IBM TN3270E Server Performance
The Tolly Group TN3270 Server Tests

IBM Network Utility and 2216-400
vs. Cisco 7507/4 with CIP2

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Agenda

- **Testing Background Introduction**
- **The Tolly Group .. Cisco Comparative Test Report**
  - ➤ Environment
  - ➤ Test Description
  - ➤ Observations
- **The Tolly Group .. IBM Resiliency Test Report**
  - ➤ Environment
  - ➤ Test Description
  - ➤ Observations
- **The Tolly Group Detailed Data**
- **Associated Observations**

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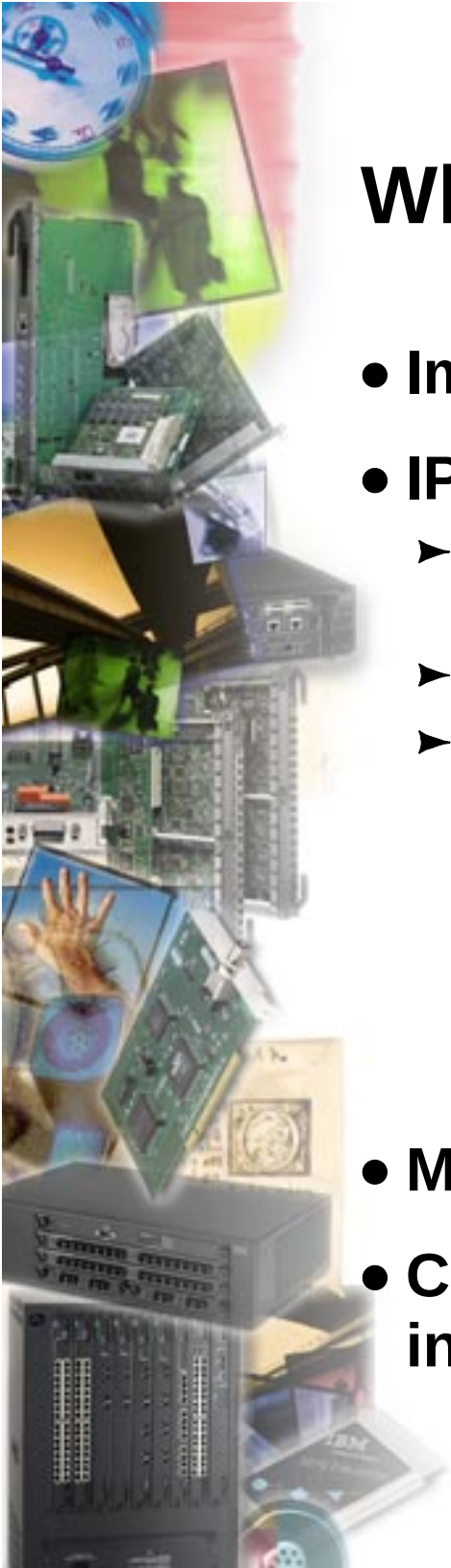

Why Compare TN3270E Server Capacity

- **Important to e-Business information access**
- **IP to SNA integration requirement**
  - ►1997 - 24% of desktops based on TCP/IP stack ..
    2001 - 87% estimated desktops based on TCP/IP stack .. IDC
  - ►Desktop access shifting to IP TN3270 and browser clients
  - ►Access to SNA application investment remains high priority
    - ◆ Over 70% of world's business information is SNA based, residing in IBM S/390 servers
    - ◆ 61% of all data networks run on SNA
    - ◆ 90% of Banking applications are still SNA
    - ◆ SNA application workload predicted to grow
- **Managing cost still a priority**
- **Customer asking for comprehensive, independently verified test comparison**

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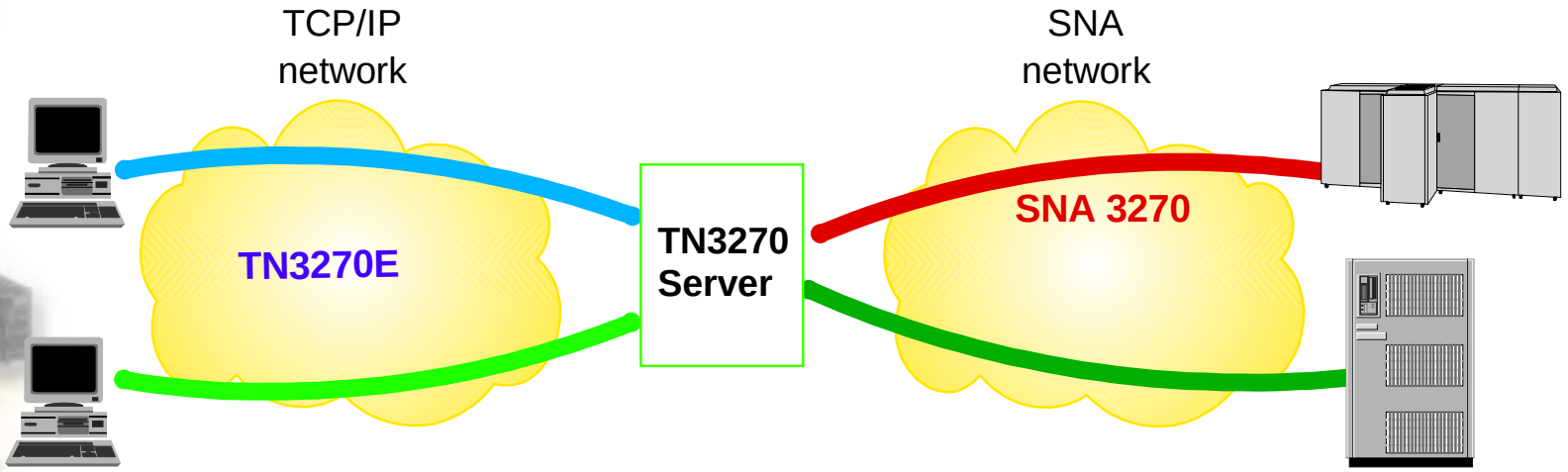
What is a TN3270 Server ?



- **Gateway that enables clients and workstations on a TCP/IP network to access applications in an SNA network**
  - 3270 applications on a mainframe in an SNA network
- **Provides TCP/IP to SNA protocol conversion for SNA 3270**
- **Placement of the TN3270 server is an important consideration**
- **TN3270E is an 'extended' version of TN3270 to provide:**
  - Printing services, extended character set, bind delivery to user

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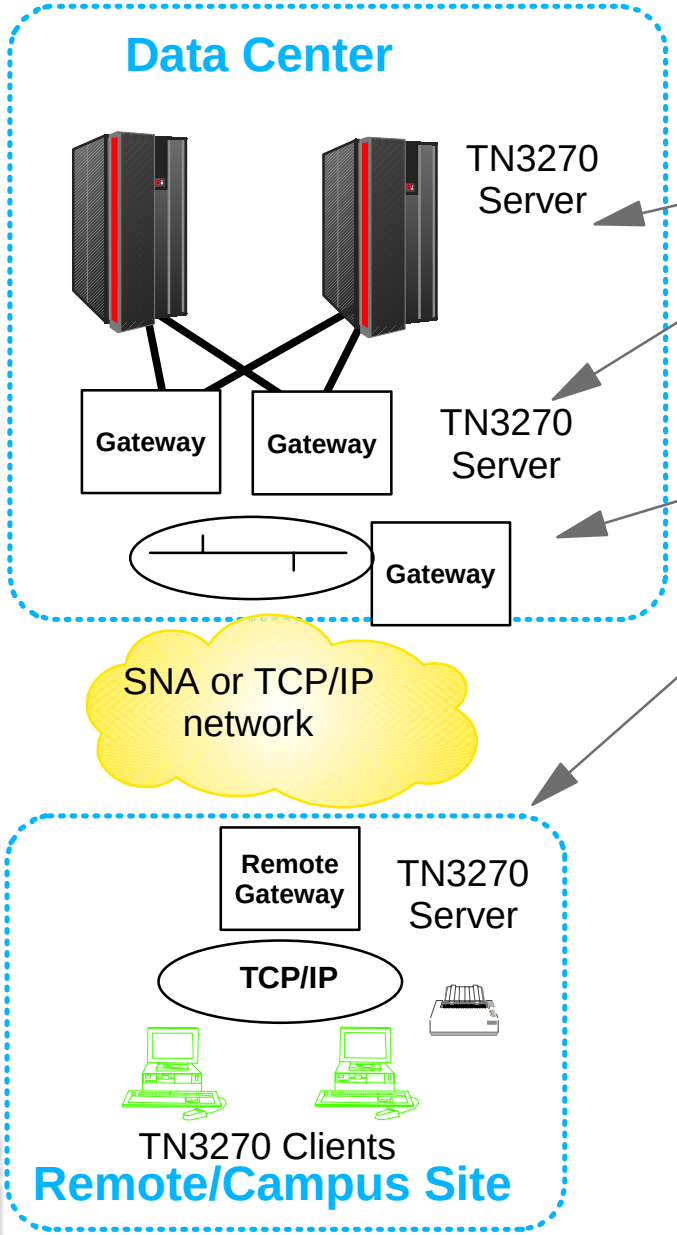
TN3270 Server Solutions From IBM



The Tolly Group test focus

- **Data Center**
  - S/390 TN3270E Server
    - TCP/IP for S/390 (CS/390)
  - Channel Gateway TN3270E Server
    - 2216 Multiaccess Connector
    - Network Utility model TN1
    - 3746 900/950 with Multiaccess Enclosure
    - CS/AIX, CS/NT
  - Campus concentration (no channel required)
    - Network Utility model TN1
- **Remote gateway TN3270E Server**
  - Larger capacity .. regional concentration or larger branch
    - Network Utility model TN1
    - 2216 Multiaccess Connector
    - 2212 Access Utility
    - CS for AIX
    - CS/NT
  - Smaller capacity branch office
    - 2210 Router
    - 2212 Access Utility
    - CS for OS/2 Warp
    - CS for NT
    - NetWare for SAA

Wherever you need it .. IBM offers clients too

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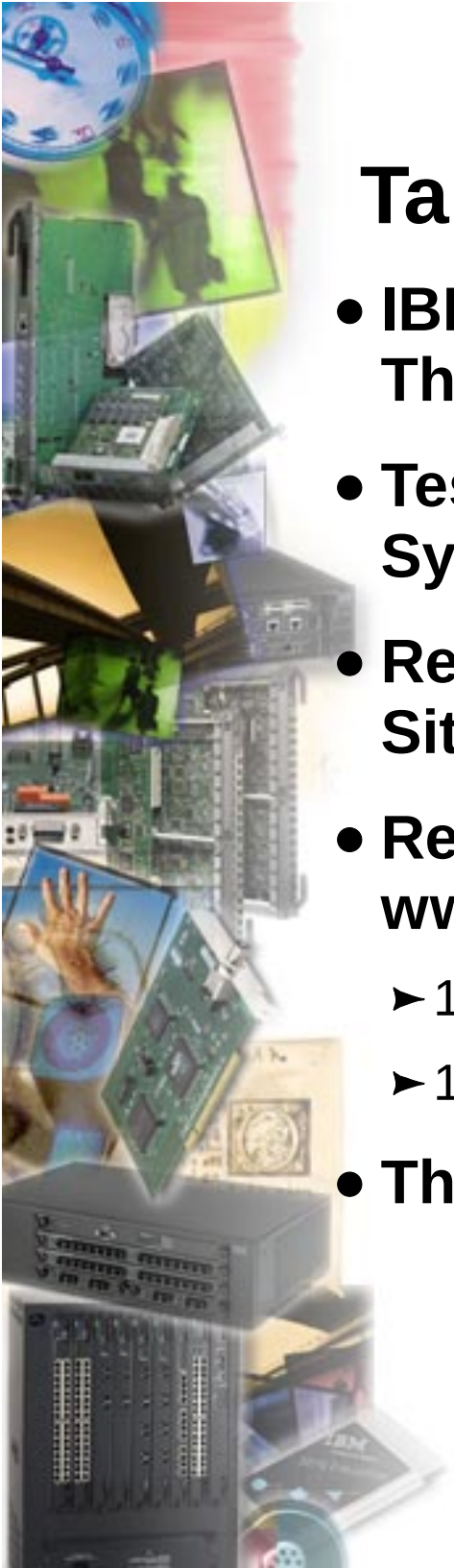

Tale of the testing ..

- **IBM commissioned The Tolly Group to Perform These Tests**
- **Testing performed at IBM Gaithersburg Networking Systems Center / Washington System Center**
- **Results available (free) from The Tolly Group's Web Site and from IBM's Web Site**
- **Reference documents at www.tolly.com and at www.networking.ibm.com**
  - ►199115 .. TN3270E Server Channel Attach Gateway Test
  - ►199116 .. Load Balancing TN3270E Servers Test
- **This is the Second Independently-verified test**

Testing Score: IBM 2216	**2**
Cisco CIP	**0**

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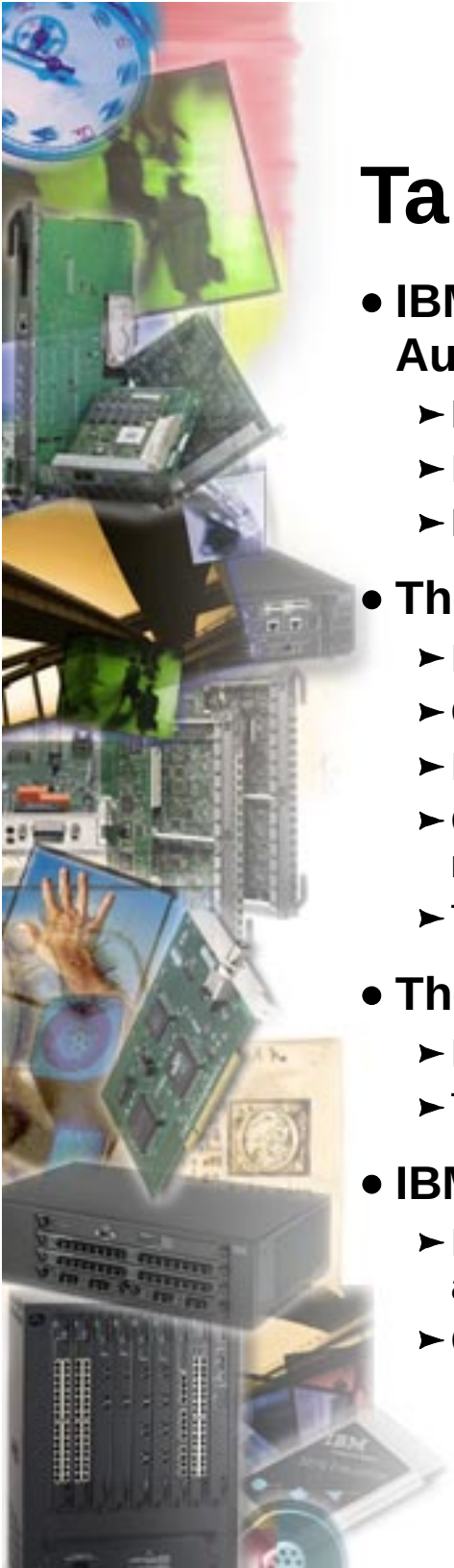

Tale of the testing details ..

