1997 Benchmarking



IBM

Networking Hardware Division
Washington Systems Center (WSC)
Benchmark

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10/9/97

- A brief overview of the benchmark testing done by IBM and audited by The Tolly Group
- See The Tolly Group Website www.tolly.com for reports 7291, 7291, and 7293
- Additional detail upon request - contact IBM
- Keith Ashmore - US 713-665-5413 or e-mail at kashmor@us.ibm.com
- Raj Rajan - US 919-486-2351

Benchmark objective

Provide valid, consultant-verified data to guide customers' selection of the best S/390 server gateway.

- Washington Systems Center customer benchmarking facility
- Independent verification of results: audit conducted by The Tolly Group

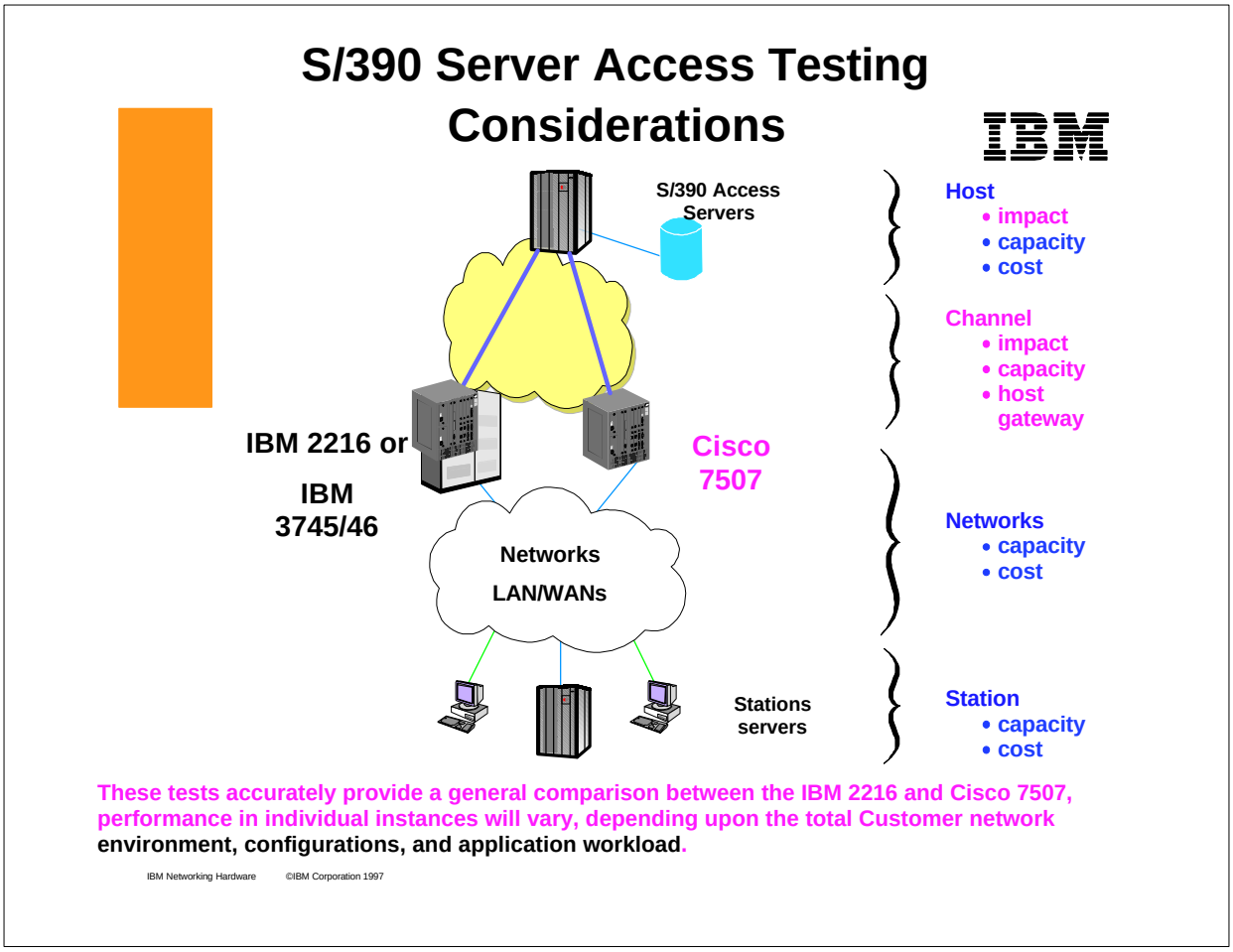
Equipment tested were as follows :

