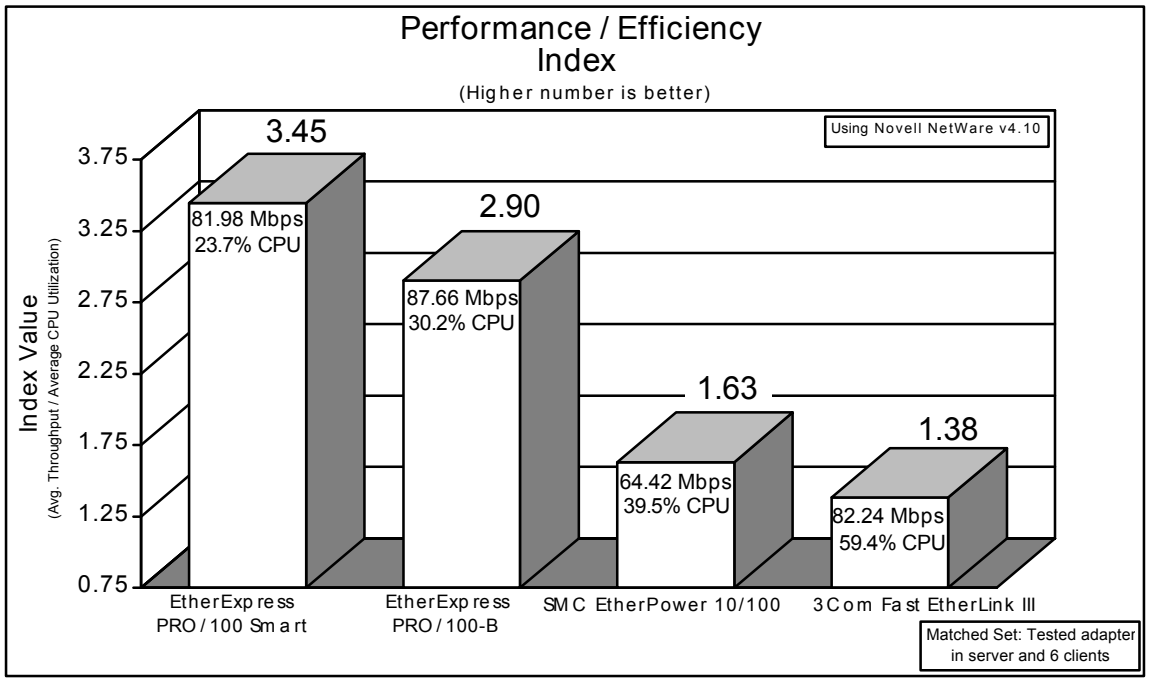
In September 1995, LANQuest Labs revisited 100-Megabit PCI Ethernet adapter performance in a new test series designed to test server NIC performance under two different Network Operating Systems. Under Novell NetWare 4.10, we compared Intel's new EtherExpress PRO/100-B (PILA8465B) Adapter and their EtherExpress PRO/100 Smart Adapter to 3Com's Fast EtherLink III and SMC's EtherPower 10/100. Then we tested the adapters (with the exception of the Intel EtherExpress PRO/100 Smart, since an NT driver was not available at the time of testing) under Windows NT Server 3.51. The test results showed the Intel adapters were consistently the fastest and most efficient of all the cards.

Our first performance analysis involved testing each card in a NetWare 4.10 file server with six clients that contained identical adapters. Our objective in this test was to determine which adapter facilitated the best Performance/Efficiency ratio when used in the server. Performance/Efficiency has been defined by PC Week as server throughput (in Mbps) divided by server CPU utilization in percent. A high Performance/Efficiency (P/E) Index indicates the power of a network adapter. It measures the ability to achieve high throughput with minimal CPU usage. As the graph below illustrates, the Intel EtherExpress PRO/100 Smart Adapter had the best Performance/Efficiency Index by combining the lowest CPU utilization of all adapters tested along with the second highest average throughput.

