An overview of the TPC-C benchmark on HP ProLiant servers and server blades

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Overview

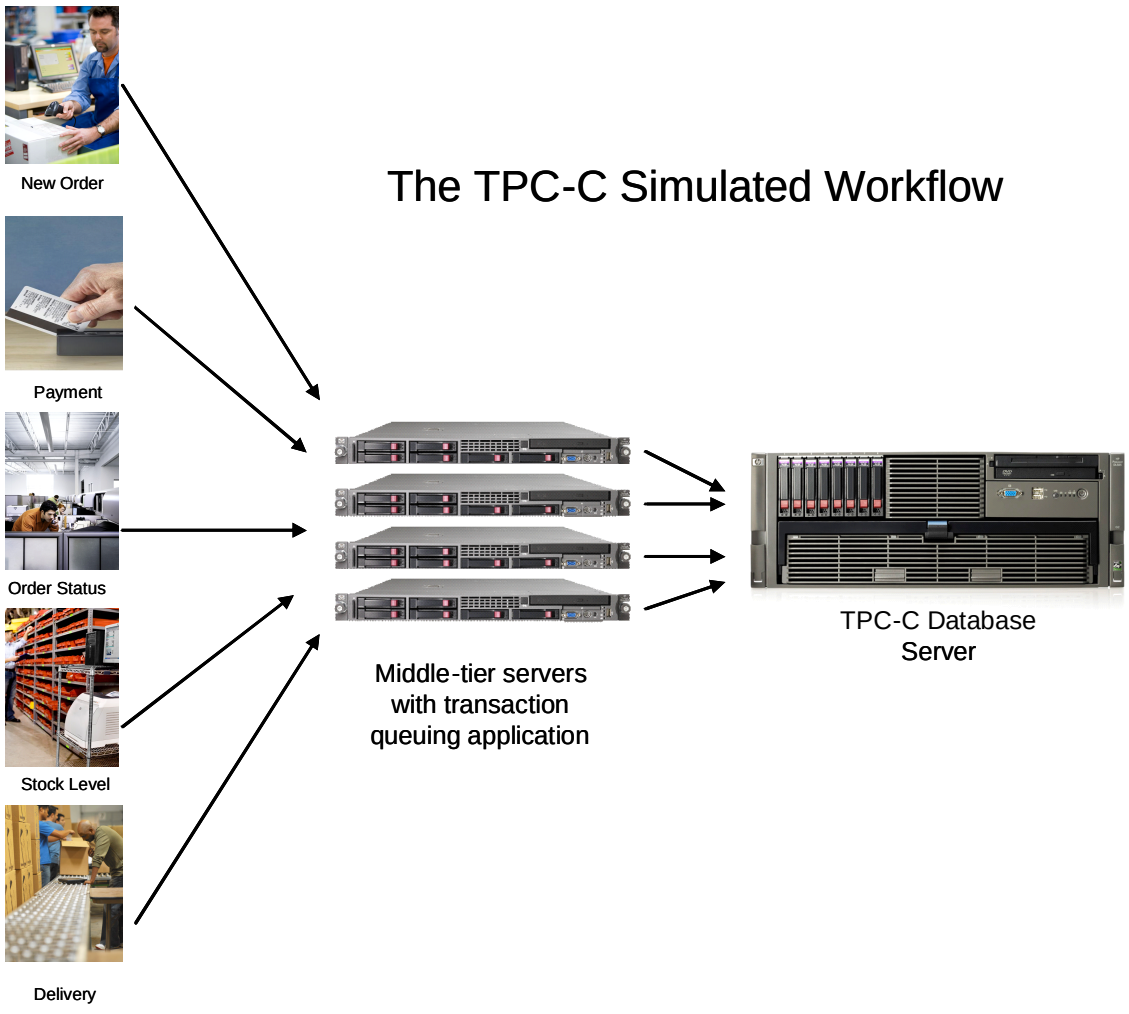
The TPC-C benchmark simulates an Online Transaction Processing (OLTP) database environment. The performance of a system is measured when the system is tasked with processing numerous short business transactions concurrently.

Workload

The TPC-C workload simulates a tiered environment wherein users interact with web pages to enter business transactions. The transactions and their percentage of the transaction mix are:

- New Order transaction (~45%): a new order entered into the database
- Payment transaction (~43%): a payment recorded as received from a customer
- Order Status transaction (~5%): an inquiry as to whether an order has been processed
- Stock Level transaction (~5%): an inquiry as to what stocked items have a low inventory
- Delivery transaction (~5%): an item is removed from inventory and the status of the order is updated