- **IBM 2216 Multi-access Connector Model 400**
- **Cisco 7507 Multiprotocol router with CIP2 and RSP4 Processor**
- **IBM 3746 Model 900**

- All equipment configured with latest, recommended hardware and software

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- Washington System Center is an IBM facility with significant expertise in benchmarking and performance measurements for IBM and outside Customers . The facility is equipped with necessary IBM mainframes and front end processors to conduct most benchmarking requirements in computer networking. NHD chose this facility to ensure that the benchmarking tests performed would be measurable and repeatable.
- IBM engaged The Tolly Group to audit a series of these tests. The Tolly Group verified the design and configurations and collected and analyzed the data.



- This testing was focused on the impact of various channel protocols supporting IBM and Cisco devices acting as a gateway to accessing the S/390 server. This includes traffic throughput measurements when handling IP, SNA and APPN protocol traffic. Tested models: Cisco 7507, IBM 3746, and IBM 2216.
- Such measurements provide a frame of comparative reference and actual results may vary. The actual performance will depend on various factors like application characteristics, network component capacity and specifications as well as the actual traffic profiles encountered in the customer's network.

Key customer concerns
S/390 Server Access

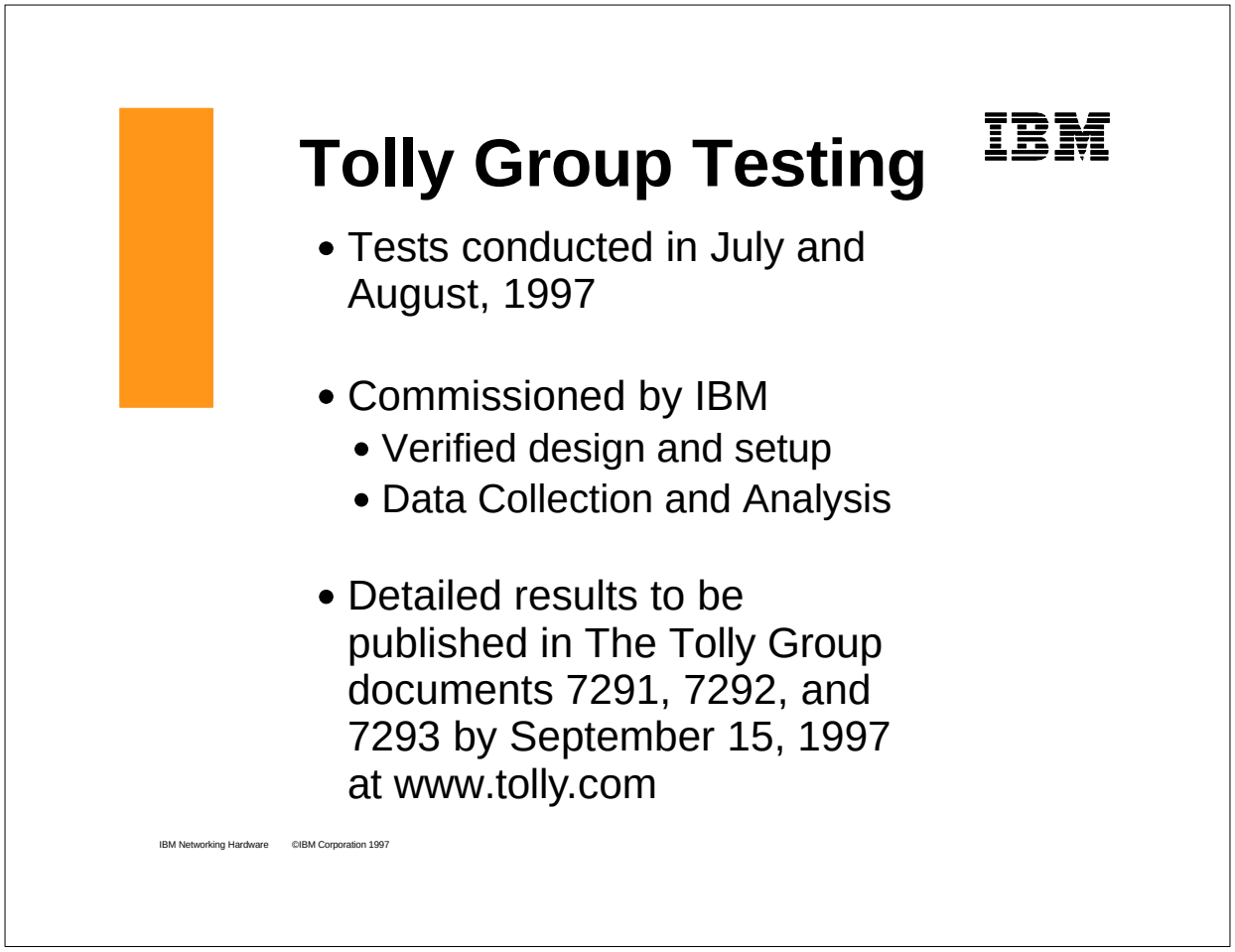
- **Superior TCP/IP** Performance
  Customer networks increasingly depend on TCP/IP as the network transport.
- **Enhanced SNA** Performance
  Support for **subarea** SNA
  Most customers today maintain mission-critical subarea SNA networks.
  APPN Performance
  APPN is an important migration option for customers enhancing their SNA networks. Sysplex support, manageability and ease of configuration are but a few of the benefits of an APPN network.

