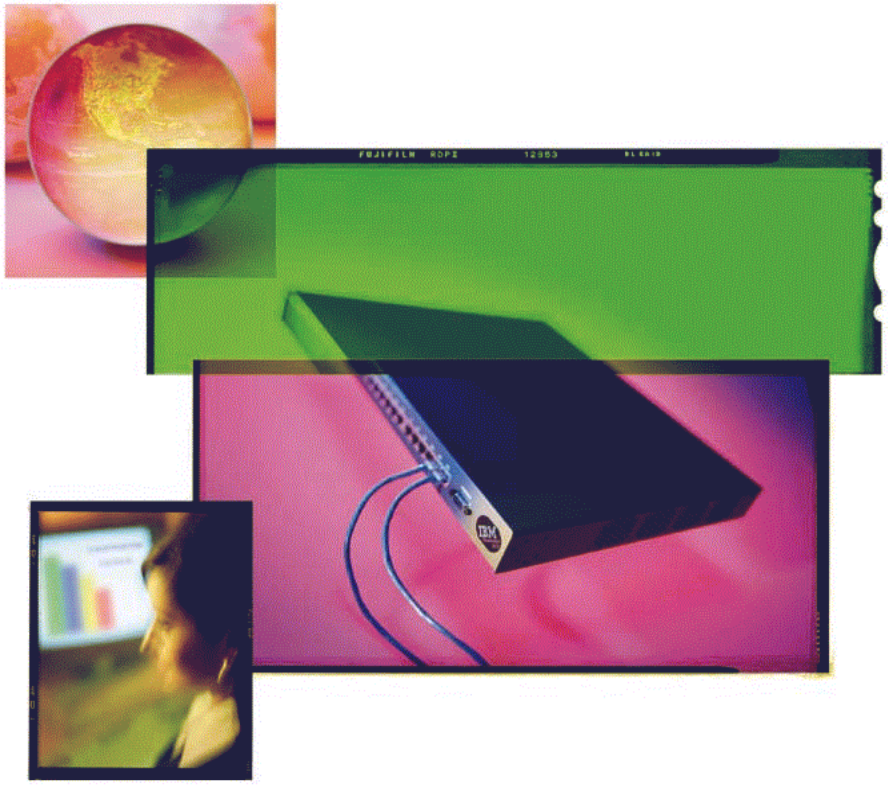
# IBM 3746 Nways Multiprotocol Controllers Models 900 and 950

**Pierre Planas**
**planas1@fr.ibm.com**
**La Gaude, France**



## Throughput and Connectivity (Processors Type 3, NNP4/SP4, MAE...)


© 2000 IBM Corporation

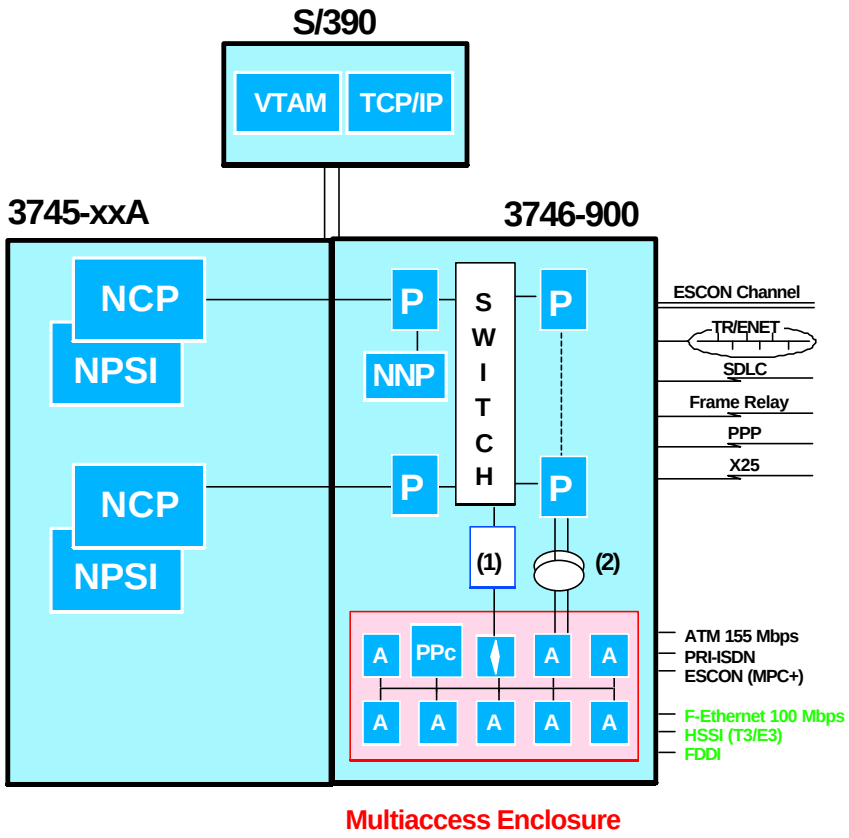
# IBM 3746 - Contents

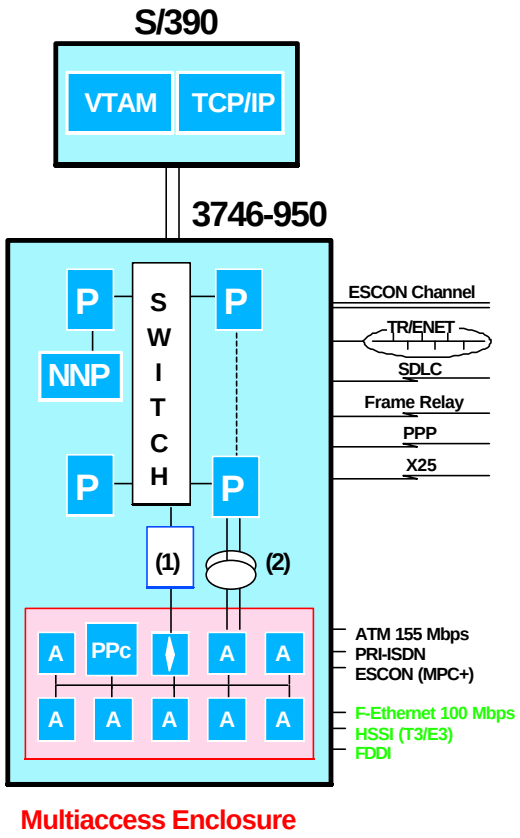
- **3745/3746 Architecture**
- **Processors Type 3 Performance***
  - Connectivity versus type 2
  - Throughputs versus type 2
- **Processors Type 4 Performance***
  - Network Node Processor
  - Service Processor
- **MAE Performance***
  - Configuration effects on throughputs
  - MAE #3000 throughput
  - MAE #3001 throughput
- **3746 aggregate throughputs***
  - NCP / IP
  - APPN/HPR

(*) Note: actual performance depends on multiple environment factors, which may include products present in the network, user parameter settings, and user traffic characteristics.
Most performance figures included in this presentation are based on actual measures.
Some figures are either estimates or extrapolatations from measures


© 2000 IBM Corporation

# IBM 3746 - Architecture




P Processor (+ Coupler)

A Adapter (=Coupler)

Processor slot

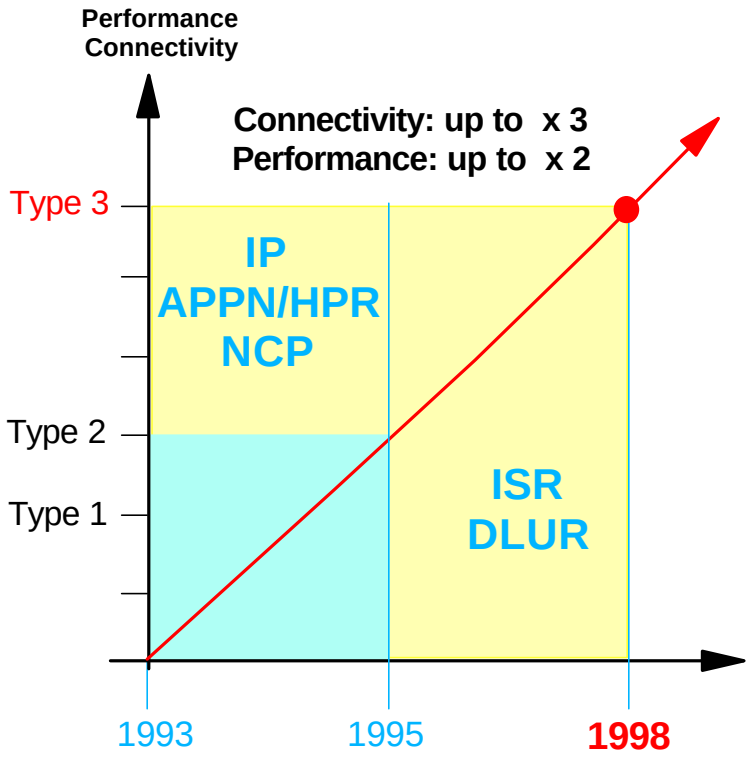
NNP Network Node Processor

PPc Power Pc

(1) IP traffic
(2) SNA and APPN/HPR traffic


© 2000 IBM Corporation

# IBM 3746 - Processors Type 3




- TRP3, ESCP3, CLP3, CBSP3
- Performance increase by up to 100% versus processors type 2
- APPN connectivity per adapter increased by up to 200% (*)
  - ESCP3: 16 PUs and 12500 ISR/DLUR
  - TRP3: 2000 PUs and 7800 ISR/DLUR
  - CLP3: 2000 PUs FR and 7500 ISR/DLUR
- Benefits to NCP traffic
  - CLP3 connectivity (number of lines) increased by up to 100 %(*)
  - Processor Load reduced by up to 50%(*)
- Processor Upgrades to Type 3
- Coexistence with other Processor Types

