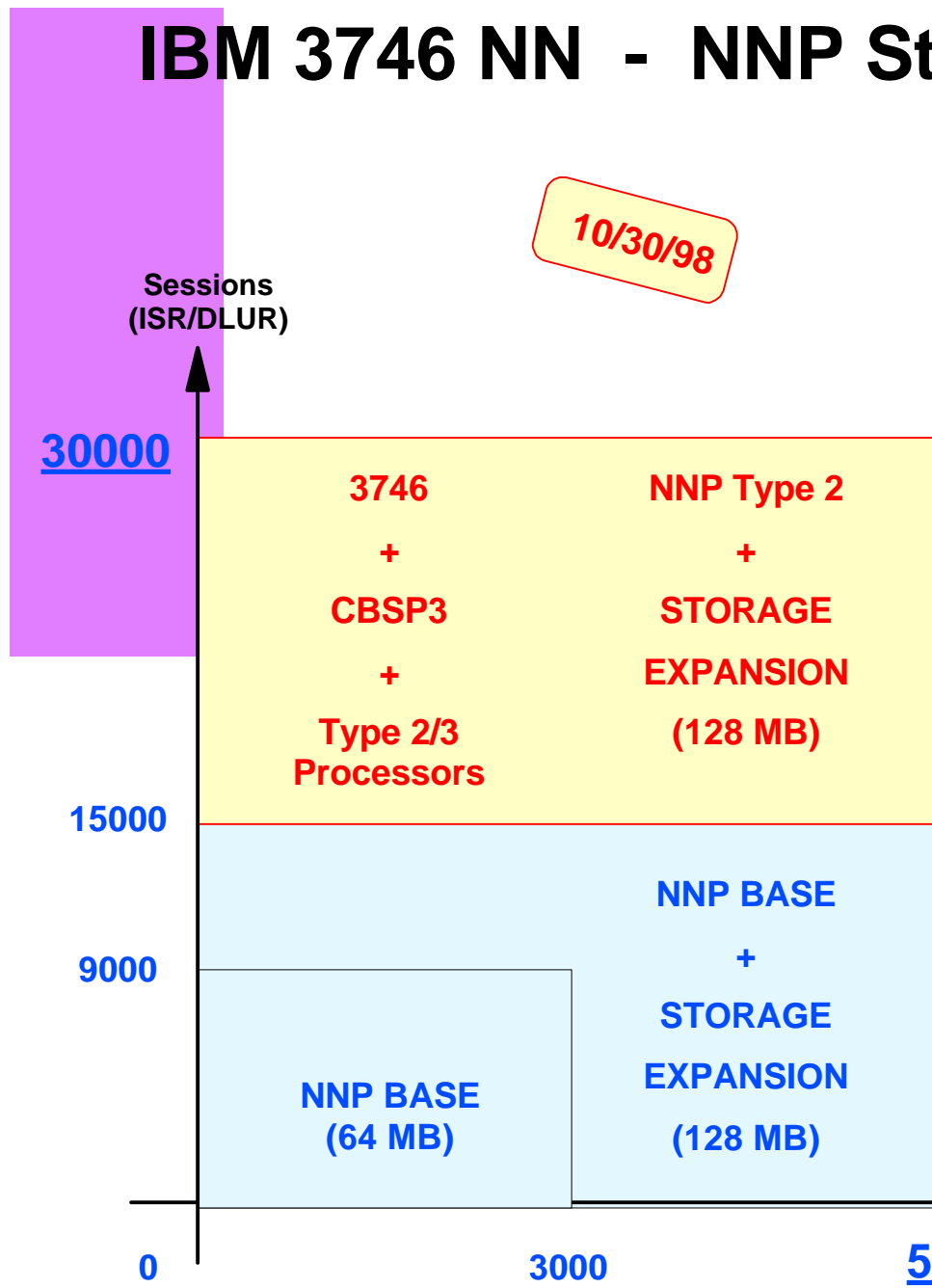
		IBM 3746-950			IBM 3746-900		
		Stage 2 (3/96)	Stage 3 (11/96)	Stage 4 (6/97)	Stage 2 (3/96)	Stage 3 (11/96)	Stage 4 (6/97)
Processor		10	16	16	10	16	16
Adjacent PUs + Nodes	3746	2000	4000	5000 (1)	2000	4000	5000 (1)
	NCP	----	----	----	3745 Storage Dependent	3745 Storage Dependent	3745 Storage Dependent
Sessions (APPN / DLU)	3746 (ISR)	6000	12000	15000 (1)	6000	12000	15000 (1)
	NCP	----	----	----	3745 Storage Dependent	3745 Storage Dependent	3745 Storage Dependent
Lines	3746 <small>- SDLC - FR - PPP - X.25</small>	120	120	120 (1)	120	120	120 (1)
	NCP NPSI <small>- SDLC - FR - X25 - ISDN</small>	----	----	----	Complement to 600	Complement to 600	Complement to 600
ANR Sessions		----	Any	Any	Any (NCP)	Any (3746 + NCP)	Any (3746 + NCP)
IP Stations		----	Any	Any	----	Any	Any
IP Routes		----	5000	5000	----	5000	5000

(1) More connectivity in the future (10/96 Preview)

# IBM 3746 NN - NNP Storage Requirement



10/30/98

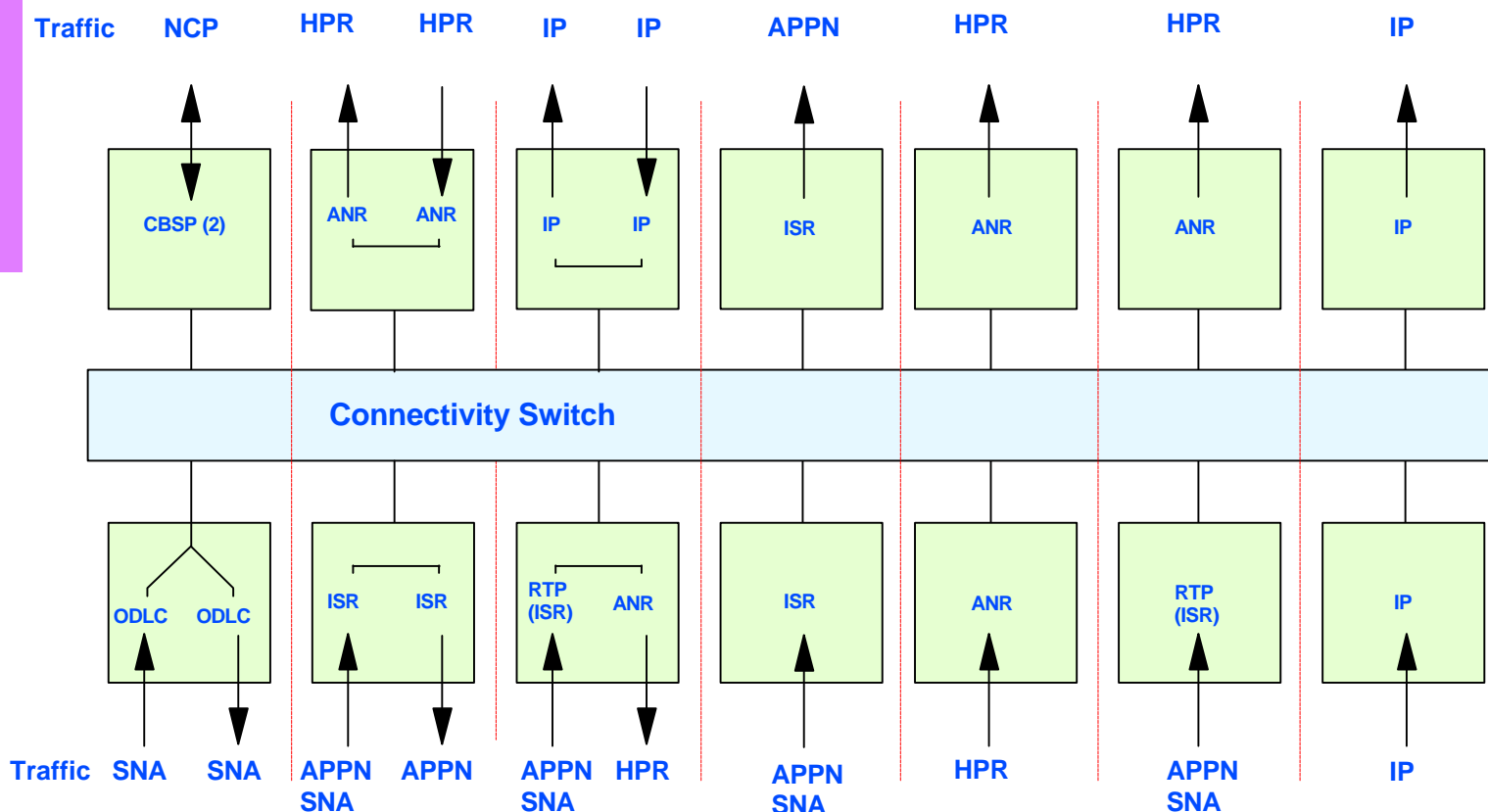


- Prerequisites for more than 15000 and up to 30000 ISR/DLUR Sessions :
  - NNP Type 2 with Storage Expansion (FC #5027)
  - CBSP3
  - Type 2 or Type 3 Processors (ESCP2/ESCP3, TRP2/TRP3, CLP/CLP3)
- Dual NNPs = Symetric storage size