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- By the year 2000, it is expected that over 95% of IBM mainframes will be running TCP/IP applications. Customers are interested in converging on a single protocol in the backbone network to optimize operations and management of their networks. With the advent of the Internet/ Intranet revolution, many customers will maintain their SNA applications and develop new applications using TCP/IP.

- Over 70% of the mission critical applications still use SNA as their transport protocol. Therefore, most customers who are happy with their subarea SNA network would want to maintain their functionality.

- Customers using Sysplex mainframes will require support for the "new" SNA that provides 24 X 7 X 365 availability and advanced congestion control and automatic network rerouting features using High Performance Routing (HPR) developed by IBM and standardized through the APPN Implementors Workshop (AIW).

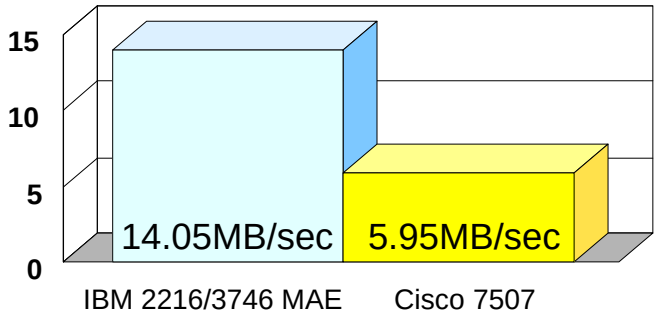


- IBM commissioned The Tolly Group because of their expertise in understanding the needs of enterprise customers.
- The Tolly Group reviewed the test equipment, test specifications and established the ground rules for conducting the tests to ensure independence.

