Network Hardware Division
Washington Systems Center
Benchmark

IBM Solutions for the Gateway to the S/390 Server

Contents

Notes on How to Use the Presentation

1. For high-level short presentation

Use the material from the

- **Overall Results and Messages section**

You may need also need to use one or two charts from the Test Setup section, depending on the amount of time. The results in here are those which have been shown to the press.

2. Detailed Presentation

For a longer presentation, use material from all the sections of the presentation:

- **Overall Results and Messages**
- **Test Setup and Configuration Details**
- **Washington Systems Center Measurements**
- **Tolly Group Measurements**
- **Other Decision Criteria**
- **Backup Information**

The WSC and Tolly results are listed separately, because they were achieved using different testing criteria. This is explained later.

Notes on Preparation for the Presentation

1. **Script**

   The script for this presentation is imbedded inside the presentation as Speaker Notes. You must print these speaker notes to get all the information you need). To print:

   - **Select File/Print or printer icon, as usual**
   - **Select Format=Speaker Notes (instead of Full Page or Handouts)**

2. **Research**

   Make sure you have read the accompanying material which backs up the presentation:

   - **Key Messages (IBMGWAY5.PRE)**
   - **IBMWAY1-6.PRE are supporting presentations on IBM's leadership in S/390 server access**
   - **Methodology (WSC804.PRE)**
   - **White paper (WSCPAPER.SAM)**
   - **Exec brochure (WSCEXEC.PDF)**
   - **Specsheet (WSCSPEC.PRE)**
   - **Questions and Answers (WSCFAQ..SAM)**
   - **Backup foils for this presentation (WSC3746C.PRE)**

3. **Education**

   - **3746- SWAT team - attend the education sessions (July 97 in WSC and Sept 97 Telecon) .**
   - **Non-3746-SWAT team - you should consult one of the 3746 SWAT team before attempting to give this presentation. They will brief you on the best charts to use.**

Notes on Assistance

1. SWAT Team

- **Asia-Pacific Geography**
  - NHD Focal Point for AP: Raj Rajan / backup Keith Ashmore
  - ASEAN - Kian Hwee Ng — SGPVM1.NGKH
  - Korea - H.T. Lim — IBMKR.HTLIM
  - TAIWAN- Daniel LIU — TAIVM1.DLIU
  - Japan - Mamoru Murayama — YMTVM1.MMURAY
  - China - Carson IP — PRCVM8.TTCIP
  - Hong Kong - Samuel So — HKGVM8.TONGDWD
  - Australia - David Reeve — SYDVM1.REEVED
  - New Zealand - Ian Gardner — SYDVM1.IANGAR
- **North American Geography**
  - NHD focal point for NA: Pam Judge / backup Keith Ashmore
  - Joe DiTomaso (Area 2) — JDITOMAS at BOSTON
  - Jere Cline (Area 4) — JWCLINE at DETVMIC1
  - Bob Schmidt (Area 5) — RGSCHMI at CHGVMIC1
  - Nancy Yee (Area 7) — NMYEE at WASVMIC1
  - Shelly Howrigon (Area 11) — SCHOWRIG at SFOVMIC1
  - Walt Taylor (Area 13) — TAYLORWT at BETVMIC1
  - Martin Dubeau (Canada) — MDUBEAU at TOROVM1
  - Ralph Brown (Area 10) — RBROWN1 at DALVMIC1
- **North American Geography Additional Team Members**
  - Allison Ingels (US) — AINGELS at DALVMIC1
  - Sam Labarbera(Area 10) — SLABARB at DALVMIC1
- **LA Geography**
  - NHD focal point for LA: Dave Travis / backupJacques Philibert
  - Brazil - German Nunez — GERMAN at RIOVMBHQ
  - Argentina - Martin Fernandez — MFERNAND at LASVM1
- **EMEA Geography**
  - NHD focal point for EMEA-Jacques Philibert / backup Keith Ashmore
  - Central - Wolfgang Singer — 61813148 at VIEVMA
  - North - Marc Poveda — POVEDAM at NHBVM2
  - Nordic - Keijo Alaspaa — ALASPAA at HEKVM
  - West - Andre Del Sol — F028779 at MLVVM5
  - South - Carlo Scaglia — 75815349 at ITHVM05

2. Other Contacts

- **If you have questions which cannot be answered by the SWAT team contact in your country, or if they are not available, the following may also be able to help:**
  - Keith Ashmore (USA) — 1-713-665-5413 kashmor@us.ibm.com
  - Tim Geiss (USA) — 1-919-486-2405
  - Pam Judge (USA) — 1-503-296-7990
  - Raj Rajan (USA) — 1-919-486-2351
  - Dave Travis (USA) — 1-919-254-8261
  - Jacques Philibert (France) — 33-9211-4780
  - Rachel Pickering (UK) — 44-181-818-4974

Overall Messages and Results Summary

Benchmark Objective

Provide valid, consultant-verified data to allow choice of the best S/390 server access gateway for any networking environment.

- **Tolly Group audit**
  - **Tests conducted in July and August at the Washington Systems Center**
  - **Commissioned by IBM**
  - **Tested a subset of the WSC configurations**
  - **Results to be published by Tolly at www.tolly.com**
- **Washington Systems Center benchmarking facility**
  - **Tests conducted April to August 1997**
  - **Comprehensive set of tests covering multiple configurations**

Benchmark Results

3746 and 2216 deliver

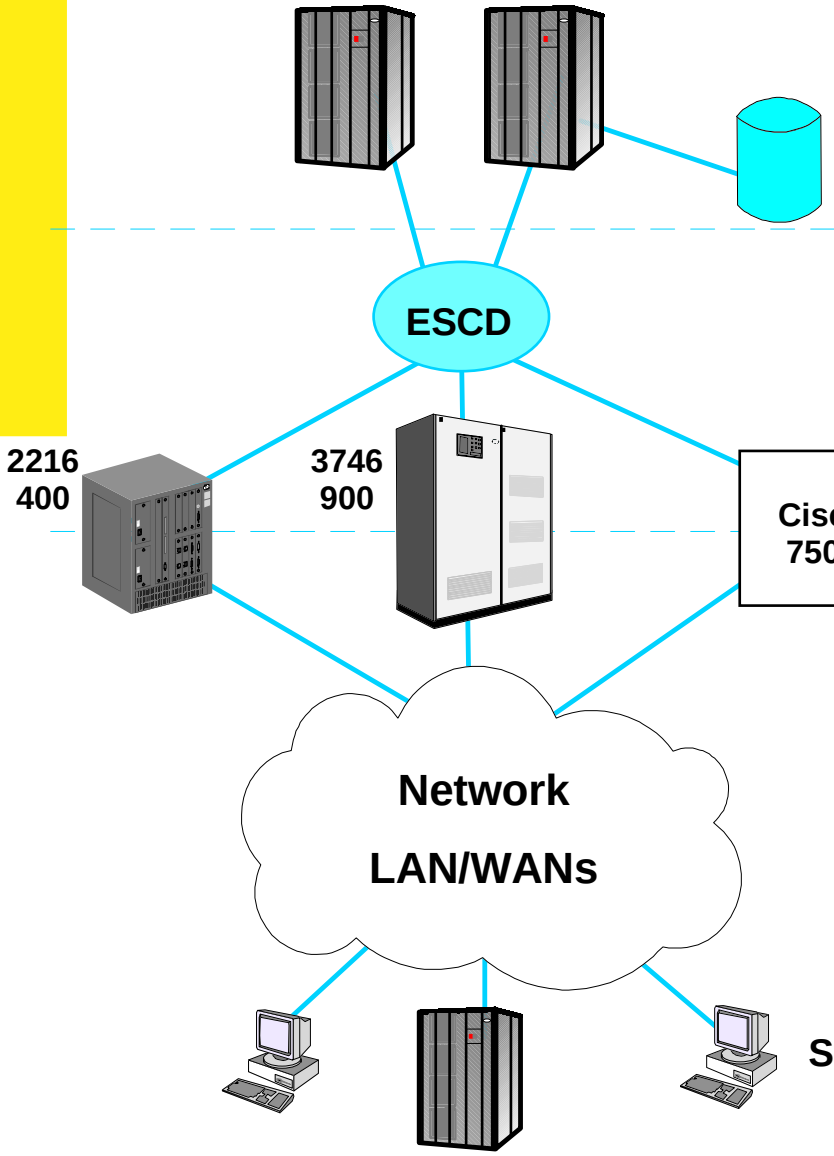
★ **Industry Leading IP Gateway Performance**

- **TCP/IP channel throughput more than twice that of Cisco**

★ **SNA Performance Leadership**

- **SNA passthrough performance**
  - **More than three times throughput than Cisco for interactive**
  - **70% more throughput than Cisco for file transfer**
- **APPN throughput more than four times that of Cisco**
- **Cisco uses up to 70% more MVS/VTAM cycles than NCP**

Benchmark Considerations



S/390
- impact
- capacity
- cost

Channel
- impact
- capacity
- host gateway
- cost

Considered in our benchmark

Network
- capacity
- connectivity
- cost

Station
- capacity
- cost

Benchmarking channel performance only provides a frame of reference.
Actual performance will depend on the total Customer network environment and applications.