Figure 1. The TPC-C Simulated Workflow



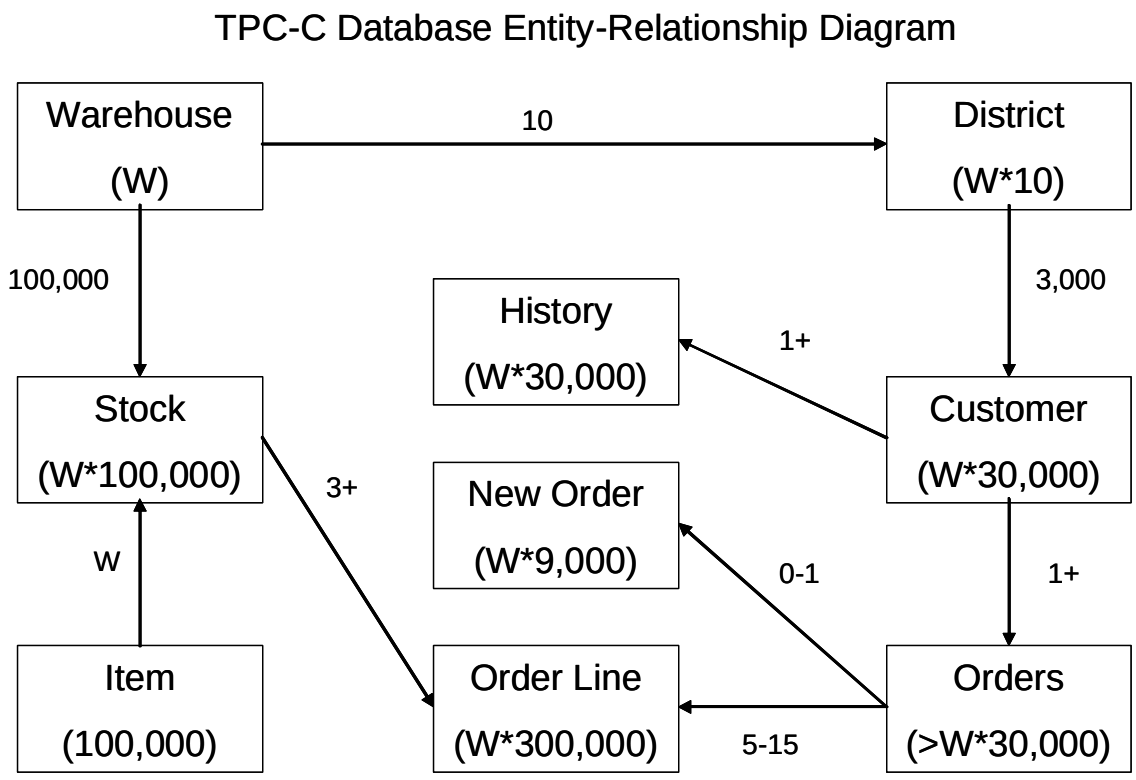
Transactions are entered by simulated users, business logic and queuing of the transactions are handled by a middle tier server, and then the transactions are passed to the TPC-C database server for processing.

Database sizing

The TPC-C database is scaled according to the number of warehouses that a simulated corporation maintains, which is represented by the “warehouse” table in the database. The rest of the TPC-C database (with the exception of the item table) is scaled based upon the number of rows in the warehouse table. The number of simulated users running transactions against the TPC-C database is 10 times the number of rows in the warehouse table.

The total disk space required for a TPC-C database is usually several hundred or even several thousand gigabytes, and the TPC-C specification requires that enough space be present on the system for 60 days of growth at top throughput. A typical TPC-C system will have many times over the required disk space since more disk spindles result in higher database I/O performance.

Figure 2. TPC-C Database ER Diagram



Metrics

The TPC-C benchmark measures performance and price/performance.

Performance: tpmC (Transactions-per-Minute-C):
This is the average number of new-order transactions that the system processes per minute over a minimum of a two hour period. It is important to note that only the new-order transactions (~45% of the transactions) are counted in the tpmC metric.

Price/Performance: $/tpmC:
With every TPC-C benchmark summary there is an itemized price-sheet of all of the commercial hardware and software components of the OLTP system, including 3 years' worth of 24x7/4-hour response time support. Price/performance is represented by the sum of this hardware, software and support pricing divided by the tpmC rate.

System components stressed

The TPC-C benchmark stresses most components of the database server system and is very sensitive to latency. CPU bandwidth and speed are major factors in TPC-C performance, along with the speed of the underlying system chipset. The database tables and indices benefit from large system memory (RAM) and processor cache as these components work together to reduce the latency required to fetch data for the processors. Disk I/O latency is paramount to TPC-C performance, as it is in many OLTP applications. This results in database systems attached to hundreds, sometimes thousands of disks above and beyond space requirements to reduce disk latency for random disk I/Os.

Comparing results

Comparing TPC-C results is straightforward – compare tpmC rates and price/performance scores. With these two metrics, you can compare different platforms, DBMS systems, Operating Systems, scalability of platforms and in some cases, the scalability of clustered systems.

When comparing TPC benchmark results, consider that the benchmark procedures are audited by a third-party auditor to ensure compliance with TPC rules. Once the benchmark audit is complete, the Transaction Processing Performance Council reviews the result as well.

All published TPC-C results are stored on the TPC website at http://www.tpc.org . When making comparisons, it is useful to download the shorter 3-4 page benchmark Executive Summary rather than try to wade through the more detailed Full Disclosure Report. The Executive Summary will include the tpmC rate, the price/performance, the scale of the database used (number of rows in the warehouse table), the number of users simulated for the benchmark, and a full price-sheet detailing all of the hardware and software used for the benchmark (excluding the computers and networks used to generate the user traffic).

HP ProLiant servers and blades

HP ProLiant servers and server blades have a long history of producing record results on the TPC-C benchmark. ProLiant server and server blade TPC-C benchmarks have included Microsoft Windows, Red Hat Linux, SUSE Linux and Oracle Linux operating systems, Oracle, Microsoft SQL Server and DB2 DBMS systems, Intel Xeon and AMD Opteron platforms, and both clustered and standalone systems.

Conclusion

The TPC-C benchmark is an ideal benchmark for measuring system OLTP performance. Simple metrics and an easily understandable workload using only 5 transactions and 9 database tables make it easy to use the TPC-C benchmark to compare systems, platforms, DBMS systems and Operating Systems. Benchmark results are audited by a third party to insure compliance with the TPC-C specification and are further reviewed by the Transaction Processing Performance Council. The TPC-C benchmark has a scalable workload from 1 processor to above 64 processors, making it the industry standard benchmark to measure system OLTP performance.

About the Transaction Processing Performance Council (TPC)

The TPC is a non-profit corporation founded to define transaction processing and database benchmarks and to disseminate objective, verifiable TPC performance data to the industry.

For more information

www.hp.com/products/servers/benchmarks
www.tpc.org

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