IBM Delivers Industry Leading IP Gateway Performance

IBM

IP Transport



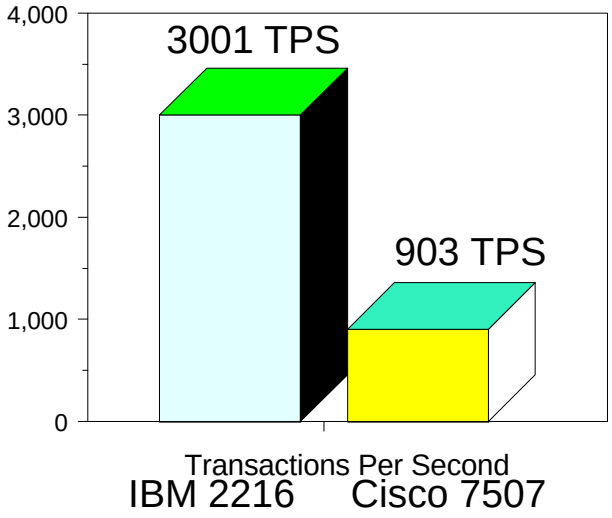
TCP/IP S/390 channel throughput more than twice as fast as Cisco

- The tests demonstrated that IBM is the leader in S/390 channel performance for IP.
- Configuration: 2 ESCON channels
- Refer to Tolly reports 7291 & 7292 in the Tolly Web Page, www.tolly.com, for details.

IBM Delivers Excellence in SNA Transaction Performance

IBM

Interactive SNA Transactions

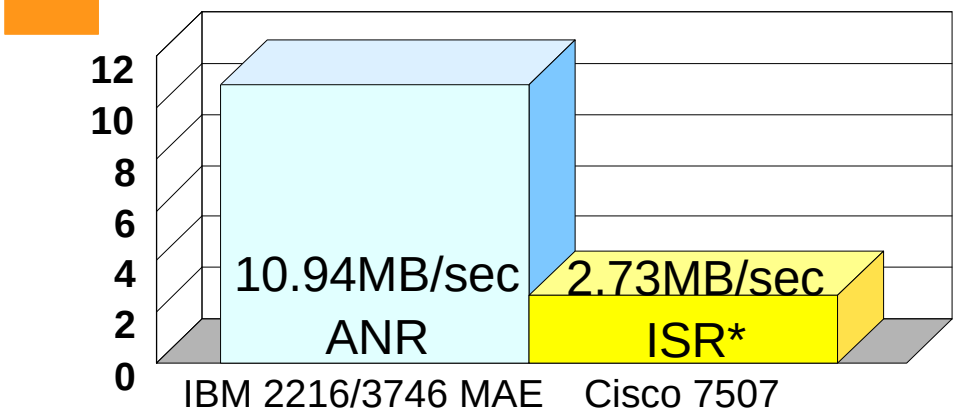


SNA Pass-through performance :

3 times as fast as Cisco for interactive

- The tests demonstrated that IBM is the leader in S/390 channel performance for SNA Transactions in the "passthrough" environment.
- This environment bypasses the advantages of traditional SNA-NCP connectivity and instead directly channel attaches (XCA mode). The host cycle utilization will increase since VTAM must do the job of the front end processor, as well (see later chart).
- Configuration: 2 ESCON channels
- Message size of 128 Bytes In and Out - the IBM 2216 was able to sustain over 3000 transactions per second (tps) whereas, the Cisco 7507 was able to sustain 903.
- Refer to The Tolly Group reports 7291 & 7292.

