Cisco Unified Computing System and EMC VNX5300 Unified Storage Platform

Implementing an Oracle Data Warehouse Test Workload

White Paper

January 2011, Revision 1.0

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Executive Summary

Data Warehouses with very diversified and rich data details with relevance to the enterprise business have been growing rapidly both in terms of data accumulated, as well as scope of how the data is used to supporting business analytics that yield valuable business insights that can radically change and improve how the business can be conducted.

The trend of deep business analytics have changed. Because of both the volume and the diverse usage scope, previously favored approaches of carefully analyzing the data content to create efficient data querying and reporting with more limited data volume have now frequently given way to leveraging the far more economical and abundant processing power provided by the high density, multi-core Intel processors, pouring through all the data "by brute force" in parallel. Warehouses are now built around far more Data Management Systems that are Massively Parallel Processing (MPP) based. Business data is frequently partitioned, and complex queries are organized into parallel subtasks that can optimally engage as much processing resource concurrently as possible.

Cisco UCS B200 M1 and M2 Blade Servers

The Cisco UCS B200 M1 and M2 Blade Servers balance simplicity, performance, and density for production-level virtualization and other mainstream data center workloads. The servers are half-width, two-socket blade servers.

The first-generation Cisco UCS B200 M1 uses the Intel Xeon processor 5500 series and the next generation Cisco UCS B200 M2 uses the Intel Xeon 5600 processor.

Each Cisco UCS B200 server uses a CNA for consolidated access to the unified fabric. This design reduces the number of adapters, cables, and access-layer switches needed for LAN and SAN connectivity.

Figure 1. Cisco UCS B200 M1 and M2 Blade Server

Cisco UCS B250 M1 and M2 Extended Memory Blade Servers

The Cisco UCS B250 M1 and M2 Extended Memory Blade Servers use the patented Cisco Extended Memory Technology. This Cisco technology provides more than twice as much industry-standard memory (384 GB) as traditional two-socket servers, increasing performance and capacity for demanding virtualization and large-data-set workloads. Alternatively, this technology offers a more cost-effective memory footprint for less-demanding workloads.

The first-generation Cisco UCS B250 M1 uses the Intel Xeon processor 5500 series and the next generation Cisco UCS B250 M2 uses the Intel Xeon 5600 processor series.

Each Cisco UCS B250 uses two CNAs for consolidated access to the unified fabric. This design reduces the number of adapters, cables, and access-layer switches needed for LAN and SAN connectivity

Figure 2. Cisco UCS B250 M1 and M2 Extended Memory Blade Server

EMC VNX Family

The introduction of the new EMC® VNX™ family of unified storage platforms not only continues the tradition of providing one of the highest industry standards in data reliability and availability, but has factored into the design a boost in performance and bandwidth to address sustained data access bandwidth rate demanded by the new MPP based data analytic approaches. The new system design has also placed heavy emphasis on storage efficiencies, density, as well as crucial green storage factors, such as data center footprint, lower power consumption and improvement in power reporting.

EMC VNX Family: Unified Storage Platforms

The new generation of EMC unified storage, like most of the previous EMC midrange storage product generations, offers a range of choices for meeting the diversified business requirements of the enterprise, including performance, capacity and protection, at the best product total cost of ownership.

A key distinction of this generation of new products is support for both block and file based external storage access over a variety of access protocols, including Fibre Channel (FC), iSCSI, FCOE, NFS and CIFS network shared file access. Furthermore, data stored in one of these systems, whether accessed as block or file based storage objects, are managed uniformly under a single Unisphere™ web based window.

Figure 3. EMC VNX Family: Unified Storage Platforms

The EMC VNX platforms are designed for mid-tier-to-enterprise storage environments that require advanced features, flexibility, and configurability. Exponential data growth, virtualization, and an IT industry shift from a storage focus to a business focus demands storage solutions that are simple, efficient, and powerful, now available with the EMC VNX.

EMC® VNX5300™ with Oracle Data Warehouse Test Workload

An Oracle Data Warehouse (DW) test workload provided by Oracle DW engineering team to their partners to facilitate evaluation of how particular components in a total DW solution system could affect the effectiveness of the entire system was used. This provided the ability to study the effect of pairing the right EMC storage platform and configuration with Cisco UCS servers to most effectively support running typical Oracle DW workloads.

This workload is built on a point of sales data model primarily partitioned by date and sub-partitioned by hash. A series of “typical queries” are run against the data by a user stream. The elapsed time taken to finish all the queries in this stream is taken as a reference point. An “acceptable” user work stream service time is then established based on this reference point.