# Session Routing versus Traffic Type



- Two "half Sessions" in same or different processors
- Traffic types in processors : NCP, ODLC, ISR, ANR, RTP, IP



- ANR, IP : NO session awareness in the processors (no storage allocation)
- Traffic types can be mixed on same processor / port

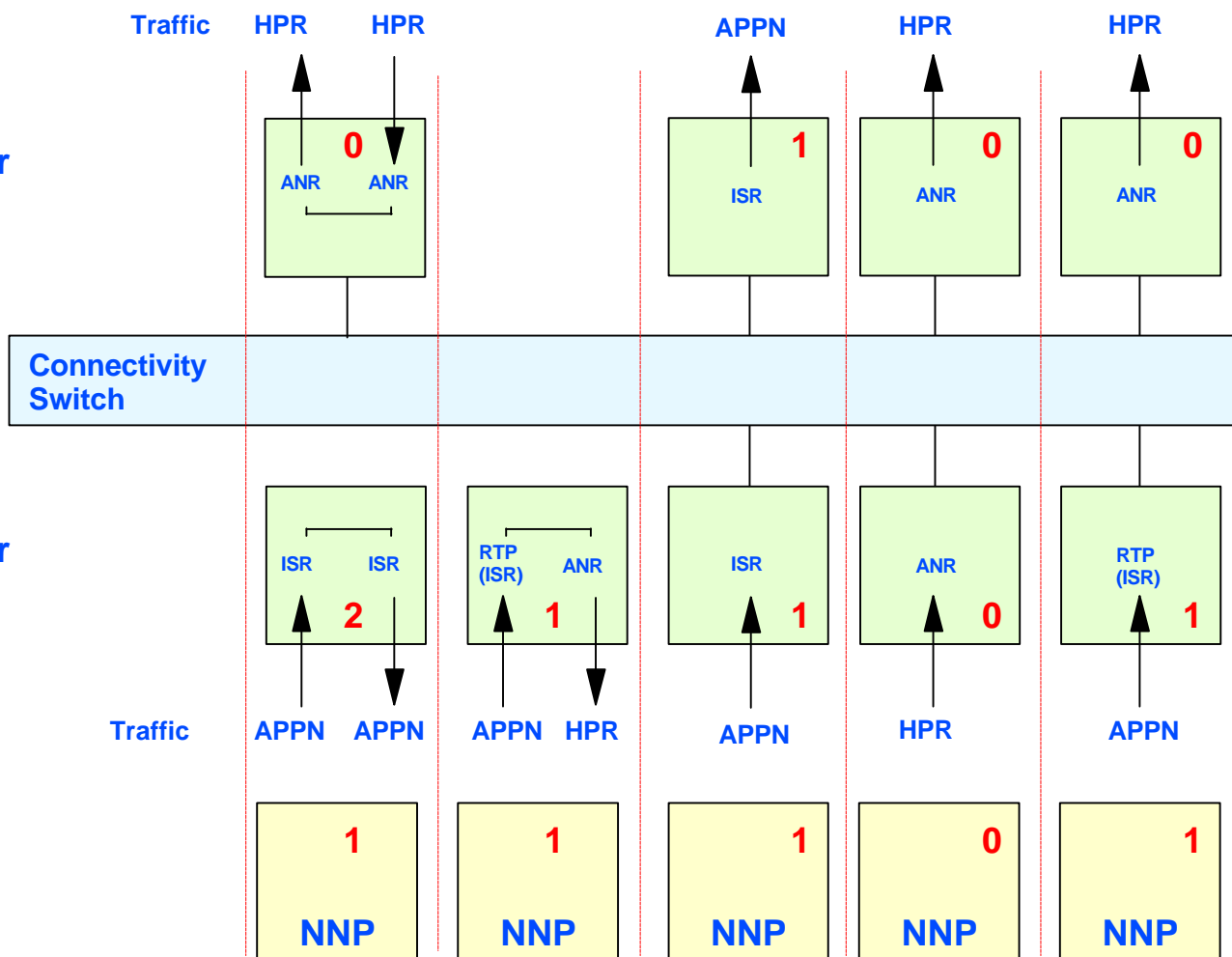
# How to Count Sessions ?

- At Processor Level (CBSP, ESCP, TRP, CLP) :
  - ISR or DLUR sessions
  - One "half Session" in the processor (In or Out)
  - Two "half Sessions" within the same processor
- At NNP Level :

At Processor Level :

At Processor Level :

At NNP Level :