IBM Delivers High Performance Routing APPN



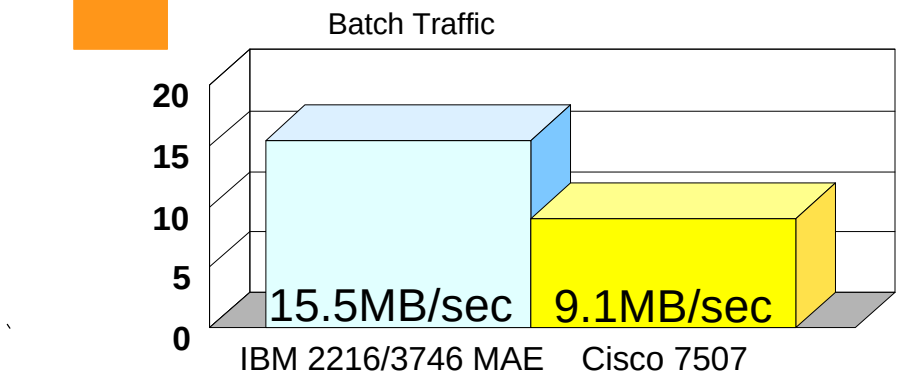
APPN throughput
3X better than Cisco

- The tests demonstrated that IBM is the leader in S/390 channel performance APPN/HPR.
- Configuration: 2 ESCON channels
- This test was audited by the Tolly Group (Visit URL: HTTP://www/tolly.com and refer to Tolly Reports 7291 & 7292)
- HPR was used in testing IBM APPN whereas HPR was not available from Cisco when these tests were performed
- Using the IBM 2216 as an ANR node in an APPN/ HPR environment, IBM was able to outperform Cisco 7507 about 4 to 1.
- note: based on the available APPN/ISR Cisco code.

IBM Delivers Excellence in SNA Performance

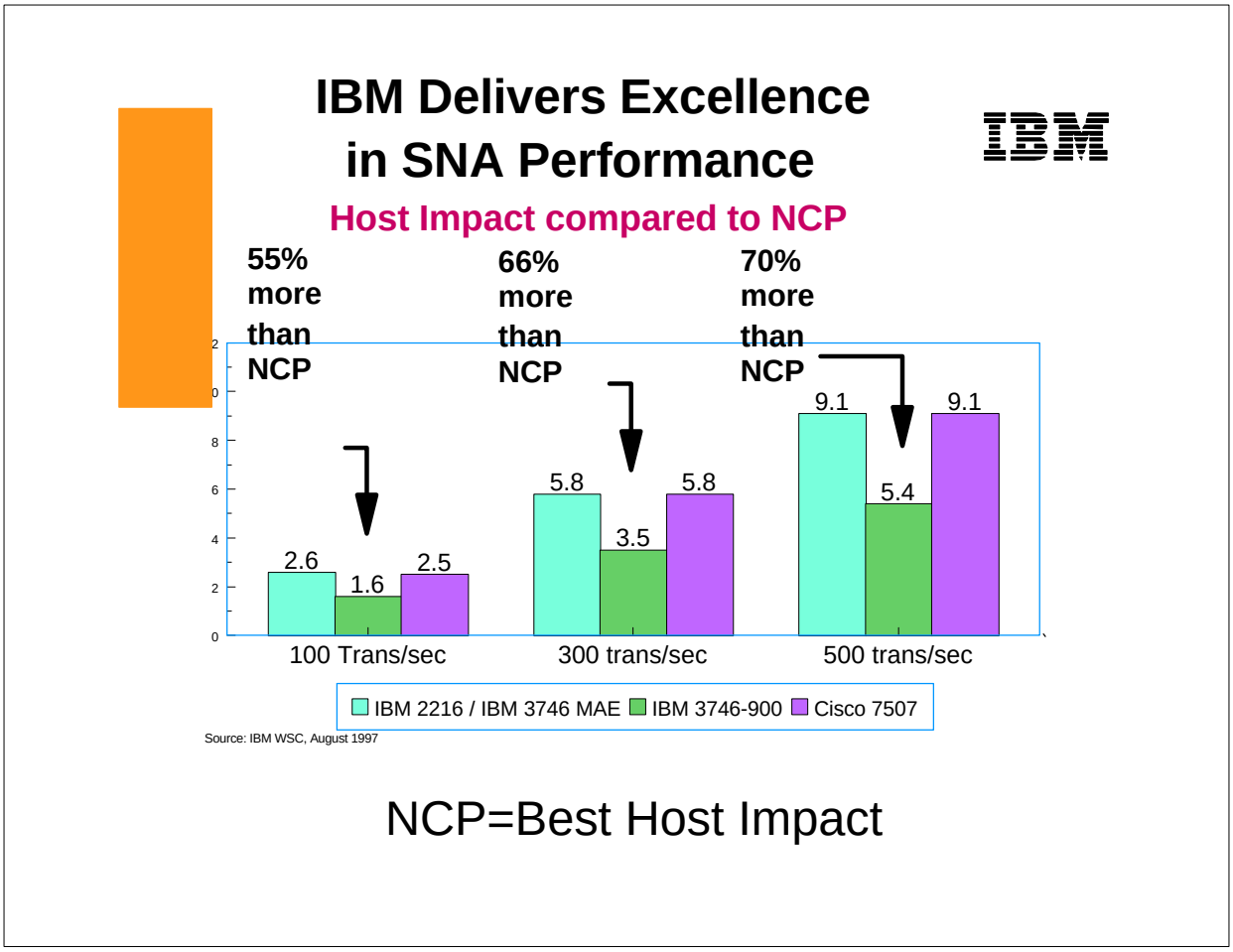
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SNA Transport - Batch



