

3Com Corporation

SuperStack® II Switch 3900

Fast Ethernet Performance

Test Summary

3Com Corporation commissioned The Tolly Group to benchmark the Fast Ethernet switching performance of the SuperStack® II Switch 3900, a 36-port Fast Ethernet switch supporting up to three Gigabit Ethernet uplinks. The Tolly Group conducted steady state throughput testing of all 36 full duplex Fast Ethernet ports and three Gigabit Ethernet uplinks. Other key performance metrics, such as latency, were also conducted on the SuperStack II Switch 3900. Testing was performed in January 1998.

RESULTS

The SuperStack II Switch 3900 can forward an aggregate throughput in excess of 9.8 million frames per second (fps) while utilizing all 36 full duplex Fast Ethernet ports and three full duplex Gigabit Ethernet uplinks. Test results show that 3Com's SuperStack II Switch 3900 delivers wire speed performance in a steady state throughput test using all switch ports. The switch also exhibits low latency.

THROUGHPUT

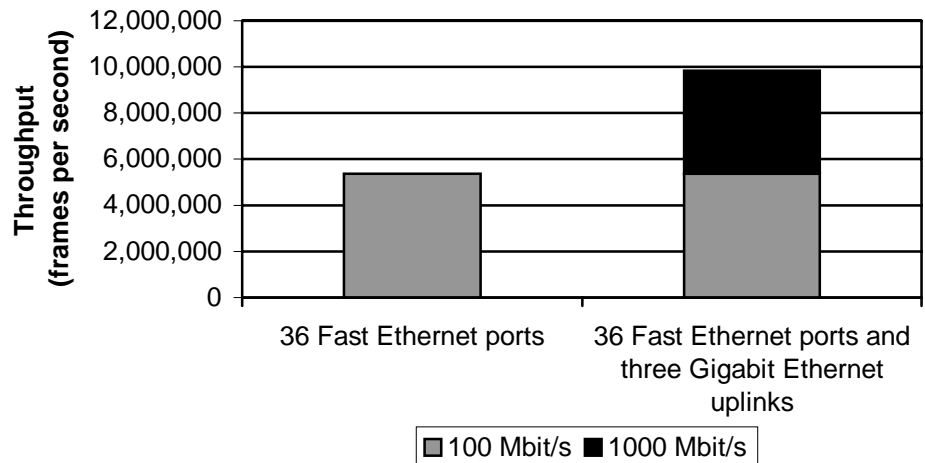
36 FULL DUPLEX FAST ETHERNET PORTS AND THREE GIGABIT ETHERNET UPLINKS

As figure 1 illustrates, 3Com's SuperStack II Switch 3900 can forward layer 2 traffic at wire speed in a configuration using all 36 Fast Ethernet ports and three Gigabit Ethernet uplinks. The SuperStack II Switch 3900 forwarded 148,814 64-byte fps on each of 36 Fast Ethernet ports, and 1,488,144 64-byte fps on each of three Gigabit Ethernet uplinks, inbound and outbound in a steady-state configuration.

Test Highlights

- Aggregate switch throughput of over 9.8 million frames per second
- Wire speed performance with 36 switched full duplex Fast Ethernet ports and three switched full duplex Gigabit Ethernet uplinks
- Gigabit uplink operates at wire speed
- Switch exhibits low latency

Aggregate Switch Throughput 36 Full Duplex Fast Ethernet Ports and Three Full Duplex Gigabit Ethernet Uplinks (64-byte frames)



Source: The Tolly Group, January 1998

Figure 1

X STREAM TEST – 36 FULL DUPLEX FAST ETHERNET PORTS

Test results show the SuperStack II Switch 3900 delivers wire speed performance in a mesh configuration, steady state throughput test utilizing all 36 full duplex Fast Ethernet ports (see figure 2). For the frame sizes tested, the SuperStack II Switch 3900 for-

warded traffic at 100% utilization. The benchmark, performed with the Netcom Systems SmartBits X Stream Throughput test, was conducted with 64-, 128-, 512-, 1,024-, and 1,518-byte frames.

GIGABIT UPLINK PERFORMANCE

The SuperStack II Switch 3900 Gigabit Ethernet uplink delivers wire speed

throughput when connected to a Gigabit Ethernet port on a SuperStack II Switch 9300. The SuperStack II Switch 9300, a 12-port Gigabit Ethernet switch, acted as a Gigabit Ethernet backbone between two SuperStack II Switch 3900s (see figure 5). A SmartBits analyzer generated 10 Fast Ethernet streams of 64-byte traffic which were switched through each SuperStack II Switch 3900 directed for a gigabit uplink port, towards the opposite SuperStack II Switch 3900. The SuperStack II Switch 3900 provided 100% throughput inbound and outbound for the gigabit uplinks.