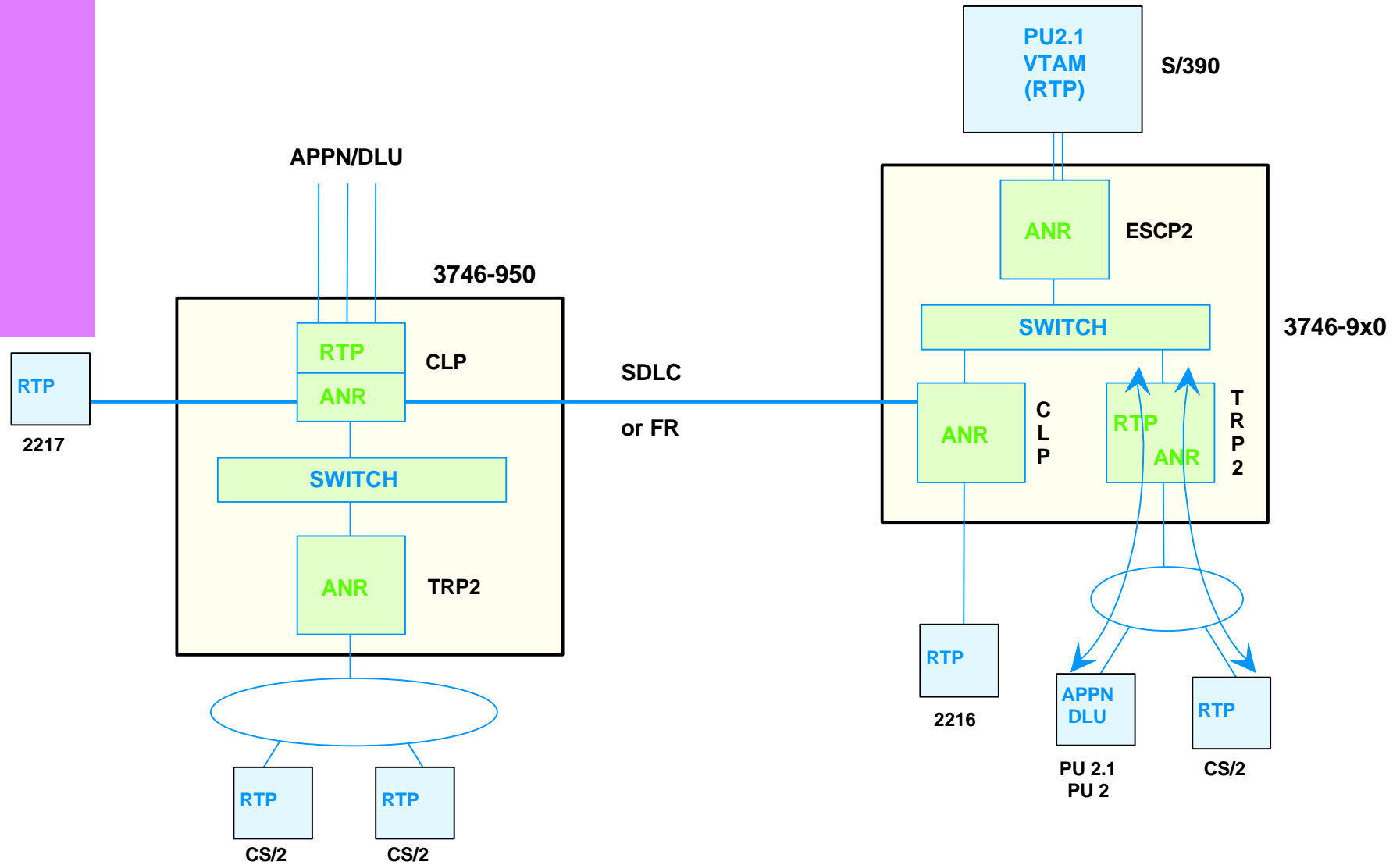
Processor Memory Block Allocation

NNP Memory Block Allocation

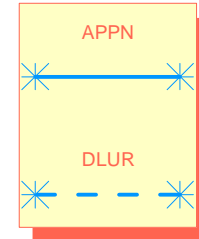
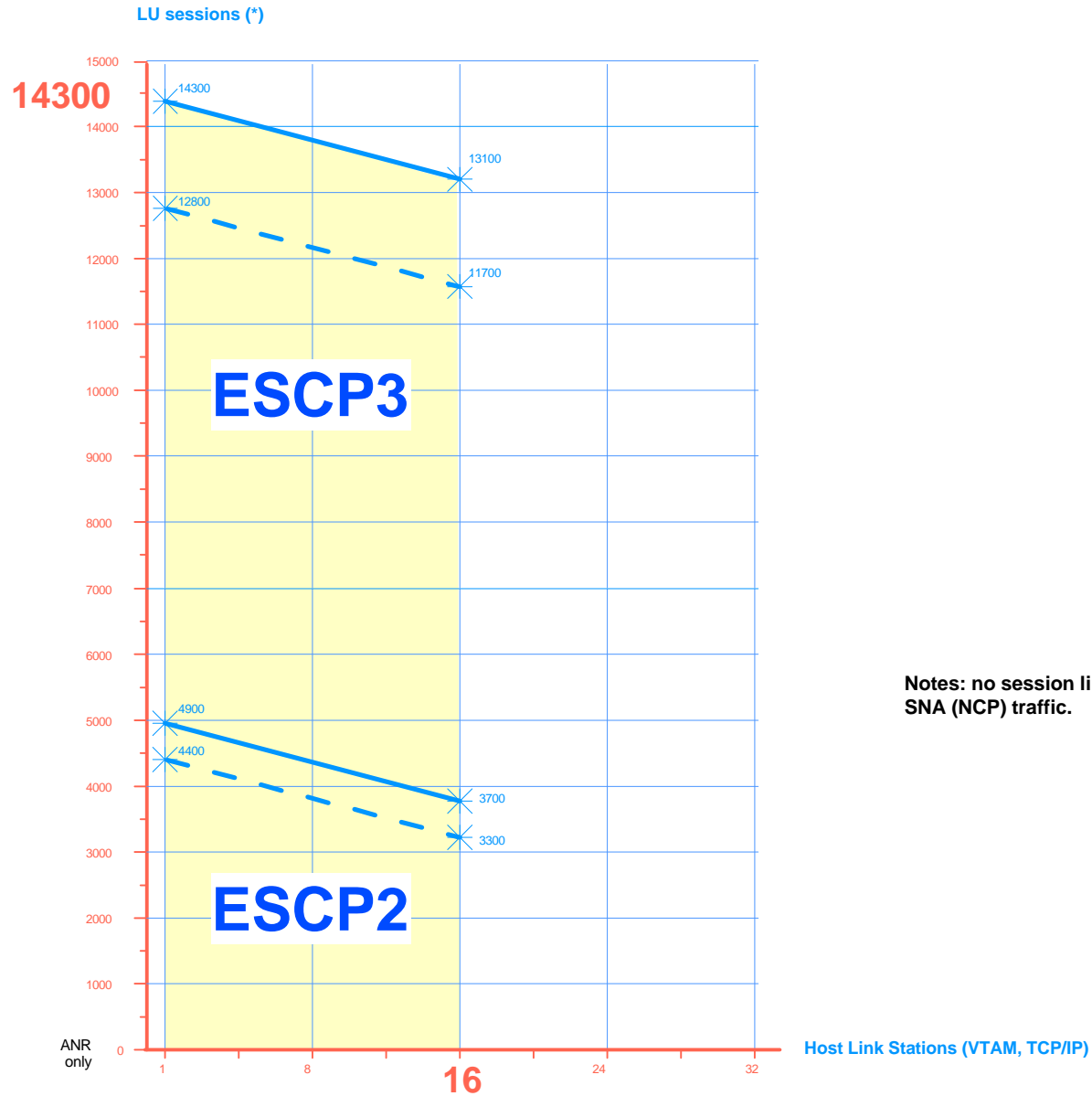
# Routing along HPR path



APPN/DLU <-> RTP <-> ANR <-> ..... <-> ANR <-> RTP



# 3746NN - ESCP2 / ESCP3 Connectivity



Notes: no session limit for HPR (ANR) and SNA (NCP) traffic.

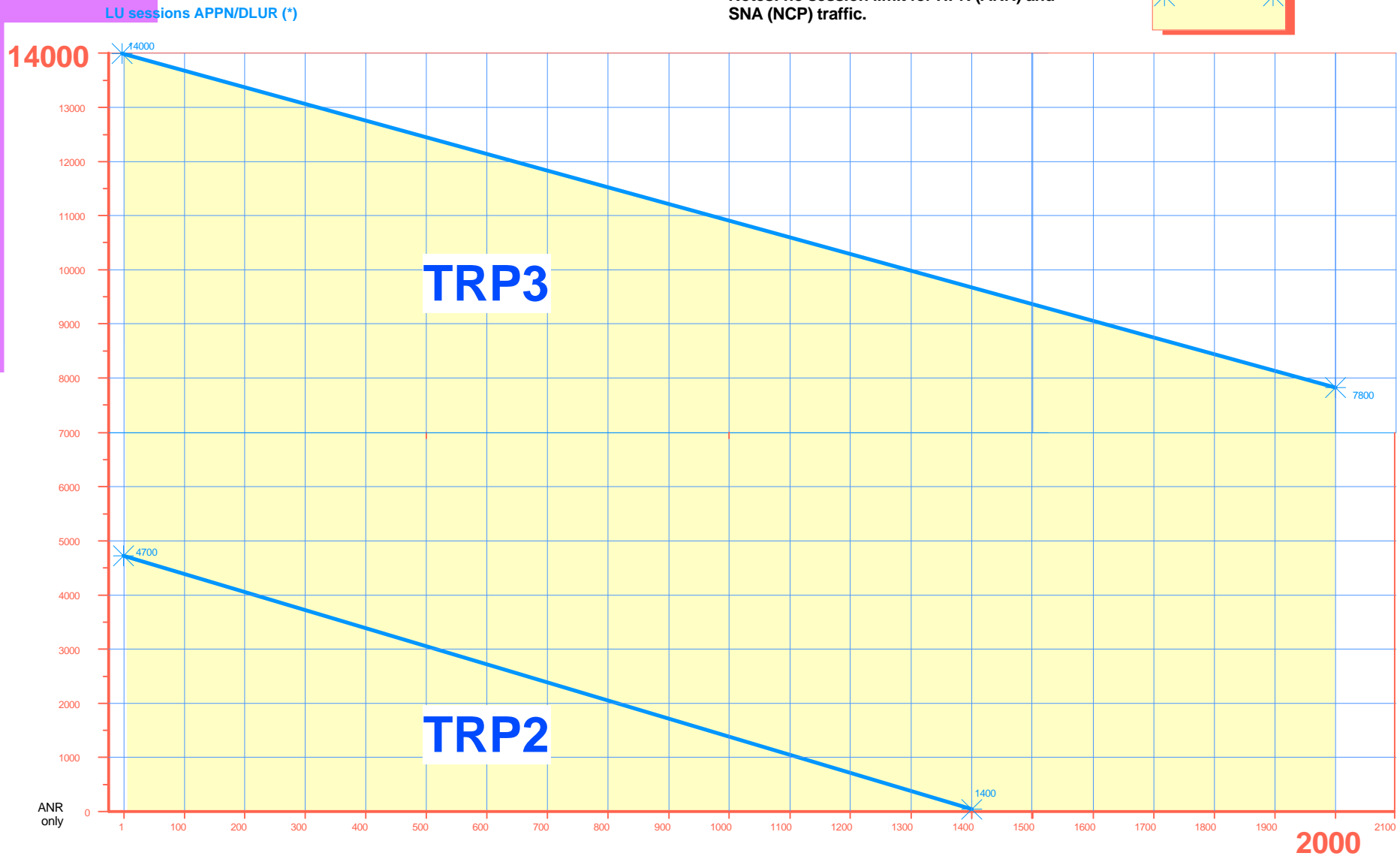
For simplicity, linear representation is used (approximation).  
If IP is used, the number of sessions is reduced by about 1000.

(\*) Control Sessions are in addition

# 3746NN - TRP2 / TRP3 Connectivity



Notes: no session limit for HPR (ANR) and SNA (NCP) traffic.



For simplicity, linear representation is used (approximation).  
If IP is used, the number of sessions is reduced by about 1000.