SNA Pass-through performance :
up to 70% better than Cisco for batch

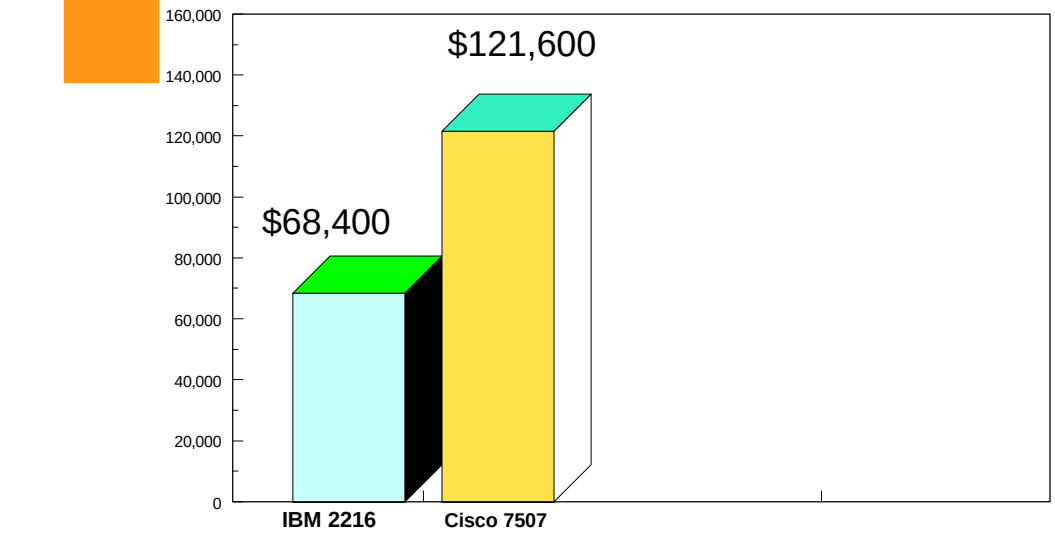
- This chart shows that IBM is the leader in S/390 channel performance for traditional SNA subarea
- This chart shows batch throughput using pass-through (XCA implementation which does not employ the host cycle offload capability of NCP).
- This test was not audited by The Tolly Group
- It is an additional performance test using the same configurations and measured by IBM personnel at the Washington Systems Center. traffic.
- The choice to exclude them from independent testing was made due to budget and time constraints.



- This chart shows that IBM is the leader in S/390 channel performance for traditional SNA subarea traffic.
- This test was not audited by the Tolly Group. It is an additional performance test using the same configurations and measured by IBM personnel at the Washington Systems Center.
- The chart measures the impact to the CPU based on the operating system and VTAM cycle utilization. The Cisco 7507 and IBM 2216 perform SNA pass-through, while the 374X uses NCP, which offloads host processing. Pass-through dramatically increases the CPU impact compared to the 374X.
- The choice to exclude them from independent testing was made due to budget and time constraints.

High end performance... Mid-range price!

Prices shown here are for the tested configuration



Source: IBM and Cisco published list prices; June, 1997

- A great benefit to IBM customers is that the IBM channel attached solution for S/390 Server access delivers this high performance at less than 60% of the cost of Cisco solution, based on June 1997 published list price comparison (We understand that Cisco discounts the list prices on these products considerably).
- We believe that even if Cisco discounts these prices, IBM solutions will be very competitive with Cisco.
- The price comparison is based on the tested configuration; but we expect that comparable savings can be realized in most customer environments.