Key Customer Concerns

TCP/IP Performance

- Customer networks are integrating TCP/IP into transport network backbone
  - Thus optimal TCP/IP performance is demanded from the network

SNA Subarea Performance

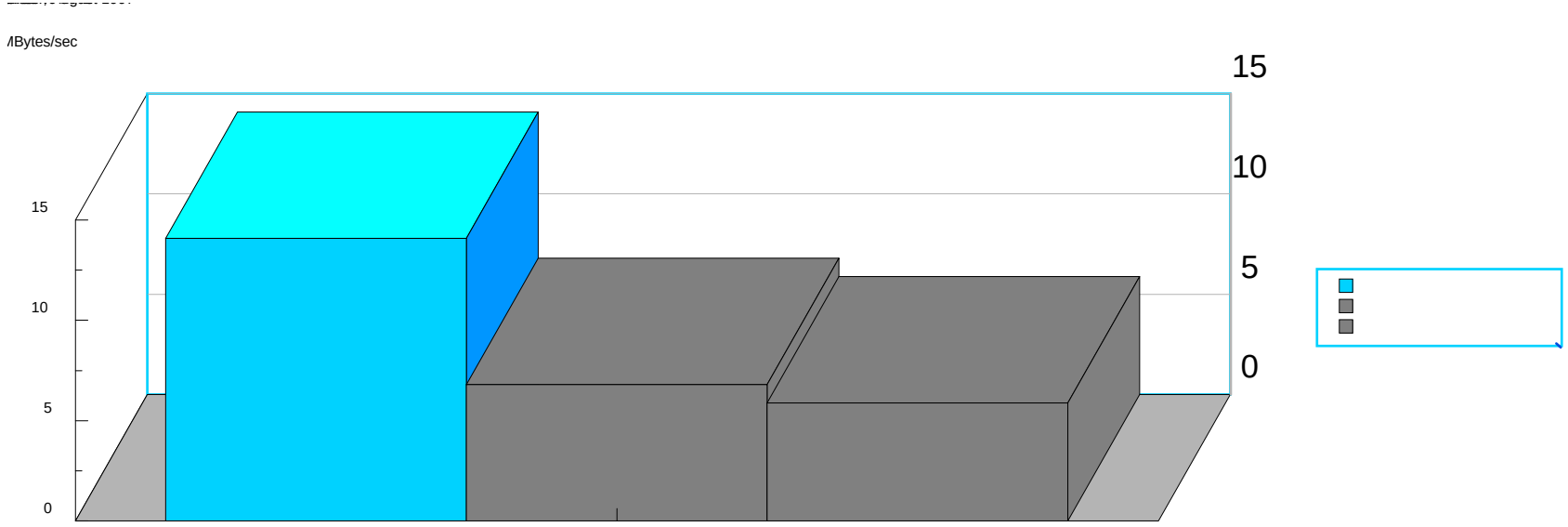
- Most customers today maintain mission-critical subarea SNA networks
  - They continue to demand good subarea support from any network infrastructure

SNA APPN/HPR Performance

- APPN Performance
  - APPN/HPR is an important migration option for customers using subarea SNA.
  - APPN/HPR is the protocol of choice in a Parallel Sysplex environment
  - Require : Nondisruptive rerouting around failures, ease of configuration, manageability and superior congestion control

Benchmark Results
IP Transport

IBM delivers superior performance for IP networks - more than twice that of Cisco as S/390 server gateway

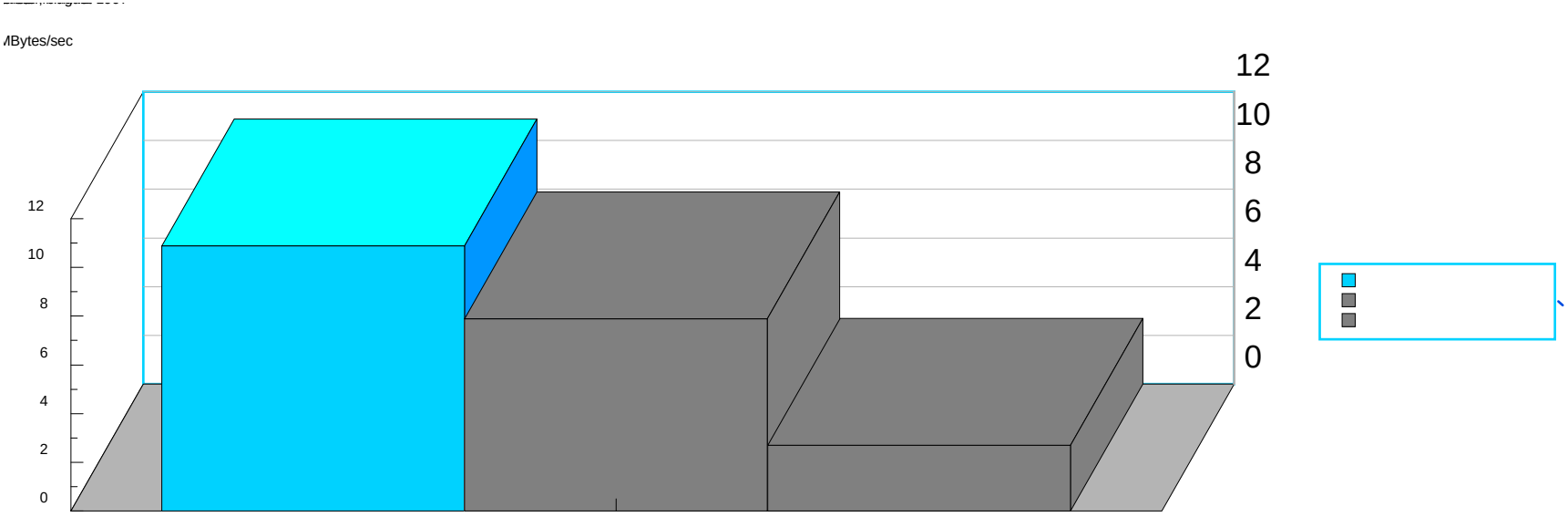


- Tested using 2 channel adapters and 8 Token-Rings

*Tolly tested 2216, 3746 MAE results will be equivalent

Benchmark Results
APPN/HPR

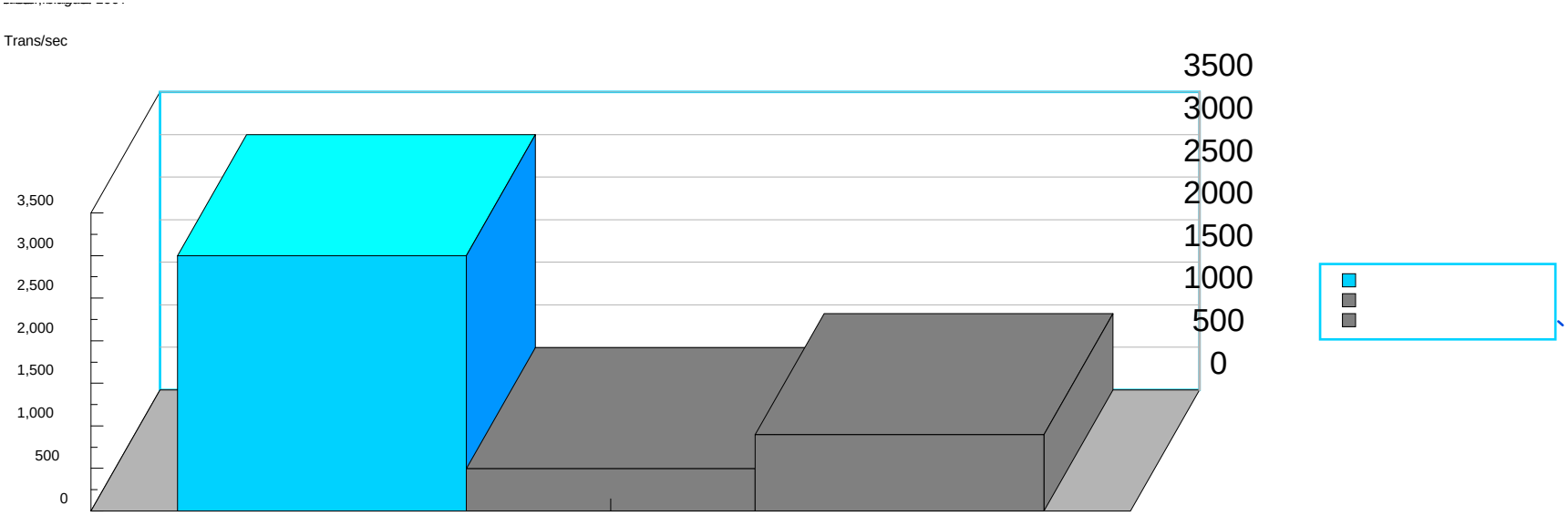
IBM delivers four times performance of Cisco for APPN/HPR as S/390 server gateway



- Tested using 2 channel adapters and 6 Token-Rings

Benchmark Results
SNA Interactive

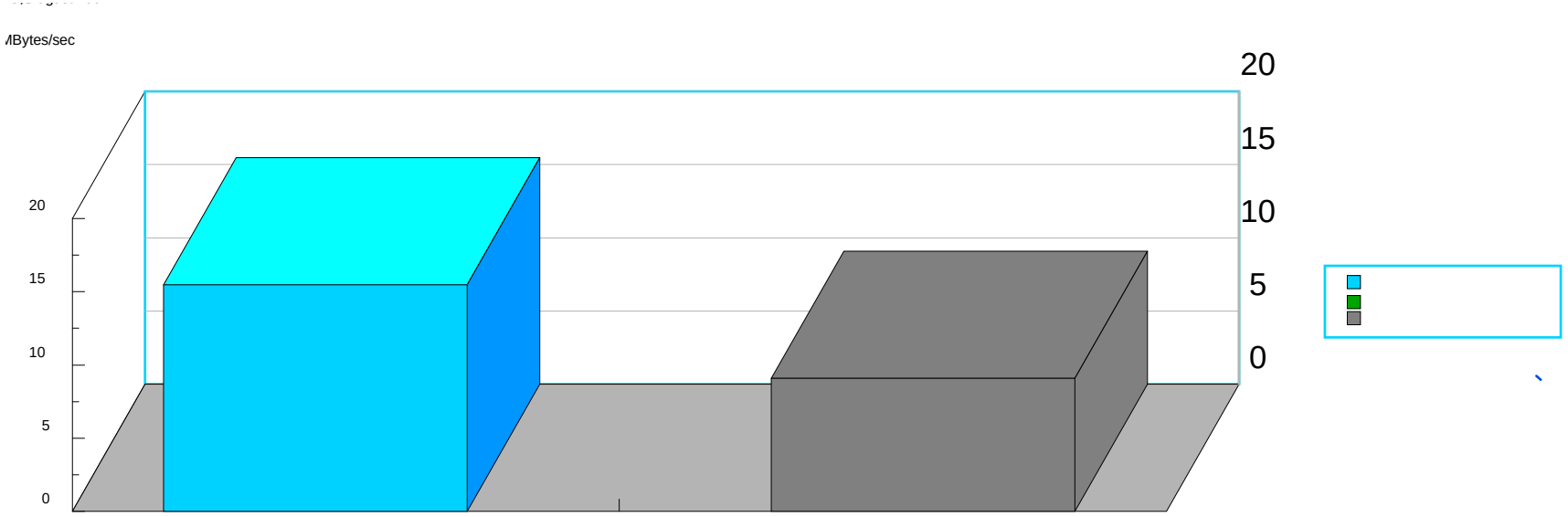
IBM delivers over three times performance of Cisco for interactive traffic as S/390 server gateway