The test mechanism then allows multiple concurrent user streams, each executing that same series of queries, though possibly in different query request order, to be simultaneously initiated and run against the system under test. The key metrics are the number of concurrent user streams that can be run on the system under test simultaneously before the prescribed user service stream response time is exceeded.

For any system under test, the idea is that the server(s) and supporting storage(s) should be calibrated and balanced as closely as possible to sustain the processing of as many concurrent user query streams as possible.

In characterizing the performance of the new VNX platforms, the EMC and Cisco engineers assembled a new system under test configuration (with a more current and powerful Cisco UCS blade server) to match up with a

new VNX5300 storage platform, and then ran this test workload to compare the ability to scale for concurrent users. The VNX5300 was chosen based on performance, simplicity, and efficiency optimized for applications such as data warehouse workloads.

Servers are getting more compact and more powerful. To be able to provide enough IO balance, the VNX storage platform used to balance one of the newer, more compact Cisco UCS servers, would have to also be capable of delivering more sustained bandwidth in general. Furthermore, because it is possible to pack more processing power in the same server footprint, it follows that not only would the VNX platforms be able to push to a higher bandwidth envelope on each unit, but it must also be able to do so in a smaller footprint, or else the advantage of the compactness from the new server investment would be greatly diluted.

With the more powerful, Cisco UCS servers now matched to the VNX platforms, newer "optimal" system configurations have been defined and tested.

The comparison reflects the advantage expected should a site move from the previous "balanced" reference configuration to the new configuration. The advantages include a system solution that yields more power for user support, in a reduced hardware footprint, and at a significantly reduced cost.

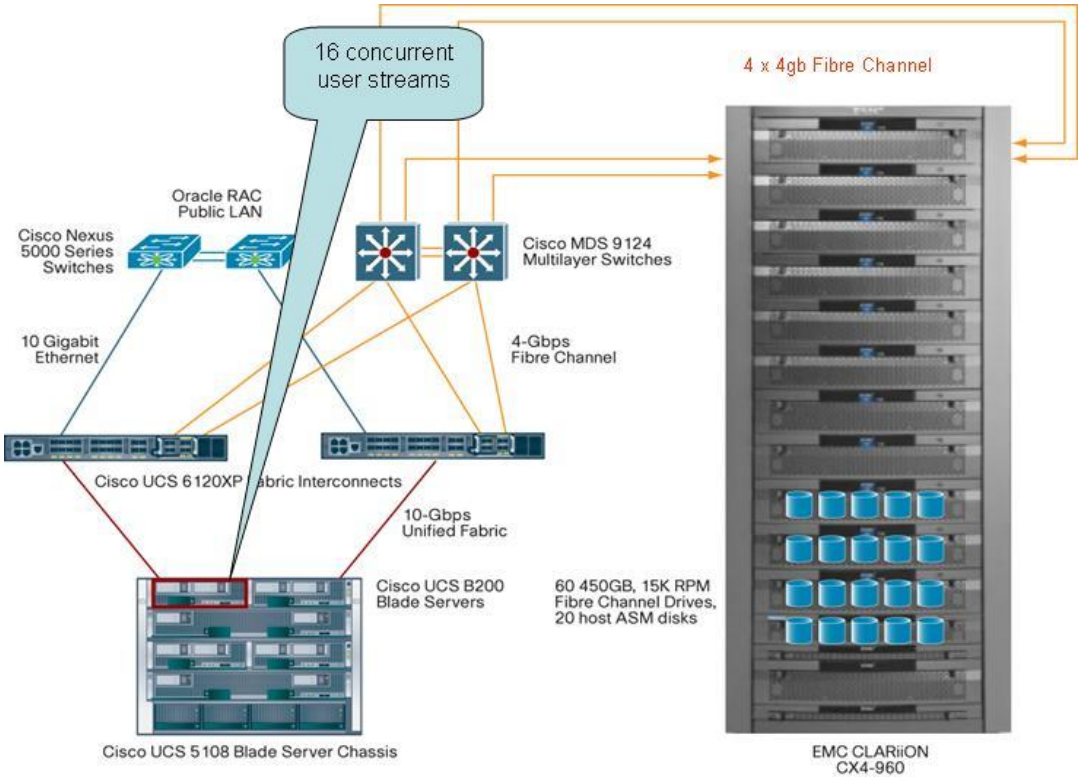
Deploying with Cisco UCS Blade Servers

Previous Reference Architecture: Cisco UCS B200 M1 Blade Server with CLARiiON CX4-960