OPERATIONAL CHARACTERISTICS

The Netcom SmartBits provides test suites to benchmark key operational characteristics of a switch. The Tolly Group ran the Many-to-One, Maximum Forwarding Rate, Filtering of Illegal Frames, Fan Out Switching and Address Handling Advanced Switch tests on the SuperStack II Switch 3900 (see figure 3). Broadcast and known unicast latency tests were conducted with the SmartWindows software.

MANY-TO-ONE

The Many-to-One test, similar to the gigabit uplink performance test above, tested the uni- and bi-directional throughput between 10 Fast Ethernet ports and a Gigabit Ethernet uplink. The SuperStack II Switch 3900 forwarded traffic at 100% throughput across all configurations tested.

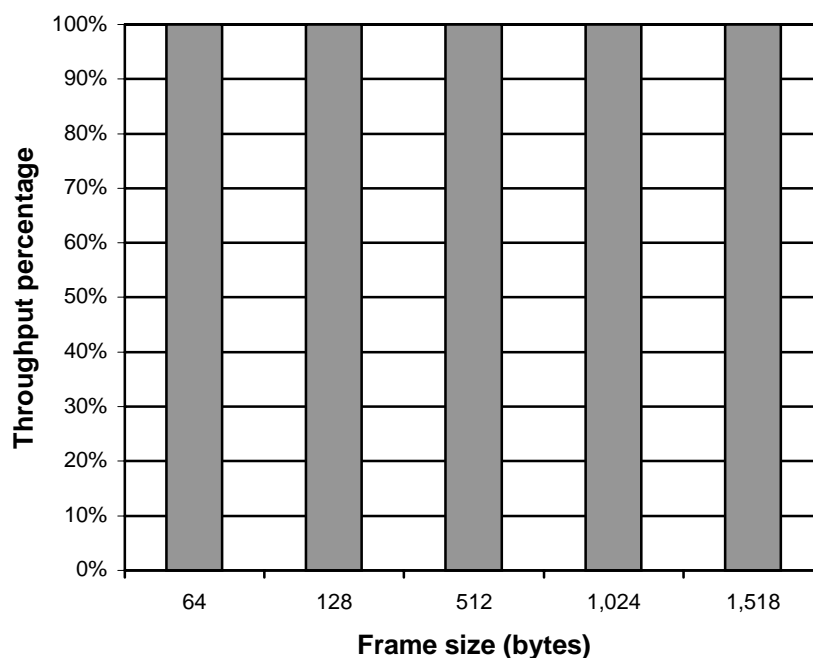
MAXIMUM FORWARDING RATE

In the Maximum Forwarding Rate test, frames were deliberately transmitted with an illegal minimum interframe gap to determine if the switch violates IEEE 802.3 specifications. Switches that compromise this specification may exhibit interoperability problems. The SuperStack II Switch 3900 did not violate the minimum interframe gap.

BROADCAST FRAME RATE

The SuperStack II Switch 3900 demonstrated wire speed performance

Switching Throughput 36 Full Duplex Fast Ethernet Ports



Source: The Tolly Group, January 1998

Figure 2

Advanced Switch Test

Name	Test Result
Many-to-One	Wire speed throughput
Maximum Forwarding Rate	148,810 frames per second
Broadcast Frame Rate	148,811 frames per second
Filter CRC Errored Frames	Pass
Filter Alignment Errored Frames	Pass
Fan Out Switching	Wire speed throughput
Address Handling	16,383 addresses

Source: The Tolly Group, January 1998

Figure 3

Latency (Microseconds)

Frame Size (bytes)	Known Unicast Frames	Broadcast Frames
64	8.9	8.6
128	9.1	9.8
512	13.0	13.1
1,024	20.9	20.9
1,518	25.0	25.3