- **IBM commissioned The Tolly Group Channel Attach Gateway tests in August 1997**
  - ►Demonstrated IBM 2216 ESCON price / performance superiority vs. Cisco 7507 CIP2
  - ►IP batch, SNA interactive, APPN / HPR batch
  - ►Results still valid today
- **The Tolly Group initiated 1998 TN3270 Server Channel Gateway Test**
  - ►IBM and Cisco invited and accepted .. lengthy testing scenarios negotiations
  - ►Cisco offered to host at their site .. IBM agreed
  - ►IBM asked to reschedule test to January 1999 to match product availability
  - ►Cisco claimed "..IBM pulling out" .. states "I will test against any of their equipment, new or old" .. F. Maly, Cisco Systems 10/98
  - ►Tolly Group canceled 1998 test in September 1998
- **The Tolly Group initiated 1999 TN3270 Server Channel Gateway Test**
  - ►IBM accepted and ready in January, Cisco refused invitation
  - ►The Tolly Group canceled their sponsored 1999 test in January 1999
- **IBM commissioned The Tolly Group TN3270 Server test May '99**
  - ►IBM breaks 1,000 transactions/sec barrier for 16,000 sessions and handily beats 7507 CIP2 ..
  - ►Cisco repeatedly invited to participate .. Cisco refused

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The Tolly Group

- **Provides Strategic Consulting and Industry Analysis**
- **Performs Independent Testing**
- **Does not endorse vendors or products**
- **Performs Testing Services, including**
  - ►Methodology validation
  - ►Conduct Tests
  - ►Results Analysis
- **Publishes results**

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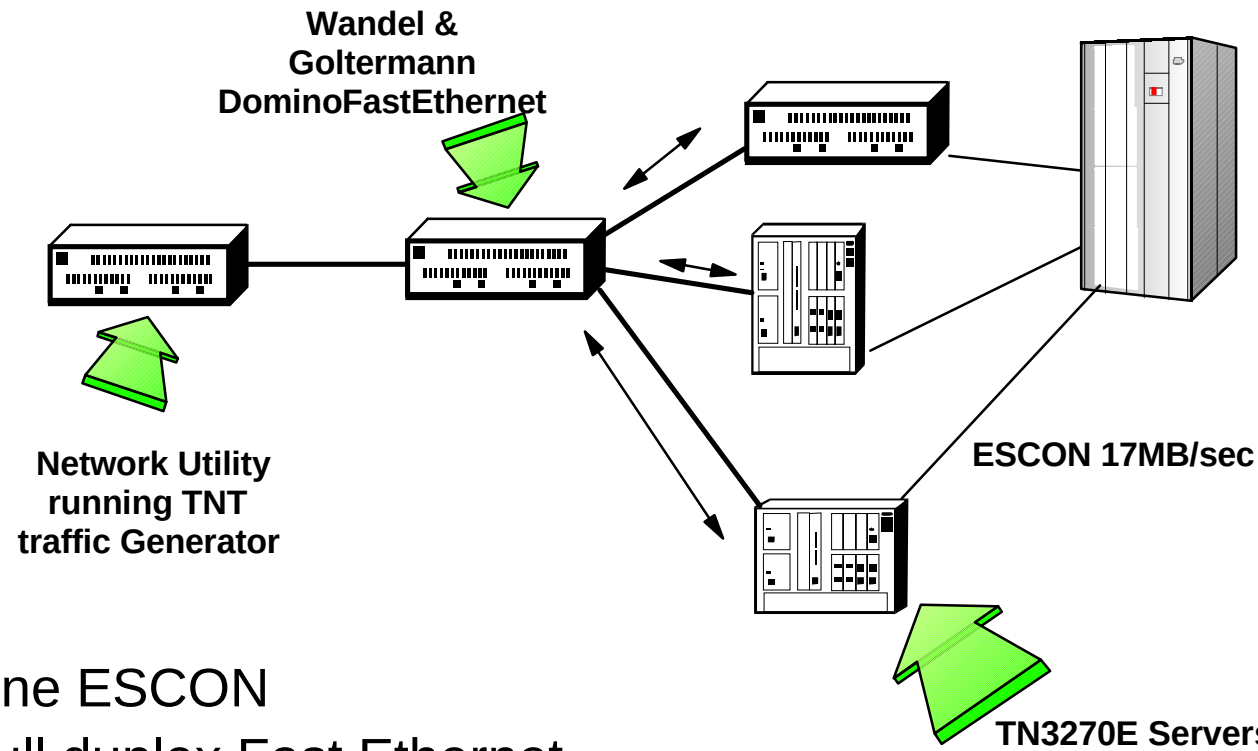
Test Summary Description

- **Systems:**
  - IBM Network Utility TN3270E Server
  - IBM 2216 Multiaccess Connector
  - Cisco Systems 7507/4 with Channel Interface Processor 2
- **Adapter types**
  - ESCON, Fast Ethernet LAN
- **Cisco Comparative Test: TN3270E Server Capacity**
  - Measured maximum transactions / second while maintaining sub-second response and no session loss
- **IBM Resiliency Test: Load balancing between two ESCON attached TN3270E Servers**
  - Measured effectiveness of network dispatcher load balancing
  - Reported capacity of IBM network dispatcher
  - Demonstrated ability to back up failed TN3270E Server
  - Measured ability to recover from failed ESCON connection to TN3270E Server using HPR

Equipment Configurations

- **IBM Network Utility TN3270E Server**
  - ►Model TN1
  - ►233MHz system card with 512MB memory
  - ►1 ESCON port
  - ►1 full duplex Fast Ethernet port
  - ►Multiprotocol Access Services V3.2 EPTF02T
  - ►Tested system list price .. $62,500 (US)
- **IBM 2216 Multiaccess Connector**
  - ►Model 400
  - ►233 MHz system card with 512MB memory
  - ►1 ESCON port
  - ►1 full duplex Fast Ethernet port
  - ►Multiprotocol Access Services V3.2 EPTF02T
  - ►Tested system list price .. $65,245 (US)
- **Cisco Systems 7507/4**
  - ►RSP4 with 256MB DRAM memory and 20MB flash memory
  - ►1 port CIP2 with 128MB memory .. 1 ESCON port
  - ►1 port Fast Ethernet on VIP-40 with 64MB DRAM memory
  - ►11.1(8)CA 1, Early Development Release (fc1) RSPx Series IOS Enterprise/APPN
  - ►CSNA
  - ►Unlimited CIP2 TN3270E Server
  - ►Tested system list price .. $ 119,650 - APPN; $113,150 non-APPN

Comparative Tests
TN3270E Server Capacity Test Bed



►9672 model Y56 G5
►OS/390 V2R6
►1 LPAR, 150MIPs

- One ESCON
- Full duplex Fast Ethernet
- Single TN3270E Server under test
- TNT traffic generation up to 16,000 sessions

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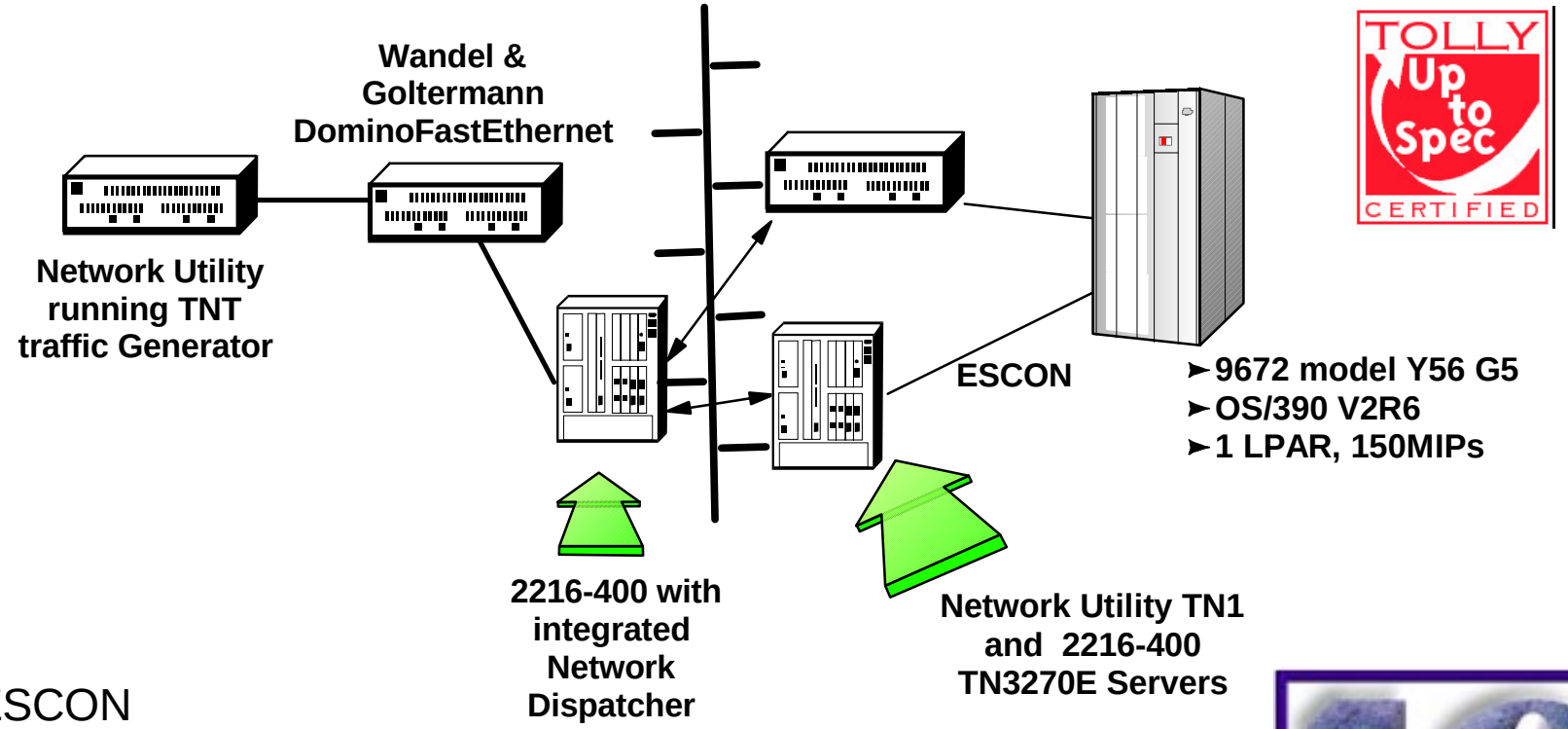
Comparative Tests
TN3270E Server Capacity Test Details

- **Measure maximum transactions per second**
- **9,000 and 16,000 sessions**
- **Must maintain one second or less response time**
- **No session loss**
- **Three traffic profiles**
  - ►100 / 800 .. Typical interactive
  - ►128 / 128 .. Data entry
  - ►40 / 1400 .. Large interactive
- **SNA .. VTAM boundary function: LSA (IBM) and CSNA (Cisco)**
- **APPN / HPR routing: MPC+ (IBM) and CMPC (Cisco)**
  - ►Cisco could not provide MPC+ support

Observations from Comparative Tests

- **TN3270E Server Capacity Testing**
  - ➤ IBM Network Utility and 2216 Multiaccess Connector TN3270E Server *significantly outperform* Cisco 7507 with CIP2
    - *33 to 49% more SNA subarea capacity*: 1,052 tx/sec vs. 704 tx/sec
    - 16,000 sessions across all traffic profiles with no session loss
  - ➤ IBM has superior TN3270E Server HPR support with MPC+
    - from *69 to 77% more HPR capacity*: 507 tx/ sec vs. 286 tx/sec
    - Cisco could not attain sub second response for small 128/128 frames .. 614 tx/sec vs. 50 tx/sec
- **In addition .. IBM more cost effective solution**
  - ➤ Cisco 1.5 times greater cost per TPS for SNA subarea
  - ➤ Cisco 3 times greater cost per TPS for HPR

Resiliency Tests
TN3270 Load Balancing and Recovery: Test Configuration



- One ESCON
- Full duplex Fast Ethernet
- All inbound traffic flows through Network Dispatcher
- TNT traffic generation up to 16,000 sessions

Resiliency Tests

- **Test 1a**: TN3270E Server load balancing
  - Balance 16,000 sessions between two ESCON attached TN3270E Servers using subarea over LSA.
- **Test 1b:** TN3270E Server load balancing
  - Balance 16,000 sessions between two ESCON attached TN3270E Servers using HPR over MPC+
- **Test 2**: TN3270E Server fail over
  - Running at steady state, disable Network Utility TN1 and reestablish its 8,000 sessions to the operational 2216-400 TN3270E Server
- **Test 3**: ESCON attachment failure recovery
  - Running at steady state, disable ESCON channel of Network Utility TN1 and reroute HPR sessions through 2216-400 TN3270E Server ESCON path

