

**Benchmark Performance Study
Sybase Adaptive Server Enterprise (ASE)
on Linux/Itanium2**

Enterprise-class performance for Linux/Itanium2

A Sybase and HP joint initiative



Sybase® Adaptive Server Enterprise on Linux/Itanium2 Benchmark Performance Study

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1 Executive Summary

Linux has created a huge new playing field for enterprises, academia, and governments across the board—namely the opportunity to replace proprietary systems with lower cost commodity platforms. Until recently, concerns around support or lack of applications have stopped many enterprises from strategic, wholesale migrations to Linux. Recent advances of Intel performance and the broad-scale support of hardware and software vendors indicate growing comfort and adoption of Linux (see Forrester, “The Linux Tipping Point,” March 2003). High-performance, mission-critical systems running on Linux has become a reality.

Sybase has been an innovator on Linux since 1999, when the company’s flagship database was released for the Linux platform. Today, all core Sybase products run on Linux including: Adaptive Server Enterprise, Open Client/Server, EAServer, Replication Server, Open Switch, Sybase IQ, Financial Fusion and SQL Anywhere Studio.

Sybase is the infrastructure for mission-critical, transaction intensive applications for inherent performance advantages. To support customers in their efforts to further reduce the costs of these traditionally high-end applications—yet maintain high-end performance and scalability—Sybase and Hewlett-Packard recently conducted internal benchmark tests with Adaptive Server Enterprise on Linux/Itanium2 at Dublin, California performance laboratories. The first such benchmark on an SMP configuration, Sybase continues to lead the way for Linux innovation and enterprise-class processing capability.

Hewlett-Packard is a leading provider of server class systems, built using Intel® Itanium® 2 processors. Intel® Itanium® 2 are ideal for high performance computing and compute-intensive custom applications where price and performance are key factors. The systems are uniquely designed for large-scale enterprise and database applications. These systems enable businesses and organizations to maximize their return on investments by delivering industry-leading performance at relatively lower cost.

Sybase Adaptive Server Enterprise (ASE) demonstrated superior performance results. This benchmark validates Sybase ASE’s suitability for running transaction-intensive workloads on lower-cost platforms.

- 51809 Transactions/Minute using single 1.5Ghz Intel® Itanium® 2 CPU.
- Demonstrated exceptional scalability from 52K Transactions/Minute on one CPU to 150K Transactions/Minute on four 1.5Ghz Intel® Itanium® 2 CPU.
- 13 milliseconds average response time on a four CPU system.

- Consistent throughput with sustained operations.

2 Objective

For customers migrating to Linux from proprietary platforms, or consolidating systems to maximize hardware expenditures, the primary question becomes: can Linux handle my required workloads? Entrusting mission-critical applications to Linux takes solid evidence to substantiate the vendor's stated capabilities. In order to fully validate ASE's scalable performance on Linux, Sybase and HP invested in an internal benchmark test to measure performance, scalability, and reliability.

Performance – Achieve an average response time less than 13ms and fully utilize the resources to deliver best throughput.

Scalability – Near linear increase in throughput as CPUs are increased throughout testing, justifying the resource.

Reliability – Optimal production throughput while maintaining a steady state processing rate. Demonstrate continuous performance over a fairly large period of time with sustained throughput results.

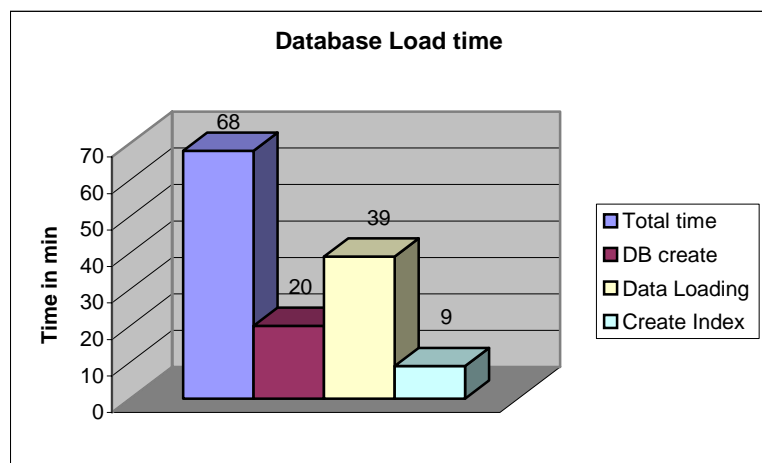
3 Performance Scenarios

The process to test and measure throughput capabilities on Linux is designed to closely mimic a typical order entry scenario, where throughput metric is number of orders processed per minute. Order entry is a typical OLTP transaction, consisting of events pertaining to the orders that were placed in the system, including new order submission, status verification, shipment, payment etc. Transactions are mixed in such a way that it rigorously exercises the transaction processing, concurrency control and logging subsystem of the database through various DML (insert/update/delete) and database query operations. Mimicking real-world business activities and typical order placement scenarios, new incoming orders represented 44% of total transactions.