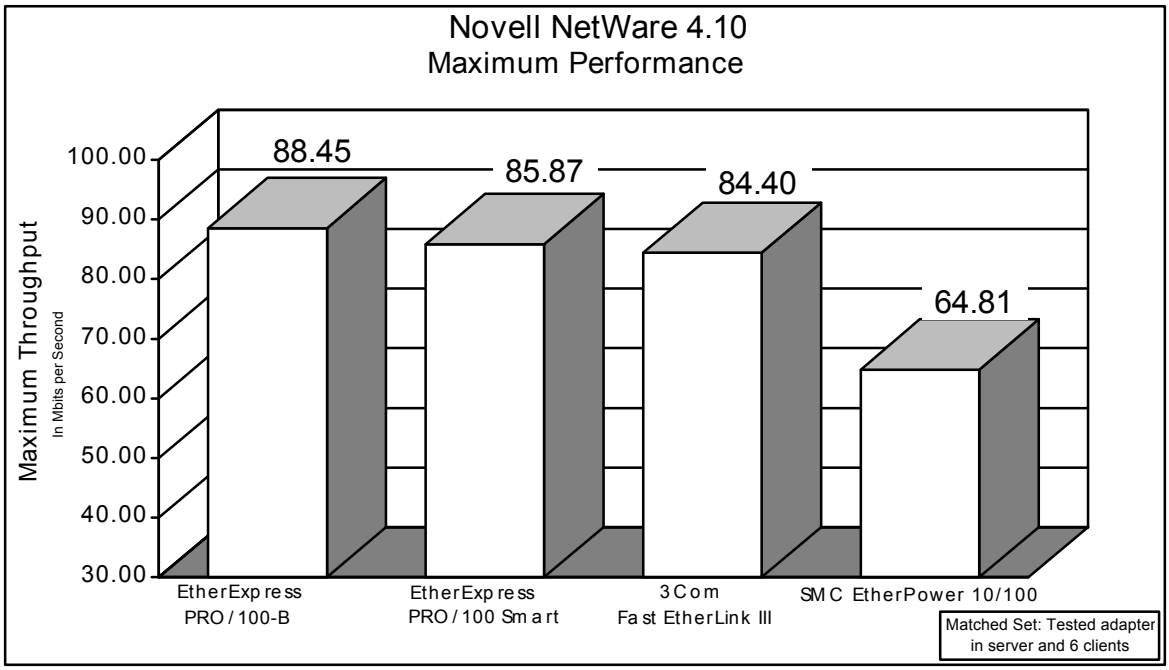



Intel's EtherExpress PRO/100 Smart Adapter had the best P/E Index due to its i960 RISC chip which Intel asserts is perfect for the card's target market of high end file and application servers.

Intel's EtherExpress PRO/100-B adapter had the highest average throughput of all of the adapters tested. The PRO/100-B card had a higher CPU utilization than the Smart adapter and therefore had a lower P/E Index. In third place, was the SMC EtherPower 10/100 adapter with an average throughput that was over 25% slower than either of the Intel adapters and

CPU utilization of almost 40%. Finally, with the lowest P/E Index, the 3Com Fast EtherLink III had a lower average throughput than the EtherExpress PRO/100-B and double the CPU utilization.