- Tested using 2 channel adapters and 6 Token-Rings
- 3746 used NCP, thus offloading host cycles

Benchmark Results
SNA File Transfer

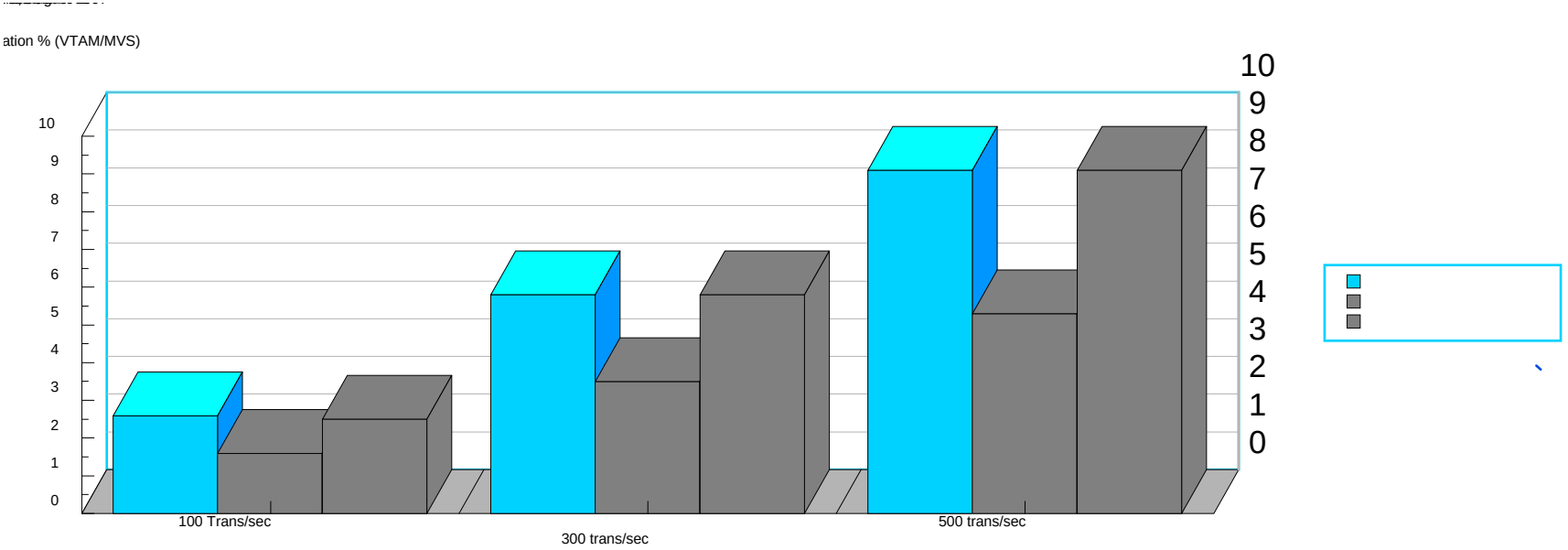
IBM delivers 70% better performance than Cisco for file transfer traffic, as S/390 server gateway



- Tested using 2 channel adapters and 8 Token-Rings
- Tested using Passthrough (not relevant on 3746)

Benchmark Results
S/390 Cycles

3746 as a Front End Processor saves S/390 cycles - Cisco uses up to 70% more than NCP



- Tested using 2 channel adapters and 6 Token-Rings

Key Decision Criteria

Scalability

- IBM offers many scaleable options
- IBM 3745/3746 provides the largest number of connections in a single footprint, with greatest sustainable performance

Evolutionary Migration Choices

- IBM solutions offer our customers choices
  - Cisco can only do 'one size fits all'
- IBM offers planned evolution
  - Manageability
  - Reliability
  - Lasting Value

Benchmark Conclusions

- ★ IBM is using new technology to provide customers with industry leading performance for S/390 server gateways
  - Using building blocks of PowerPC technology and common code provide excellent migration choices for the 374x customer
  - Delivered today on 2216 and 3746 Multi-access Enclosure
- ★ IBM delivers this performance across the board so all types of network can benefit
  - IP, subarea SNA, APPN/HPR
- ★ High performance and high speed connectivity enhancements increase the lasting value of the 3746 9x0 for S/390 server access

Benchmark Product Conclusions

- ★ IBM 2216 offers a very competitive, high performance IP gateway to the host
- ★ IBM 3746/9x0 and IBM 2216 are the best products for S/390 server access using SNA/APPN in the market today
- ★ IBM 3746 with MAE provides the best single footprint S/390 server access gateway for large mission critical networks requiring optimal multiprotocol (SNA & IP) traffic
- ★ IBM 2216 is the best fit as APPN/IP channel gateway for small to medium networks
- ★ IBM 3745/3746 continues to provides the best solution for subarea SNA support

Test Setup and Configurations

Equipment Tested

All equipment configured with latest, recommended hardware and software

IBM 3746 Multiprotocol Controller Model 900

- 2 ESCON Processor Type 3
- 2 ESCON Coupler Type 2
- 2 TRP-3
- 1 TRP-2
- 6 TICs
- 3745 61A running NCP V7R5
- Network Node Processor (for APPN/HPR and IP)
- MAE *
- Microcode level D46130

IBM 2216 Multi-access Connector Model 400

- 2 ESCON adapters
- 4 Token-Ring adapters

Cisco 7507 Multiprotocol Router

- 1 RSP4 processor (32MB)
- 1 CIP with 2 ESCON channel interfaces
- 3 TR adapters on an 8-port Token-Ring VIP2 controller
- IOS 11.1.11

*MAE not available when benchmark done. 2216 results are equivalent for LAN to ESCON channel configuration

Equipment Tested (cont)

All equipment configured with latest, recommended hardware and software

S/390 Server

- 9021-241
- 275 MIPS (5 processors)
- MVS/SP 5.2.2
- VTAM V4R4
- TCP/IP V3R2

PCs

- OS/2 Warp V3
- Comms Server 4.0

Simulation Equipment

- Interactive SNA tests done using TPNS
- File Transfer and IP tests done using Netmarks
  - Components in MVS and OS/2

New Technology

IBM has developed new high speed technology based on the PowerPC and common code software.

Available today in two implementations:

- 2216 Multi-access Connector Model 400
- 3746 Model 900 with Multi-access Enclosure

In this benchmark, we tested the 2216 implementation of this new technology.

Customers can expect to receive equivalent performance using the 3746 Multi-access Enclosure.

3746 Testing Environment

Test results for three 3746 configurations are available.

IBM 3746 provides multiple configuration choices for customers migrating from traditional subarea SNA platform.

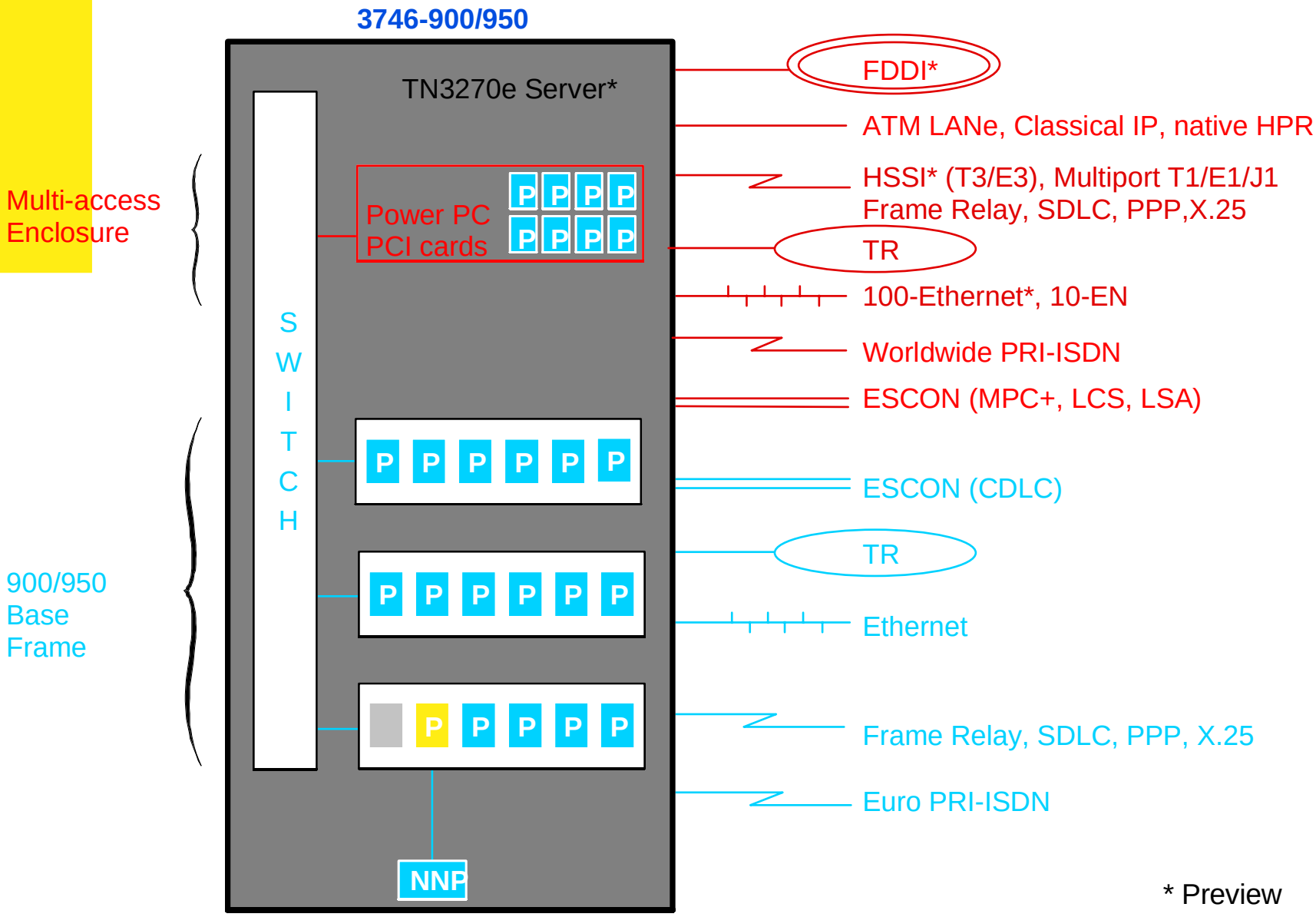
Two configurations of the IBM 3746-900 were tested:

- **3746 using Network Node Processor (NNP), which supports APPN/HPR and/or IP routing**
- **3746 using NCP running in the attached 3745, which was used for subarea SNA tests**

In addition, all the 2216 test results are equivalent to those of a 3746 Multi-access Enclosure (MAE), assuming a direct LAN/WAN to channel configuration

- **3746 using MAE supports subarea SNA (Passthrough), APPN/HPR and/or IP routing**

3746-900/950 Architecture Evolution



3746 Multiaccess Enclosure Value

Scalability

- Greater number of adapters and channels than any other platform
- Shared ports for subarea SNA, APPN/HPR and IP

Performance

- Routing function is distributed among many processors, greatly improving throughput
- Switch-centric architecture

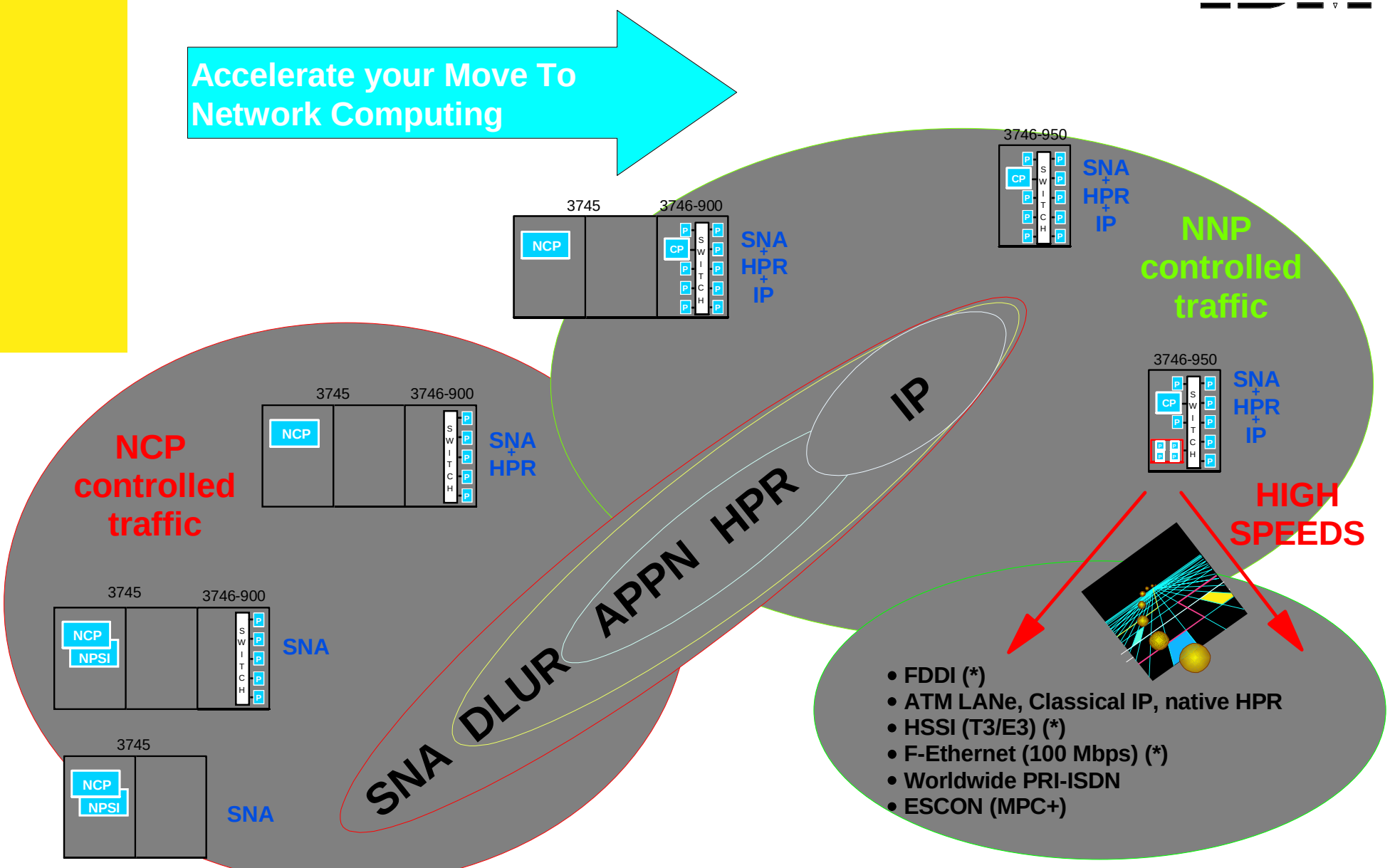
Single platform for subarea SNA, APPN/HPR and IP routing

- Reduced cost of ownership
- Easier management

Availability

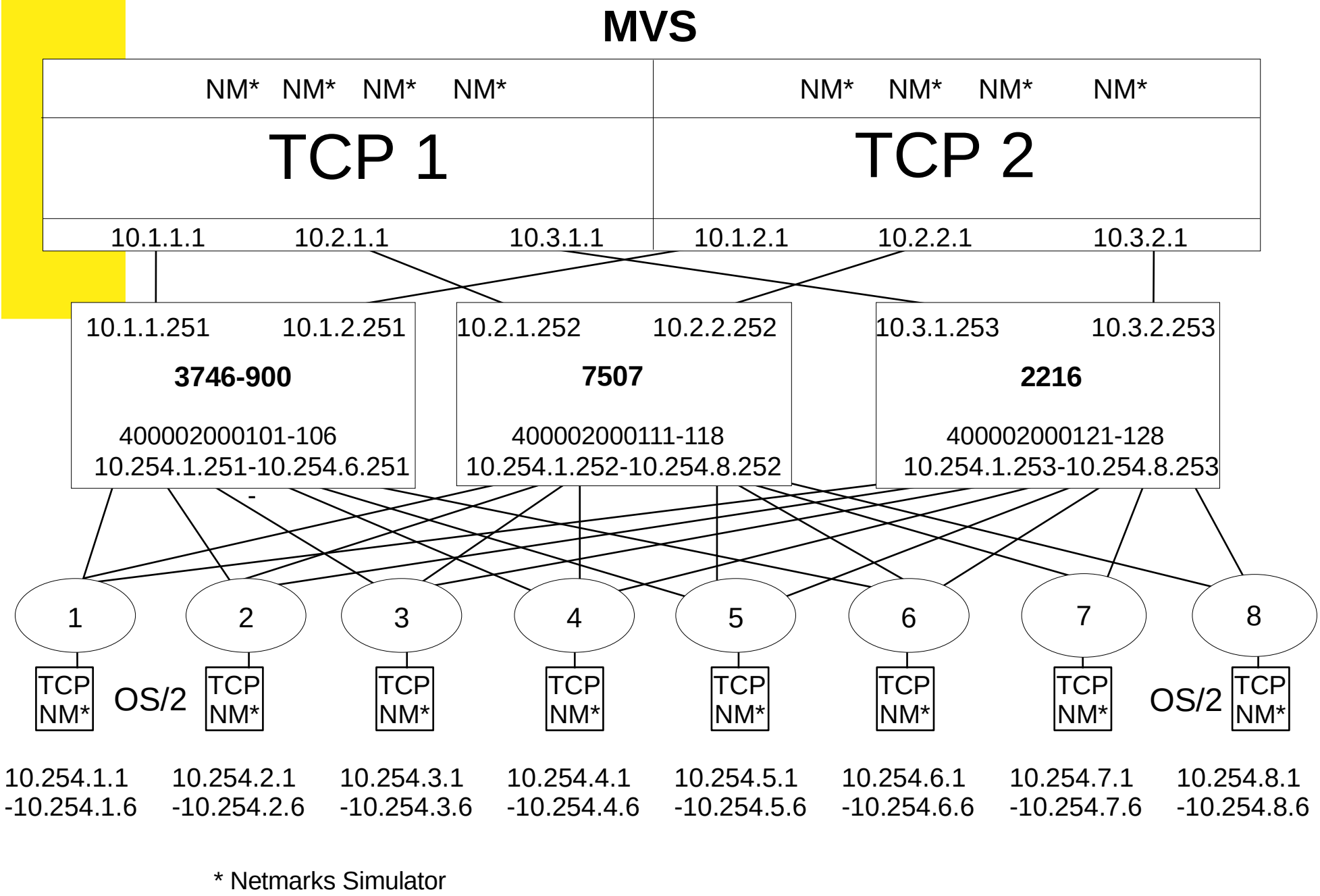
- Option of dual Network Node Processors for high availability
- APPN/HPR functions to support Parallel Sysplex objectives of 24x7 availability