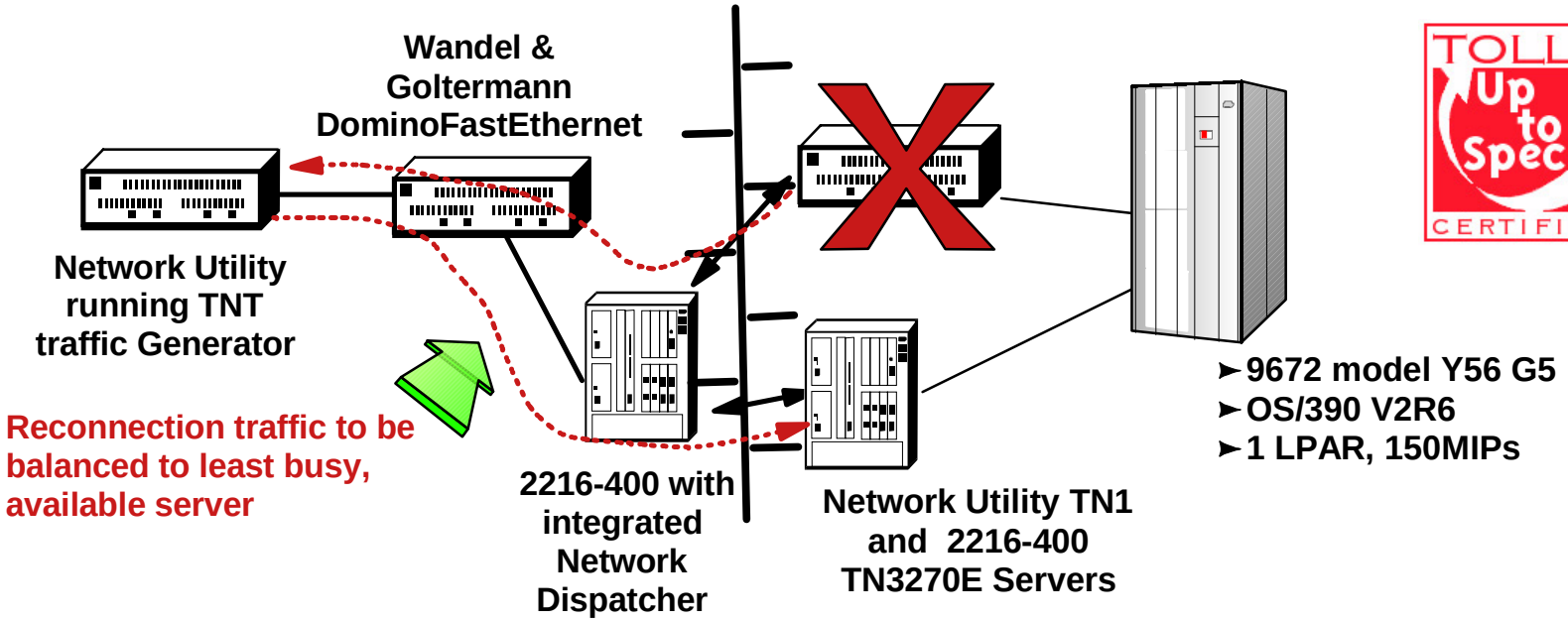
Resiliency Tests
Test 1: TN3270E Server Load Balancing

- Measured maximum transaction / second capacity through the TN3270E Servers and the Network Dispatcher machine
- Must maintain sub-second response time with no session loss
- 100 / 800 .. Interactive .. some modified fields
- 128 / 128 .. Data entry or credit inquiry
- 40 / 1400 .. Large interactive .. full screen refresh
- Test 1a: TN3270E Server load balancing
  - ➤Balance 16,000 sessions between two ESCON attached TN3270E Servers using SNA subarea over LSA
- Test 1b: TN3270E Server load balancing
  - ➤Balance 16,000 sessions between two ESCON attached TN3270E Servers using APPN / HPR over MPC+

Resiliency Tests: Observations
Test 1: TN3270E Server Load Balancing

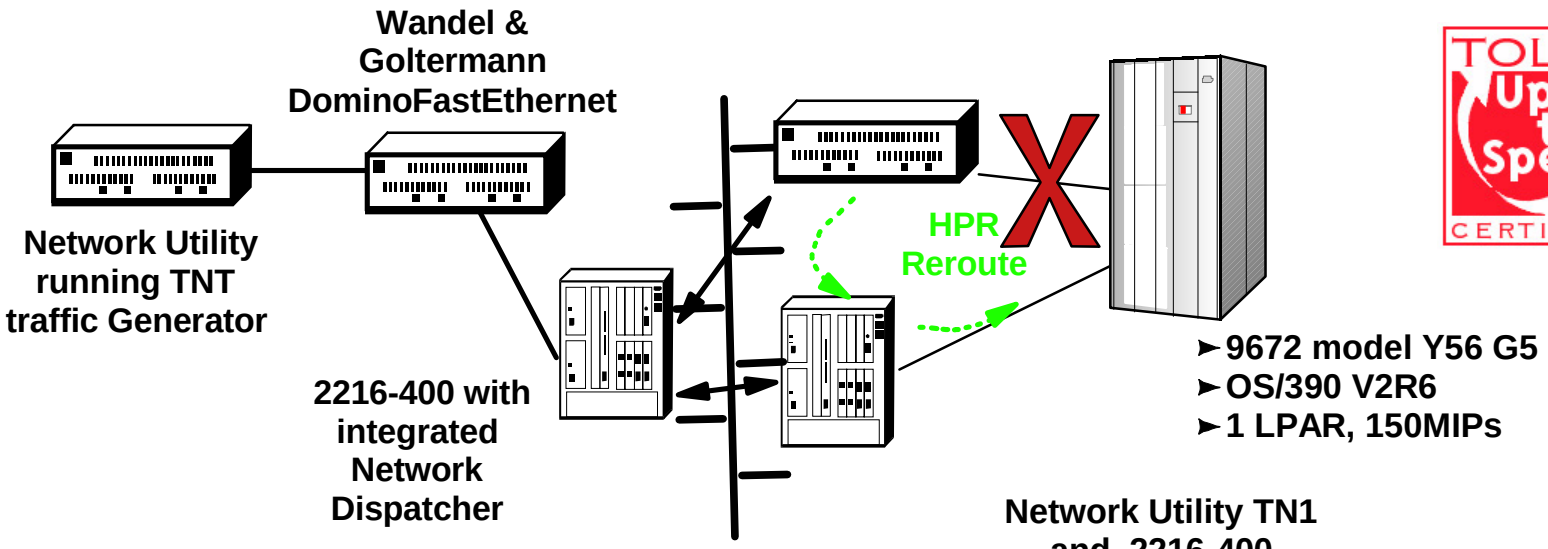
- **TN3270E Server load balancing with Network Dispatcher**
  - ► *Evenly balances 16,000 sessions* between two TN3270E Servers
    - ◆ Difference in session loading across the two gateways less than 10%
  - ► *Maintained sub-second response to both servers*
  - ► *Over 2,000 transactions per second* for LSA .. scaleable capacity aggregation *almost doubling tx/sec of single server .. use 28% CPU* of Network Dispatcher machine
  - ► *Over 1,200 transactions per second* for MPC+ .. scaleable capacity aggregation *doubling tx/sec of single server .. use 20% CPU* of Network Dispatcher machine

Test 2: TN3270 Server Fail Over



- 16,000 session balanced evenly between two TN3270E Servers
- LSA Direct using VTAM boundary function
- Steady state, 1 tx/minute for 16,000 sessions .. 266 tx/sec .. 100 / 800 .. Typical interactive
- Power off Network Utility TN3270E Server
- Restart 8,000 sessions from failed server
- Route in process and reconnection inbound traffic through Network Dispatcher
- Observations
  - ►Maintained sub-second response during session reconnections
  - ►Average reactivation 170mS per session
  - ►Network Dispatcher machine reported 9 - 11% CPU utilization

Test 3: ESCON Attachment Failure Recovery



- APPN / HPR using MPC+
- 16,000 session balanced evenly between two TN3270E Servers
- Steady state, 1 tx/minute for 16,000 sessions .. 266 tx/sec .. 100/800
- Unplugged ESCON cable between director and Network Utility
- VTAM / Network Utility RTP sensed failed channel and sought alternate path
- Reroute all TN3270 HPR Network Utility session traffic over fast ethernet to 2216-400 ANR channel path
- Conclusions
  - ►Sessions reroute in ONE SECOND
  - ►Maintained sub-second response time in both servers
  - ►No measurable user delay
  - ►No decrease in tx / sec in either TN3270 Server
  - ►Network Dispatcher machine reported 10 - 14% CPU utilization

Resiliency Tests: Summary Observations

- **TN3270E Server load balancing with Network Dispatcher**
  - ► *Evenly balances 16,000 sessions* between two TN3270E Servers
  - ► *Maintained sub-second response to both servers*
  - ► *Over 2,000 transactions per second* for LSA .. scaleable capacity aggregation *almost doubling tx/sec of single server .. use 28% CPU* of Network Dispatcher machine
  - ► *Over 1,200 transactions per second* for MPC+ .. scaleable capacity aggregation *doubling tx/sec of single server .. use 20% CPU* of Network Dispatcher machine
- **TN3270E Server fail over**
  - ► Effectively *backs up failed TN3270 Server* while *maintaining sub-second response*
- **ESCON attachment failure recovery**
  - ► *Reroutes HPR session* flow within ***ONE SECOND*** *after ESCON failure* .. sub second response time with no session loss to end user

Summarized Observations from All Tests

- **TN3270E Server Capacity Testing**
  - ➤ IBM Network Utility and 2216 Multiaccess Connector TN3270E significantly outperform Cisco 7507 with CIP2
    - *33 to 49% more SNA subarea capacity*: 1,052 tx/sec vs. 704 tx/sec
    - 16,000 sessions across all traffic profiles with no session loss
  - ➤ IBM has superior TN3270E Server HPR support with MPC+
    - from *69 to 77% more HPR capacity*: 507 tx/ sec vs. 286 tx/sec
    - Cisco could not attain sub second response for 128/128
- **TN3270E Server load balancing with Network Dispatcher**
  - ➤ *Evenly balances 16,000 sessions* between two TN3270E Servers
  - ➤ *Maintained sub-second response for both servers*
  - ➤ *Over 2,000 transactions per second* .. *scaleable capacity aggregation*
  - ➤ *Effectively double the throughput* TN3270E Server solution
- **TN3270E Server fail over with Network Dispatcher**
  - ➤ Effectively *backs up failed TN3270 Server* while *maintaining sub-second response*
- **ESCON attachment failure**
  - ➤ *Reroutes HPR session* flow within ***ONE SECOND*** *after ESCON failure* sub second response time and no session loss to end user
- **In addition .. IBM more cost effective solution**
  - ➤ *Cisco 1.5 times greater cost* per TPS *for SNA subarea*
  - ➤ *Cisco 3 times greater cost* per TPS *for HPR*

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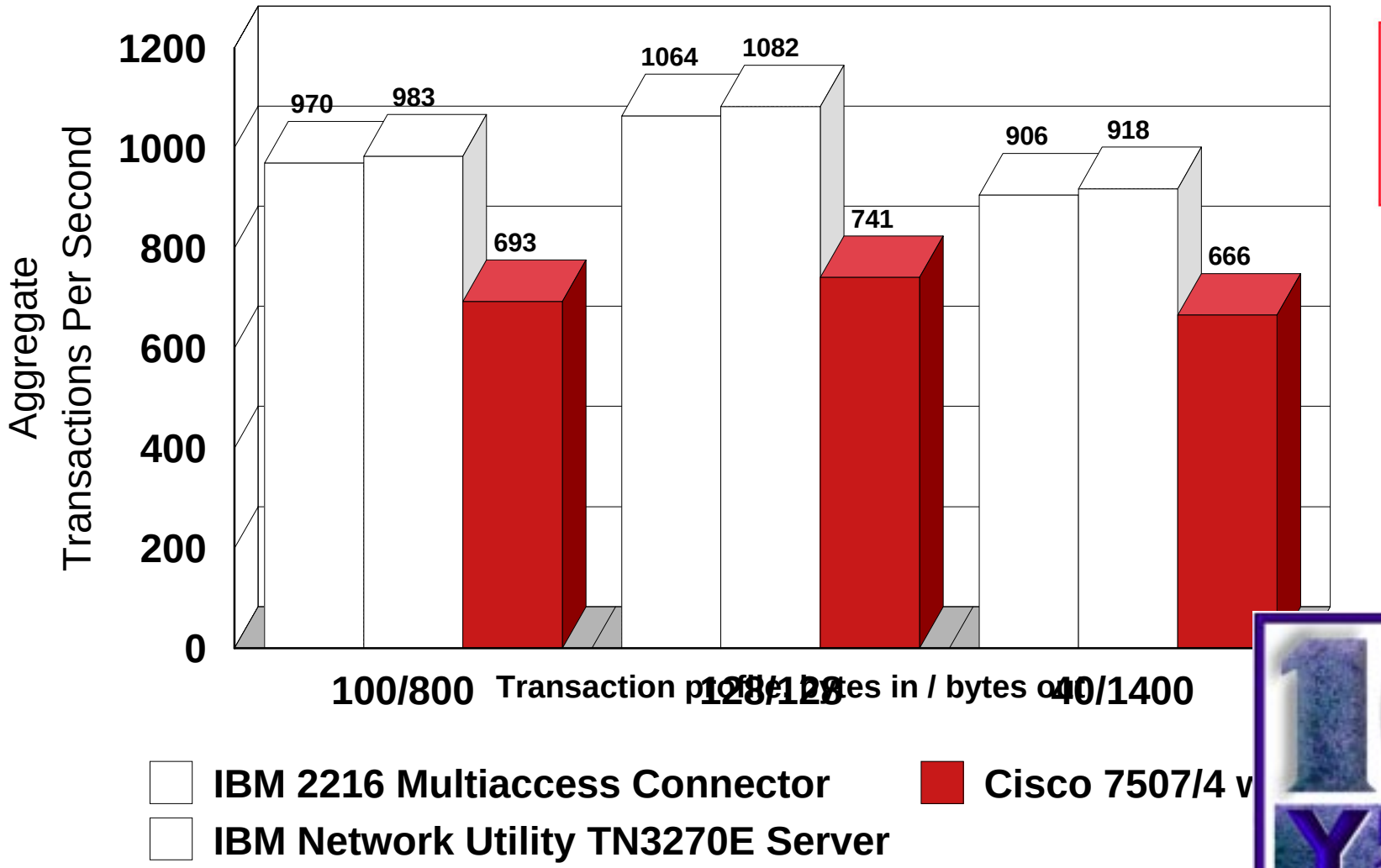
Tolly Detailed Data Measurements