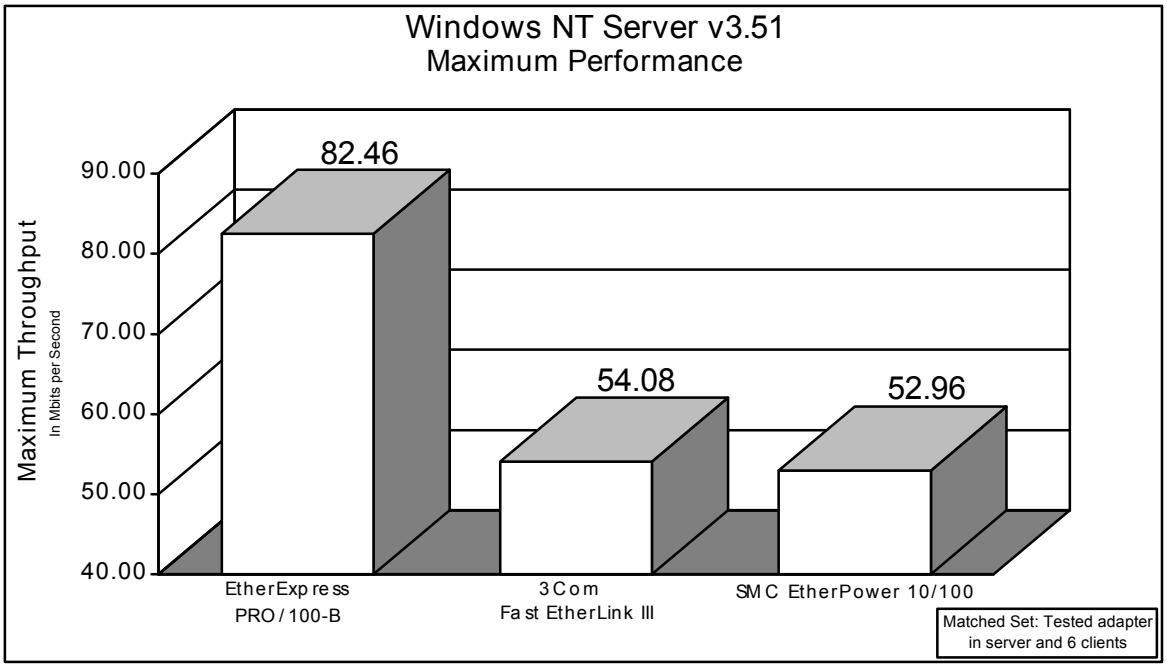
In addition to tracking CPU utilization and average throughput, we also measured the maximum throughput that each adapter was able to facilitate under NetWare. As the graph below illustrates, both of the Intel cards outperformed the 3Com adapter. In this comparison, the SMC adapter was the slowest card tested by a significant margin.



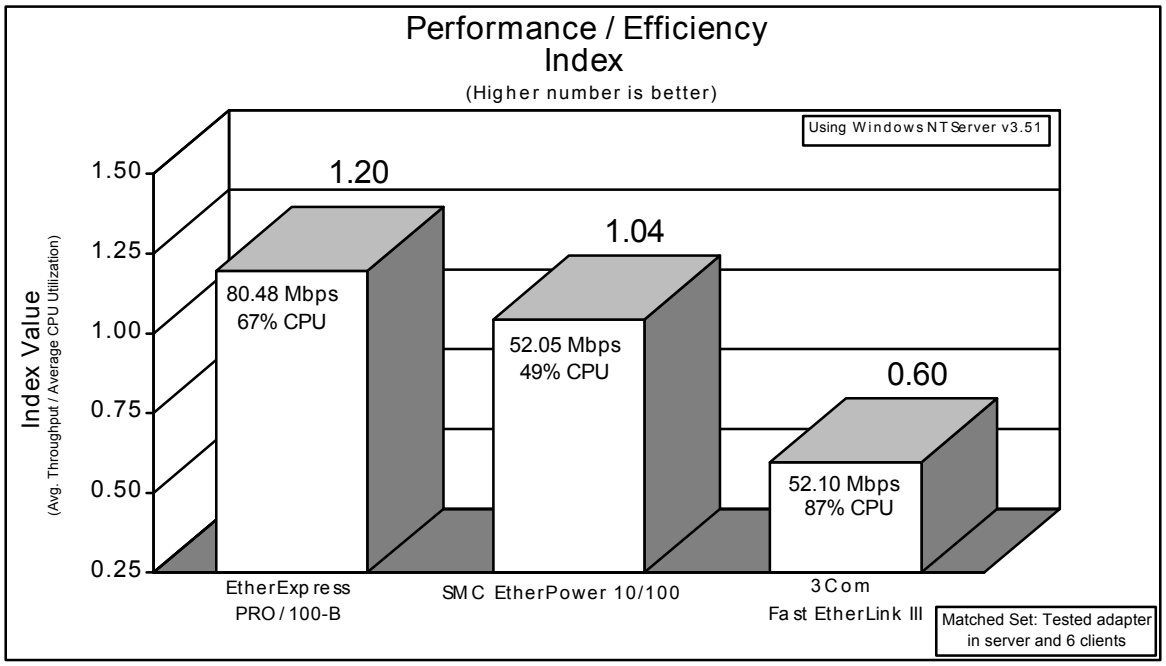

When comparing the maximum performance of the tested adapters under NT Server, Intel's EtherExpress PRO/100-B remains the clear leader, outperforming 3Com's Fast EtherLink III by over 52% and SMC's

EtherPower 10/100 by over 55%, as the graph below illustrates.