3746 Evolution



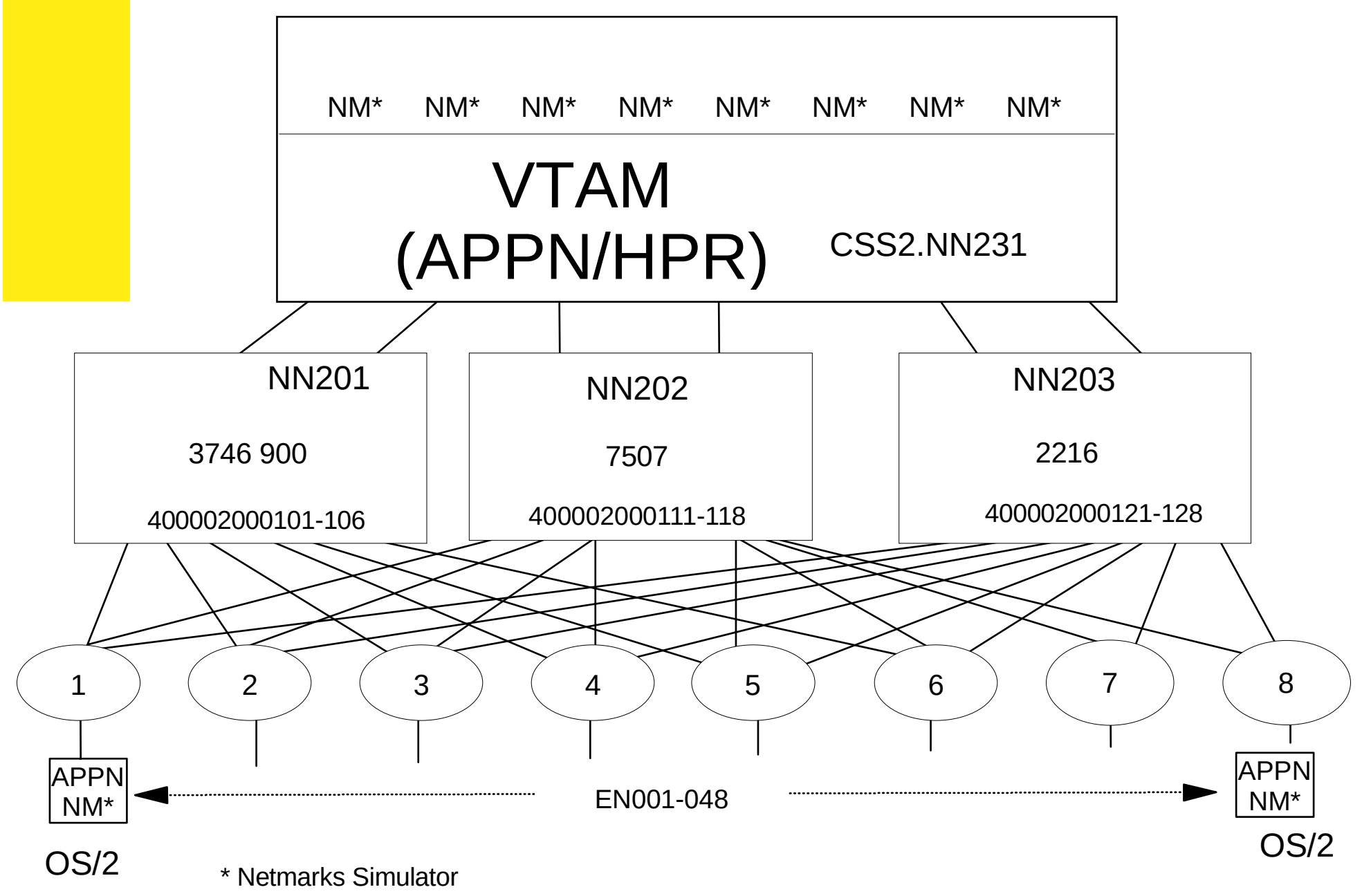
* Preview

Test Setup - TCP/IP

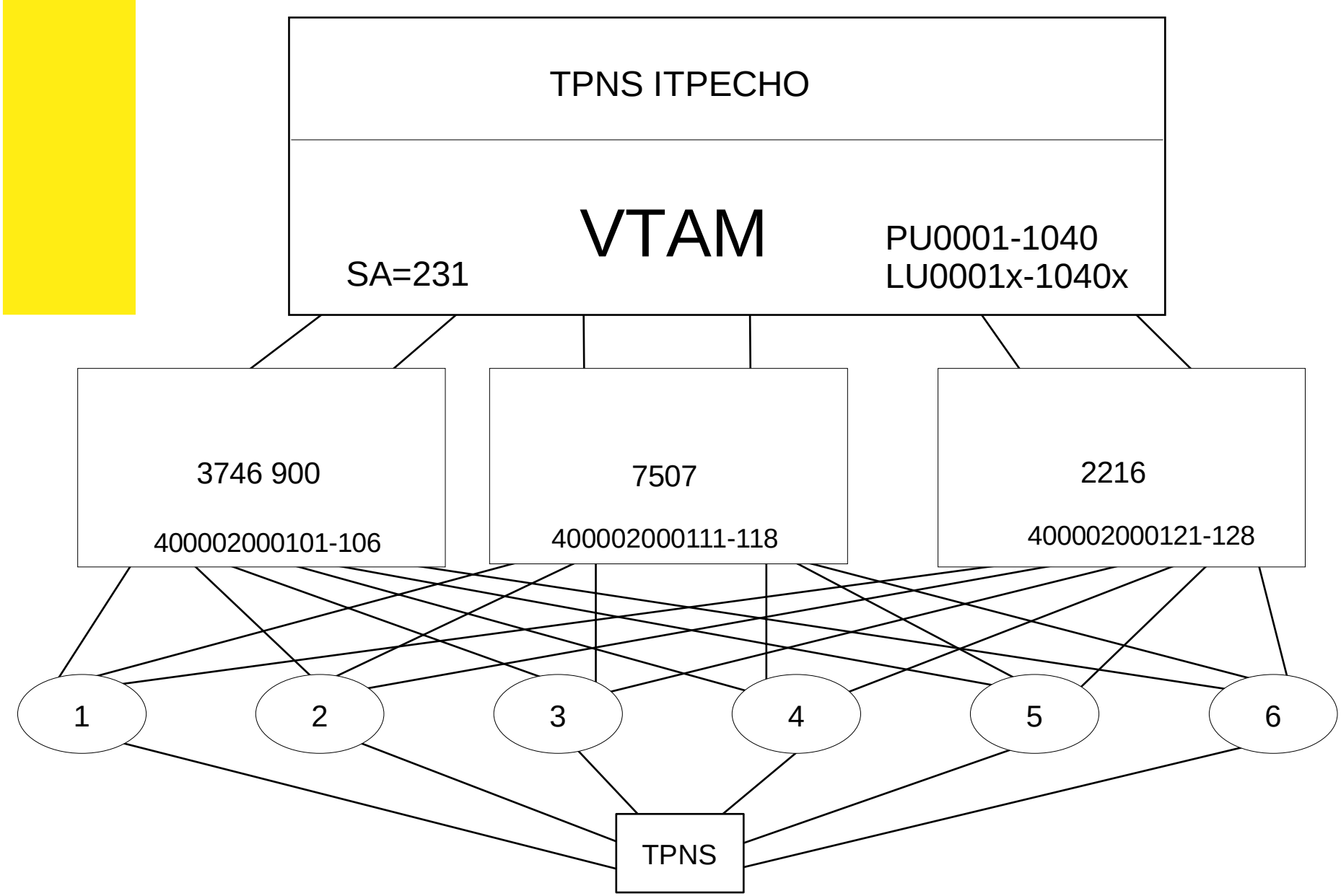


* Netmarks Simulator

Test setup - APPN/HPR



Test setup - Subarea SNA



WSC Benchmark Test Cases

Gateway Configuration	2216/ 3746MAE	3746	7507
TCP/IP (Netmarks)	*Test #12**	*Test #1**	*Test #19**
SNA Passthrough (TPNS)	*Test #13**		*Test #20**
SNA NCP Offload (TPNS)		*Test #4**	
APPN/HPR/ANR (Netmarks)	*Test #16**	*Test #2**	
APPN/ISR- Passthrough (Netmarks)	Test #30		Test #32
APPN/ISR - Native (Netmarks)	Test #31	Test #36	Test #23

** Tests audited by The Tolly Group*

Benchmark Audit and Test Criteria

★ The WSC tested more configurations than The Tolly Group did, over a period of months..

- IBM /Tolly chose the tests to audit, based on the most important configurations.
  Eg The design point for SNA on the 2216 is for HPR, and so the APPN/HPR configuration was audited by Tolly, but not the APPN/ISR configuration

★ Tests were done with different criteria

- IBM tested the maximum capacity
- Tolly tested for sustained performance, which will be closer to customers actual configurations

★ Some tests were done to measure specific configurations even through there was no equivalent across all the platforms

- Eg 2216/Cisco Passthrough which is not relevant to the 3746
- Eg 3746 NCP support which is not relevant to the 2216 or Cisco

Traffic Profiles

IP

- File Transfer using Netmarks (*)
  - 1500 Bytes outbound
  - 1500 Bytes inbound or outbound
  - 4000 Bytes outbound
  - 4000 Bytes inbound or outbound
  - Largest frame size in or out (Max thruput)

SNA-1(DLUR, SNA Subarea, SNA Passthru)

- Interactive using TPNS
  - 128 Bytes inbound / 128 Bytes outbound(DLUR/DLSw)
  - 128 Bytes inbound / 128 Bbytes outbound at 500/1000 trans/sec
  - 100 Bytes inbound / 1000 Bytes outbound (Max trans/sec)
  - 100 Bytes inbound / 1000 Bytes outbound with DR (Max trans/sec)

SNA-2 (Host Cycles)

- Interactive using TPNS
  - 128 Bytes inbound / 128 Bytes outbound at 100/300/500/1000 trans/sec

SNA-3 (APPN, APPN/HPR)

- File Transfer using Netmarks
  - 2000 Bytes inbound/outbound
  - 4000 Bytes inbound/outbound
  - 8000 Bytes inbound/outbound
  - 16000 Bytes inbound/outbound
  - Largest RU size in or out (Max thruput)