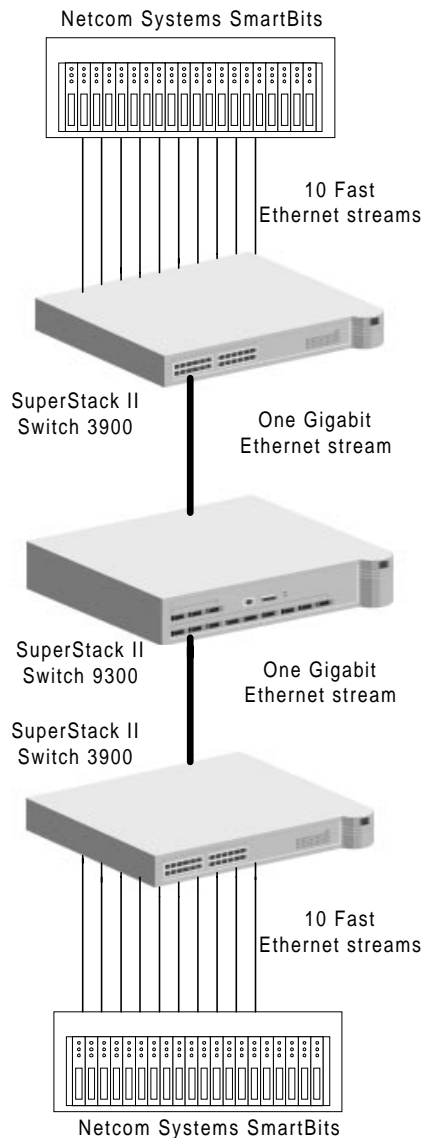
Source: The Tolly Group, January 1998

Figure 4

in the Broadcast Frame Rate test using 64-byte frames. Because switches implement different mechanisms to forward broadcast frames versus unicast frames, this test determines any vari-

ance in the throughput of MAC layer broadcast traffic. The SuperStack II Switch 3900 was able to forward broadcast frames at a rate comparable to unicast traffic.

Gigabit Uplink Test Bed



Source: The Tolly Group, January 1998
Figure 5

FILTER ILLEGAL FRAMES

The SuperStack II Switch 3900 discarded illegal CRC and alignment frames. The Tolly Group verified that the switch filtered the errored frames correctly by monitoring port counters.

FAN OUT SWITCHING

In the Fan Out Switching test, the SuperStack II Switch 3900 demonstrated no frame loss with 100% load of 64-byte frames. During this test, half of the ports under test sent traffic and the other half received it. The SuperStack

II Switch 3900 forwarded the unidirectional traffic at wire speed.

ADDRESS HANDLING

Network managers should be concerned with switch table depth, which is the amount of individual media access control (MAC) addresses (Ethernet stations) that can be stored on a switch. The IEEE 802.1d specification requires that the switch remember the output ports of all destination frames that pass through it. Frames with a destination address that the switch does not identify are broadcast to all ports. The SuperStack II Switch 3900 stored 16,383 addresses in its MAC address table in a single port test. According to the vendor, all ports share this address space.

LATENCY

Latency testing on the SuperStack II Switch 3900 produced low transit times for broadcast and unicast frame types (see figure 4). Latency was measured as the interval between the time the source port received the first byte of the frame and the time the destination port transmitted the first byte of the frame.

TEST CONFIGURATION AND METHODOLOGY

The SuperStack II Switch 3900 consists of 36 fixed Fast Ethernet ports and one fixed Gigabit Ethernet uplink. The switch has slots available for two additional Gigabit Ethernet uplinks. The Tolly Group performed all testing with code version beta 1.1.0. Testing was performed with spanning tree and flow control disabled.

THROUGHPUT 36 FULL DUPLEX FAST ETHERNET PORTS AND 3 GIGABIT ETHERNET UPLINKS

The SuperStack II Switch 3900 was connected to three Netcom Systems SmartBits Advanced Multiport Performance/Simulator/Analyzers consisting of two SMB-1000s and one

3Com
Corporation

SuperStack II
Switch 3900

Fast Ethernet
Performance



3Com Corporation SuperStack II Switch 3900 Product Specifications*

- Full line-rate nonblocking switching performance (6.6 Gbit/s throughput and over 9.8 million pps frame processing)
- Support for trunking — multiple and parallel active links — on both Fast Ethernet and Gigabit Ethernet ports (up to six ports per trunk group and four trunks per unit)
- Multicast filtering using IGMP Snooping
- Fully standards-based 802.1Q VLANs, including GVRP — GARP (Generic Attribute Registration Protocol) VLAN Registration Protocol — support for automatic VLAN configuration distribution
- IEEE 802.1p Class of Service support and dual priority queuing
- RMON support for seven groups
- Roving Analysis Port (RAP) for copying data from any port to another port with a network analyzer attached
- Web browser interface for management and configuration functions
- Support for IEEE 802.3x flow control on all full duplex ports
- Support for up to three Gigabit Ethernet uplinks
- Supports up to 16,000 MAC addresses
- Full duplex support on all Gigabit Ethernet and Fast Ethernet ports

