Balanced performance matters most when selecting an enterprise server

Reliance on TPC-C, alone, is not enough

Reliance on a single performance measure is not advised

TPC-C is an important benchmark when validating systems performance characteristics. However, system performance more than just TPC-C. Reliance on a single benchmark is not advised as it can lead to erroneous conclusions, especially when a system is unbalanced in its performance characteristics and optimized for this single workload to the detriment of others.

The HP Integrity Superdome has been validated by a comprehensive TPC-C test and some of the latest commercial industry standard benchmarks. Contrast this to IBM who focused on TPC-C with its p5 595 with POWER5+:

Table 1. HP Integrity Superdome vs. IBM p5 595 performance benchmark results.

Benchmark	HP Integrity Superdome with Dual-Core Itanium2	IBM p5 595 with POWER5+
TPC-C	4,092,799 tpmC $2.93/tpmC Avail: 8/23/07	4,033,378tpmC $2.97/tpmC Avail: 01/22/07
TPC-H@10TB	171,380 QphH $38.98/QphH Avail: 04/01/07	No result (?)
SPECjbb2005	2,054,864 BOPs 64 chips/128 cores/ 2 cores per chip	No result (?)
SPECint_rate2006	1,650 64 chips/128 cores/ 2 cores per chip	No result (?)
SPECfp_rate2006	1,480 64 chips/128 cores/ 2 cores per chip	No result (?)
Balanced Performance Validated?	Yes	No

Results as of 2/27/2007, See www.tpc.org and www.spec.org
Commercial benchmarks only. SPECjAppServer2004, SPECjbb2005, SPECint_rate2006, SPECfp_rate2006 are trademarks of the Standard Performance Evaluation Corp. (SPEC). Reference: TPC-C, TPC-H are trademarks of the Transaction Processing Performance Council.

Does TPC-C best reflect the real world?

High-end TPC-C results are impressive, but what do they mean to customers? Today, many customers use TPC-C benchmark results to evaluate the OLTP performance of enterprise systems. It is important to understand the limitations of this benchmark as it relates to customers' real life environments.

Currently, the TPC-C benchmark is used extensively as the basis for sizing and performance comparisons. The problem is that this benchmark was released in the early '90s when businesses were extremely different from today. Applications on which businesses operated were based on slow transactions, limited opening hours, and long batch operations during off hours.

Business requirements have changed with the arrival of the Internet, 24x7 IT needs, complex yet fast online banking transactions, and advanced business intelligence needs. Today, transactions require less than 500ms latency, particularly with workloads such as analytics, batch, or query.

Often, vendors end up using huge amount of memory and storage and extreme database partitioning to deliver high TPC-C performance. Such configurations rarely reflect customer environments.

Finally, only a few customers in the world use a single application on a big system. Most of the time, the system is used for multiple applications. High-end systems have grown too big to be used by a single application.[1]

What do experts say?

"At the scale at which it is currently being run, TPC-C has lost its similarity to the business processing tasks that go on in real customer scenarios."

"..today's Big Iron systems are far more about running multiple workloads in a highly virtualized environment than they are about hyper-scaling any single application. Perhaps TPC-C or a related successor can continue to have a place at such a future, but it will need to be run at more workaday sizes . . ."

Industry Analyst Firm Illuminata, TPC-C Passes Escape Velocity, Gordon Haff, Dec 2 2004
Source: http://h20341.www2.hp.com/integrity/downloads/TPCC.pdf

Questions to consider when evaluating enterprise class systems

What are your specific enterprise needs?

- Do you run more than one type of application
- Do you run more than OLTP (on-line transactional processing) type applications?
- Does your enterprise include a mix of application types; e.g. OLTP, batch, query-based I/O intensive, JAVA or others?
- Would it be more efficient to run these applications within a common system architecture rather than separate systems each dedicated to one application type?
- Would it be more efficient to run these applications within a common system architecture rather than separate systems each dedicated to one application type?
- Would you rather invest in a single well-balanced architecture that runs a wide variety of application types well instead of several different systems each optimized for only one type of application workload?
- Is your IT staffing insufficient to allow a thorough evaluation of a vendor's architecture's ability to run each application type? Do you expect the system vendor to assist in this validation process?

Real world customers typically answer, "YES" to the above, indicating a need for a balanced system architecture that can perform well across a wide range of workloads.

IT performance needs in the enterprise are complex and usually are a mix of workload types. Transactional workloads, demonstrated by TPC-C and SAP SD among others, represent only a portion of the workloads, while query-based workloads, represented by TPC-H, SAP BW, or other data warehousing type benchmarks, illustrate another type of workload.

Therefore, a system must have a balanced performance capability to handle the variety of workloads that real world enterprises encounter.

[1] Source: Illuminata, TPC-C Passes Escape Velocity, Gordon Haff, Dec 2 2004

n How do I evaluate whether a vendor has a balanced architecture?

Without testing the system in your environment, customers must rely on the benchmarks performed by the system vendors. To validate a system's balanced architecture, a vendor must perform a wide range of benchmarks representing varied workloads.

HP Integrity servers have validated balanced performance

Different benchmarks representing various workloads stress a system's architecture in different ways. For example, a transactional benchmark such as TPC-C may stress a system's processor and memory subsystem, while a query-based benchmark, such as TPC-H may stress a system's I/O subsystem.

HP Integrity has been validated across a wide range of workloads, operating systems resulting in a portfolio industry leading benchmark results (see Benchmark Data at the end of this document):

Table 2. HP Integrity servers defeat IBM servers in a variety of performance benchmarks.