(\*) Control Sessions are in addition

2000  
PUs (APPN/DLUR/HPR)



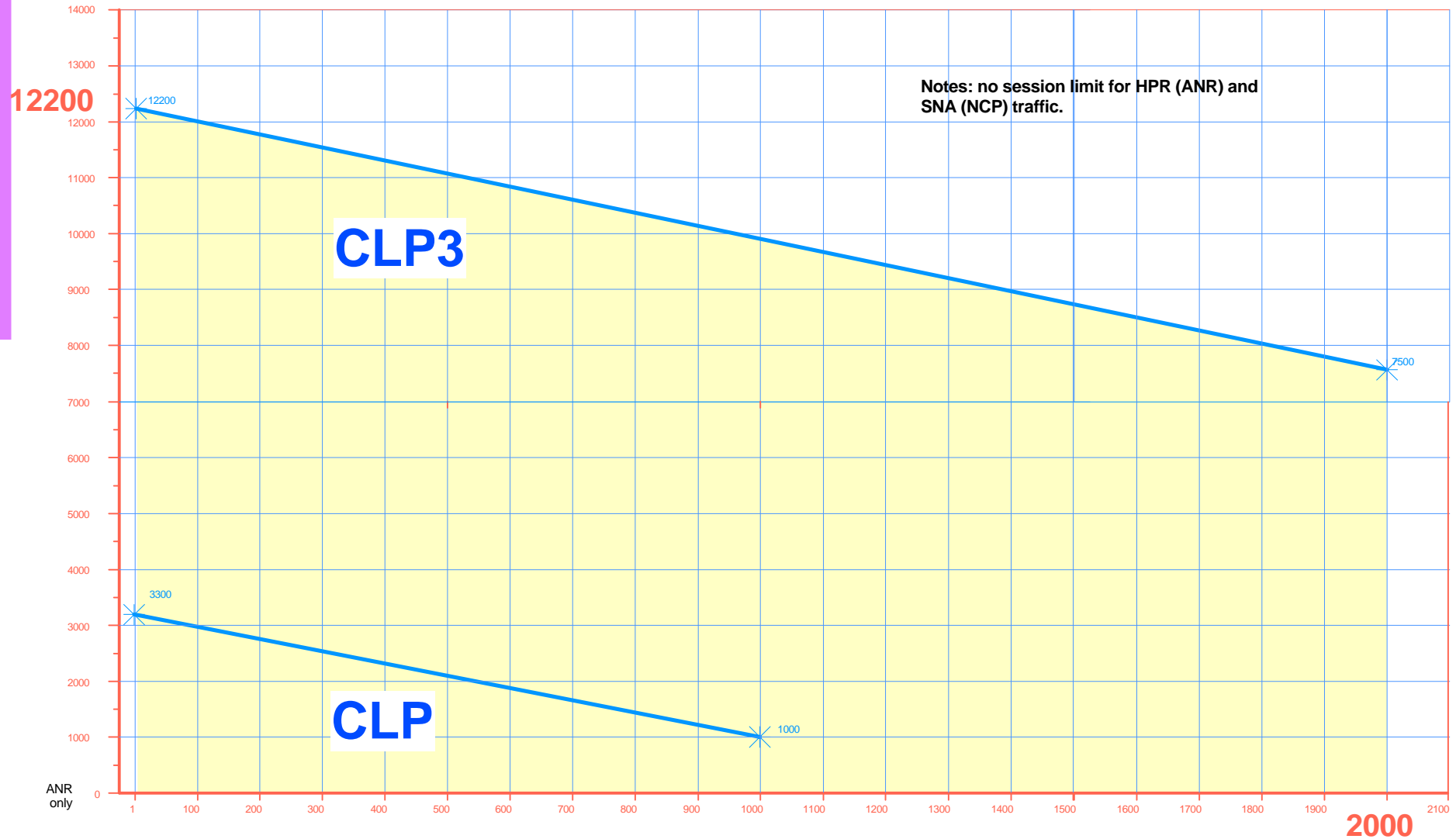
# 3746NN - CLP / CLP3 Connectivity



Up to 120 Lines (FR, X.25)



LU sessions APPN/DLUR (\*)



For simplicity, linear representation is used (approximation).  
 If IP is used, the number of sessions is reduced by about 1000.  
 If X.25 is used instead of FR, the number of sessions is reduced by about 200.

(\*) Control Sessions are in addition

PU's (APPN/DLUR/HPR)

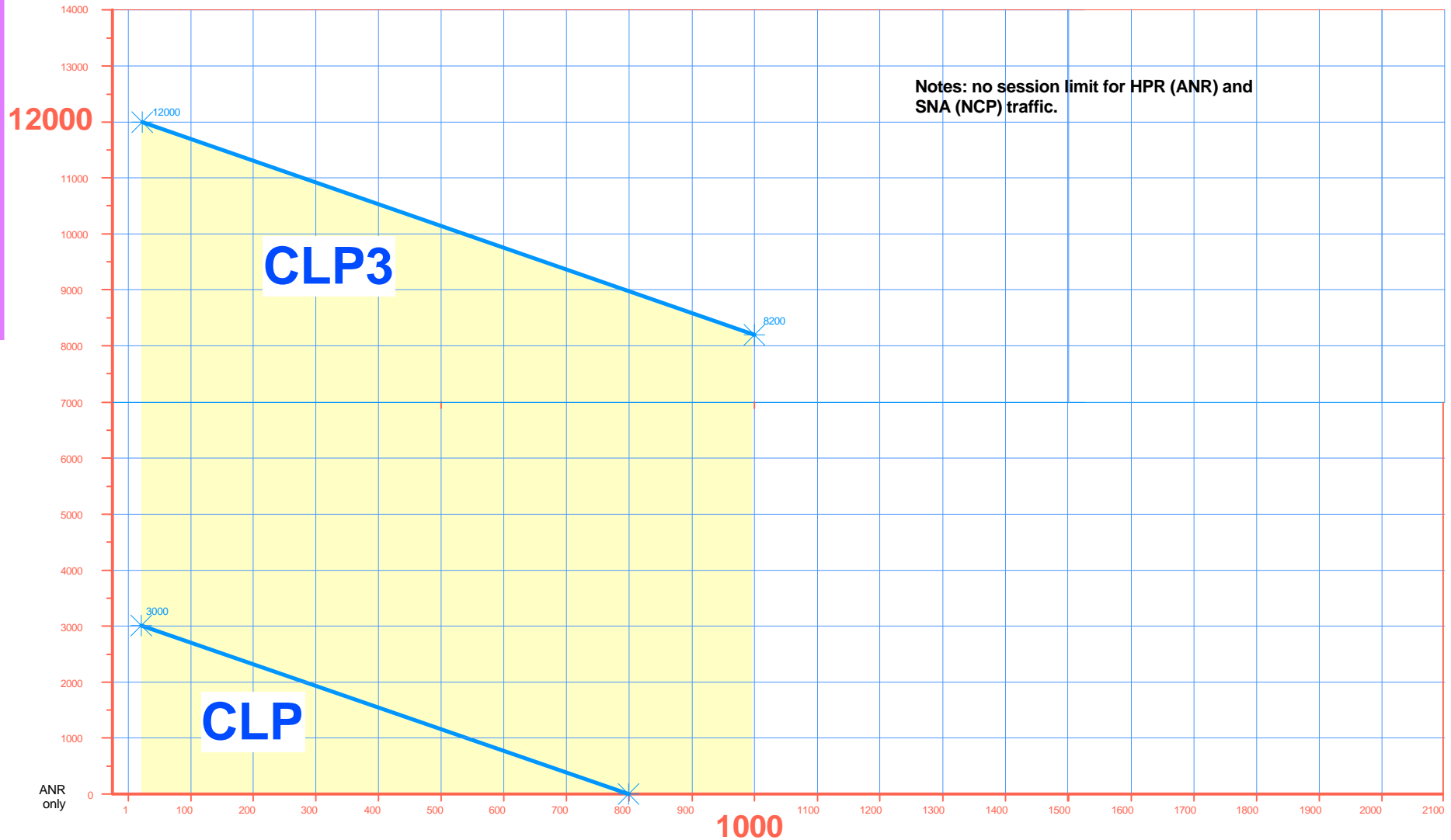
# 3746NN - CLP / CLP3 Connectivity



## 20 Lines (SDLC)



LU sessions APPN/DLUR (\*)



For simplicity, linear representation is used (approximation).  
If IP is used, the number of sessions is reduced by about 1000.