(*) estimate


© 2000 IBM Corporation

# IBM 3746 - ESCP3 versus ESCP2

## • Connectivity : Up to 3 X

| Example | ESCP2 | ESCP3 | Ratio |
|---|---|---|---|
| PUs (Stations) | 16 and | 32 and | X2 |
| Sessions (APPN/DLUR) | 3500 | 11250 | X3.2 |
| Sessions (ANR or NCP) | No Limit | No Limit | |

ESCP3 MAX = 32
ESCP2 MAX = 16

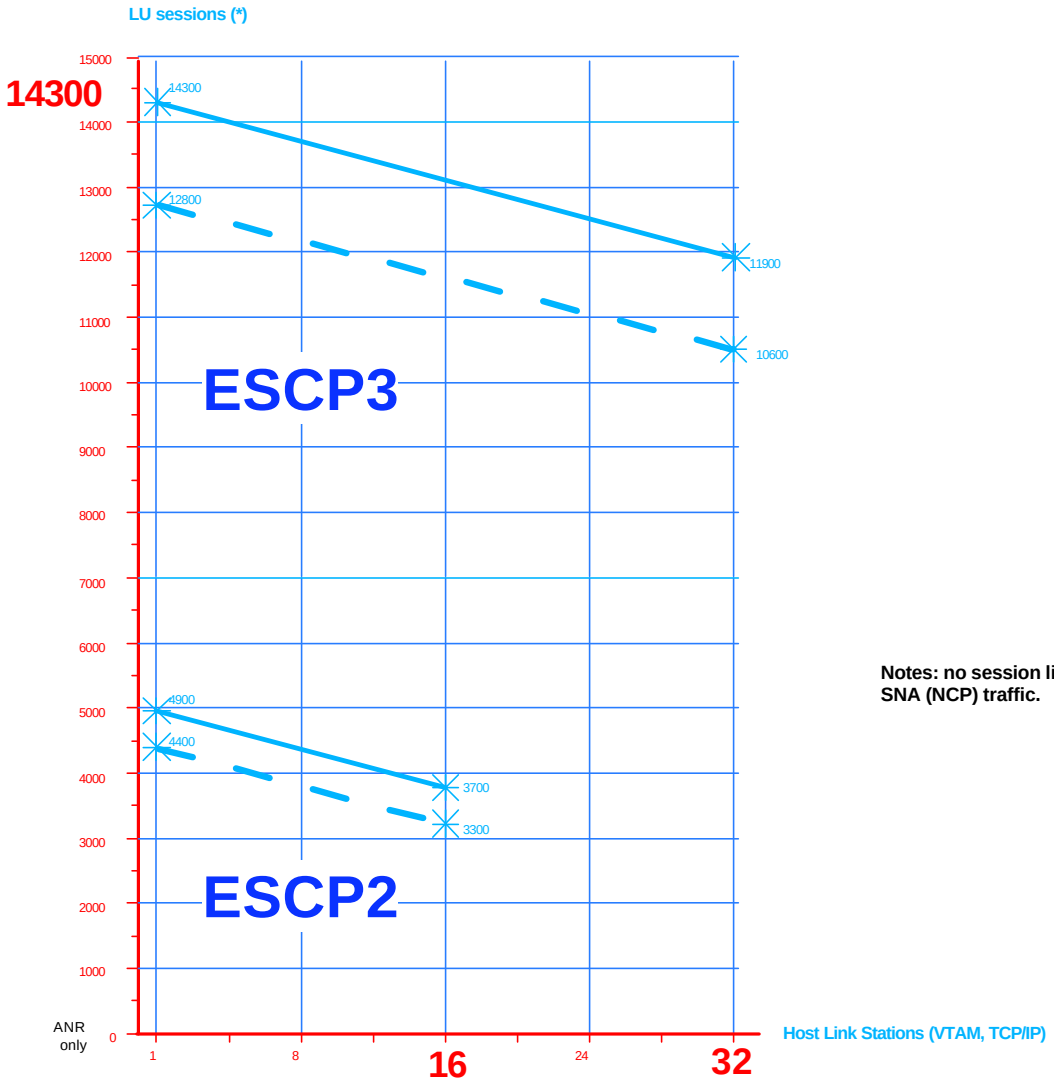
ESCP3 MAX = 14300
ESCP2 MAX = 4900

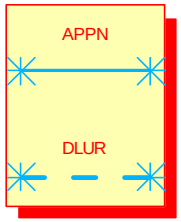
## • Performance : Up to +60%

| | | ESCP2 | ESCP3 | Ratio |
|---|---|---|---|---|
| **IP** | pps (64 Bytes) | 1280 pps | 1700 pps | 1.30 |
| | FT (4KBytes) | 3.0 MB/s | 3.5 MB/s (7) | 1.15 |
| **HPR(ANR)** | Tr/s (128/128) | 550 Tr/s (1) | 900 Tr/s (1) | **1.60** |
| | FT (8KBytes) | 4.0 MB/s (4) | 4.3 MB/s (7) | 1.1 |
| **HPR(RTP)** | Tr/s (128/128) FT (8KBytes) | | | 1.50 (5) |
| **APPN/DLUR** | Tr/s (128/128) | 247 Tr/s (1) | 376 Tr/s (1) | 1.40 |
| | FT (8 KBytes) | 2.6 MB/s (1) | 3.7 MB/s (1) | 1.40 |


© 2000 IBM Corporation

# 3746 NN - ESCP2 / ESCP3 Connectivity




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

**For simplicity, linear representation of max connectivity is used (approximation).**
**If IP is used, the number of APPN and DLU sessions is reduced by about 1000.**

**(*) Control Sessions are in addition**


© 2000 IBM Corporation

# IBM 3746 - TRP3 versus TRP2

- **Connectivity : Up to 3 X**

| Example | TRP2 | TRP3 | Ratio |
|---|---|---|---|
| PUs | 650 and | 2000 and | X3 |
| Sessions (APPN/DLUR) | 2650 | 7800 | X3 |
| Sessions (ANR or NCP) | No Limit | No Limit | |