- TN3270 Server Transaction Throughput ..
  9,000 Sessions via Fast Ethernet and LSA/CSNA
- TN3270 Server Transaction Throughput ..
  16,000 sessions via Fast Ethernet and LSA/CSNA
- TN3270 Server Transaction Throughput ..
  16,000 Sessions via Fast Ethernet, APPN/HPR and MPC+/CMPC
- Cost Per Transaction Per Second ..
  Based on 9,000 Sessions via Fast Ethernet LSA / CSNA
- Cost Per Transaction Per Second ..
  Based on 16,000 Sessions via Fast Ethernet LSA / CSNA
- Cost Per Transaction Per Second
  Based on 16,000 Sessions via Fast Ethernet and MPC+ / CMPC
- Dual ESCON-gateway Test .. 16,000 Sessions, Network Dispatcher load balancing between two Subarea LSA attached TN3270E Servers .. sub-second response
- Dual ESCON-gateway Test .. 16,000 Sessions, Network Dispatcher load balancing between two APPN/HPR MPC+ attached TN3270E Servers .. sub-second response

TN3270 Server Transaction Throughput
9,000 Sessions via Fast Ethernet and LSA/CSNA



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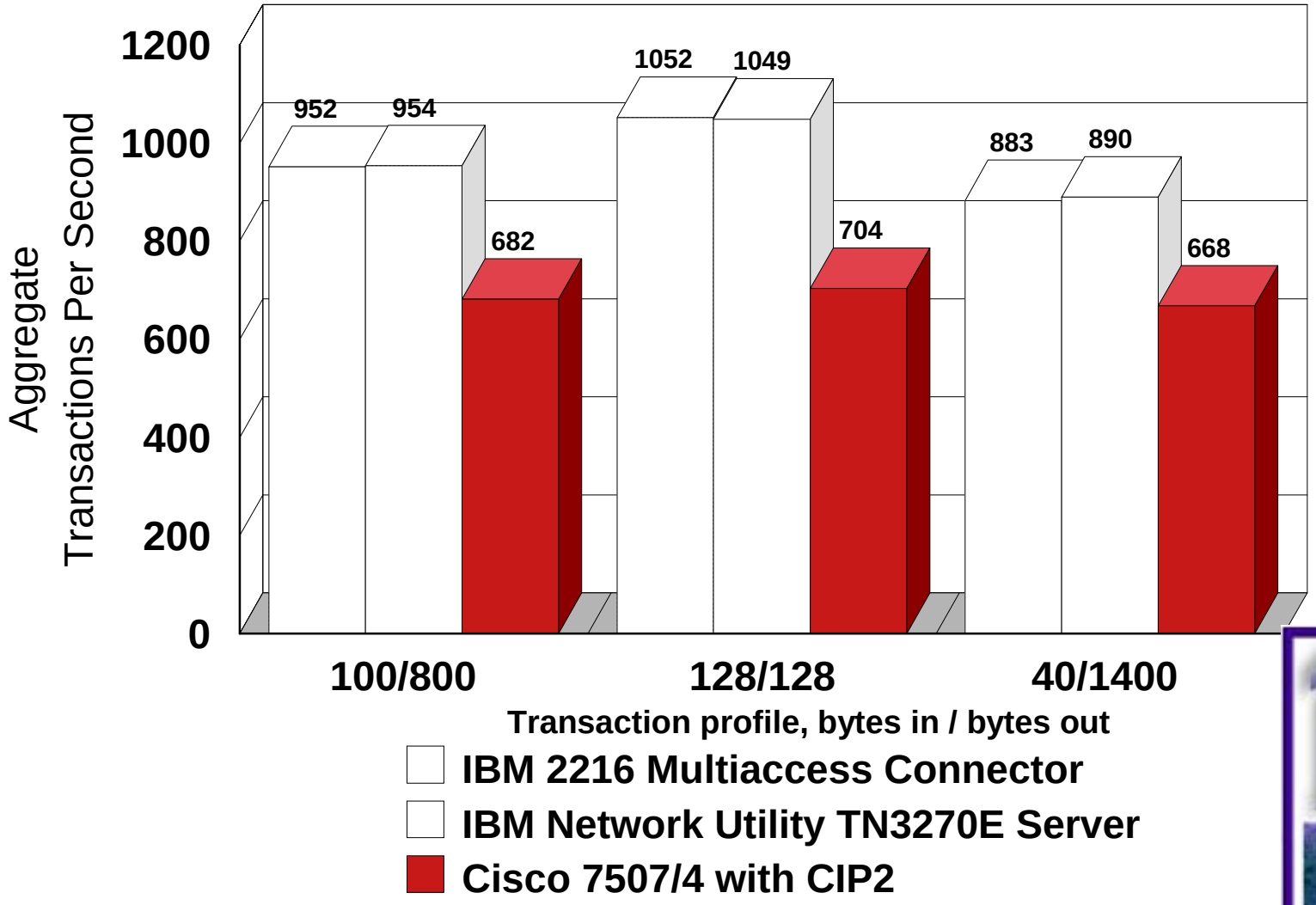
Observations:
TN3270 Server Transaction Throughput
9,000 Sessions via Fast Ethernet and LSA/CSNA

IBM 38 to 46% more capacity

TN3270 Server Transaction Throughput 16,000 sessions via Fast Ethernet and LSA/CSNA



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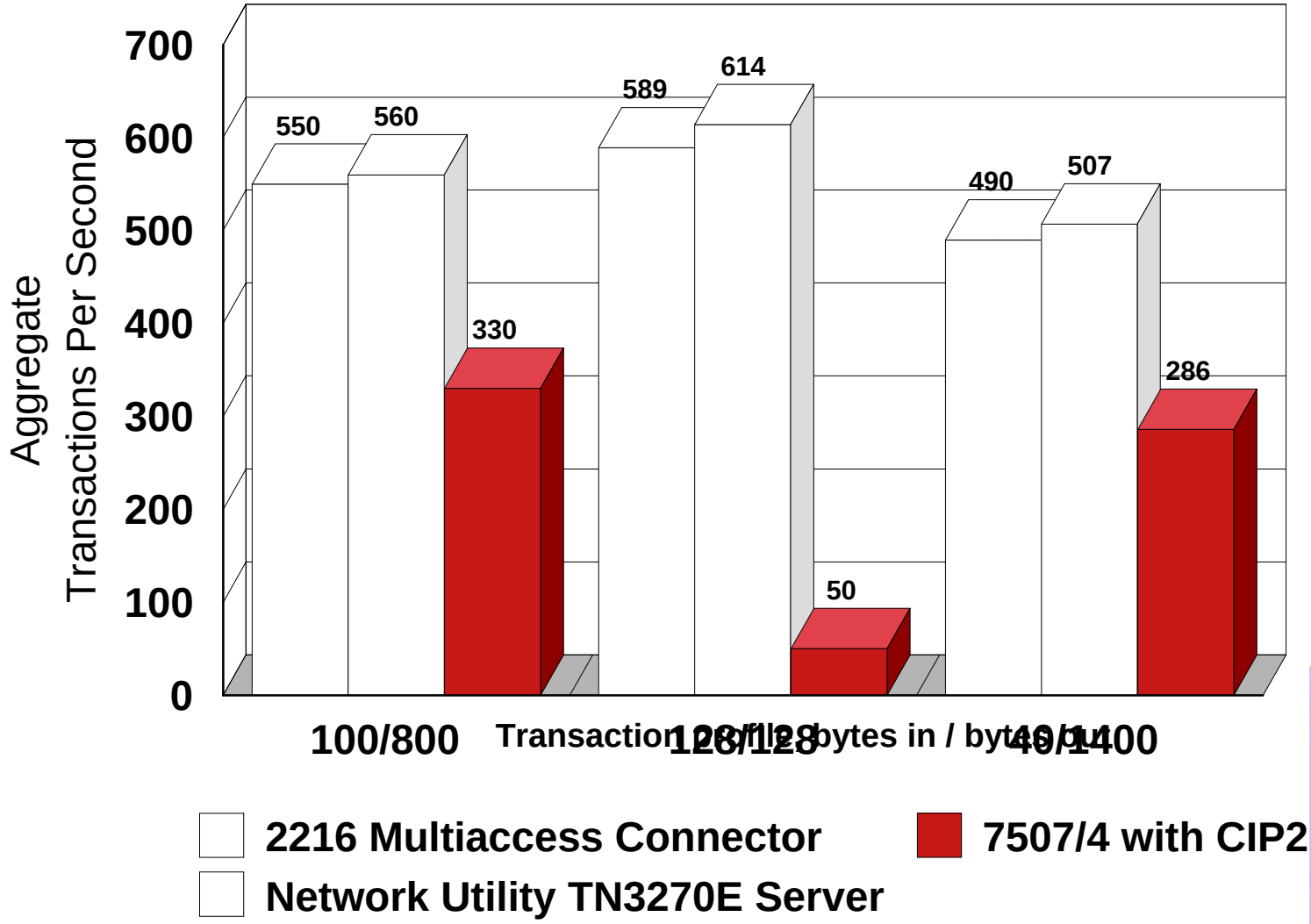
Observations:
TN3270 Server Transaction Throughput
16,000 Sessions via Fast Ethernet and LSA/CSNA

- **IBM 33 to 49% more capacity**

- **LSA is appropriate in environments with few hosts that do not require the availability benefits of HPR, and where host cycles are available for VTAM boundary routing processing**

TN3270 Server Transaction Throughput 16,000 Sessions via Fast Ethernet, APPN/HPR and MPC+/CMPC



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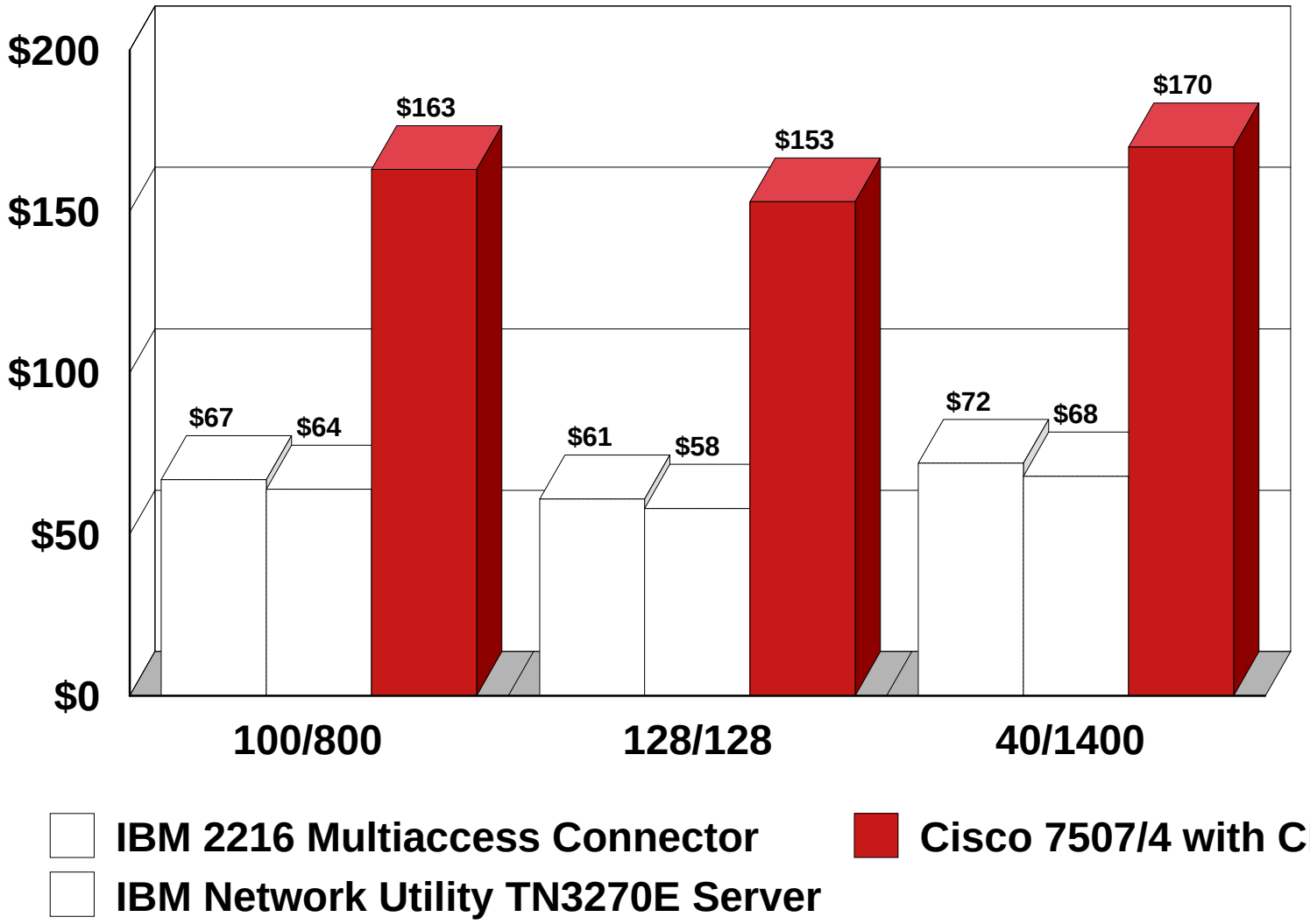
Observations: TN3270 Server Transaction Throughput 16,000 Sessions via Fast Ethernet, APPN/HPR and MPC+/CMPC