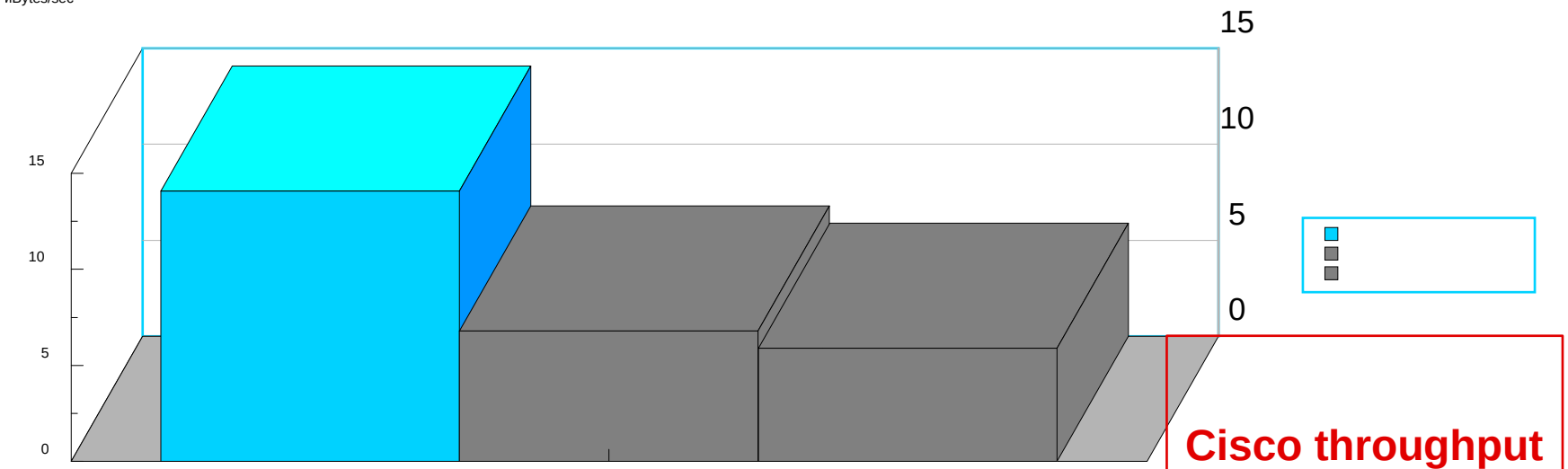
* Netmarks Test Simulator

Test Results

As Measured By

The Tolly Group

Benchmark Results
IP Transport

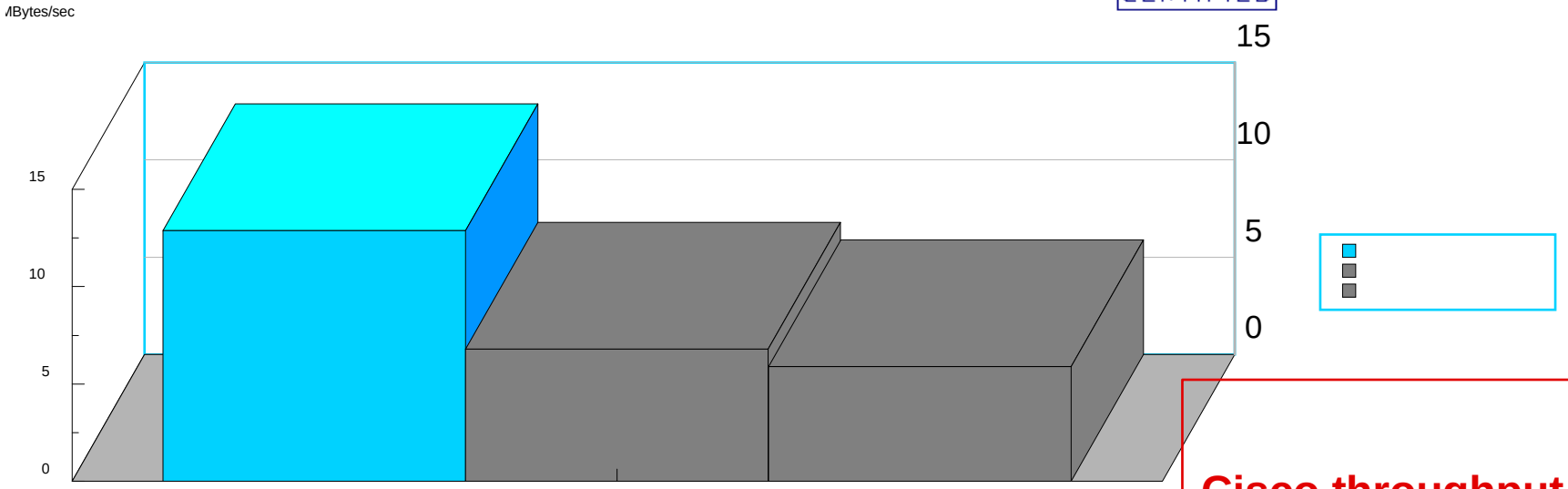


Cisco throughput decreases as IP load increases

- Test Configurations
  - 2 ESCON Channels
  - 8 Token-Rings on 2216 and Cisco; 6 Token-Rings on 3746
  - 3746 used NNP IP router support
  - Tests #12, #1, #19
- Traffic profile for IP
  - 48 servers and 16K frames outbound for 2216
  - 32 servers and 4K frames outbound for 3746
  - 48 servers and 4K frames outbound for Cisco

Cisco can only support 4K outbound for IP traffic

Benchmark Results
IP Transport (Additional)



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  - 48 servers and 4K frames outbound for Cisco

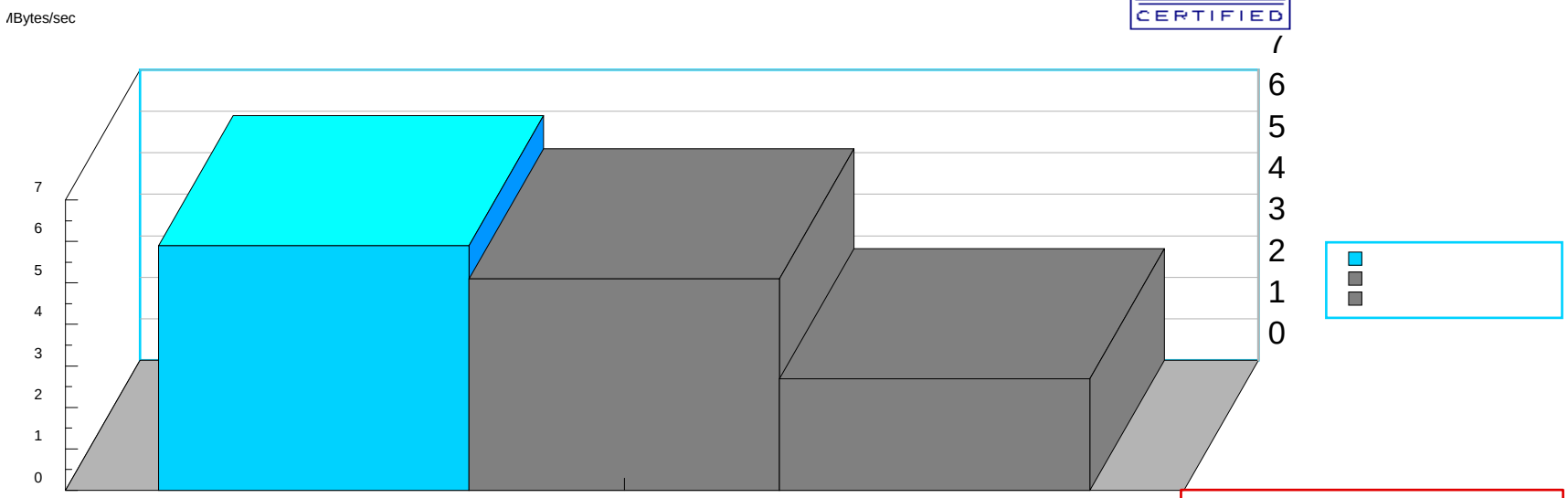
Cisco can only support 4K frames for IP traffic

Benchmark Results
APPN/HPR

Cisco still have not shipped HPR

- Test Configurations
  - 2 ESCON Channels
  - 6 Token-Rings in all configurations
  - 3746 used NNP APPN network node support
  - 2216 and 3746 used HPR/ANR routing; Cisco test used APPN/ISR
  - Tests #16, #2, #23
- Traffic Profile SNA-3
  - 24 servers and 16K RUs outbound for 2216
  - 24 servers and 16K RUs outbound for 3746
  - 24 servers and 4K RUs outbound for Cisco

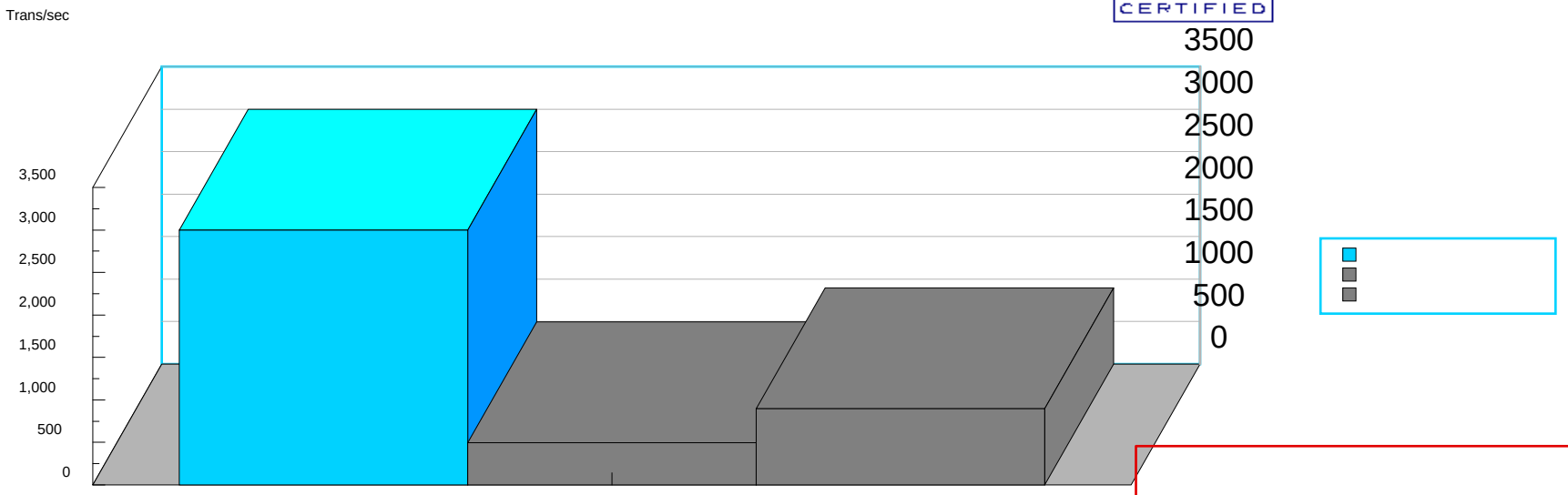
Benchmark Results
APPN/HPR (Additional)