TRP3 MAX = 4000
TRP2 MAX = 2000

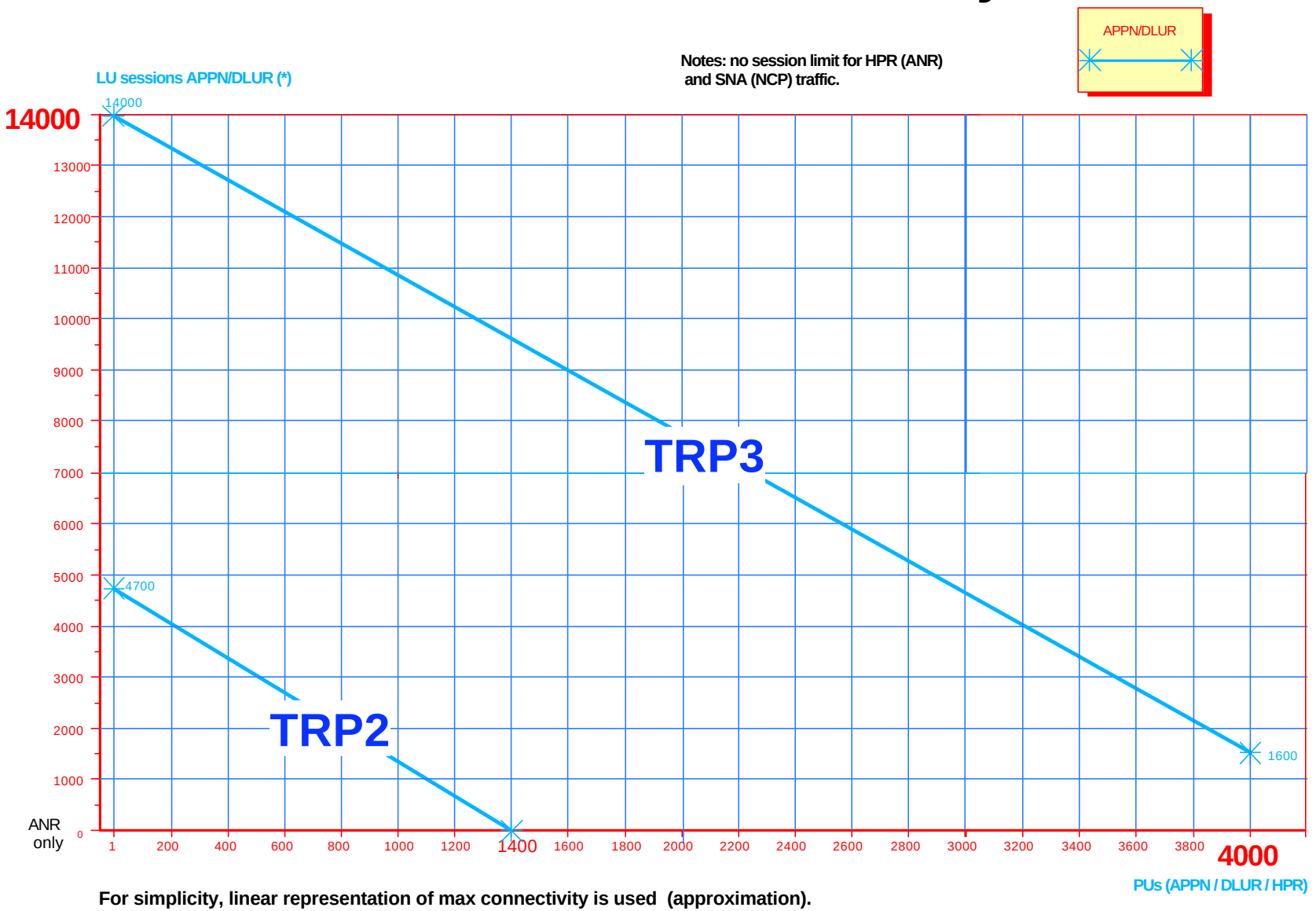
TRP3 MAX = 14000
TRP2 MAX = 4700

- **Performance : Up to +70%**

| | | TRP2 | TRP3 | **Ratio** |
|---|---|---|---|---|
| **IP** | pps (64 Bytes) | 1500 pps | 2100 pps | 1.40 |
| | FT (4KBytes) | 3.1 MB/s | 3.6 MB/s (8) | 1.20 |
| **HPR(ANR)** | Tr/s (128/128) | 450 Tr/s (1) | 800 Tr/s (1) | **1.70** |
| | FT (8KBytes) | 3.8 MB/s (4) | 3.8 MB/s (2) | 1.0 |
| **HPR(RTP)** | TR/s (128/128) FT (8K Bytes) | | | 1.60 (6) |
| **APPN/DLUR** | Tr/s (128/128) | 190 Tr/s (1) | 280 Tr/s (1) | 1.50 |
| | FT (8 KBytes) | 2.2 MB/s (1) | 3.3 MB/s (1) | 1.50 |


© 2000 IBM Corporation

# 3746 NN - TRP2 / TRP3 Connectivity




**For simplicity, linear representation of max connectivity is used (approximation).**
**If IP is used, the number of APPN and DLU sessions is reduced by about 1000.**

**(*) Control Sessions are in addition**


© 2000 IBM Corporation

# IBM 3746 - CLP3 versus CLP (Connectivity) (1/2)

- **Connectivity : Up to 3 X**

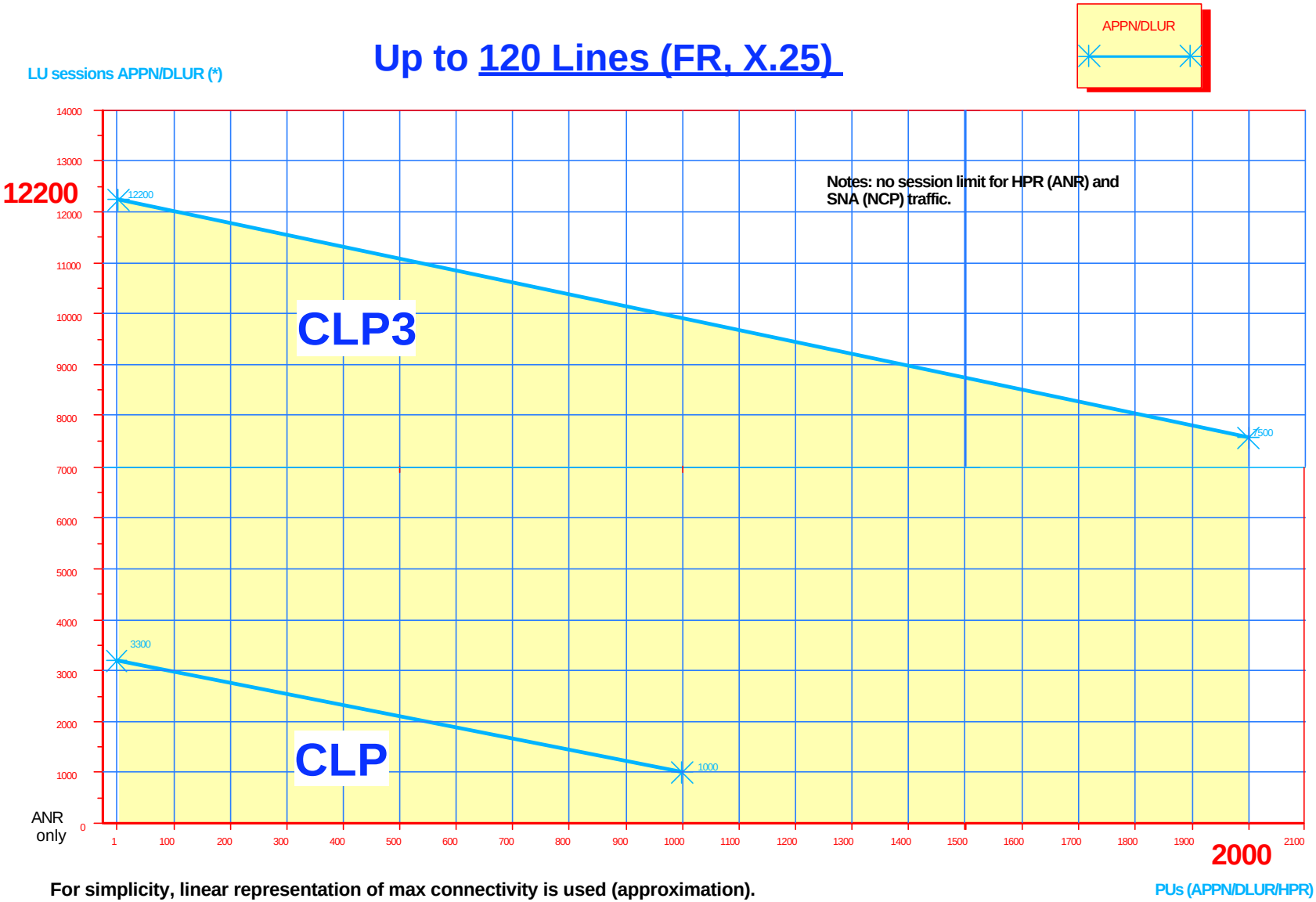
| **Example 1** | CLP | CLP3 | Ratio |
|---|---|---|---|
| Lines (SDLC) | 20<br>and | 60<br>and | X3 |
| PUs (SDLC) | 300<br>and | 1000<br>and | X3 |
| Sessions (APPN/DLUR) | 2000 | 7900 | X4 |
| Sessions (ANR or NCP) | No Limit | No Limit | |

| **Example 2** | CLP | CLP3 | Ratio |
|---|---|---|---|
| Lines (FR, X25) | 120<br>and | 120<br>and | X1 |
| PUs (FR, X25) | 650<br>and | 2000<br>and | X3 |
| Sessions (APPN/DLUR) | 1900 | 7500 | X4 |
| Sessions (ANR or NCP) | No Limit | No Limit | |