(\*) Control Sessions are in addition

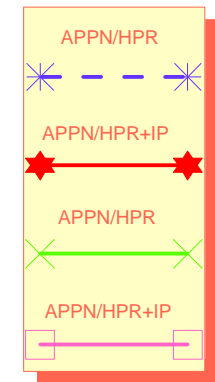
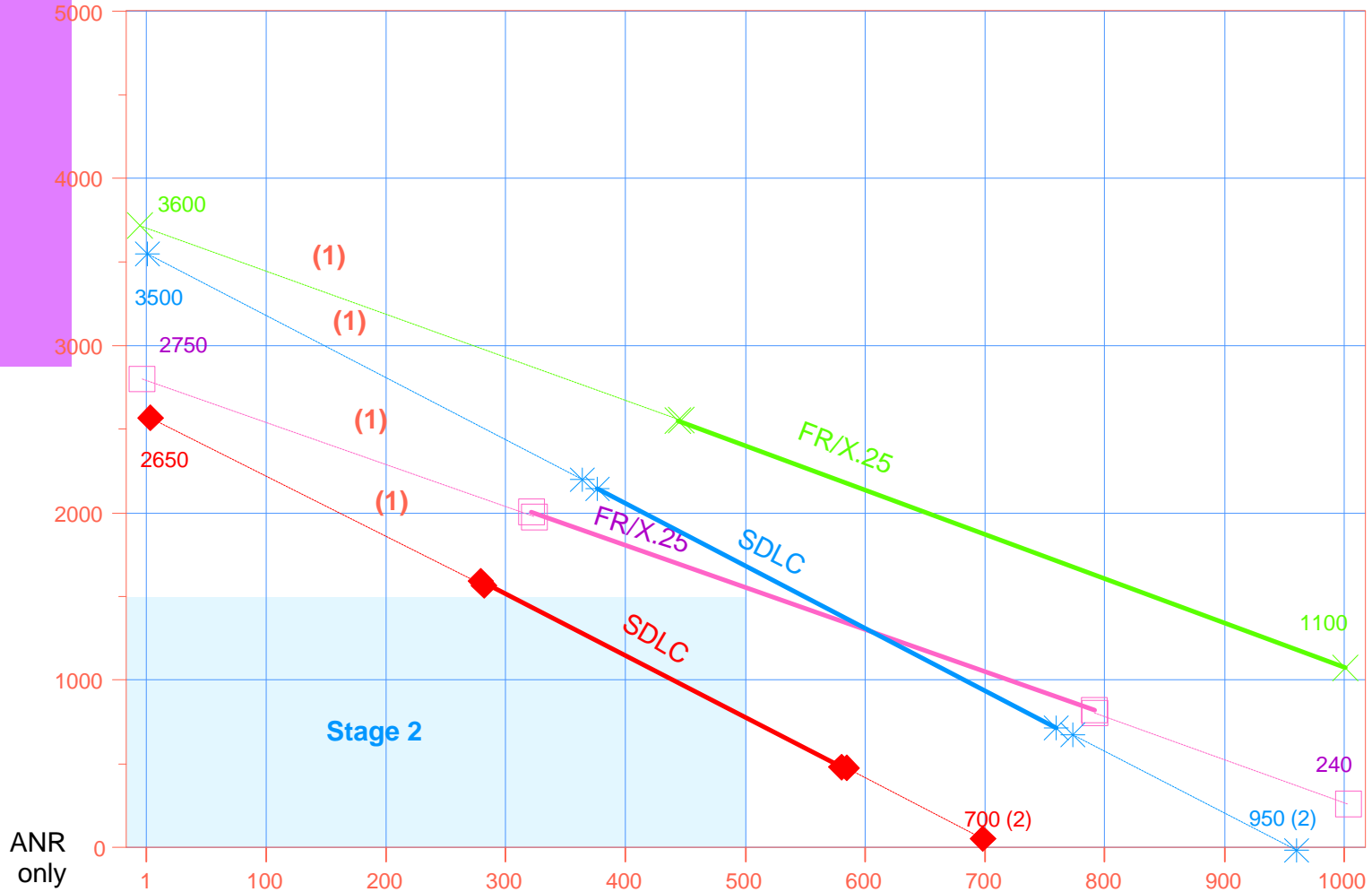
PU's (APPN/DLUR/HPR)

# 3746NN - CLP Connectivity - Stage 3



LU sessions (ISR)

20 SDLC lines versus Frame Relay/X25 lines (up to 120)



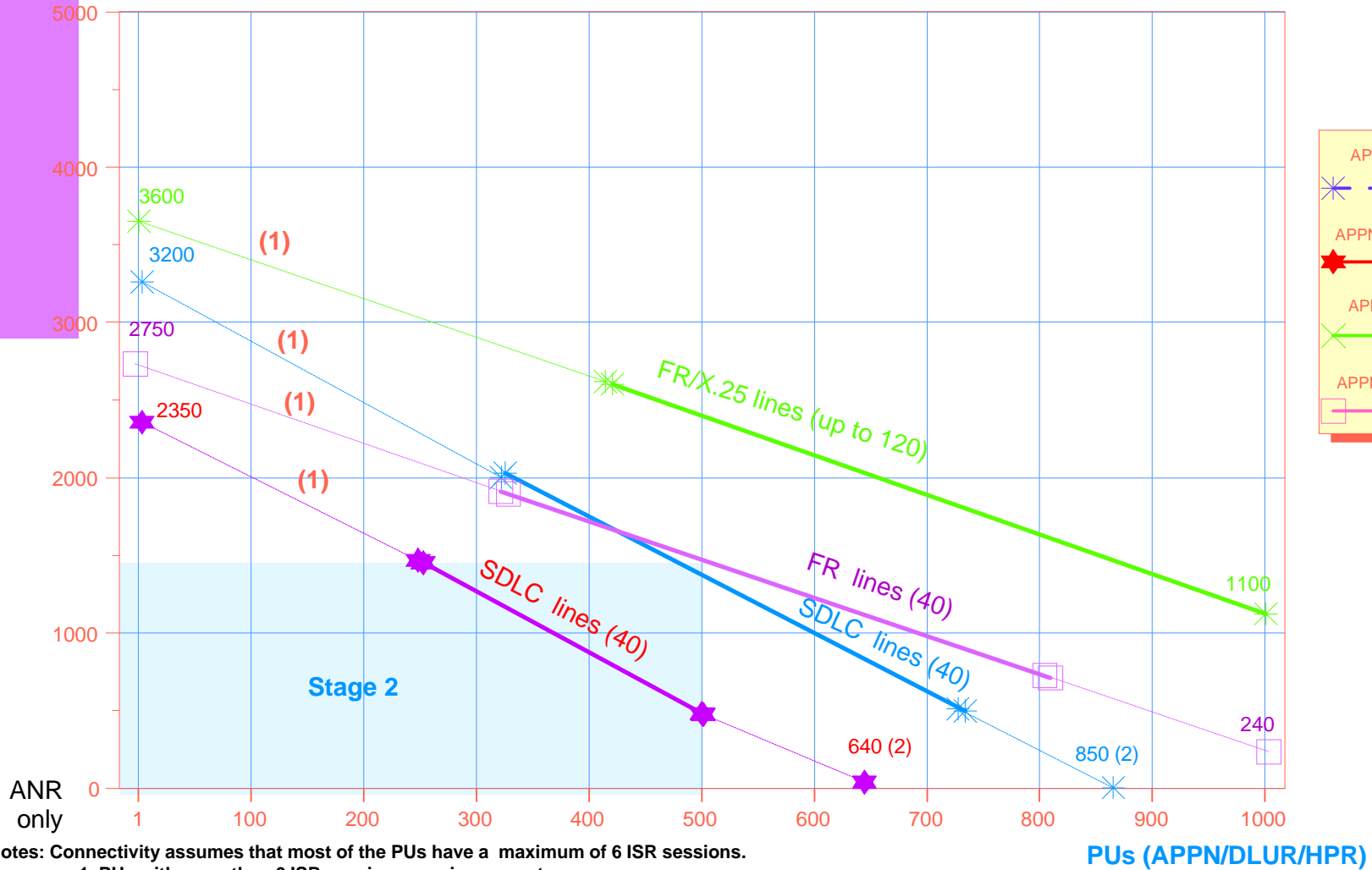
Notes: Connectivity assumes that most of the PUs have a maximum of 6 ISR sessions.  
 1. PUs with more than 6 ISR sessions require more storage  
 2. All HPR PUs (no ISR sessions)