- **IBM HPR clearly outperforms Cisco CIP2**
  - ►From 69 to 77% more transactions/sec
  - ►12 times more capacity at small 128/128 frames
  - ►Sub-second response with no session loss
- **Cisco does not support MPC+ in generally available IOS**
- **IBM provides benefits of APPN / HPR and MPC+ in a single, high performing channel attached gateway offering**
  - ►Most cost effective, and flexible solution
- **Cisco recommends separate APPN/HPR machine to offload main CPU of router**
  - ►30% CPU load on RSP4 with single CIP2 *significantly 75XX TN3270 Server scalabilty*
  - ►CIP2 does not support full APPN stack (no RTP or HPR)
  - ►Cisco HPR support for small frames could not provide sub-second response (4 minutes 53 second average)

Cost Per TPS
Based on 9,000 Sessions via
Fast Ethernet LSA / CSNA



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Cost Per TPS
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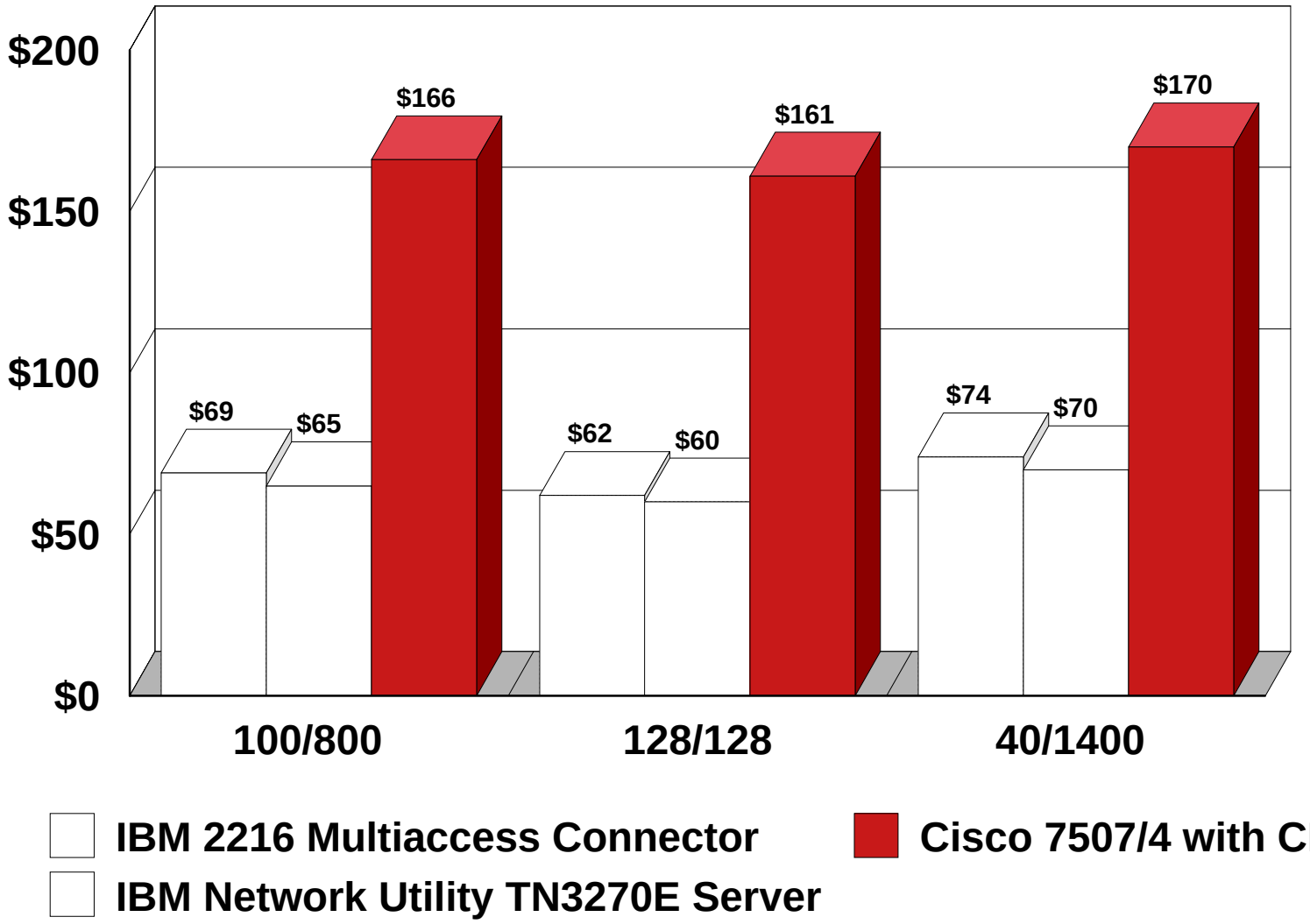

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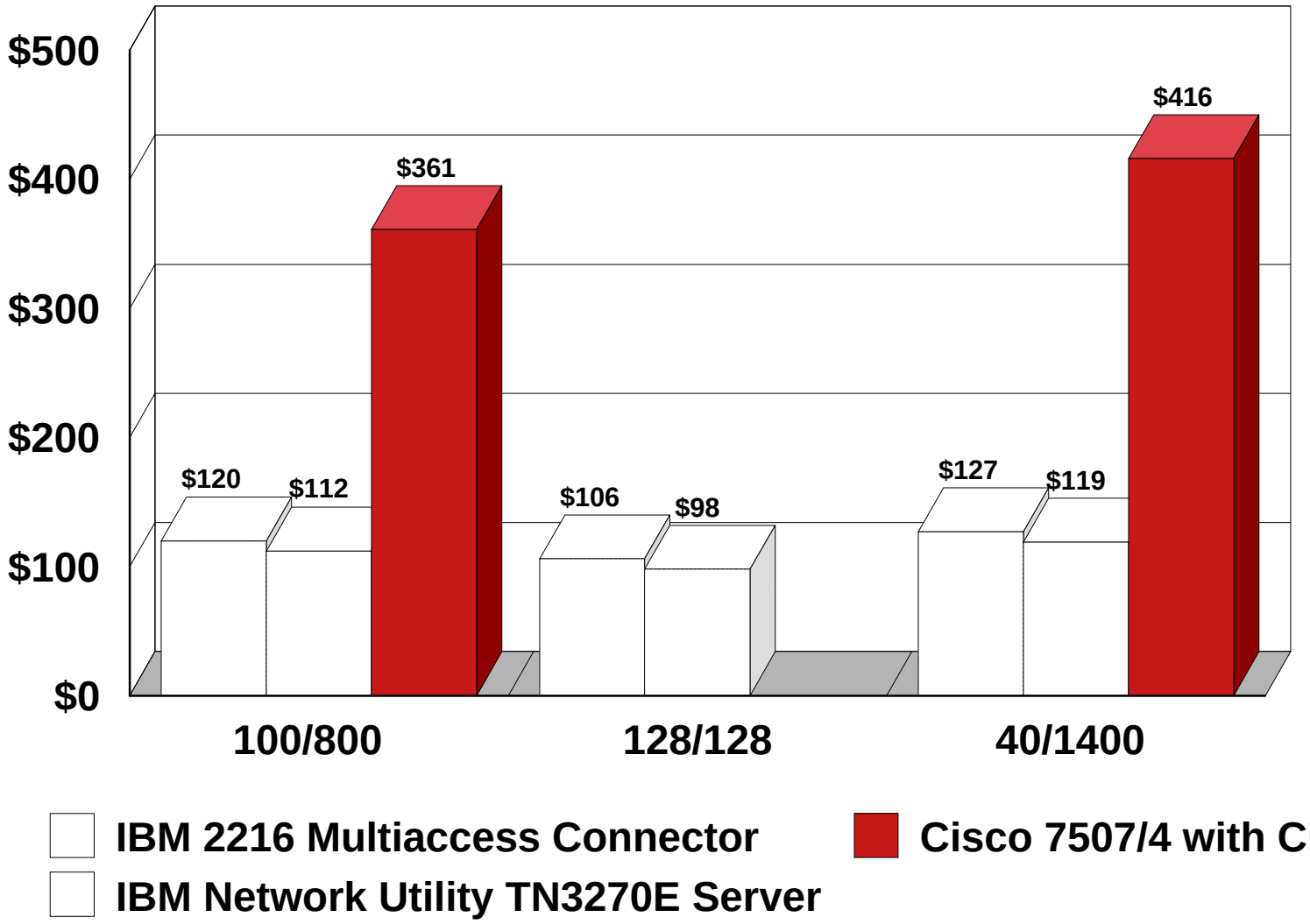
Cost Per TPS
Based on 16,000 Sessions via Fast Ethernet and MPC+/CMPC



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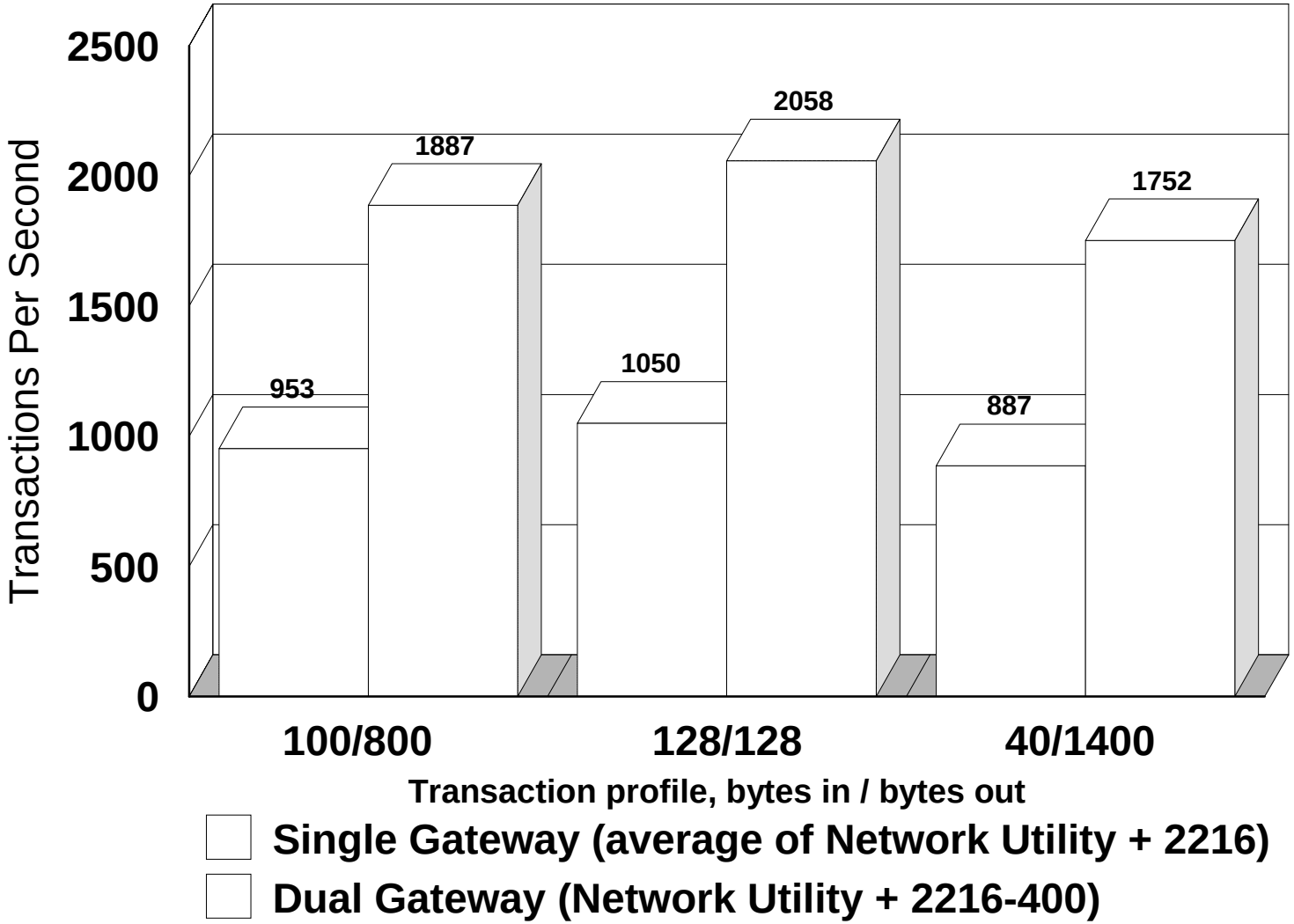
Dual ESCON-gateway Test
16,000 Sessions, Network Dispatcher load balancing between two Subarea LSA attached TN3270E Servers .. sub-second response