© 2000 IBM Corporation

# 3746NN - CLP / CLP3 Connectivity

## Up to 120 Lines (FR, X.25)



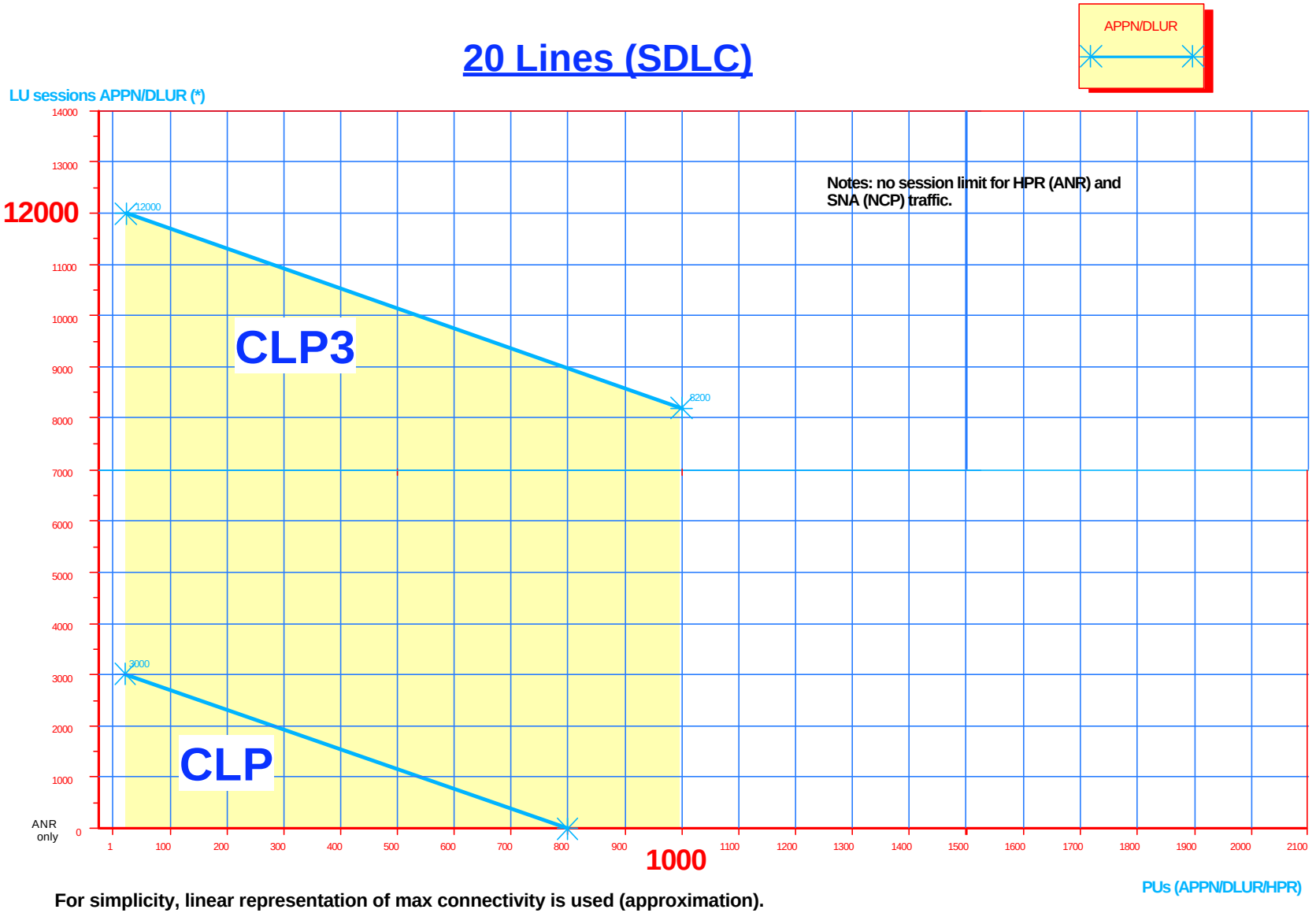

**For simplicity, linear representation of max connectivity is used (approximation).**
**If IP is used, the number of APPN and DLU sessions is reduced by about 1000.**
**If X.25 is used instead of FR, the number of sessions is reduced by about 200.**

**(*) Control Sessions are in addition**


© 2000 IBM Corporation

# 3746NN - CLP / CLP3 Connectivity

## 20 Lines (SDLC)




**For simplicity, linear representation of max connectivity is used (approximation).**
**If IP is used, the number of APPN and DLU 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**


© 2000 IBM Corporation

# IBM 3746 - CLP3 versus CLP (Connectivity) (2/2)

**NNP Controlled**

| Limits | CLP | CLP3 | Ratio |
|---|---|---|---|
| Lines | 120 | 120 | X1 |
| PUs (SDLC) | 1000 | 1000 and | X1 |
| PUs (FR, X25) | 1000 and | 2000 and | X2 |
| FR DLCIs | 500 | 2000 | X4 |
| Sessions (APPN/DLUR) (FR) | 3300 (1xPU) | 12200 (1xPU) | X3.7 |
| Sessions (ANR) | No Limit | No Limit | |

**NCP Controlled**

| Limits | CLP | CLP3 | Ratio |
|---|---|---|---|
| Lines | 120 and | 120 and | X1 |
| PUs (SDLC) | 1000 and | 1000 and | X1 |
| PUs (FR, X25, ISDN) | 3000 and | 3000 and | X1 |
| FR DLCIs | 3000 | 3000 | X1 |
| Sessions (SNA/APPN) | (1) | (1) | |
| Sessions (ANR) | No Limit | No Limit | |

**(1) CCU storage dependent**


© 2000 IBM Corporation

# IBM 3746 - CLP3 versus CLP (Performance)

- **Performance : Up to +100%**

| | | Type 2 | Type 3 | Ratio |
|---|---|---|---|---|
| **IP** | X25 (64 Bytes) | 780 pps (12) | 1800 pps (12) | **2.30** |
| | FT (4KBytes) | 1.8 MB/s (10) | 1.8 MB/s (10) | 1.00 |
| **HPR(ANR)** | FR (128/128) (non-ERP) | 550 Tr/s (1) | 1100 Tr/s (1) | 2.00 |
| | X25 (40/40) | 400 Tr/s | | (11) |
| | FT (8 KBytes) | 1.8 MB/s (10) | 1.8 MB/s (10) | 1.00 |
| **HPR(RTP)** | FR (128/128) | 116 Tr/s (12) | 177 Tr/s (12) | 1.50 |
| | X25 (40/40) | 117 Tr/s | | |
| | FT (8 KBytes) | 1.8 MB/s (10) | 1.8 MB/s (10) | 1.00 |
| **APPN/DLUR** | FR (128/128) | 170 Tr/s (12) | 300 Tr/s (12) | 1.75 |
| | X25 (40/40) | 208 Tr/s | | (11) |
| | FT (8 KBytes) | 1.8 MB/s (10) | 1.8 MB/s (10) | 1.00 |


© 2000 IBM Corporation

# IBM 3746 - NNP4 and SP4 (Performance)

- **NNP Type 4  Performance : up to 1.75**

| NNP Type | Network Restart Time* | Ratio versus NNP4 |
|---|---|---|
| NNP1 | 19' | 1.75 |
| NNP2 | 16' | 1.5 |
| NNP4 | 11' | |

(*) Network configuration: 750 PUs, 30,000 SSCP-LU session, 10,000 LU-LU sessions

- **SP Type 4 Performance: up to 5* x**

(*) Response time reduction versus older versions of the Service Processor (estimate)


© 2000 IBM Corporation

# IBM 3746 - Notes

(1) Measure extrapolated to 95% of processor load (EC D46130)

(2) Measure extrapolated (max coupler throughput reached before 95% processor load) (EC D46130)

(4) Measure extrapolated to 95% of processor load (also max coupler throughput)

(5) For HPR in the Network - No VTAM HPR
Extrapolated from APPN and ANR (128/128) ratios

(6) For HPR between Network and parallel Sysplex (server access)
Extrapolated from APPN and ANR (128/128) ratios

(7) Coupler limit (ESCC2)

(8) Not measured (TIC3 port limit x 2)

(10) Not measured : 90% of 4 x 2 Mbps Duplex (limit = 4 x ports at E1 speed)
(1.3 MB/s for T1 speed)

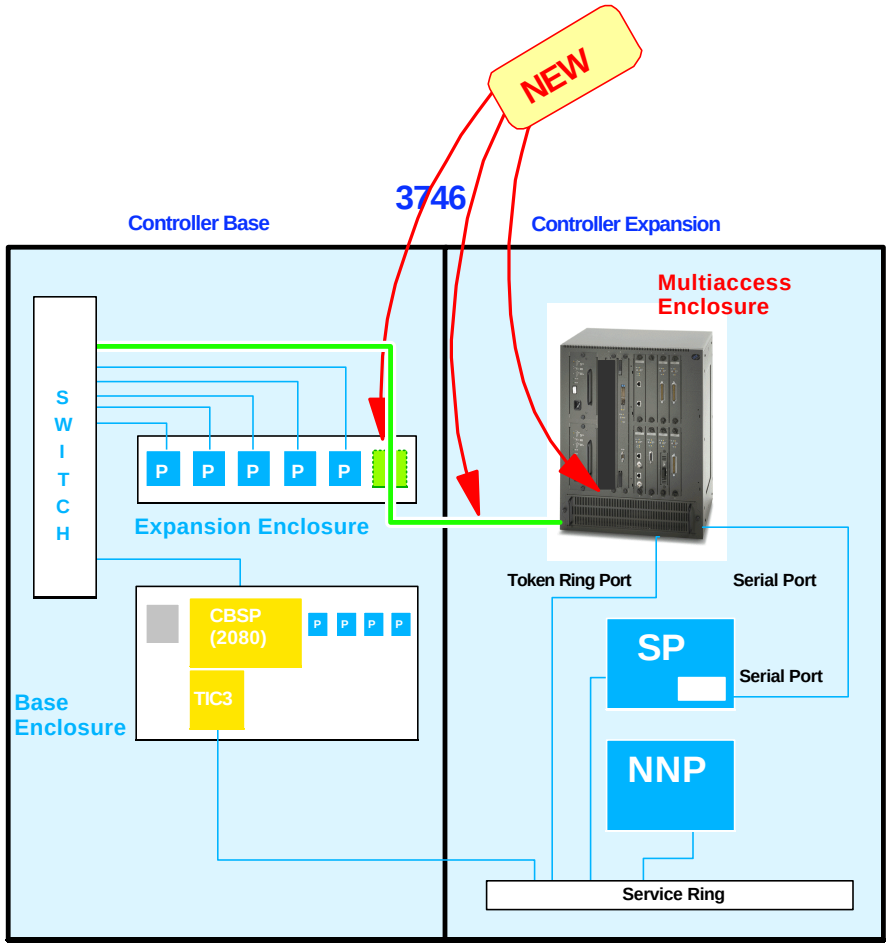
(11) Projected improvement for other traffic, should be in same range as HPR (ANR) over FR
(limit of CLP/CLP3 = processor cycles)