# 3746NN - CLP Connectivity - Stage 3

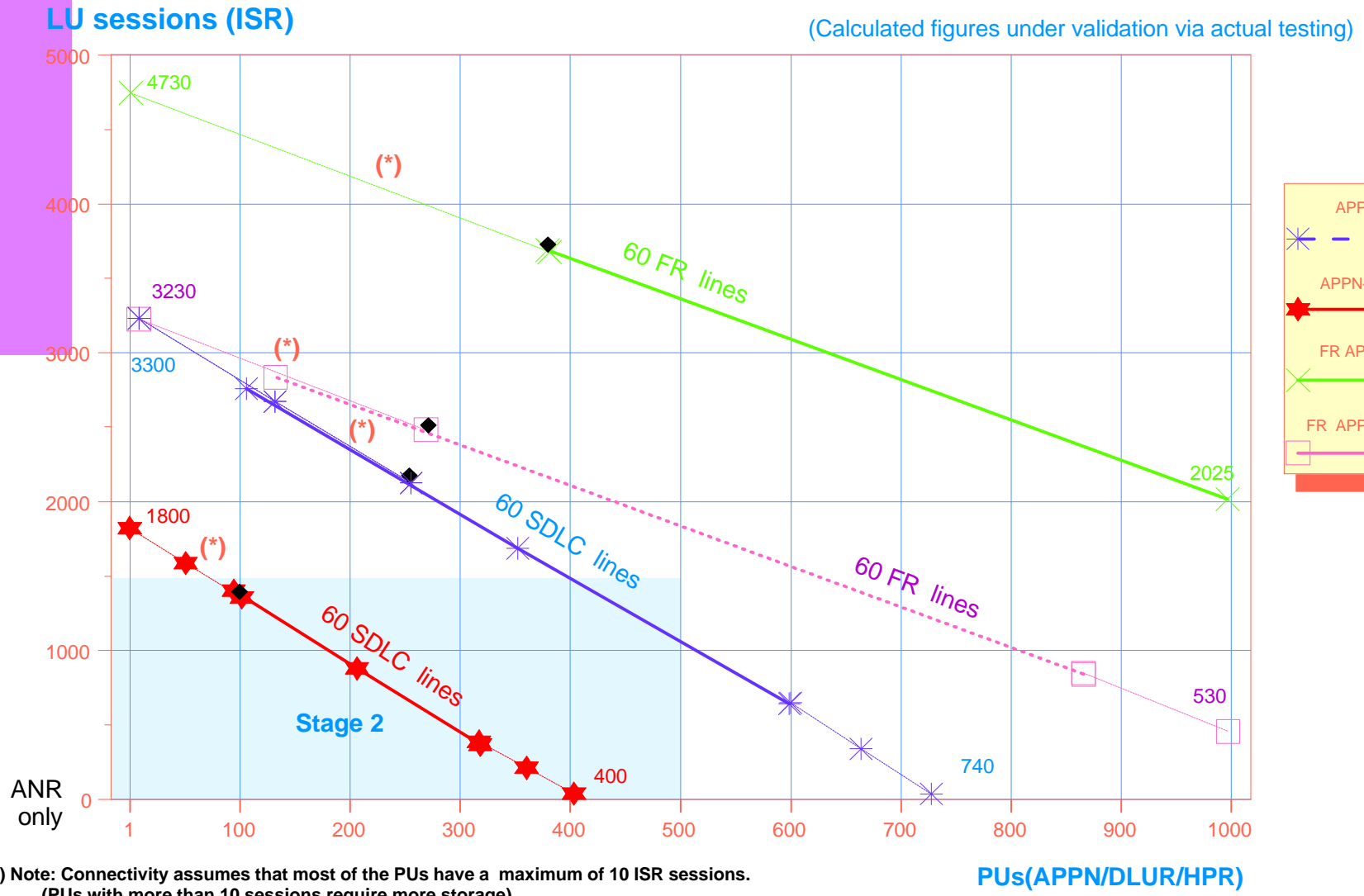


LU sessions (ISR)

40 SDLC lines versus Frame Relay/X25 lines (up to 120)



# 3746NN - CLP Connectivity (60 lines) - Stage 3 (Future)



# 3746 - Processors Connectivity (APPN, ANR, IP) 1/2



(1) Maximum IP cache per processor : 5000 IP host destinations

Assumed IP cache ESCP2 = 1000, TRP2/CLP = 100

(2) Maximum PUs or nodes: obtained with no ISR (ANR only); maximum ISR sessions: 1 Node

Processor Category		Ports		Adjacent PUs/nodes		ISR sessions (APPN/DLU)		ANR Sessions and/or IP stations
		Stage 2	Stage 3	Stage 2	Stage 3	Stage 2	Stage 3	
ESCP 2	w/o IP	1		16	16	3000	5000	Any
	with IP (3)	1		--	16	--	4300 (1)	Any (4)
TRP2	w/o IP	2		500	1400 (2)	3000	5000 (2)	Any
	with IP (3)	2		--	1200 (1)(2)	--	4000 (1)(2)	Any
(CB) TRP2	w/o IP	1		500	1300 (2)	3000	4500 (2)	Any
	with IP (3)	1		--	1100 (1)(2)	--	3750 (1) (2)	Any

(3) IP (if used) is loaded with APPN/HPR in all the processors of this category

(4) For each TCP/IP MVS, IP uses one (out of 16) ESCP2 logical link station

# 3746 - Processors Connectivity (APPN, ANR, IP) 2/2



(1) Maximum IP cache per processor = 5000 host destinations

Assumed IP cache: ESCP2 = 1000, TRP2/CLP = 100

(2) Maximum PUs or nodes: obtained with no ISR (ANR only); maximum ISR sessions: 1 Node

Processor Category			Ports		Adjacent PUs/nodes		ISR sessions (APPN/DLU)		ANR Sessions and/or IP stations
			Stage 2	Stage 3	Stage 2	Stage 3	Stage 2	Stage 3	
C L P	SDLC	w/o IP	120 (2)	120 (2)	500 (2)	950 (2) (20 lines)	1500 (2)	3500 (2) (20 lines)	Any
		with IP (3)	--	120 (2)	--	700 (1)(2) (20 lines)	--	2650 (1)(2) (20 lines)	Any
	FR/X25 (500 DLCIs)	w/o IP	--	120	--	1000 (2)	--	3600 (2)	Any
		with IP (3)	--	120	--	1000 (2)	--	2750 (1)(2)	Any
	PPP	with IP (3)	--	120	--	--	--	--	Any

(3) IP (if used) is loaded with APPN/HPR in all the processors of this category

# 3746-900 - Processors Connectivity (NCP/NPSI)



Processor Type	Ports	Adjacent nodes and PUs	Sessions (BNN, INN, ISR, ANR)	
ESCP2	1	16 (1)	3745  CCU  STORAGE  DEPENDENT	
TRP2	2	2000 (1) (2)		
(CB) TRP2 3745-41A/61A	1	2000 (1) (2)		
CLP	w/o APPN/HPR w/o IP	120		SDLC: 1000 FR+X.25+ISDN: 3000 FR DLCIs: 3000
	with IP and/or with APPN/HPR	120 (1)(2)		SDLC:1000 (1) (2) FR+X.25+ISDN: 1000 (1) FR DLCIs: 500 (1)
CBSP2	1 (4)	500 (4)		
ESCP (3)	1	16		
TRP (3)	2	2000		
(CB) TRP (3)	1	500		
CBSP (3)	1	500		

- (1) If 3746 APPN/HPR and/or IP is used, this is the maximum in combination with the resources own by the 3746NN/3746 IP
- (2) If 3746 APPN/HPR and/or IP is used, the maximum (combined NCP/3746NN/3746 IP) may be lower depending on other active resources
- (3) Withdrawn from Marketing. Does not support 3746NN and 3746 IP
- (4) If 3746 APPN/HPR and/or IP used, connectivity=0 (no user traffic on CBSP2/TIC3)



# Processor load versus traffic types



	ESCP2	TRP2		CLP <sup>(4)</sup>		
		ERP	Non ERP	SDLC	FR <sup>(3)</sup>	PPP
NCP <sup>(1)</sup> (ODLC)	e	t	t x .7 (CNN ANR)	c		
ISR <sup>(2)</sup> (APPN/ DLUR)	e x 5	t x 3	--	c x 2.5		
RTP <sup>(2)</sup>	--	t x 6	--	c x 5		
ANR <sup>(2)</sup>	e	t	t x .7	c x .7		
IP <sup>(2)</sup>	e x 1.5	--	t x .7	c x .6		

(1) Processor load of installed 3746/NCP can be obtained from NPM (or MOSS-E graphical display)

(2) NCP traffic is used as a reference for comparison with other traffics

(3) Non-ERP or ERP

(4) Reflects approximately line weight ratios

Notes - Projections based on design and some measures

For NCP traffic, ESCP2/TRP2 load = ESCP/TRP load x .6

# IBM 3746 - Optional Microcode Loading



**Features Selection**

Select the features/functions you want to install and enter corresponding passwords:

Features	Password	Extended Functions	Password
<input type="checkbox"/> APPN/HPR	no password	<input type="checkbox"/> 3746 (FC.5800 / FC.5802)	<input type="password"/>
<input type="checkbox"/> IP	<input type="password"/>	<input type="checkbox"/> MAE (FC.5804 / FC.5805)	<input type="password"/>
<input type="checkbox"/> X.25	<input type="password"/>	<input type="checkbox"/> TN3270E Server (FC.5806)	<input type="password"/>
<input type="checkbox"/> ISDN	no password		

# IBM 3746 - Mcode selection per category of processors

## Optimizes processor storage utilization

- IP not selected/loaded  
More storage for PUs, LU-LU sessions (APPN/DLUR), SDLC lines
- APPN/HPR and IP not selected/loaded (3746-900)  
=> 3000 PUs (FR/ISDN) and/or VCs (X25) per CLP  
=> 3000 DLCI (FR) per CLP

## Selection applies to processors Type 2 and Type 3

Network Routing Protocol Selection Per Processor Type

Select the routing protocol(s) you want to load per processor type :

CLP	CBTRP	TRP	ESCP
<input type="checkbox"/> APPN/HPR	<input checked="" type="checkbox"/> APPN/HPR	<input checked="" type="checkbox"/> APPN/HPR	<input checked="" type="checkbox"/> APPN/HPR
<input type="checkbox"/> IP	<input type="checkbox"/> IP	<input checked="" type="checkbox"/> IP	<input checked="" type="checkbox"/> IP

OK Cancel

Note: APPN/HPR selection is mandatory for all the 3746-950 processors and for any category of processors running IP

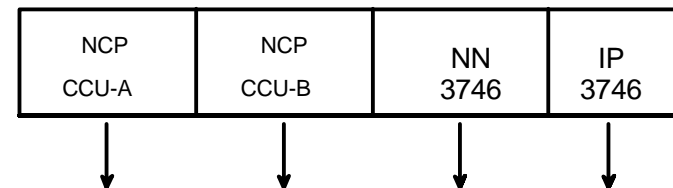
# IBM 3746 - Adapter Sharing Rules



The same CLP can support simultaneously SDLC, Frame Relay, PPP, X.25 NPSI and X.25 QLLC on different lines

(2) Frame Relay sharing : Line and DLCI

(X.25 QLLC = SNA support of 3746NN and NCP V7R4/V7R5)



ESCON Channel Processor Type 2	NCP-A	NCP-B	NN	IP
ESCON Port	NCP-A	NCP-B	NN	IP

Token-Ring Processor Type 2	NCP-A	NCP-B	NN	IP	
Token-Ring Port	either	NCP-A	NN	IP	
	or		NCP-B	NN	IP
	or		NN	NN	IP

Communication Line Processor (1)	NCP-A	NCP-B	NN	IP	
SDLC line	either	NCP-A			
	or		NCP-B		
	or		NN		
X25 Line (QLLC) FR Line/DLCI (2)	either	NCP-A	NN	IP	
	or		NCP-B	NN	IP
	or		NN	NN	IP
Line (PPP)				IP	

- **ESCON adapters**

- Full NN, IP, NCP sharing on a single processor/port

- **CLP adapters**

- Full NN, IP, NCP sharing on processor

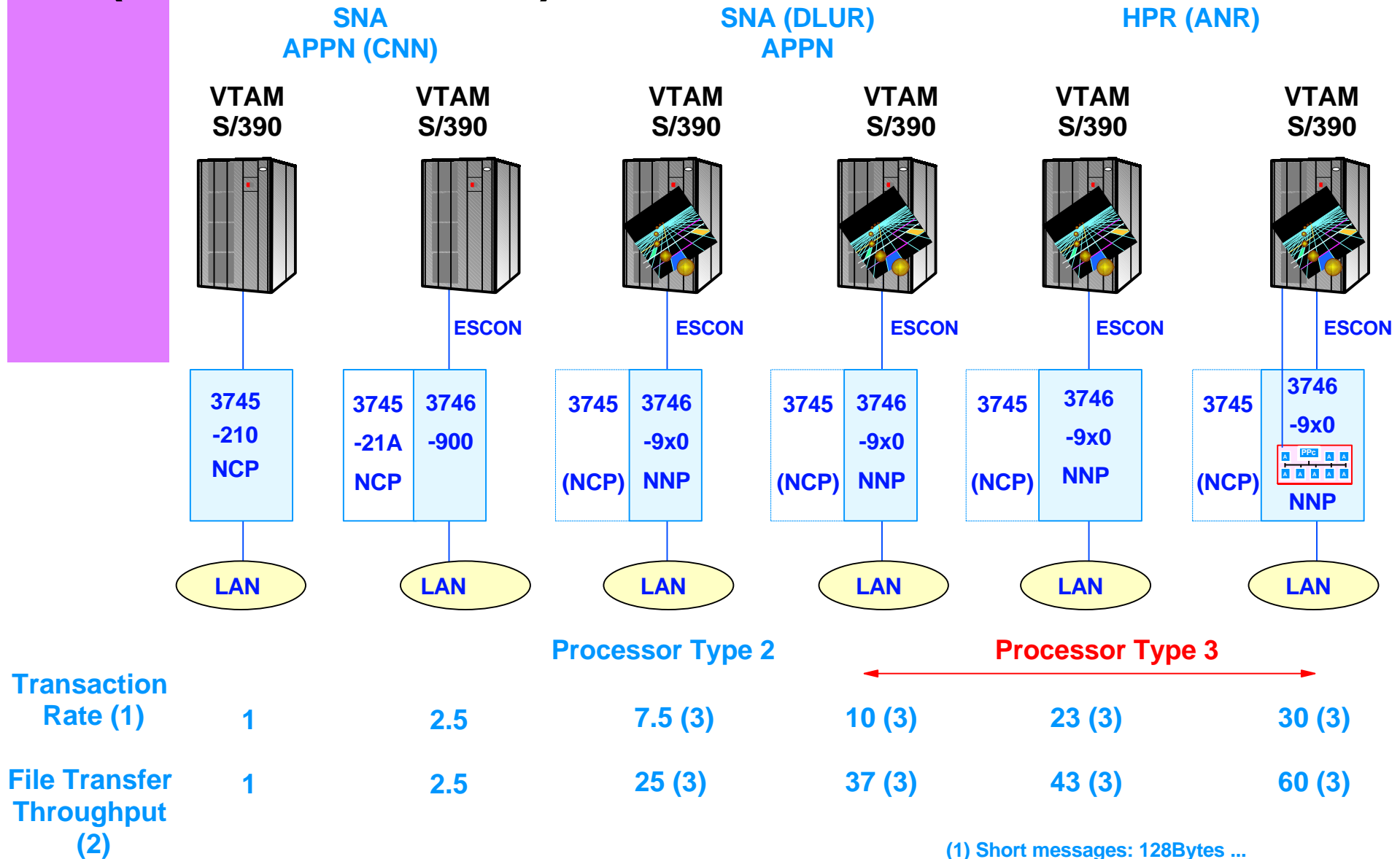
- Dedicated traffic (NN, IP or NCP) at port level, except FR/X25 (NN, IP and one NCP)