The number of concurrent users in the test is also designed to closely mirror real-life activities, in which the number of users on the system varies. The Sybase/HP benchmark environment tested database entries to represent up to 50,000 front-end users using 135 dedicated database user connections. This was designed to ensure scalability while continuing to maintain throughput performance statistics.

Each test ran for one hour for three consecutive hours. So, over a 24-hour period, each test series repeated eight times. The design was to supply a constant flow of information over and over, testing the performance numbers at each session's end.

The test database was approximately 180GB in size, with eight tables and several indexes within these tables. Initial data was 72GB, and entire loading was achieved in about an hour.



4 System Configuration

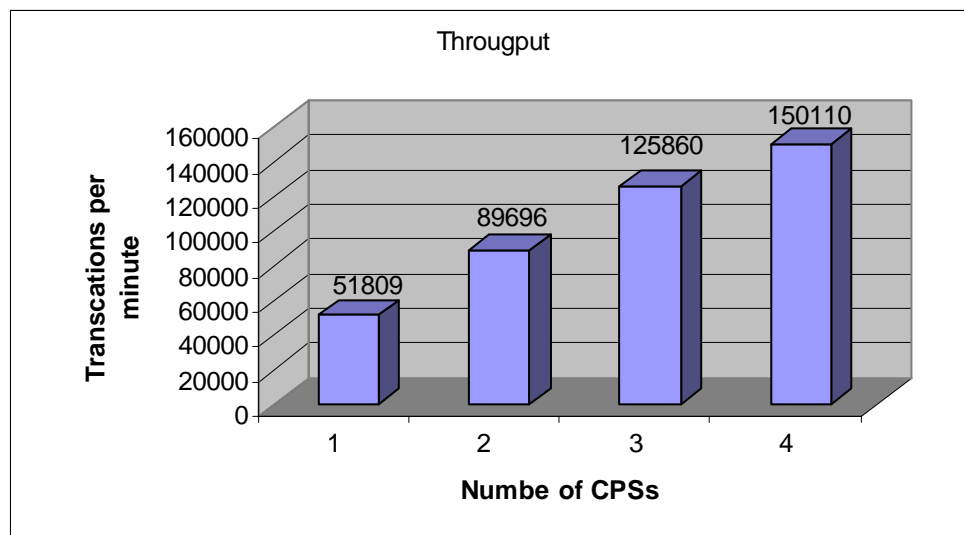
Server Machine	HP Integrity Server rx5670, 4 Intel Itanium2 1.5Ghz, 6MB
Total Memory	22GB
Storage Disk Controller	5 Smart Array 6402/128 -WW 8 U320 Single Bus I/O Module ALL 1 U320 Dual Bus I/O Module ALL 126 36GB 15K U320 Pluggable Hard Drive -WW
Rack	Rack 10636 (36U) Standard Pallet -WW
Server Software	Red Hat Enterprise Linux AS Premium Edition 3.0 Red Hat Enterprise Linux ES Standard Edition Sybase Adaptive Server Enterprise 12.5.2 Sybase Open Client 12.5
Client Machine	HP ProLiant DL380 with 2 2.8Ghz CPUs, 1GB RAM, 1Gbit Ethernet card, monitor

5 Test Results

For testing purposes, we increased the number of ASE engines – which typically correspond to the number of machine CPUs. Each CPU is fully utilized by one engine.

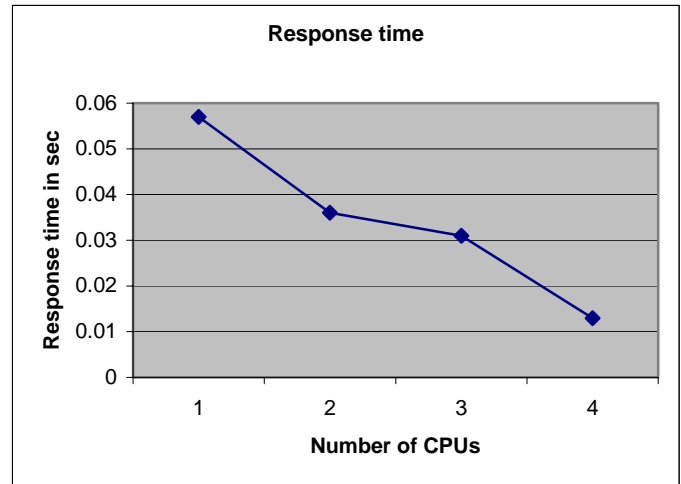
ASE posted record throughout performance, achieving:

- 150,110 transactions per minute using four ASE engines
- 125,860 transactions per minute using three ASE engines
- 89,696 transactions per minute using two ASE engines
- 51,809 transactions per minute using one ASE engine