Workload	HP System	Benchmark	Beats IBM
Java	HP Integrity rx2660	SPECjbb2005	IBM p5 505Q 1.65GHz POWER5+
	HP Integrity rx6600	SPECjbb2005	IBM p5 550Q 1.65GHz POWER5+
	HP Integrity rx6600	SPECjAppServer2004	IBM p5 550 1.9GHz POWER5+
OLTP	HP Integrity rx6600	TPC-C (4-core)	IBM p5 570 1.9GHz POWER5
	HP Integrity Superdome	TPC-C	IBM p5 595 2.3GHz POWER5+
Data Warehouse	HP Integrity rx8640	TPC-H @1000GB (16- core)	IBM p5 570 1.9GHz POWER5
SAP® Solutions	HP Integrity Superdome	Two-tier SAP SD Standard Application Benchmark	IBM p5 595 2.3GHz POWER5+
Compute Intensive - Integer	HP Integrity Superdome	SPECint_rate2000	IBM p5 595 2.3GHz POWER5+
Compute Intensive – Floating Point	HP Integrity Superdome	SPECfp_rate2000	IBM p5 595 2.3GHz POWER5+

As of 2/27/2006: See Benchmark Data at the end of this paper

To learn more about HP Integrity's balanced performance see:
http://h20341.www2.hp.com/integrity/cache/393900-0-0-225-121.html?jumpid=reg_R1002_USEN

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Benchmark Data

4 core SPECjbb2005 HP Integrity rx2660, 1.6GHz 18M Itanium2, 2 chips/4cores/2 cores per chip, 80,884 BOPS, 80,884 BOPS/JVM. IBM p5 505Q, 1.65GHz POWER5+, 2 chips/4 cores/2 cores per chip, 63,544 BOPS, 31,772 BOPS/JVM Results as of 2/26/07. See: www.spec.org

8 core SPECjbb2005; HP Integrity rx6600, 1.6GHz 24M Itanium2, 4 chips/8cores/ 2 cores per chip, No HW threading,, 158,174 BOPs, 39,544 BOPS/JVM. IBM p5 550Q, 1.65GHz POWER5+, 4 chips/8cores/ 2 cores per chip, HW threading enabled , 127,851, 15,981 BOPS/JVM. Results as of 2/26/07. See: www.spec.org

SPECjAppServer2004; HP Integrity rx6600, 1.6GHz 24M Itanium2, 24chips/48cores/2 cores per chip, 6 Nodes, 7,629.45 JOPS. Integrity rx6600, 1.6GHz 24M Itanium2, 16chips/32cores/2 cores per chip, 4 Nodes, 4,915.49 JOPS. IBM p5 550, 1.9GHz POWER5+, 16 chips/32cores/2 cores per chip, 8 Nodes, 2921.48 JOPS. Results as of 2/26/07. See: www.spec.org

4 core TPC-C; HP Integrity rx6600, 1.6GHz 24M Itanium2, 2 processors/4 cores/8 threads, 230,569 tpmC, $2.63 USD/tpmC, availability 12/1/2006. IBM p5 570, 1.90 GHz POWER5, 2 processors/4 cores/8 threads, 203,440 tpmC, $3.93 USD/tpmC, availability 10/17/2005. Results as of 02/26/07. See: www.tpc.org

TPC-C; HP Integrity Superdome, 1.6 GHz 24M Itanium2, 64 processors/128 cores/256 threads, 4,092,799 tpmC, $2.94 USD/tpmC, availability 08/23/07. IBM p5 595 2.3 GHz POWER5+, 32 processors/644 cores/128 threads, 4,033,378 tpmC, $2.97 USD/tpmC, availability 01/22/2007 Results as of 02/27/07 see: www.tpc.org

16 core TPC-H @ 1000 GB; HP Integrity rx8640 1.6GHz 24M Itanium2, 8 processors/16 cores/16 threads, 27,144 QphH@1000GB, 36.00 US $ per QphH@1000GB, availability 01/01/2007. IBM p5 570, 1.90 GHz POWER5, 8 processors/16 cores/32 threads, 26,156 QphH@1000GB, 53.43 US $ per QphH@1000GB, availability 12/15/2004. Results as of 2/26/07 see: www.tpc.org

Two-tier SAP Sales and Distribution (SD) Standard Application Benchmark; Certification number 2006089-HP Integrity Superdome, 64 processors/128 cores/256 threads, Dual-Core Intel Itanium2 9050 1.6GHz, running the mySAPTM ERP2005 application and HP-UX 11i v3 and Oracle 10g achieved 30,000 SAP SD Benchmark users. Certification number 200645 - IBM p5 595 64 processors/64 cores/128 threads, 2.3 GHz POWER5+ running mySAP ERP2004 and AIX v5.3 and DB2 v9 achieved 23,456 SAP SD Benchmark users. Results as of 02/26/07. See: www.sap.com/benchmark

SPECint_rate2000; HP Integrity Superdome 1.6GHz 24M Itanium2, 64 chips/128 cores/2 cores per chip, Hyper-Threading Technology disabled, SPECint_rate2000: 2,367. IBM p5 595, 2.3GHz GHz POWER5+, 32 chips/64 cores/ 2 chips per core. SMT on, SPECint_rate2000: 1,513. Results as of 02/26/07. See: www.spec.org

SPECfp_rate2000; HP Integrity Superdome 1.6GHz 24M Itanium2, 64 chips/128 cores/2 cores per chip, Hyper-Threading Technology disabled, SPECfp_rate2000: 2,837. IBM p5 595, 2.3GHz GHz POWER5+, 32 chips/64 cores/2 chips per core, SMT on, SPECfp_rate2000: 2,406. Results as of 02/26/07. See: www.spec.org

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