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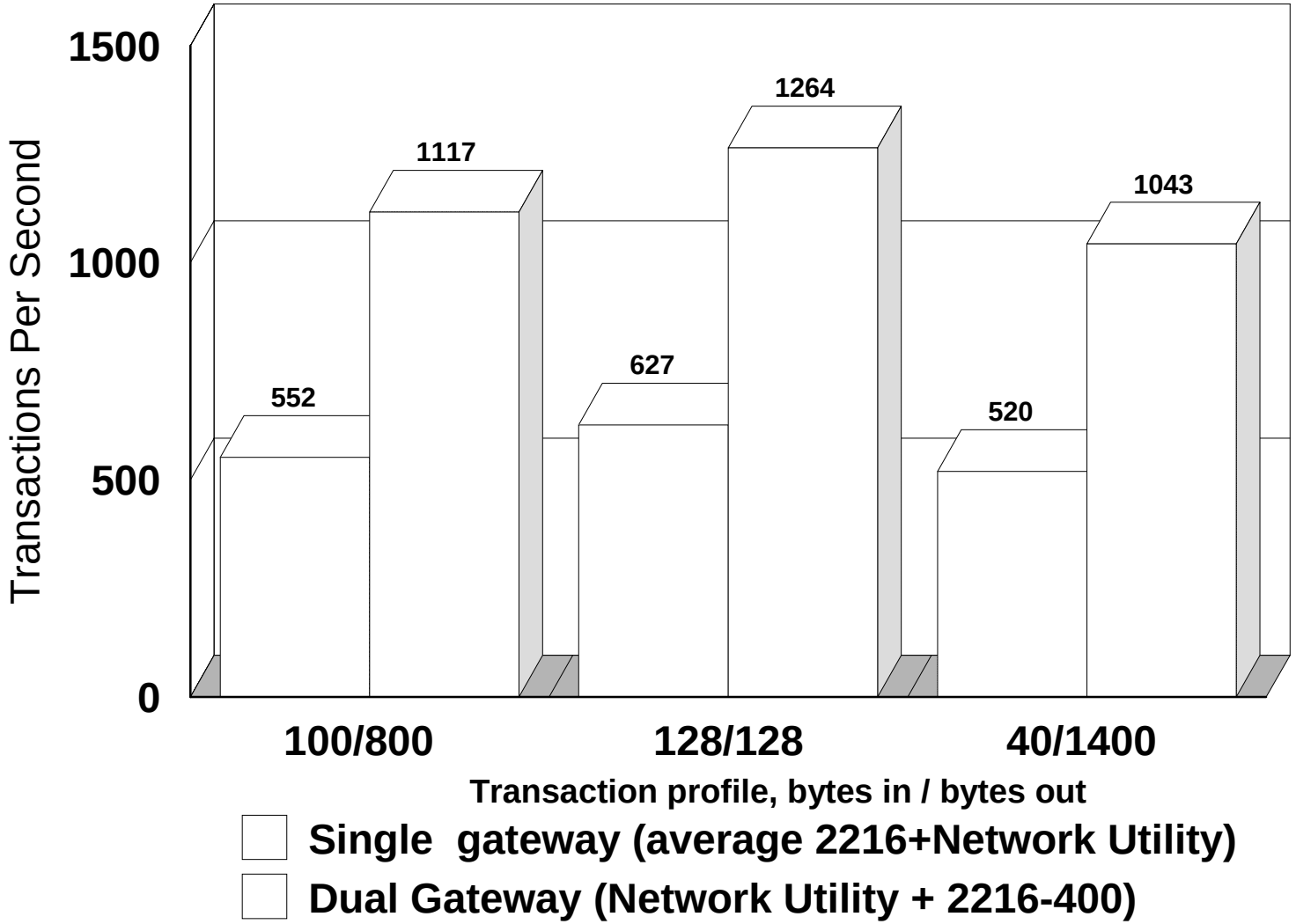
Dual ESCON-gateway Test
16,000 Sessions, Network Dispatcher load balancing between two APPN/HPR MPC+ attached TN3270E Servers .. sub-second response



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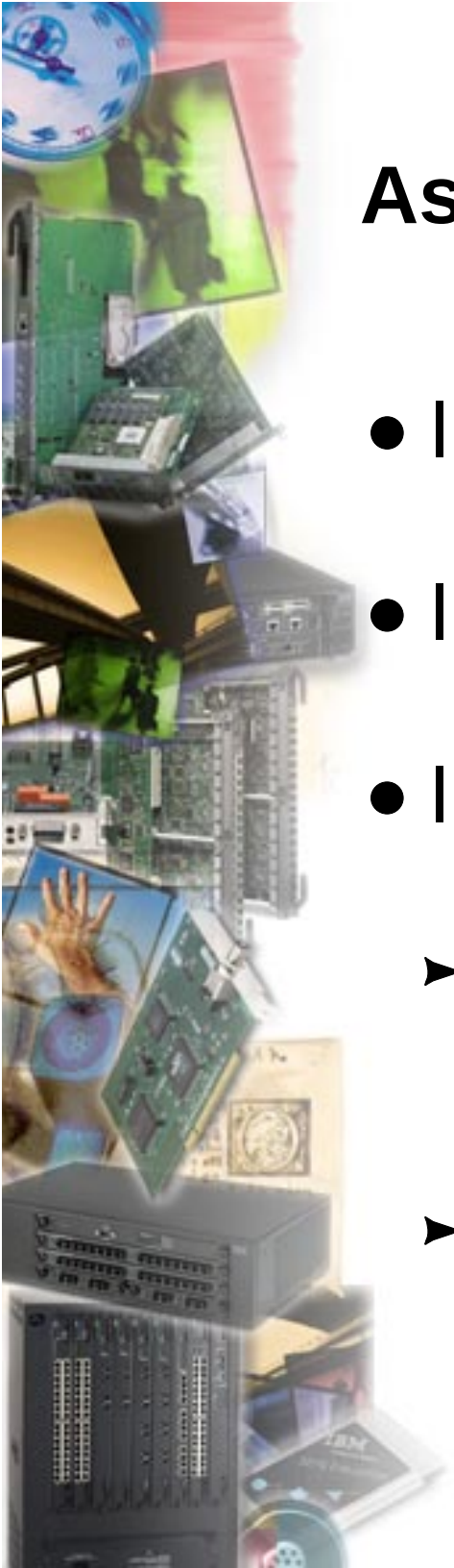

Associated Observations

- IBM beats Cisco's claimed maximums
- IBM more Cost Effective per transaction
- IBM Provides Higher User Availability
  - ►Using Network Dispatcher load balancing with TN3270E Server
  - ►Using TN3270E Server with APPN / HPR

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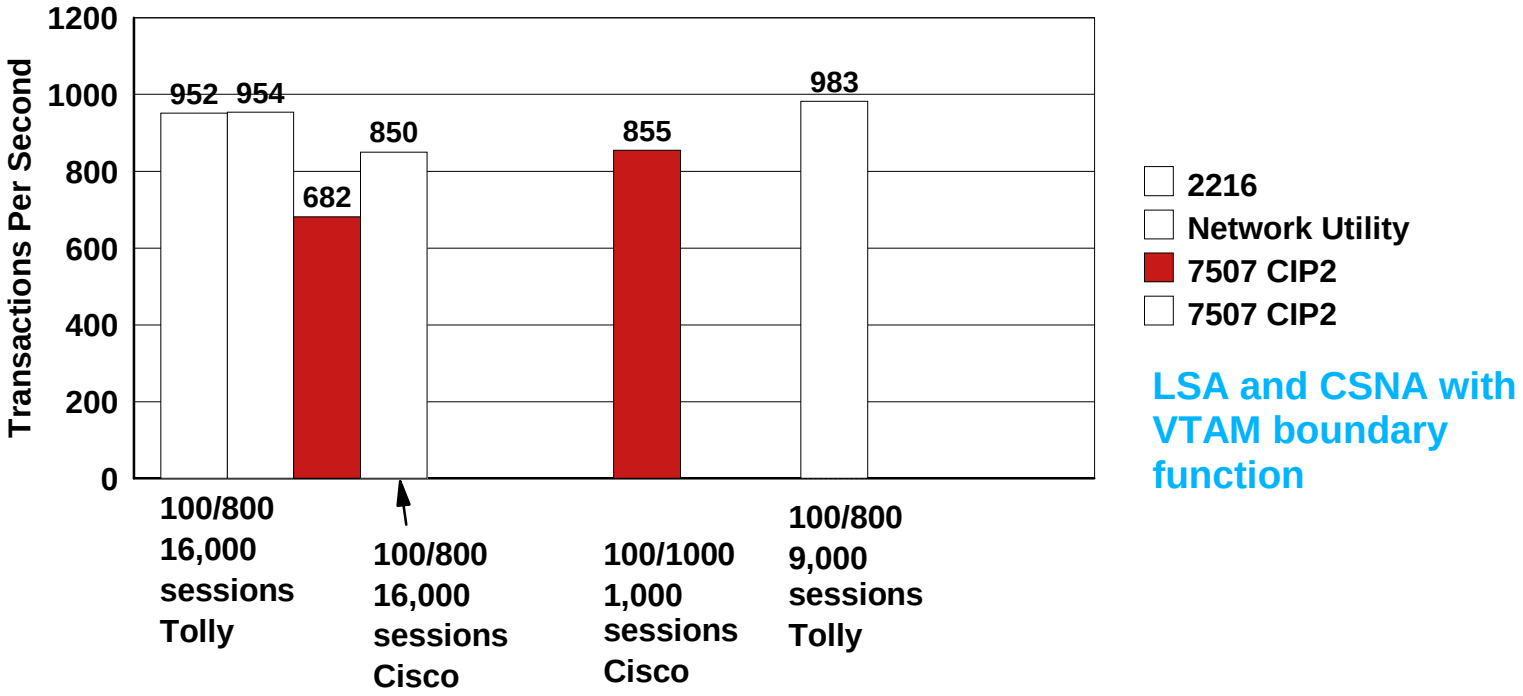
IBM beats Cisco's claimed maximums



LSA and CSNA with VTAM boundary function

- **Customer Performance Testing of Cisco's CIP2 with TN3270 Server .. white paper on www.cisco.com**
  - ►for 100/1000 .. "Each CIP card supported 16,000 sessions and approximately 711 transactions per second" (ref. page 25)
  - ►for 1,000 sessions .. "CPU of the CIP was operating at 100% utilization while passing 855 transactions per second." (ref. page 21)
  - ►"..CIP was the limiting factor--operating at 100 percent utilization--" (ref. page 21)
  - ►***No documented response time .. NO APPN measurements***
- **The Tolly Group testing showed**
  - ►IBM solution outperformed Cisco CIP2
  - ►Documented sub-second response time
  - ►All tested TN3270 Servers running at 99% CPU

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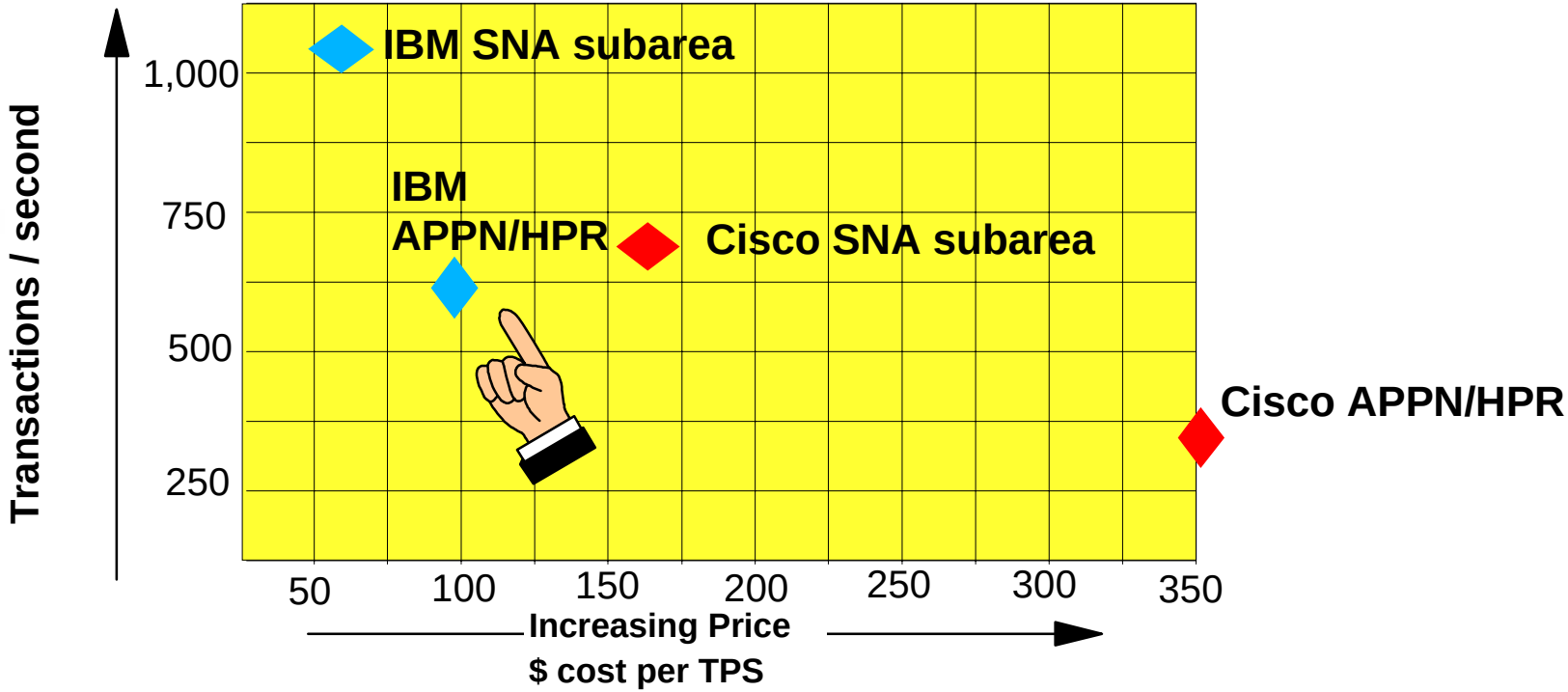
Cost per TPS

- *IBM is the performance, price, and price / performance leader*
- *Get the availability of HPR for less cost and about the same performance as Cisco non-HPR support*