(12) Measure extrapolated to 95% processor load (EC D46130)

Note: (128/128) or (40/40) are the most standard profiles for benchmark performance measurement


© 2000 IBM Corporation

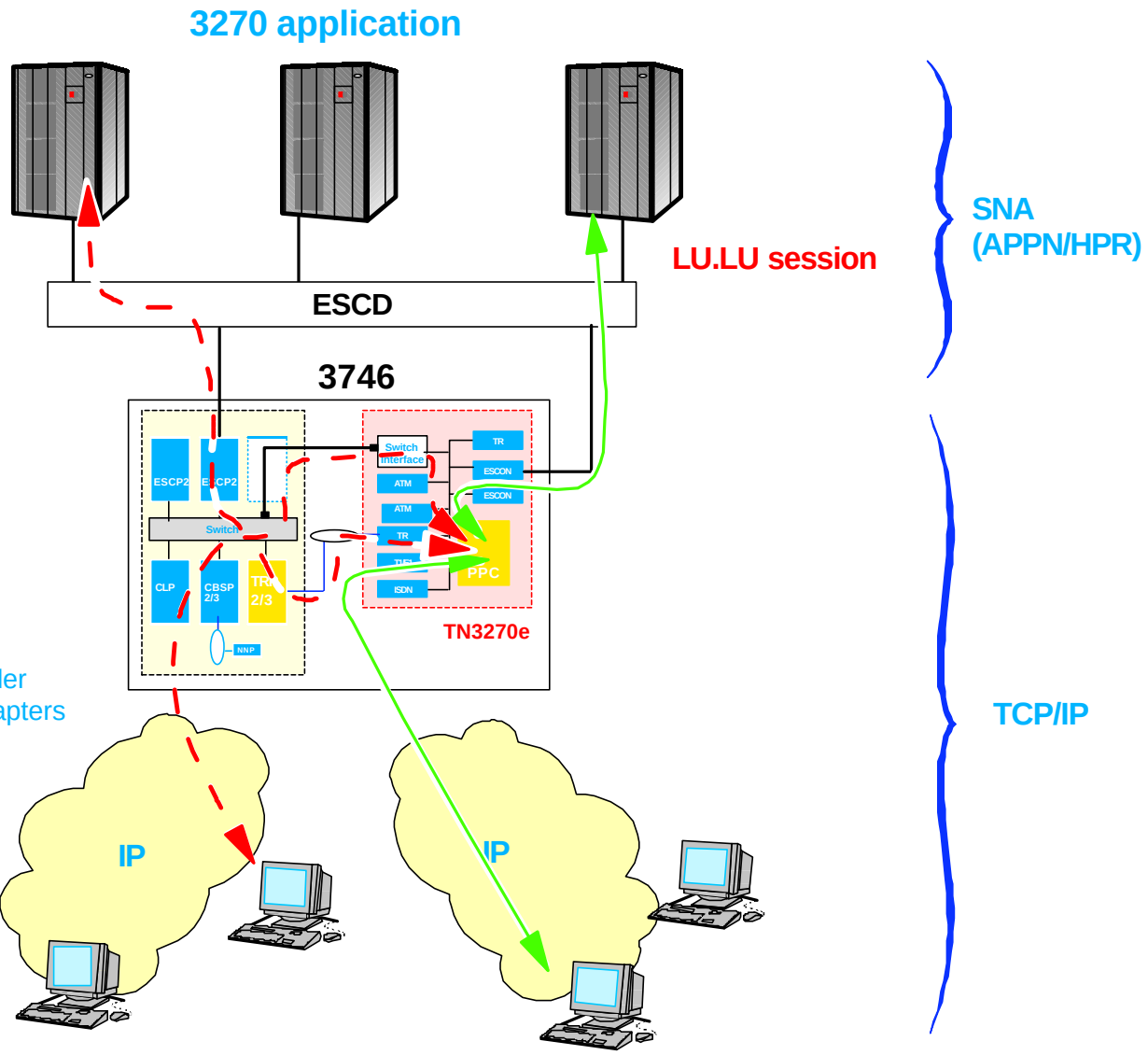
# IBM 3746 - MAE Direct Attached (FC#3001)




- **MAE hardware coupling**
  - 2 cards provided
    - **Switch Interface Extended (3746)**
    - **Switch Access Card (MAE)**
  - MAE can be 6 meters away of the 3746 (cable = 9m)
- **MAE IP resources**
  - Own by 3746 IP "Control Point"
  - Configured from Service Processor
  - Single IP Router image and management
- **MAE maintained from SP**
- **Pre-requisites**
  - 3746-900 + NNP or 3746-950
  - 3746 IP Routing (FC #5033)
  - SP Type 2 (FC#5052), Type 3 (FC#5053) or Type 4 (FC#5054) or SP Upgrade to Type 4 (FC#5450)
  - 1 x 3746 Processor slot
- **MAE #3000 Upgrade to MAE 3001**
  - 2 cards + cable + mcode
- **MAE 3001 TR kit (FC#5713)**
  - MAU (8228) + MAU-to-MAE cable
  - For APPN/DLUR, HPR, SNA subarea traffic with other enclosures
  - Qty = 0, 1, 2


© 2000 IBM Corporation

# IBM 3746 - TN3270e Server Data Path

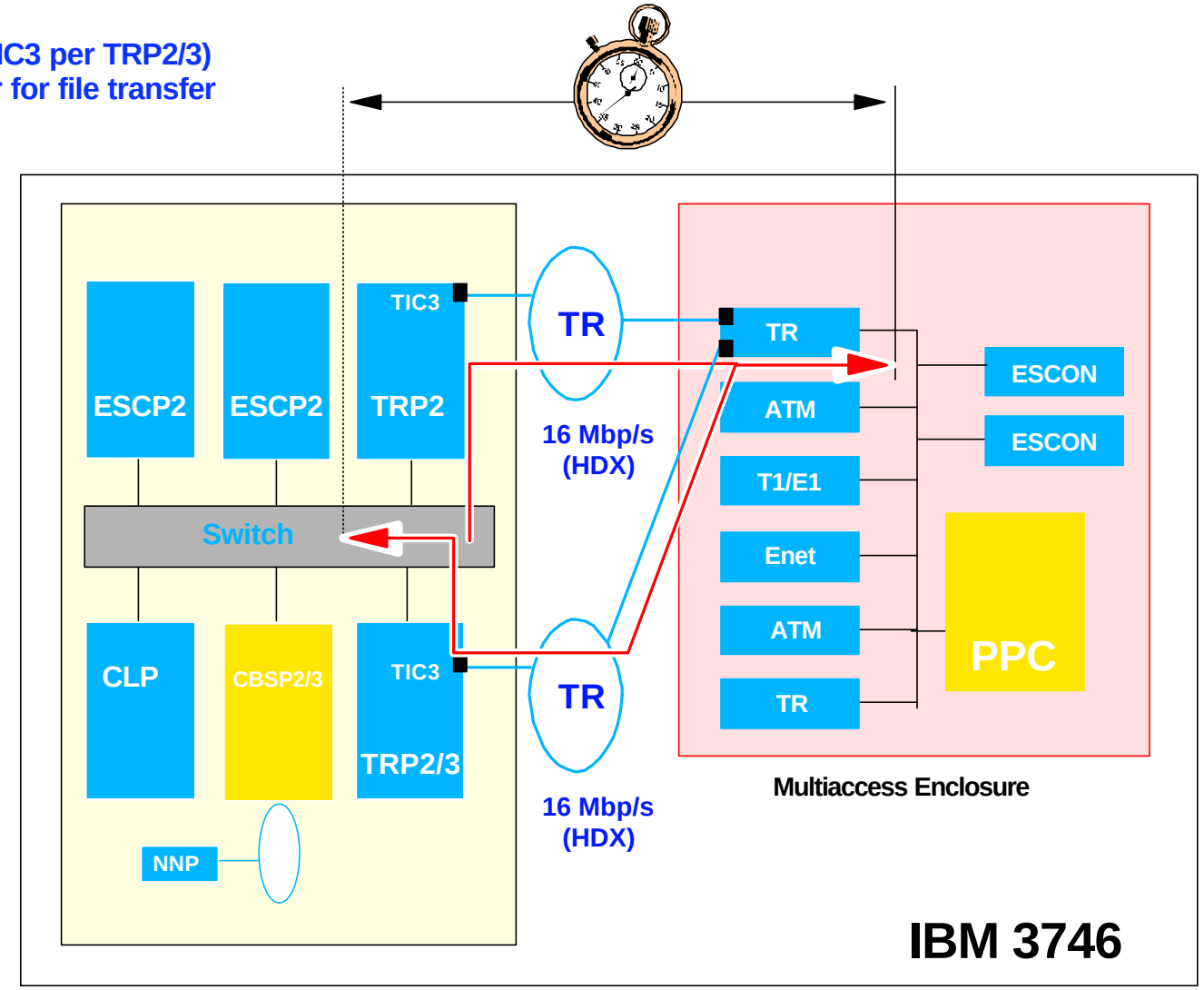



Note: DLSw and Enterprise Extender with upstream traffic over 3746 adapters have a similar data path