**Vendor-supplied information not verified by The Tolly Group*

SMB-10 (running SmartWindows version 6.23) (see figure 6). The SMB-1000s contained 36 Fast Ethernet SmartCards (model SX-7405) and the SMB-10 contained three Gigabit Ethernet SmartCards (model GX-

1405). Each of the SmartBits modules was configured to generate and receive a single stream of either 100 or 1,000 Mbit/s traffic on each switch port. The Tolly Group allowed the test to run for 30 seconds and recorded the number of frames transmitted and received on each port. Testing was conducted with 64-byte frames only.

X STREAM TEST – 36 FULL DUPLEX FAST ETHERNET PORTS

The SuperStack II Switch 3900 was connected to two Netcom Systems SmartBits consisting of two SMB-1000s containing 36 Fast Ethernet SmartCards. The Tolly Group examined throughput with the SmartBits X Stream Advanced Switch test (version 1.1). The analyzers transmitted frames at wire speed for 30 seconds in a full duplex mesh configuration with each port generating to every other port on the switch. Frames sizes of 64-, 128-, 512-, 1,024- and 1,518-bytes were tested.

GIGABIT UPLINK PERFORMANCE

Two SuperStack II Switch 3900s each connected to a SuperStack II Switch 9300 (version 1.1.0) via a gigabit uplink port. Ten Fast Ethernet SmartCards installed in a Netcom Systems SMB-1000, were connected to each of the SuperStack II Switch 3900s (see figure 5). The analyzers transmitted 64-byte frames at wire speed for 30 seconds onto 10 Fast Ethernet ports of the SuperStack II Switch 3900s, which fed it across the backbone to a port on the opposite SuperStack II Switch 3900.

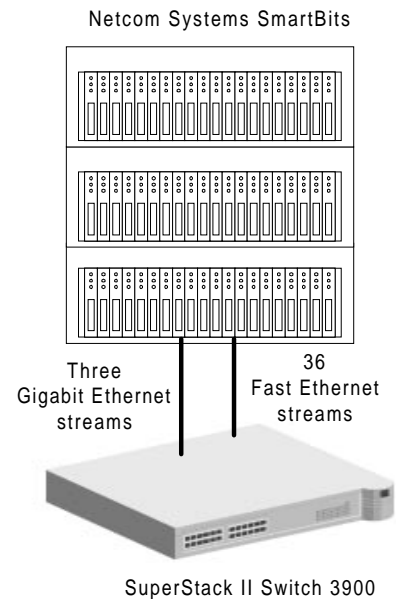
OPERATIONAL CHARACTERISTICS

Operational characteristics were tested by using the SmartBits Advanced Switch Test application. Since these tests are well documented by Netcom Systems, the details are not provided here. All tests performed with the Advanced Switch tests were executed with the default values.

LATENCY

Latency was tested with a latency application provided in SmartWindows.

Throughput Test Bed



Source: The Tolly Group, January 1998

Figure 6

The test, conducted with broadcast and unicast frames at five sizes, was repeated three times for unicast frames and four times for broadcast frames. The results were averaged.

ABOUT THE TOLLY GROUP

The Tolly Group provides strategic consulting, independent testing, and industry analysis. It offers a full range of services designed to furnish both vendor and end-user communities with authoritative, unbiased information. Fortune 1,000 companies look to The Tolly Group for vendor-independent assessments of critical corporate technologies. Leading manufacturers of computer and communications products engage The Tolly Group to test both pre-production and production equipment.

The Tolly Group is recognized worldwide for its expertise in assessing leading-edge technologies. By combining engineering-caliber test methodologies with informed interpretation, The Tolly Group consistently delivers meaningful analyses of technology solutions. The Tolly

Group has published more than 400 product evaluations, network design features and columns in the industry's most prestigious publications.

Kevin Tolly is President and CEO of The Tolly Group. He is a leading industry analyst and is responsible for guiding the technology decisions of major vendor and end-user organizations. In his consulting work, Tolly has designed enterprise-wide networks for government agencies, banks, retailers, and manufacturers.

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