Cisco still does not have HPR support

- Test Configurations
  - 2 ESCON Channels
  - 6 Token-Rings in all configurations
  - 3746 used NNP APPN network node support
  - 2216 and 3746 used HPR/ANR routing; Cisco test used APPN/ISR
  - Tests #16, #2, #23
- Traffic Profile SNA-3
  - 24 servers and 4K RUs outbound for 2216
  - 24 servers and 4K RUs outbound for 3746
  - 24 servers and 4K RUs outbound for Cisco

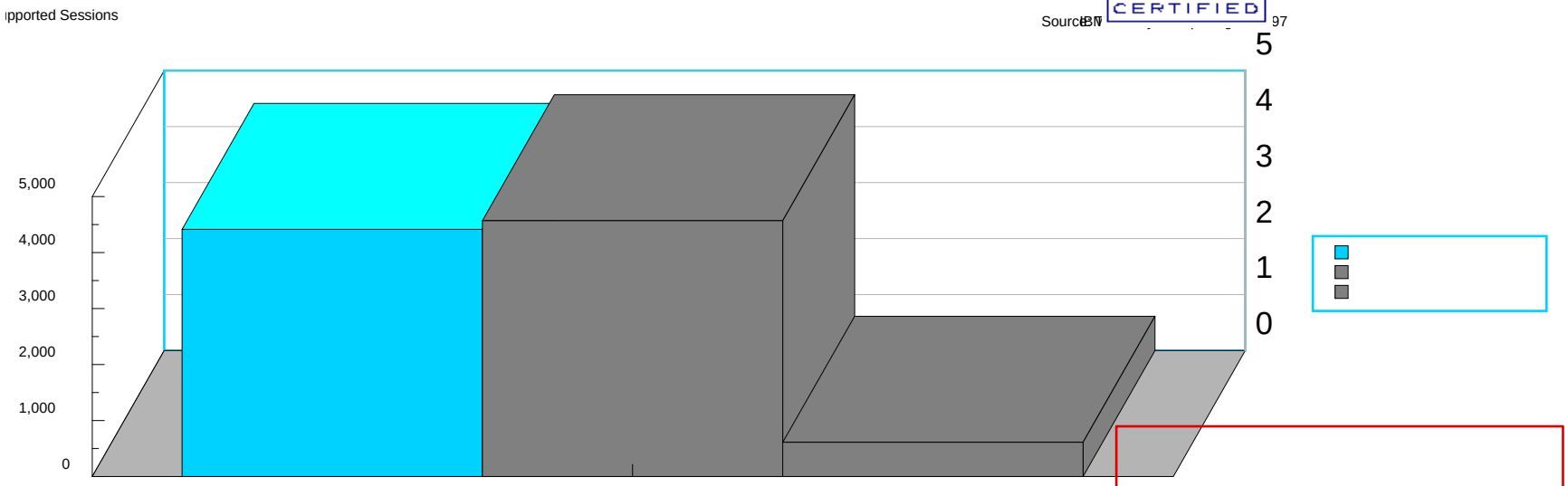
Benchmark Results
SNA Interactive



*** Have to slow down activation rate on Cisco to get SNA PUs and sessions up**

- Test Configurations
  - 2 ESCON Channels
  - 6 Token-Rings in all configurations
  - 2216 and Cisco used Passthrough; 3746 used NCP(on single CCU)
  - Tests #13, #4, #20
- Traffic Profile SNA-1 with 128B/128B messages
  - 1160 PUs/4416 LUs for 2216
  - 1160 PUs/4570 LUs for 3746
  - 240 PUs/619 LUs for Cisco*

Benchmark Results
SNA Interactive (Additional)



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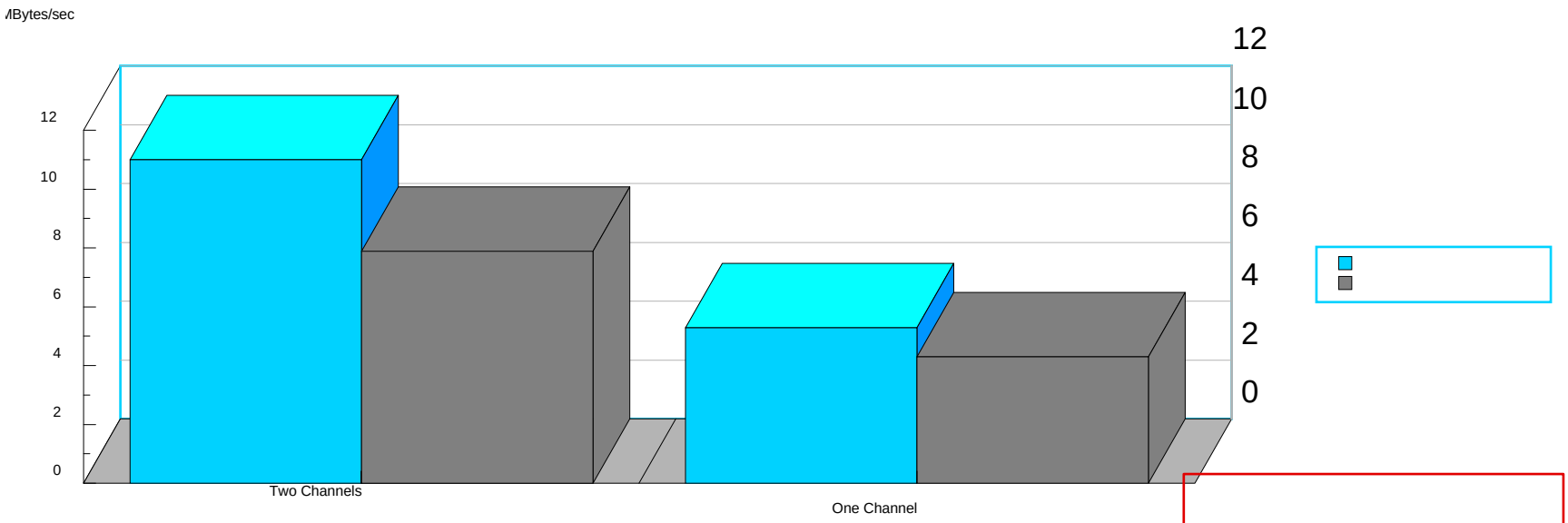
  - 240 PUs/619 LUs for Cisco*

Test Results

As Measured By IBM At The Washington Systems Center

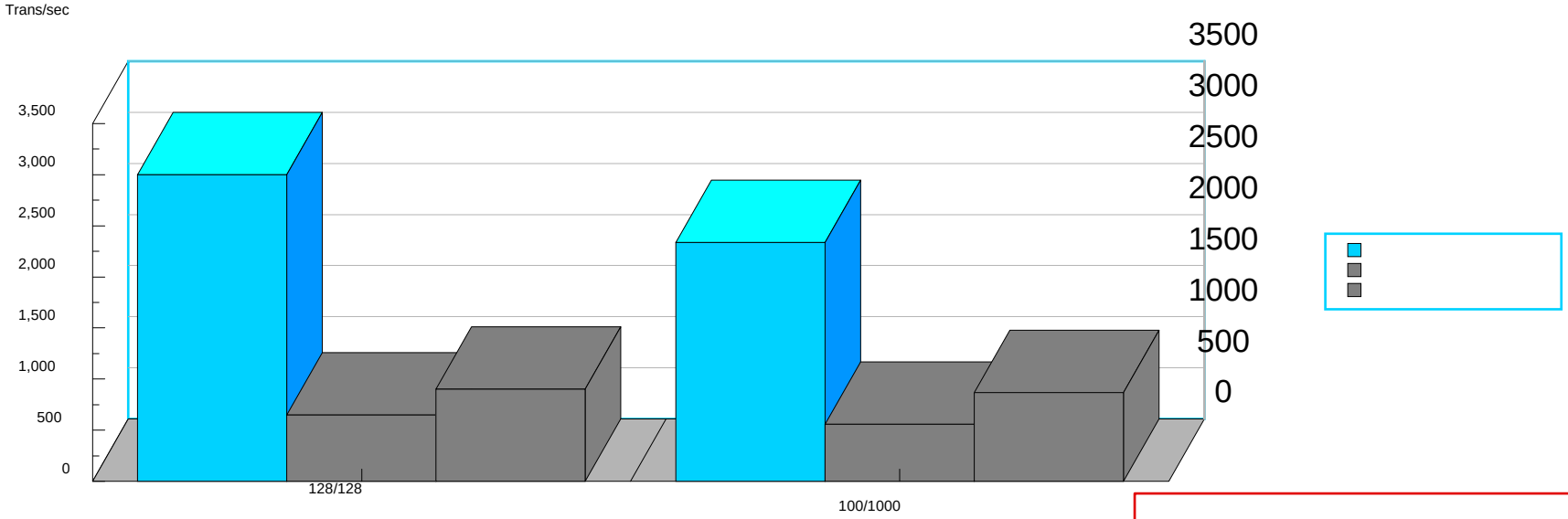
Benchmark Results
APPN/HPR



Cisco still does not have HPR support

- Test Configurations
  - 1 or 2 ESCON Channels
  - 6 Token-Rings in both configurations
  - Both configurations used HPR/ANR routing (not available on Cisco)
  - 3746 used NNP APPN network node support
  - Tests #16, #2
- Traffic Profile SNA-3
  - 48 servers and 16K RUs outbound for 2216
  - 32 servers and 16K RUs outbound for 3746