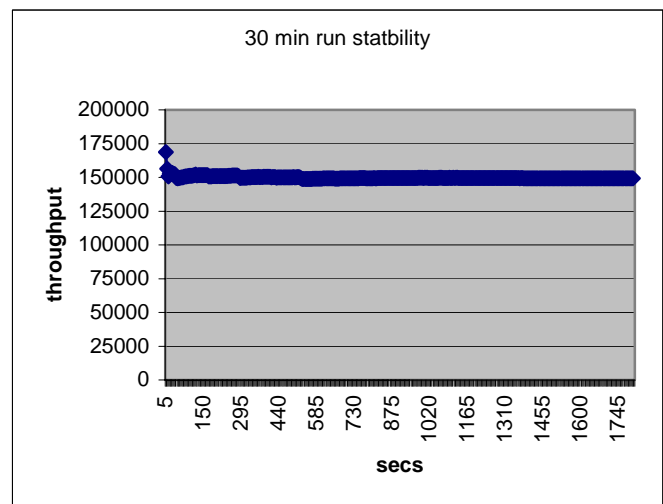


ASE demonstrates exceptional scaling with increased number of CPUs. From the graph, there is a near linear scaling between from one to four processors. It shows a record breaking 51,809 transactions per minute on a single CPU system. Such scalability is possible due to highly optimized ASE code on Linux/Itanium2 platform.

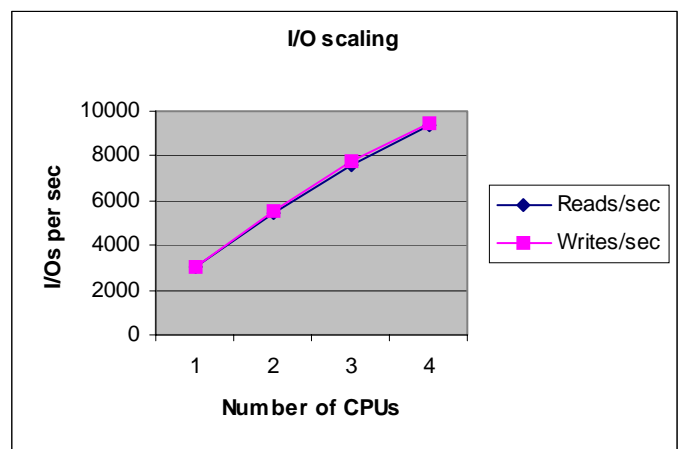
Response time results also demonstrated superior scaling capabilities. As the number of engines increased, a given user is able to push a higher number of transactions/minute because of the linear reduction in response time.



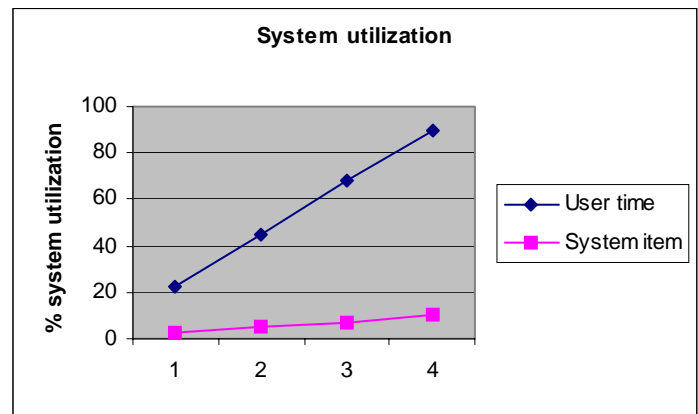
It was also observed that the performance with the four-engine configuration remained stable at 150,110 transactions/minute for the continued 30-minute measurement intervals throughout testing.



The Input/Output subsystem was fully utilized by the database server. Data disks access were mostly random in nature and number of reads and writes on the data disks were almost equal. Log writes were sequential in nature. At steady state, the system was driving about 18,000 IOs per sec.



With the four CPU/four ASE engine configurations, CPU's were fully utilized. The total system time remained well under 10% resulting in over 90% of the CPU utilized for user workload. ASE's unique architecture has made it possible to utilize the system resources efficiently.



6 Conclusions

- Sybase ASE on Linux/Itanium2 posted the highest throughput of any RDBMS on any 4-way Linux system
- Based on typical system costs, with these results Sybase can show leading price/performance for business-critical computing on Intel-based hardware.

The key elements of all Sybase technologies are: dependability, scalability, performance and low total cost of ownership. This holds true for Adaptive Server Enterprise (ASE) on the Linux/Itanium2 platform. The same high-performance stability that distinguishes ASE against competitors stands alone in the noisy world of Linux offerings.

Sybase continues to offer the best TCO story – with lowered administrative costs, out-of-the box Linux productivity, and now, proven enterprise-class scalability and measurable throughput performance.