© 2000 IBM Corporation

# IBM 3746 - MAE Performance factors (1/3)

- TIC3 : (1xTIC3 per TRP2/3)
  Main factor for file transfer

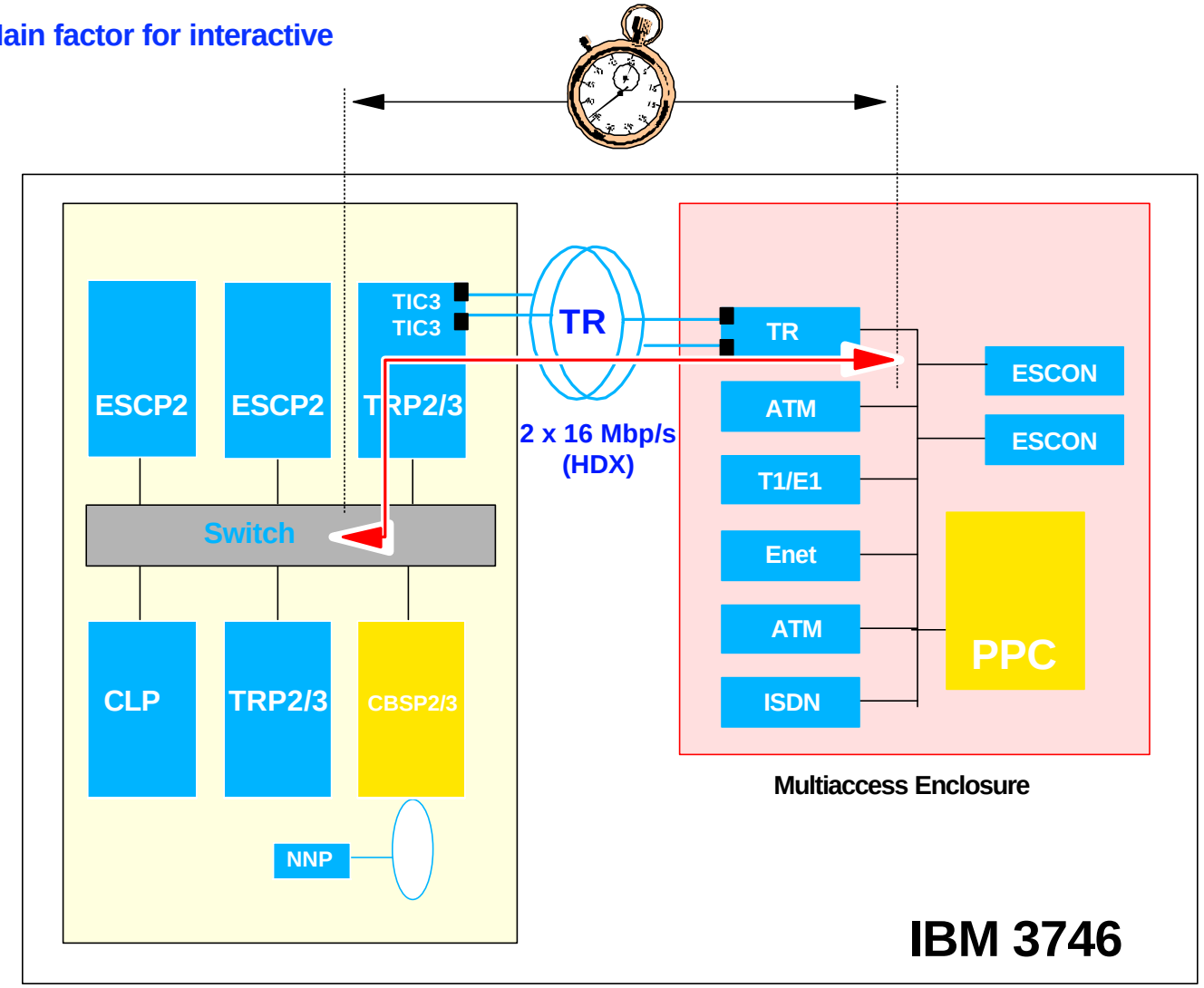




© 2000 IBM Corporation

# IBM 3746 - MAE Performance factors (2/3)

- TRP2/3 Main factor for interactive traffic

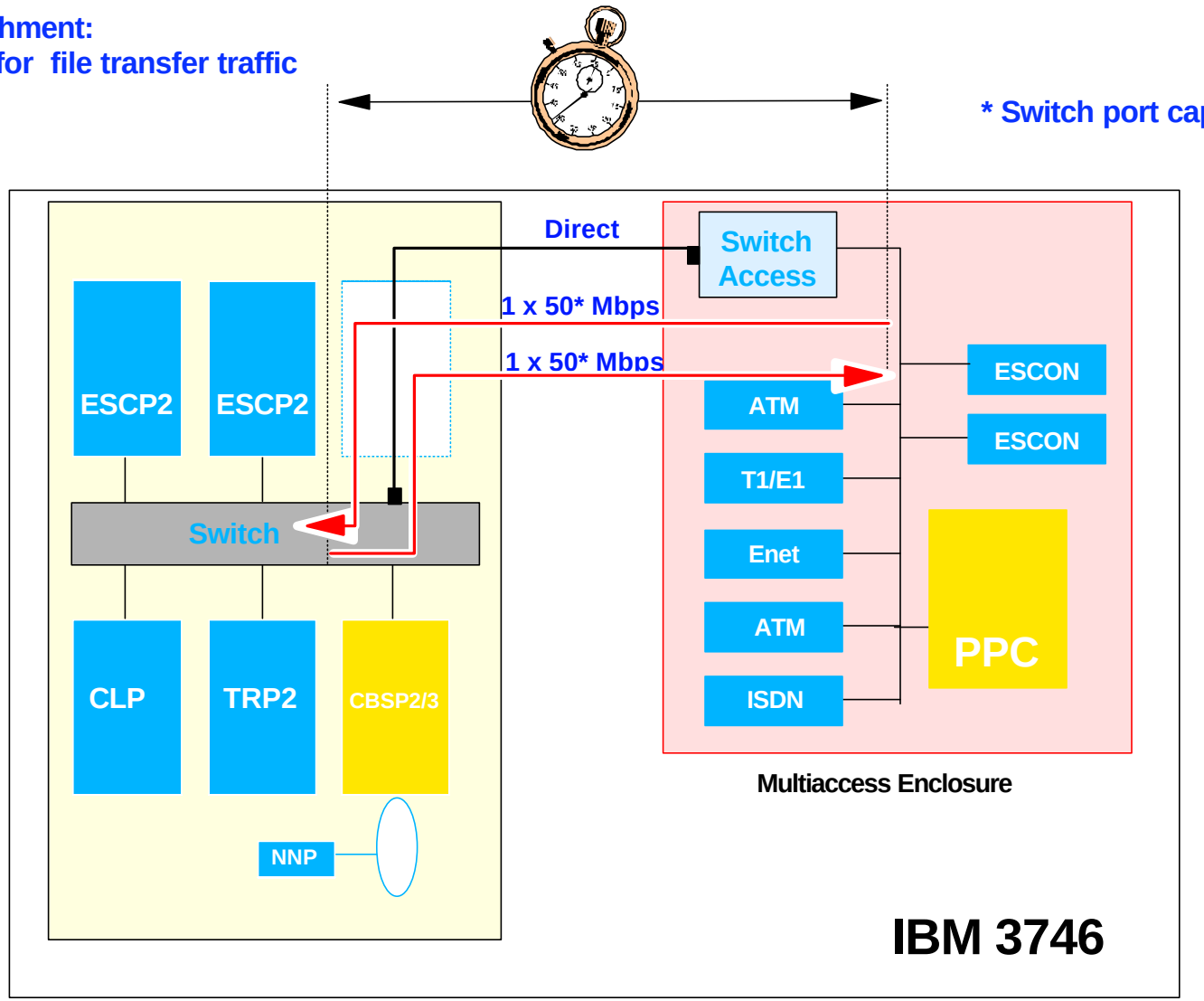




© 2000 IBM Corporation

# IBM 3746 - MAE Performance factors (3/3)

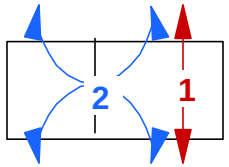
- **Switch attachment:**
  **Main factor for file transfer traffic**





© 2000 IBM Corporation

# IBM 3746 - MAE Performance (1/2)



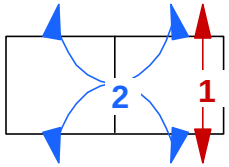

- **Traffic 1: Port-to-Port within MAE**
  Performance: equivalent to 2216
- **Traffic 2: MAE-to-ESCP2/TRP2/ CLP**
  See Table below

| MAX | THROUGHPUTS (Traffic 2) | TR Attached via 1 x TRP2 1 x TIC3 | TR Attached via 1 x TRP2 2 x TIC3 | TR Attached via 2 x TRP2s 2 x TIC3s | Switch Attached MAE #3001 |
|---|---|---|---|---|---|
| **IP** | pps (64 Bytes) | 1500 pps (2) | 1500 pps (2) | 3000 pps (2) | 13500 pps (3) |
| | FT (4KBytes) | 1.8 MB/s (1) | 3.1 MB/s (2) | 3.6 MB/s (1) | 2 x 6 MB/s |
| **APPN/ DLUR** | Tr/s (128/128) | 190 Tr/s (2) | 190 tr/s (2) | 350 Tr/s (2) | |
| | FT (8 KBytes) | 1.9 MB/s (1) | 2.2 MB/s (2) | 3.8 MB/s (1) | |
| **HPR (ANR)** | Tr/s (128/128) | 450Tr/s (2) | 450 Tr/s (2) | 900 Tr/s (2) | |
| | FT (8KBytes) | 1.9 MB/s (1) | 3.8 MB/s (2) | 3.8 MB/s (1) | |