Benchmark results: Key decision criteria

Scalability
IBM offers
Many options for S/390 Server Access including the largest number of connections in a single box (3746-9X0) - up to 240 lines in addition to the 3745 capacity

Migration choices
IBM offers
Not a "one size fits all" approach
Planned evolution
- Manageability
- Reliability
- Lasting value

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- IBM offers the Customer a number of choices in S/390 server connectivity. Each solution leverages some unique networking environment to provide reliable high-performance connectivity to S/390. IBM 3745/46 platform provides excellent scalability and migration characteristics from their subarea SNA networks to high speed SNA/APPN networks - at your pace.
- IBM 2216 has excellent price points to compete effectively while enabling access to high speed ATM networks now and FDDI and Fast Ethernet in the near future.

Customer Value

- High speed and high performance access to S/390 Servers
  - IBM is using new technology to bring industry leading performance for S/390 server gateways
- Enhanced high performance access to S/390 applications
  - IBM delivers industry leading performance across the board - ALL networks (IP, APPN, SNA) benefit.
- Common PowerPC technology and Common software base in the 2216 and 3746
  - Large and small customers can benefit from accessing S/390 high performance server
- High end performance at a midrange price :
  - The 2216 establishes a new price point for S/390 server access.

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- Bottom line: You will be able to derive excellent value from IBM while investing in channel solutions to deploy the scalability, availability and reliability characteristics of S/390 servers, especially in mission critical Sysplex environments.
- IBM channel attached solutions provide high performance in handling SNA/APPN and IP traffic at a very competitive price.

Equipment tested: details

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
- NCP V7R3

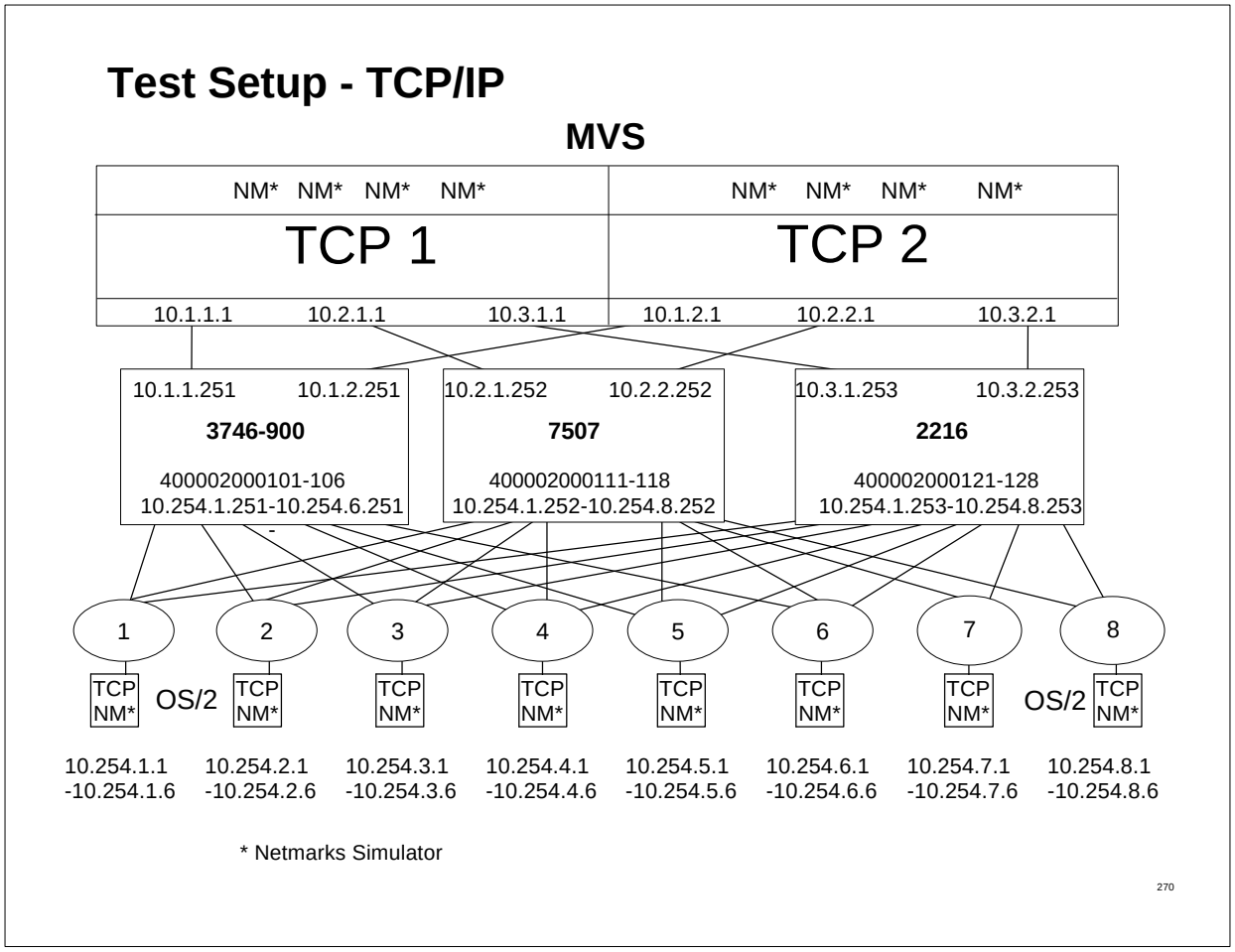
IBM 2216 Multi-access Connector Model 400
- 2 ESCON connections
- 4 TR adapters