- **TRP adapters**

- Full NN, IP, NCP sharing on processor

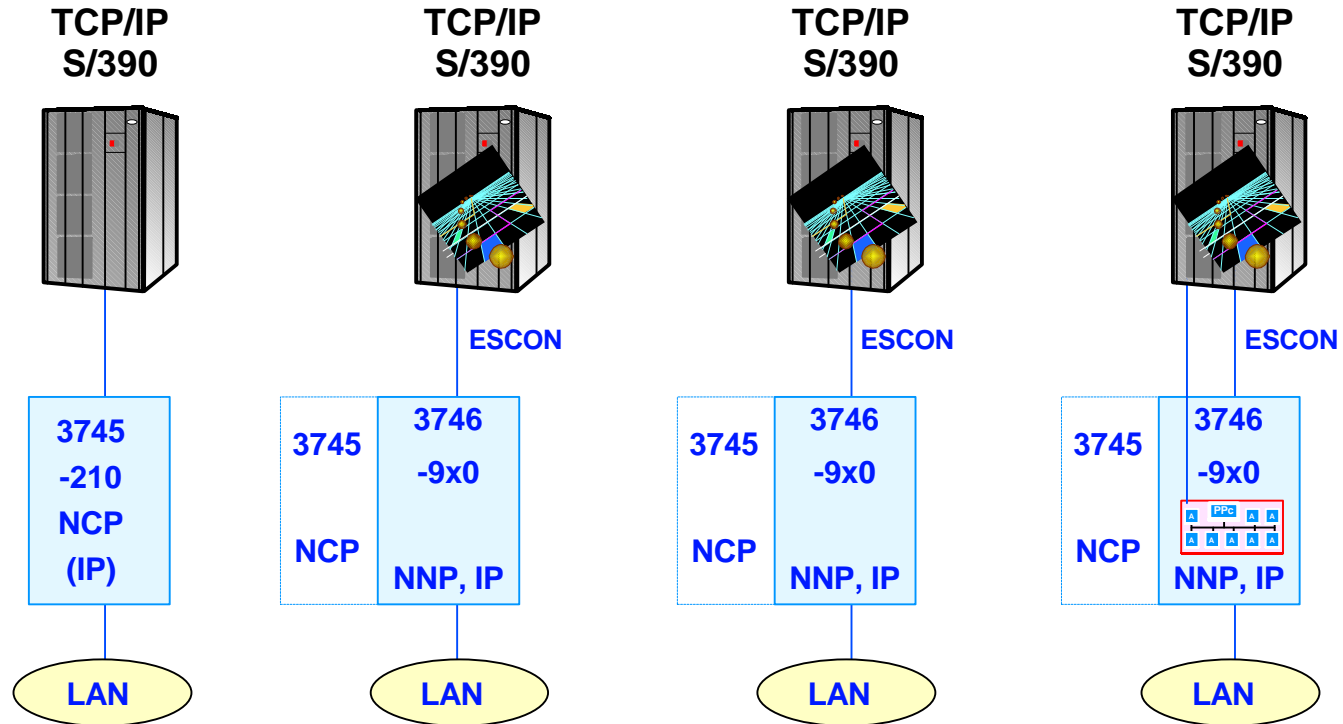
- NN, IP and one NCP at port level

# IBM 3746 - Performance Ratio (SNA/APPN/HPR)



(1) Short messages: 128Bytes ...  
 (2) Large data blocks : 8000 Bytes  
 (3) estimate (16 processors)

# IBM 3746 - Performance Ratio (TCP/IP)



Transaction Rate (Telnet) (1)

File Transfer Throughput (FTP) (2)

	1	18 (3)	25 (3)	60 (3)
Transaction Rate (Telnet) (1)	1	18 (3)	25 (3)	60 (3)
File Transfer Throughput (FTP) (2)	1	34 (3)	40 (3)	60 (3)

(1) packets: IN=100 Bytes, OUT=1000 Bytes  
 (2) packets: 4000 Bytes  
 (3) estimates (16 processors)

# IBM 3746 - Standard Line Connectivity (CLP) (APPN/HPR,IP)



- **Number of Lines per CLP**
  - Based on standard traffic mix and line utilization ("STANDARD" Line Weights)

Line Speed (Kbps)	Line Utilization	FR SDLC			FR PPP	X.25			X.25	(**)
		APPN DLUR	ANR	RTP	IP	APPN DLUR	ANR	RTP	IP	NCP
2048 1544	40 %	1 2	4 4	*1 1	4 4	*1 *1	1 1	*1 *1	*1 1	2 3
256 128	45 %	10 20	32 32	4 10	32 32	4 8	7 14	3 6	6 12	8 13
64 56	50 %	28 30	90 100	14 15	120 120	11 12	20 21	8 9	17 18	32 34
28.8 19.2	45 %	40 50	120 120	20 25	120 120	16 20	28 35	12 15	25 31	62 100
4.8 1.2	40 %	83 100	120 120	41 50	120 120	33 40	58 71	25 30	52 62	120 120

(\*) Line utilization may not reach the percentage indicated in the second column

(\*\*) Any DLC (SDLC, FR, X.25) and Routing protocols

# IBM 3746 - Standard Line Weights (CLP)



- Based on standard:
  - Traffic mix (number of transactions = 70% Interactive + 30% Batch)
  - Line utilization
  - Parameters (ie: APPN/DLUR/RTP = NO segmentation, IP = NO fragmentation)

(Detailed tables and assumptions are in the 3746 Migration and Planning Guide - MKTTOOLS/Intranet)

Line Speed (Kbps)	Line Utilization	FR SDLC			FR PPP	X.25			X.25	(**)
		APPN DLUR	ANR	RTP	IP	APPN DLUR	ANR	RTP	IP	NCP
2048 1544	40 %	67 50	20 15	*100 100	16 12	*100 *100	94 70	*100 *100	*100 80	37 33
256 128	45 %	9.6 4.9	2.9 1.5	19.2 9.6	2.2 1.1	24 12.2	13.5 6.9	32 16	15.4 7.8	12.5 7.5
64 56	50 %	3.5 3.3	1.1 1.0	7.0 6.6	0.8 0.6	8.7 8.2	4.9 4.6	11.5 10.9	5.6 5.3	3.1 2.9
28.8 19.2	45 %	2.5 2.0	0.75 0.6	5.0 4.0	0.35 0.3	6.2 5.0	3.5 2.8	8.2 6.6	4.0 3.2	1.6 1.0
4.8 1.2	40 %	1.2 1.0	0.35 0.3	2.4 2.0	0.15 0.15	3.0 2.5	1.7 1.4	4.0 3.3	1.9 1.6	0.3 0.15

(\*) Line utilization may not reach the percentage indicated in the second column  
 (\*\*) Any DLC (SDLC, FR, X.25) and Routing protocols



# IBM 3746 - Standard Line Connectivity (CLP3) (APPN/HPR,IP)



- **Number of Lines per CLP3**
  - Based on standard traffic mix and line utilization ("STANDARD" Line Weights)

Line Speed (Kbps)	Line Utilization	FR SDLC			FR PPP	X.25			X.25	(**)
		APPN DLUR	ANR	RTP	IP	APPN DLUR	ANR	RTP	IP	NCP
2048 1544	40 %	2 3	4 4	1 1	4 4	*1 1	2 2	*1 *1	1 2	4 4
256 128	45 %	15 30	32 32	7 15	32 32	6 12	15 27	4 9	12 24	14 25
64 56	50 %	43 45	120 120	21 22	120 120	17 18	38 41	12 13	34 35	62 66
28.8 19.2	45 %	58 76	120 120	30 37	120 120	24 30	55 66	18 22	47 58	120 120
4.8 1.2	40 %	120 120	120 120	62 76	120 120	50 58	111 120	37 45	100 120	120 120

(\*) Line utilization may not reach the percentage indicated in the second column

(\*\*) Any DLC (SDLC, FR, X.25) and Routing protocols

# IBM 3746 - Standard Line Weights (CLP3)



- Based on standard:
  - Traffic mix (number of transactions = 70% Interactive + 30% Batch)
  - Line utilization
  - Parameters (ie: APPN/DLUR/RTP = NO segmentation, IP = NO fragmentation)

(Detailed tables and assumptions are in the 3746 Migration and Planning Guide - MKTTOOLS/Intranet)

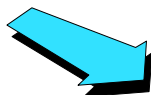
Line Speed (Kbps)	Line Utilization	FR SDLC			FR PPP	X.25			X.25	(**)
		APPN DLUR	ANR	RTP	IP	APPN DLUR	ANR	RTP	IP	NCP
2048 1544	40 %	45 33	10.5 7.9	89 67	8.4 6.3	*100 83	50 37	*100 *100	56 42	20 17
256 128	45 %	6.4 3.3	1.5 0.8	12.8 6.4	1.15 0.6	16 8.1	6.6 3.6	21 10.6	8.1 4.1	6.7 4.0
64 56	50 %	2.3 2.2	0.6 0.5	4.7 4.4	0.4 0.3	5.8 5.5	2.6 2.4	7.7 7.3	2.9 2.8	1.6 1.5
28.8 19.2	45 %	1.7 1.3	0.4 0.3	3.3 2.7	0.15 0.15	4.1 3.3	1.8 1.5	5.5 4.4	2.1 1.7	0.8 0.5
4.8 1.2	40 %	0.2 0.15	0.2 0.15	1.6 1.3	0.1 0.1	2.0 1.7	0.9 0.7	2.7 2.2	1.0 0.8	0.15 0.10

(\*) Line utilization may not reach the percentage indicated in the second column  
 (\*\*) Any DLC (SDLC, FR, X.25) and Routing protocols

# IBM 3746 - Custom Line Weights



- Definition of Lines carrying Multiple traffic types
- Definition of Lines which traffic is significantly "different" from the traffic assumed for the "Standard" line weights



## HOW TO PROCEED

- Specify Line Weight as a Percentage (\*) of standard Line Weight for each line group

- Traffic Types:      N = NCP              R = RTP              P = APPN/DLUR  
                                 A = ANR              I = IP                      (+ others for X.25 lines)

- Examples:

P150 = APPN/DLUR traffic at 150% of standard line weight for this group of lines  
I30A60 = IP traffic at 30% and ANR at 60% of standard line weight

- CF3745:

<u>Line Group</u>	<u>Line Speed</u>	<u>Traffic</u>	<u>(other parameters)</u>
G1	2048	I30A60	
G2	128	P150	

(\*) This may be used to reflect higher/lower line utilization, performance model results (after "standard" line weight run), etc...