**(1) TIC3 performance**
**(2) TRP2 performance**
**(3) Two ways**


© 2000 IBM Corporation

# IBM 3746 - MAE Performance (2/2)



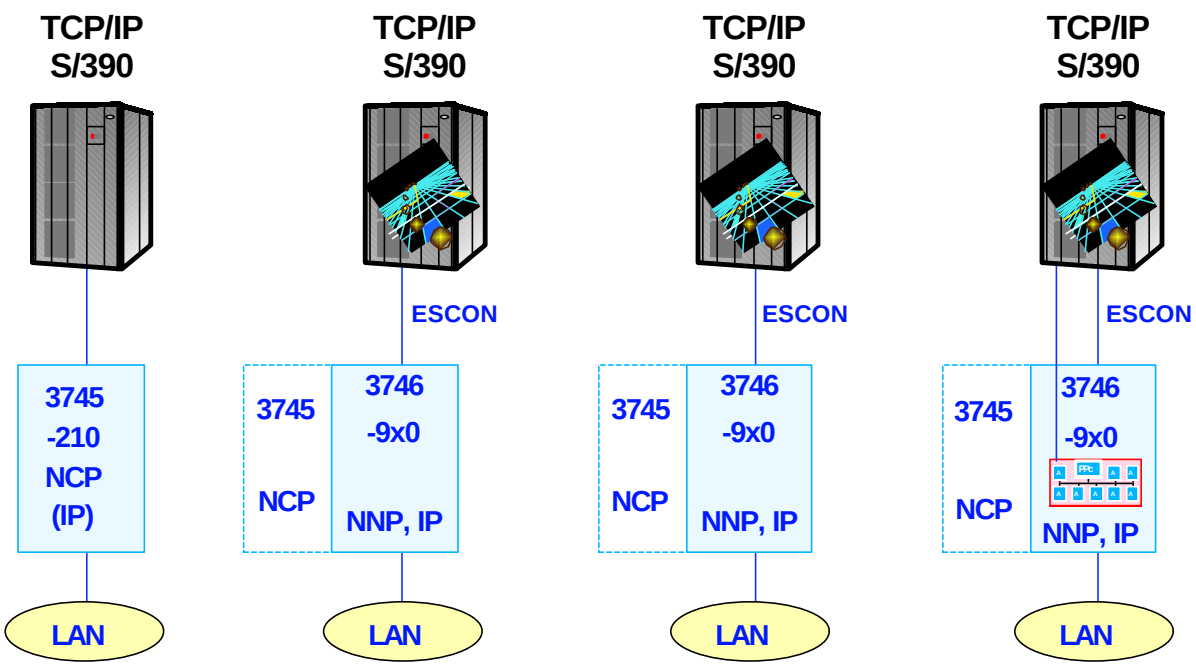

- **Traffic 1: Port-to-Port within MAE**
  Performance: equivalent to 2216
- **Traffic 2: MAE-to-ESCP3/TRP3/ CLP3**
  See Table below

| MAX | THROUGHPUTS (Traffic 2) | TR Attached via 1 x TRP3 1 x TIC3 | TR Attached via 1 x TRP3 2 x TIC3s | TR Attached via 2 x TRP3s 2 x TIC3s | Switch Attached MAE #3001 |
|---|---|---|---|---|---|
| **IP** | pps (64 Bytes) | 2100 pps (2) | 2100 pps (2) | 4200 pps (2) | 13500 pps (3) |
| | FT (4KBytes) | 1.8 MB/s (1) | 3.6 MB/s (1) | 3.6 MB/s (1) | 2 x 6 MB/s (6) |
| **APPN/ DLUR** | Tr/s (128/128) | 280 Tr/s (2) | 280 tr/s (2) | 560 Tr/s (2) | |
| | FT (8 KBytes) | 1.9 MB/s (1) | 3.3 MB/s (2) | 3.8 MB/s (1) | |
| **HPR (ANR)** | Tr/s (128/128) | 800Tr/s (2) | 800 Tr/s (2) | 1600 Tr/s (2) | |
| | FT (8KBytes) | 1.9 MB/s (1) | 3.8 MB/s (1) | 3.8 MB/s (1) | |

**(1) TIC3 performance**
**(2) TRP3 performance**
**(3) Two ways**


© 2000 IBM Corporation

# IBM 3746 - Performance (TCP/IP)

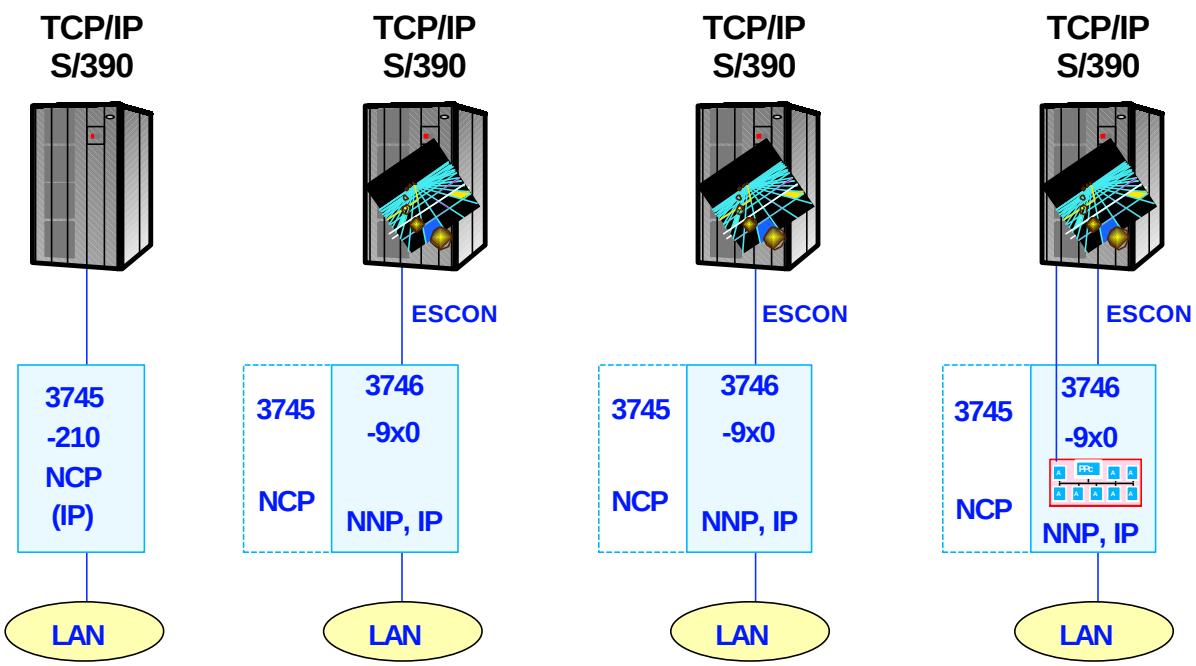



| | | Processors Type 2 | Processors Type 3 | |
|---|---|---|---|---|
| Transaction Rate (Telnet) (1) | 215 | 4000 (3) | 5400 (3) | 14000 (3)(4) |
| File Transfer Throughput (FTP) (2) | 0.7 | 24 (3) | 28 (3) | 42 (3)(4) |

(1)Tr/sec : packet In (100 bytes) + Out (1000 bytes)
(2) MBytes/sec : 4000 byte packets
(3) Estimate
(4) MAE: LAN to ESCON