Cisco 7507 Multiprotocol Router
- 1 RSP4 processor
- 1 CIP2 w/ 2 ESCON connections
- 3 TR adapters
- IOS 11.1.11

S/390 server: 9021-241, 275 MIPS (5 processors), MVS/SP 5.2.2, VTAM 4.4, TCP/IP 3.2
PC's: Comm. Server 4.0 - OS/2 Warp V3

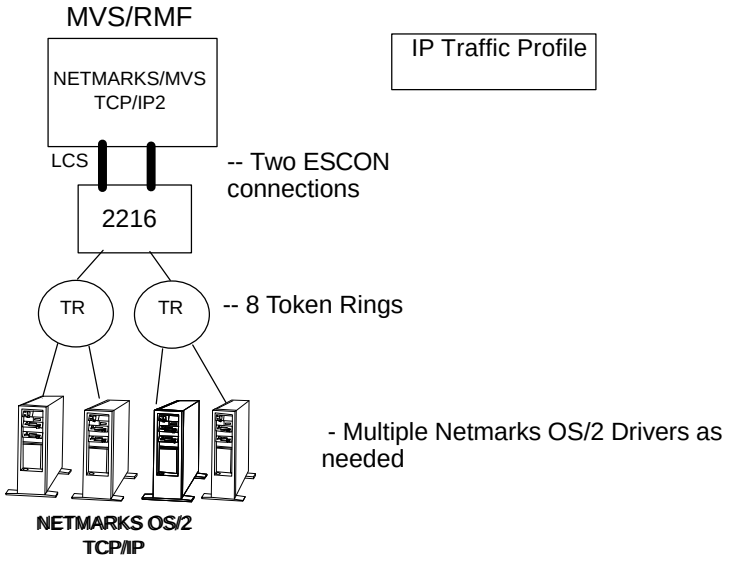
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- This chart provides the details of the equipment tested during this benchmarking project. Please note that the Cisco 7507 was upgraded with the latest technology using CIP2 card and RSP4 processor.



- This picture shows an example of the lab set up for TCP/IP test configuration. The diagram shows that the gateway boxes were connected to token- rings on the network side and to two TCP stacks on the channel side. Traffic was driven using PCs running Netmarks software for performing such measurements.

2216 in IP Mode - Sample Test Setup



- This is an example of typical test setup for IP traffic profiles. A number of similar tests were performed on Cisco 7507, IBM 3745/46 and IBM 2216



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