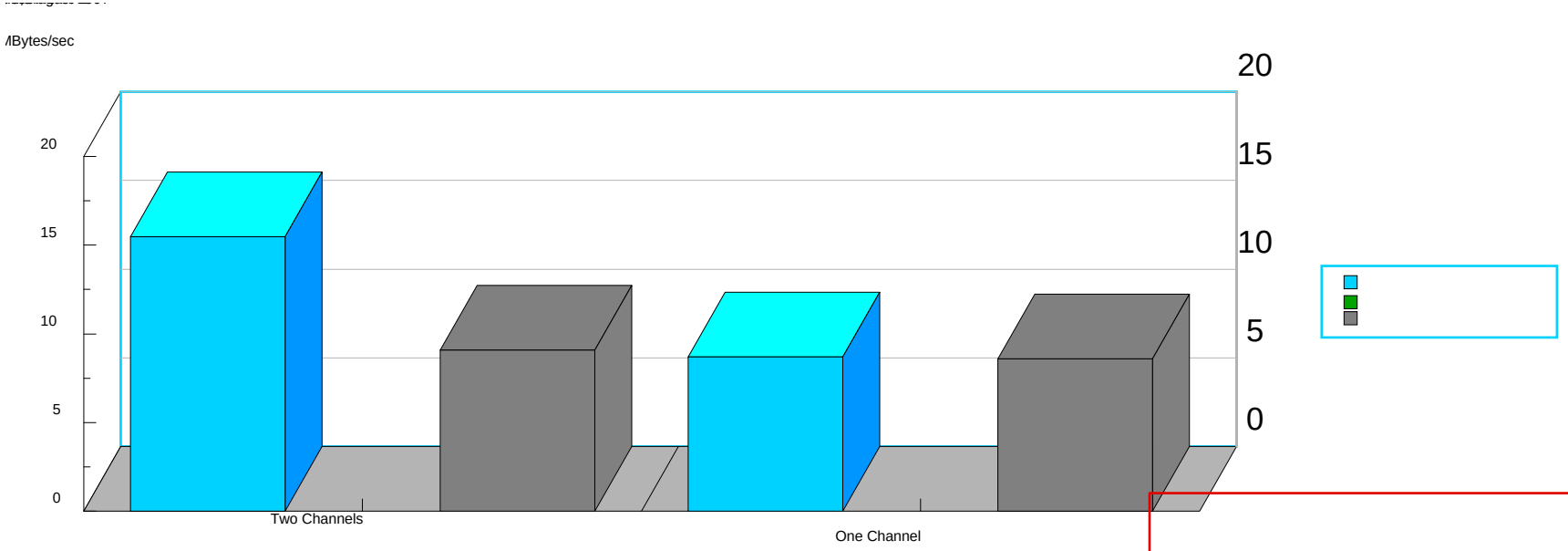
Benchmark Results
SNA Interactive



A single CIP with multiple channel interfaces is limited to 256 PUs

- Test Configurations
  - 2 ESCON Channels
  - 6 Token-Rings in all configurations
  - 2216 and Cisco used Passthrough; 3746 used NCP(on single CCU)
  - Tests #13, #4, #20
- Traffic Profile SNA-1 with 128B/128B and 100/1000 messages
  - 1160 PUs/4610 LUs for 2216
  - 1160 PUs/4570 LUs for 3746
  - 240 PUs/960 LUs for Cisco*

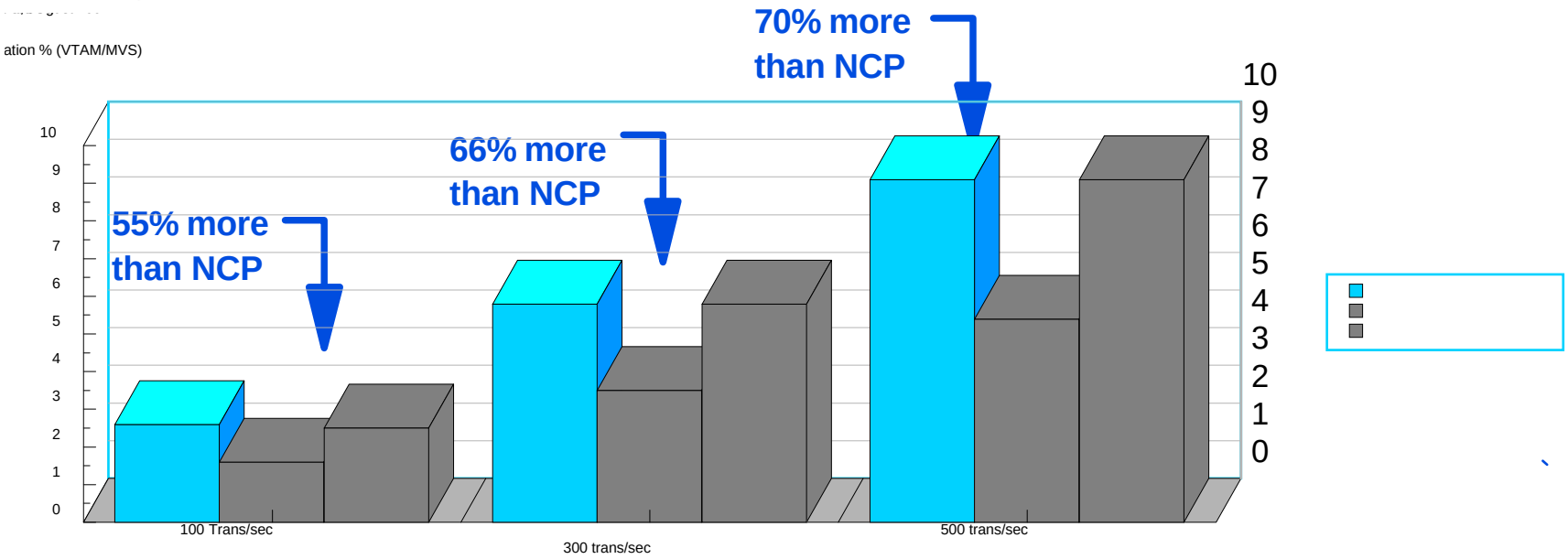
Benchmark Results
SNA File Transfer - APPN Passthrough



Cisco CIP is not scalable

- Test Configurations
  - 1 or 2 ESCON Channels
  - 8 Token-Rings
  - Both configurations used Passthrough (not applicable to 3746)
  - Tests #30, #32
- Traffic profile SNA-3
  - 48 servers and 8K RUs inbound for 2216
  - 48 servers and 4K RUs inbound for Cisco

Benchmark Results
S/390 Cycles



Cisco uses up to 70% more S/390 cycles than NCP

- Test Configurations
  - 2 ESCON Channels
  - 6 Token-Rings in all configurations
  - 2216 and Cisco used Passthrough; 3746 used NCP
  - Tests #13, #4, #20
- Traffic Profile SNA-2 with 128B/128B messages
  - 240 PUS/ 954 LUs for all configurations

WSC Benchmark Testing Experiences

★ Cisco 7507 testing observations

- Low number of PUs supported
  - Could only 240 PUs per CIP2
  - PUs had to be activated very slowly (2 second interval vs 4 PUs/sec for IBM)
- Cisco can only support 4K frames
- Poor scalability
  - Channel thruput dropped when traffic load is increased
  - Dual ESCON card performance only 110% of single ESCON (SNA passthrough testing)
- CIP handling of LLC frames consumes excessive router processor cycles (APPN/ISR testing)

★ Inadequate Cisco configuration support

- Can store only two code images (compared to 2 code images each with 4 configurations on the 2216)
- Importing code image from NVRAM or TFTP - overlays the old image

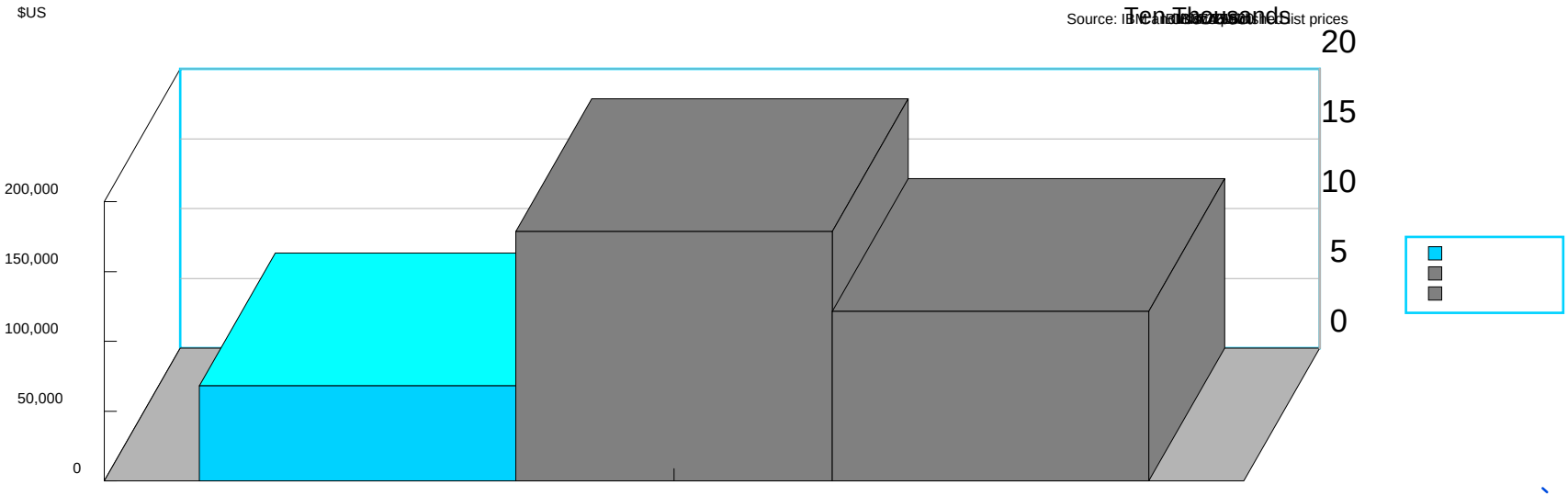
★ Cisco announced HPR in 1996 - still not available

★ Poor Cisco support for SNA problems

- Little or no SNA expertise in Level 1 support

Other Decision Criteria

Price Comparisons



- These are the prices of the configurations tested at the WSC (based on US$ list prices)