© 2000 IBM Corporation

# IBM 3746 - Performance Ratio (TCP/IP)

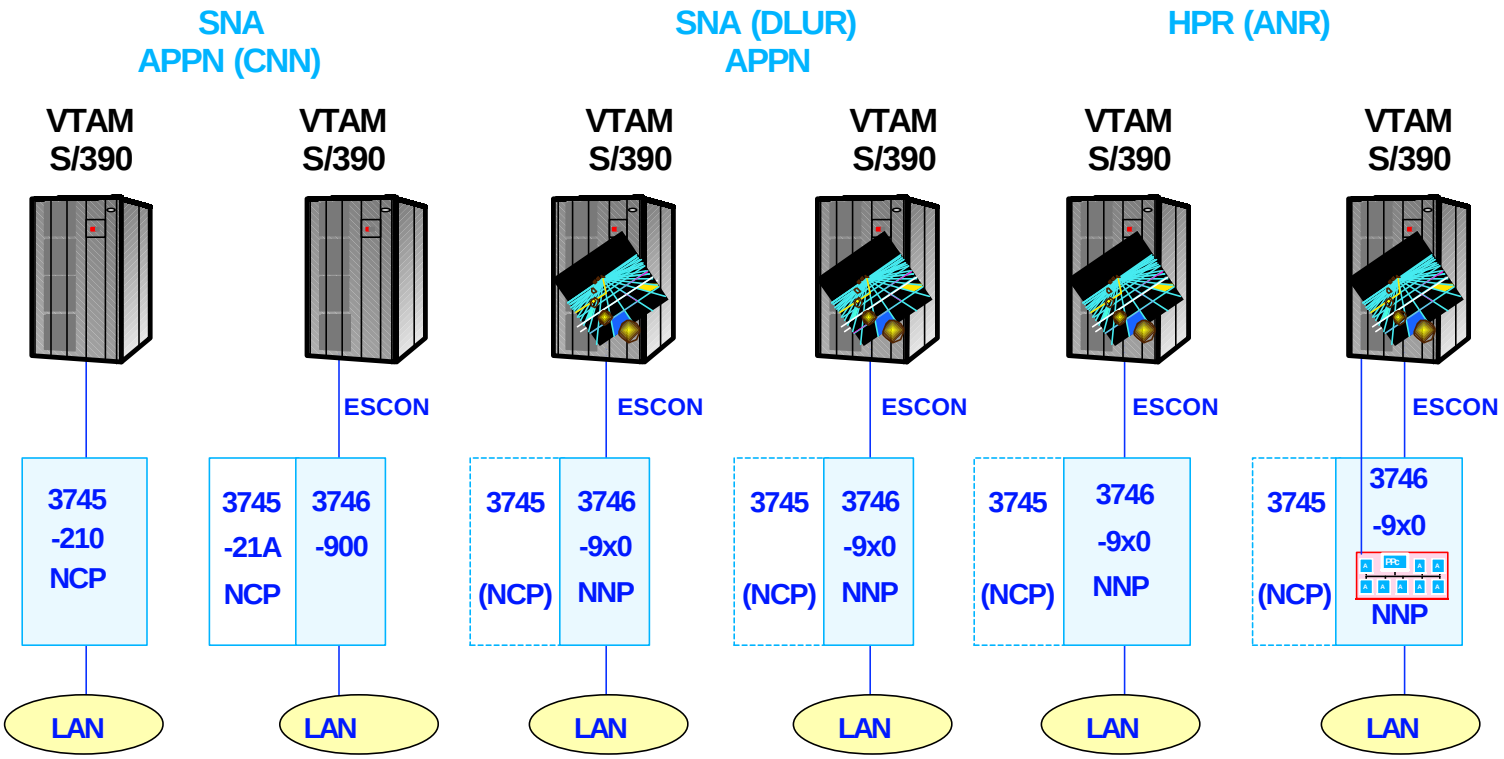



| | | Processors Type 2 | Processors Type 3 | |
|---|---|---|---|---|
| Transaction Rate (Telnet) (1) | 1 | 18 (3) | 25 (3) | 60 (4) |
| File Transfer Throughput (FTP) (2) | 1 | 34 (3) | 40 (3) | 60 (4) |

(1) Tr/Sec: packet In (100 bytes) + Out (1000 bytes)
(2) packets: 4000 Bytes
(3) estimates (16 processors)
(4) MAE: LAN to ESCON


© 2000 IBM Corporation

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

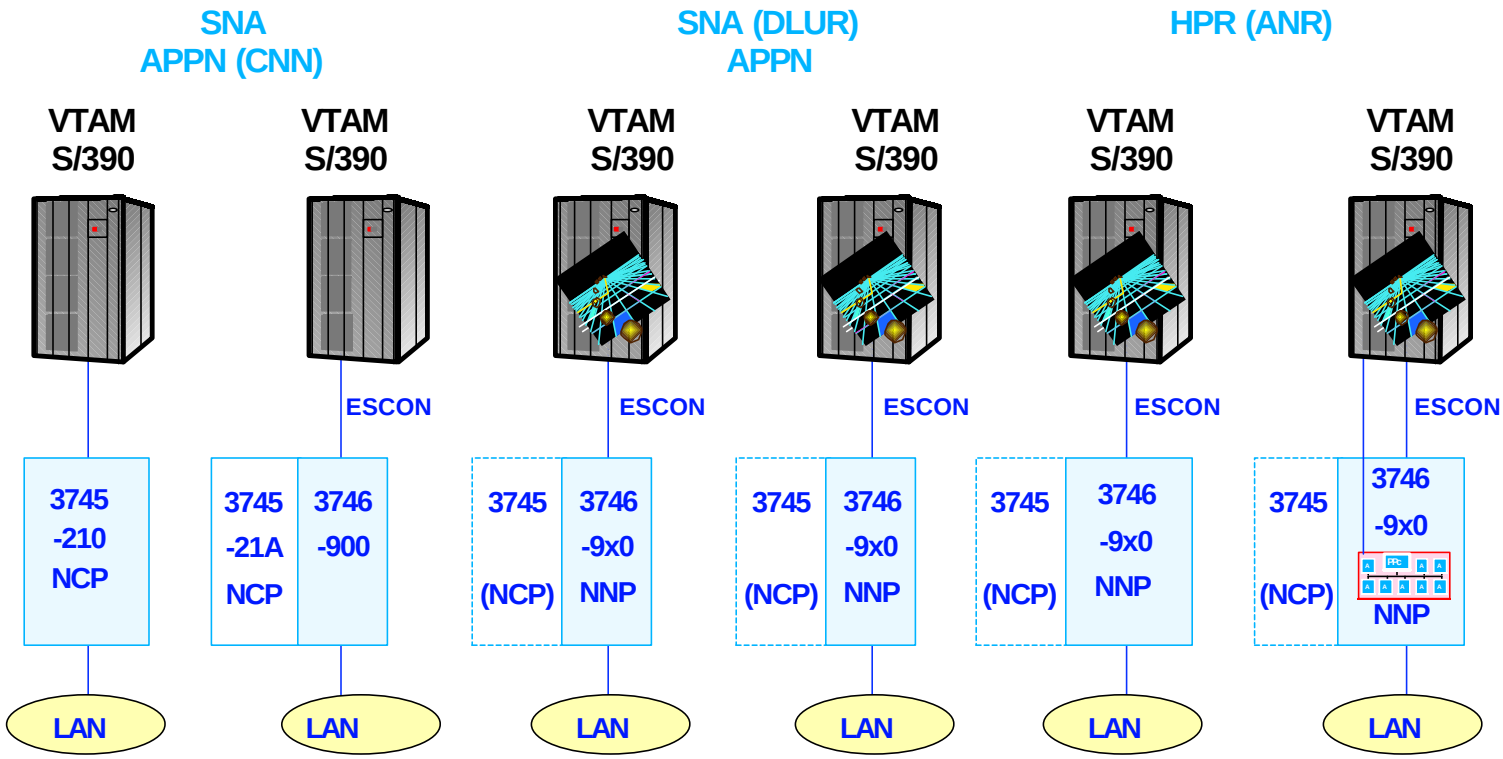



| | | | Processors Type 2 | Processors Type 3 | | |
|---|---|---|---|---|---|---|
| Transaction Rate (1) | 280 | 700 | 2000 (3) | 3000 (3) | 6500 (3) | 8000 (3)(4) |
| File Transfer Throughput (2) | 0.7 | 1.7 | 18 (3) | 26 (3) | 30 (3) | 41 (3)(4) |

(1)Tr/sec : 128/128 (In/Out)
(2) MBytes/sec : 8000 Byte data blocks
(3) estimate (16 processors)
(4) MAE: LAN to ESCON (MPC+)


© 2000 IBM Corporation

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




| | | | Processors Type 2 | Processors Type 3 | | |
|---|---|---|---|---|---|---|
| Transaction Rate (1) | 1 | 2.5 | 7.5 (3) | 10 (3) | 23 (3) | 30 (3)(4) |
| File Transfer Throughput (2) | 1 | 2.5 | 25 (3) | 37 (3) | 43 (3) | 60 (3)(4) |

(1)Tr/sec : 128/128 (In/Out)
(2) MBytes/sec : 8000 Byte data blocks
(3) estimate (16 processors)
(4) MAE: LAN to ESCON (MPC+)


© 2000 IBM Corporation

# IBM 3746 versus 3745 - Performance (LAN-ESCON)

| | Interactive | FTP |
|---|---|---|
| APPN/HPR | x 30 | x 60 |
| IP | x 60 | x 60 |

## 3745

- **Model 210**
  (1 active NCP)

## 3746

- **Models 900 and 950**
  (15 x Type 3 Processors + Multiaccess Enclosure via MAE ESCON)

| HPR/ANR | 3745 | 3746 (5) |
|---|---|---|
| Interactive (Tr/s) (1) | 280 | 8000 |
| FTP (MB/s) (3) | 0.7 | 41 |

| IP | 3745 | 3746 (5) |
|---|---|---|
| Interactive (Tr/s) (2) | 215 | 14000 |
| FTP (MB/s) (4) | 0.7 | 42 |

(1) Transactions/sec: in (100 bytes), Out (100 bytes)
(2) transactions /sec : In (100 bytes) , Out (1000 bytes)
(3) 8 KByte data blocks
(4) 4 KByte packets
(5) estimates


© 2000 IBM Corporation