	SNA subarea Price / TPS	SNA subarea tx/sec	APPN/HPR Price / TPS	APPN/HPR tx/sec
IBM	$60	1,049	$98	614
Cisco	$161	704	$361	330

Source: The Tolly Group May 1999
http://www.tolly.com document #199115

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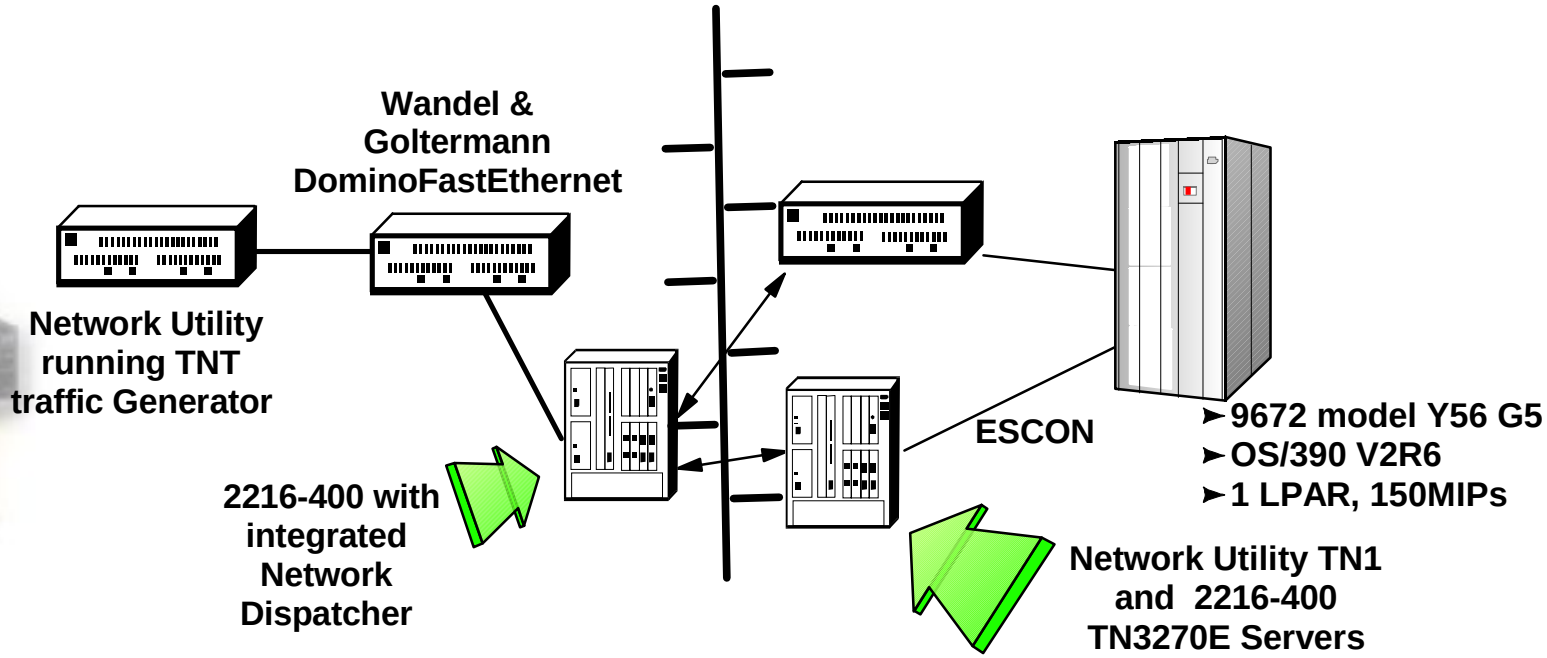
TN3270 Load Balancing and Recovery



- Demonstrates IBM's solution for availability and scalability of TN3270E Server
  - ►Load balancing efficiency and capacity of Network Dispatcher
  - ►Transaction throughput capacity scaling
  - ►Validates server back up capability
  - ►Shows minimal impact on server response time and TX/SEC during recovery
  - ►Fast switch over time to reroute session traffic to alternate channel path
  - ►Benefits of HPR session rerouting to provide mesh network availability for TN3270 Server users

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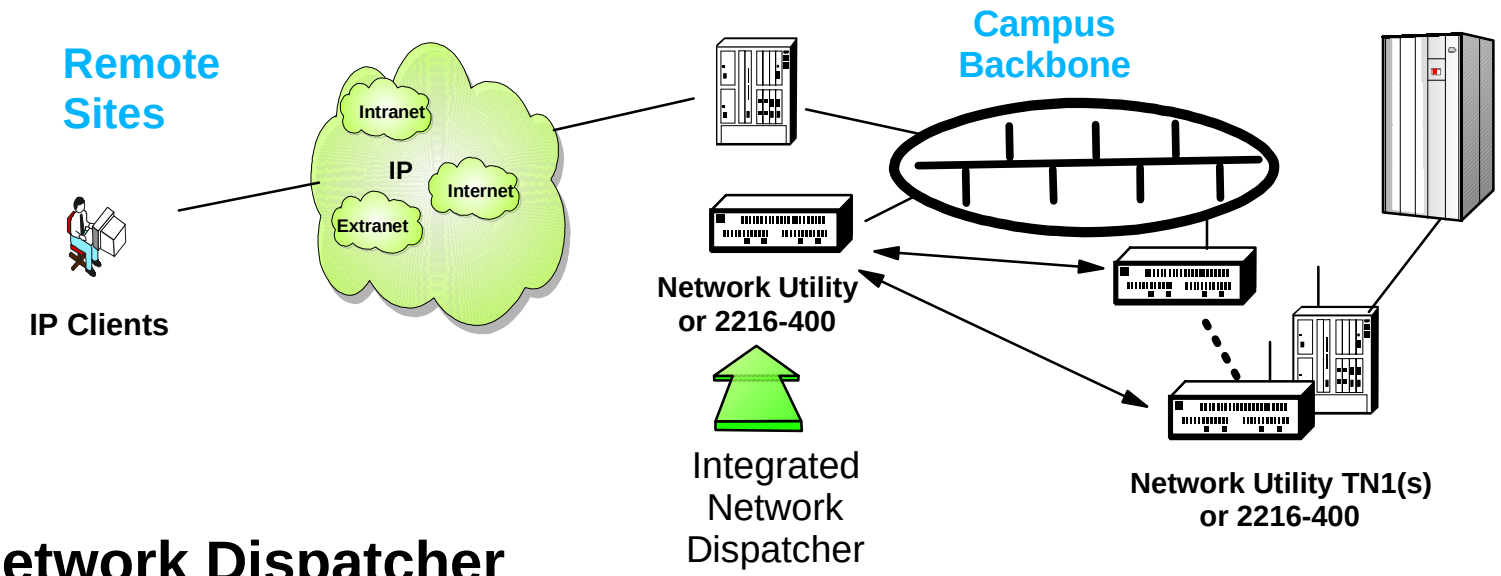
TN3270E .. Highly Available User Service



- **Network Dispatcher**
  - Distributes traffic to least busy, available TN3270E server
    - Increase aggregate performance of server cluster
    - Minimize single point of failure inherent in large single chassis, blade based solution
    - Reduce processor and memory demands on a specific server
  - Provides Intelligent balancing with Network Dispatcher advisor and associated TN3270E server advisor support
  - Supports a backup 'hot standby' configuration
    - If primary fails, the backup non-disruptively picks up connected session traffic and continues balancing new inbound connection requests
    - Switch back can be manual or automatic once Primary comes back online

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Summary TN3270 Server Load Balancing

- Evenly balances traffic
  - ➤Difference in session loading across the two gateways less than 10%
- Over 2,000 transactions / second while maintaining sub-second response for LSA
- Over 1,200 transactions / second while maintaining sub-second response for MPC+
- Effectively doubles tx/sec using Network Dispatcher with dual TN3270E Servers with ESCON
  - ➤Scaleable performance .. N*servers transaction rate
- Network Dispatcher has ample capacity for additional TN3270E Server balancing
  - LSA: 28% CPU utilization during test
    1-2% impact on tx/sec rates of individual TN3270E Servers
  - MPC+ :20% CPU utilization during test
    no impact on tx/sec rates of individual servers
- Mixed TN3270E Server types Feasible
- Consistent sub-second response times with no session loss
- Each TN3270 Server 99% CPU

Network Dispatcher load balancing provides scaleable capacity and high availability for users

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Summary Resiliency Tests: TN3270 load balancing

- **Directed user re-logons to backup server while maintaining sub-second response time for connected users**

- ***ONE SECOND*** **session rerouting around failed ESCON channel when using HPR**
  - ►Maintained sub-second response time
  - ►Transparent to end users .. no session loss

High service level to end users

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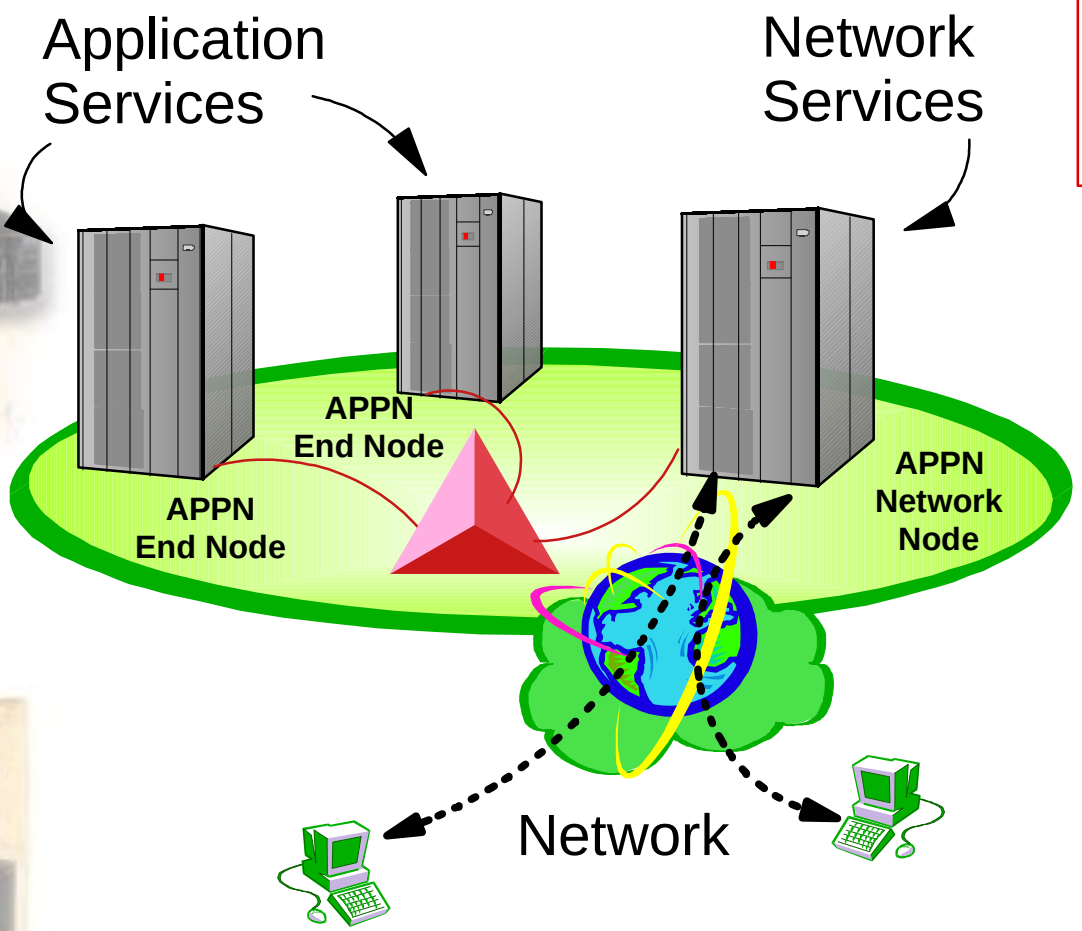
Why APPN / HPR



APPN/HPR - a key technology within the Parallel Sysplex and multiple host environment

- ***User keeps working even when the application moves***
- ***APPN Network Nodes***
  - Network services
  - Usually 2 VTAM NNs in parallel Sysplex for availability
- ***APPN End Nodes***
  - Application services
  - Multiple application images
- ***Multiple ESCON connections for redundancy***

<u>APPN/HPR in the network is not a prerequisite</u>

<u>BUT</u> can be mapped over IP for high user session availability .. called Enterprise Extender

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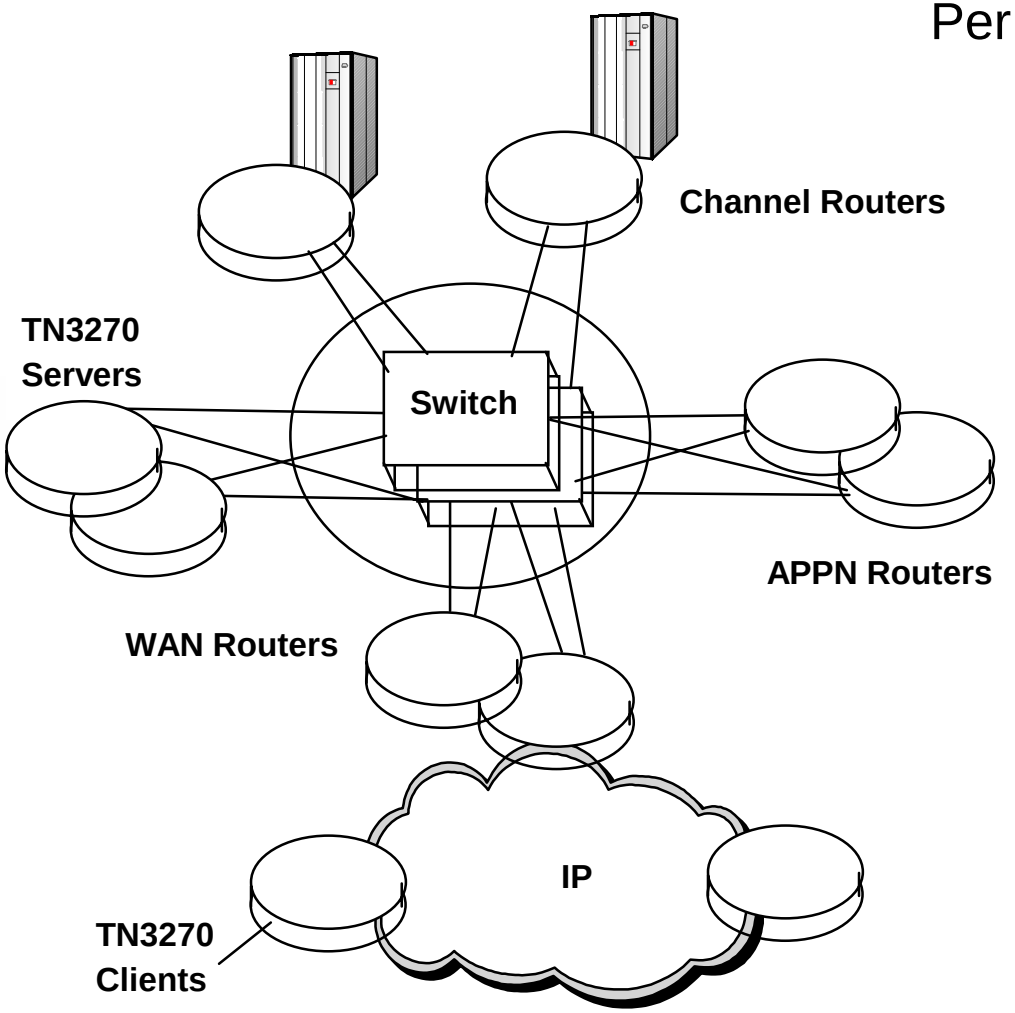
Cisco's TN3270 Server Data Center Design



Per Cisco ...