Under Windows NT, just like under NetWare, Intel's EtherExpress PRO/100-B was the most powerful adapter with a P/E Index of 1.2 - twice that of the 3Com adapter. With an average throughput of 80.48 Mbits/second and CPU utilization of 67%, the Intel EtherExpress PRO/100-B adapter outscored the SMC adapter by over 15%. Though the 3Com adapter had an average throughput that was almost the same as the SMC adapter, its high CPU utilization of 87% resulted in it having the lowest P/E index, being outscored by Intel by 100%, as the graph below illustrates.




Why is Performance/Efficiency Index important? In today's server environment, having a high throughput yet efficient (i.e. low CPU utilization) network adapter is critical. Tying up CPU resources to support network communication can adversely affect server performance. It's also important in new desktops. The new multi-tasking operating systems (e.g. Windows 95, OS/2, Windows NT) demand efficient high speed network adapters. High speed, lower CPU utilization adapters frees the processor in today's powerful Pentium and PCI based desktops to concentrate on software related tasks instead of concentrating on communication tasks.

## Test Methodology and Philosophy

LANQuest Labs used the latest adapters and drivers in all tests. All adapters were installed and configured according to their installation guides' instructions for best performance.

Novell NetWare 4.10 (with the most recent patches from Novell) and Microsoft Windows NT Server v3.51 were installed on identical Dell Dimension XPS P90 (90 MHz Pentium) PCI systems with 32 MB RAM and a 1 GB hard drives. The clients were Dell Dimension XPS P90 (90 MHz Pentium) PCI computers with 16 MB RAM and 1 GB hard drives, running MS DOS 6.20 and VLM drivers for Novell testing and NDIS 2 drivers for Windows NT Server testing (server utilized NDIS 3 drivers). Category 5 twisted-pair cabling was used to connect the clients to the servers through a NetWorth Micro100, 100-Megabit hub.

LANQuest measured each adapter's performance using Novell's Perform3 v.1.61 to simulate traffic loads across the LAN. The performance data reported represents the average throughput observed during an 8-minute test that began with a 65535 block request size, decreasing the block request size by 4096 bytes every 30 seconds. The results were averaged over three test runs. Server CPU utilization was obtained on the NetWare server by using Novell's STAT.NLM, and on the Windows NT server using Microsoft's Performance Monitor utility. The results of the CPU utilization sampling were averaged for each test run.

For each PCI card, testing was performed in a "matched-set" arrangement, where the adapters used in the clients matched the adapter in the server. The exception to this was the testing of the Intel EtherExpress PRO/100 Smart Adapter, which used Intel's standard EtherExpress PRO/100-B adapters in each of the clients. A six client load point was chosen for testing because it adequately shifts the bottleneck to the server adapter. At this load point, six client adapters can collectively exceed the theoretical performance limit of the server adapter. Following this logic, testing at this load level accurately gauges the maximum performance of the server adapter.

## LANQuest Labs

LANQuest Labs is the nation's leading independent network product testing laboratory. Since 1987, LANQuest has tested thousands of combinations of network operating systems, servers, routers, bridges, adapters, workstations, protocol analyzers and network applications. LANQuest also designs network diagnostic and performance testing products, which are sold through manufacturers' representatives and international distributors. LANQuest's testing services include compatibility, functionality, interoperability, performance, Q.A., stress, and certification testing. LANQuest Labs' tests are nationally known and have appeared in such publications as Network World, LAN Technology, MacWEEK and Personal Computing. LANQuest Labs' clients include most leading

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