- Channel routers transport SNA data, but have no SNA node function .. **WHY?**
- TN3270 Server and DLuR in same router .. **WHY not use the CIP channel attach?**
- APPN as separate router .. **WHY?**
- Scalability and availability provided by multiple routers .. **WHY so many**?

Let's understand WHY?

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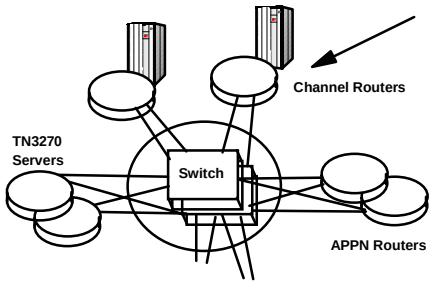
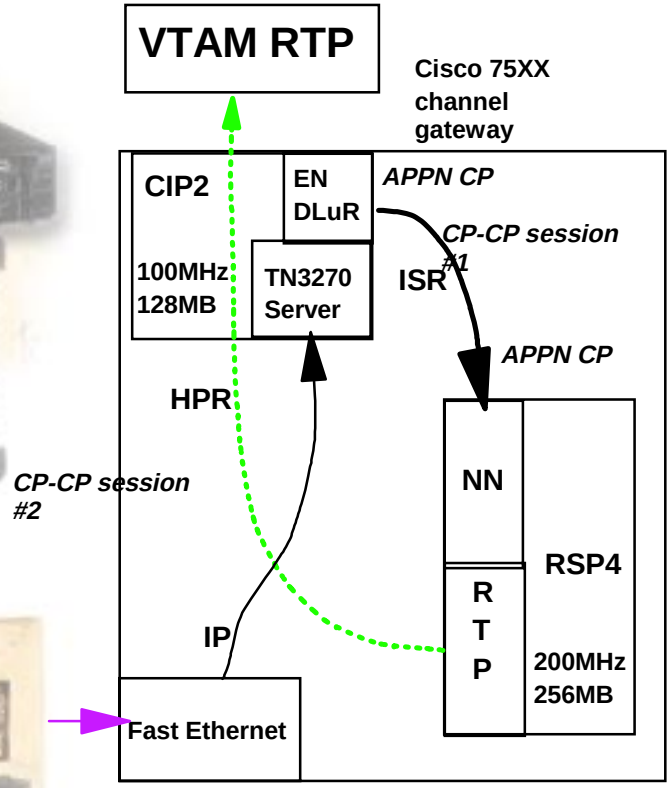
TN3270 Server with APPN HPR in Channel Attached Gateway



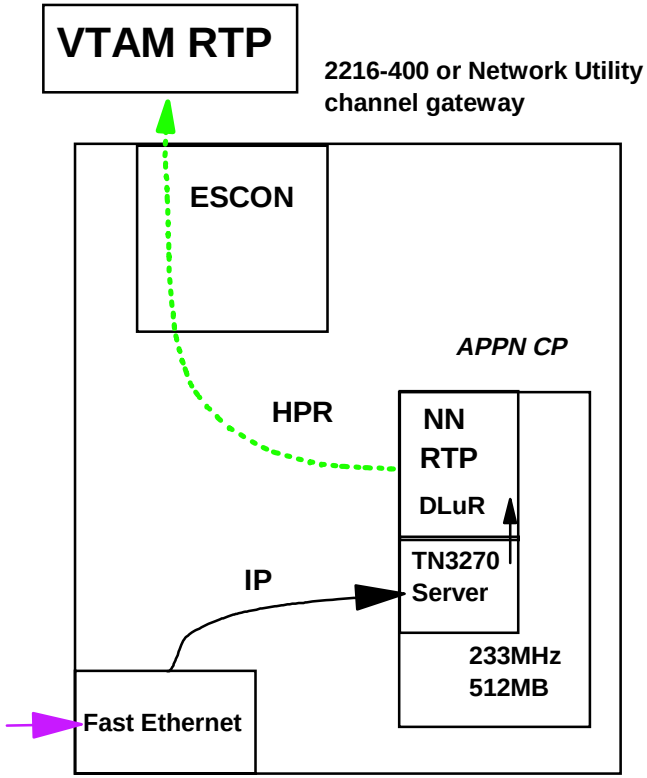
The inefficient, costly path by Cisco CIP2

OR

The efficient, cost effective path by IBM



Up to 330 transactions/sec with CMPC .. RSP4 at 30%, CIP2 at 99% .. minimal scalability in chassis .. poor response time with small packets



Up to 638 transactions/sec with MPC+ .. CPU at 99% .. dedicated to the TN3270 server channel attach gateway task

IBM channel attached APPN/HPR TN3270E Server superior design

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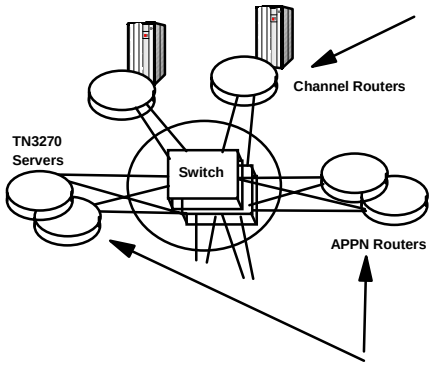
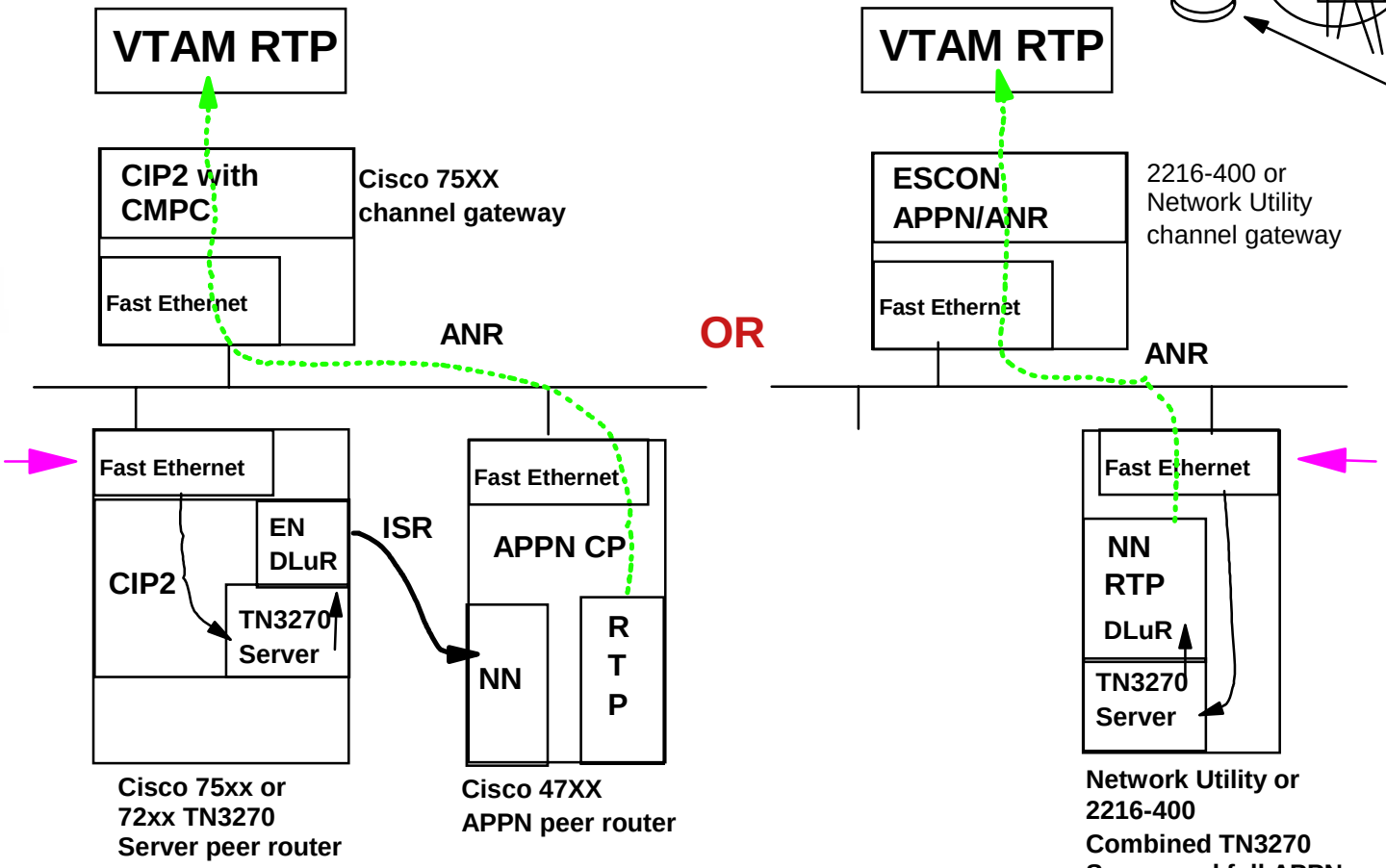
Separate TN3270 Server, APPN and Channel Attached Gateway





- IBM: Less machines, better integration, more performance, higher scalability, better availability, best price / performance
- Cisco: Unused, expensive CIP ESCON port, more machines, less aggregate performance, costs more

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So Why Does Cisco Recommend this Design

- Channel routers transport SNA data, but have no SNA node function
  - ►**Because CIP2 has minimal APPN support .. no RTP .. requires many RSP4 cycles which significantly limits 75XX scalability**
  - ►**30% CPU load on RSP4 with single CIP2** *significantly limits 75XX TN3270 Server scalabilty*
  - ►**Poor performer**
- TN3270 Server and DLuR in same router ..
  - ►**The TN3270 Server still runs in the CIP2 that you pay for BUT you are advised not to connect it to the channel**
  - ►**Traffic must travel to APPN router or use router's main CPU to obtain availability characteristics of HPR**
- APPN as separate router ..
  - ►**The full APPN stack runs in the main processor of the 75XX, 72XX, or 4XXX so you should plan for this requirement**
  - ►***Use the IBM APPN / HPR solution for better performance, price and function***
- Scalability and availability provided by multiple routers ..
  - ►***IBM offers superior scalability, performance, price and function with fewer numbers of Network Utility and 2216-400***

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Summary Observations

- IBM Network Utility and 2216 Multiaccess Connector TN3270E Servers break the 1,000 transaction per second barrier
- Clearly outperform Cisco CIP2 TN3270E Server for both SNA and APPN / HPR in Independent Testing
- Surpass Cisco's own published test maximums
- IBM offers flexible TN3270E Server network designs for high service level to end users
  - ►Network Dispatcher load balancing and scaleable capacity
  - ►Server fail over while maintaining sub second response
  - ►One second HPR rerouting if ESCON path failure
- Expect Similar Benefits with 3746 Equipped with Multiaccess Enclosure (note: maximum 15,000 sessions)
- IBM solution more scaleable
- IBM HPR availability solution superior
- IBM more cost effective
- IBM continues leadership in IP - SNA Integration
  - ►Recent Cisco reorganization de-emphasizes SNA support
  - ►IBM expands the gap

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For more information

- **IBM Networking**
  - ►Your local IBM representative
  - ►IBM Business Partner
  - ►http://www.networking.ibm.com
  - ►or Jim Goethals .. jimgo@us.ibm.com
- **The Tolly Group**
  - ►http://www.tolly.com
    - ◆Document 199115 .. TN3270E Server Channel Attach Gateway Test .. May 24, 1999
    - ◆Document 199116 .. Load Balancing TN3270E Servers Test .. June 11, 1999
    - ◆Review The Tolly Group and Cisco Systems, Inc. interaction via 'Technical Support Diary for Competitive Products Tested'
  - ►info@tolly.com
  - ►732.528.3300
  - ►732.528.1888 fax
- **See your IBM Networking Representative or IBM Business Partner for Incentives to Move to**
  - ►Network Utility
  - ►2216 Multiaccess Connector
  - ►3746 Multiaccess Enclosure

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Thank You

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