The configuration tested together with Cisco server division and Oracle over a year ago included the following:

- Cisco UCS half-width B200 M1 blade with 4 x 4gb FC virtual HBA, 2-sockets, quad-core Nehalem processors with 48GB RAM;
- Oracle Real Application Cluster Database 11gR1;
- Oracle Enterprise Linux 5.4;
- CX4-960 with 60 total FC drives of 450GB @ 15k rpm, 3.5" form factor;
- 20 fixed LUNs of 2+1R5;
- Spread over 4 DAEs (not counting base DAE for storage vault drives and hot spares);
- 6TB of test data stored 50% compressed;
- Total of 12U SAN storage footprint for the four DAEs holding the test data

Figure 4. Cisco UCS Blade Servers Using Oracle Deployment with EMC CX4-960

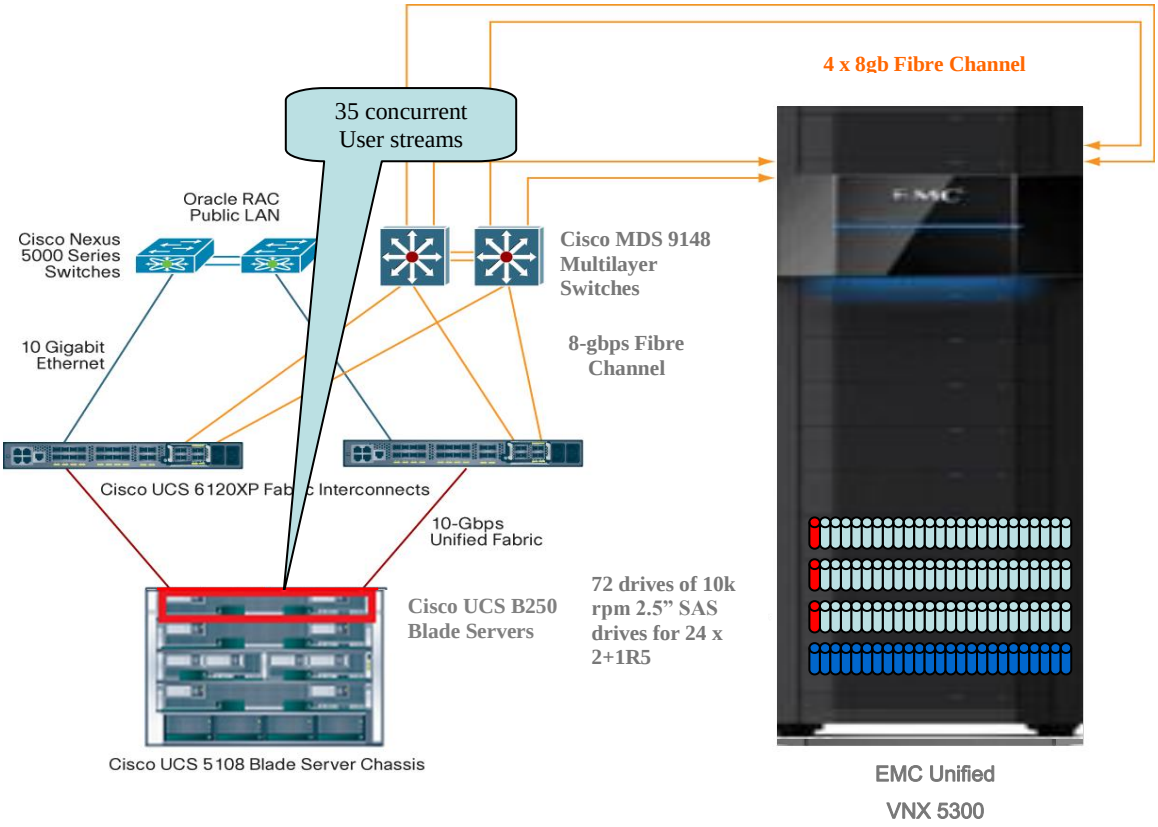


New Reference Architecture: Cisco UCS B250 M2 Blade Server with EMC VNX5300

The new configuration tested with a VNX5300 included:

- Cisco UCS full width B250 M2 Westmere blade with 2-sockets, hex-cores, 196GB RAM, with 8 x 8gb virtual HBAs;
- Oracle Real Application Cluster Database 11gR2;
- Oracle Enterprise Linux 5.5;
- VNX5300 with 72 SAS drives of 600GB @ 10k rpm, 2.5” form factor;
- 24 fixed LUNs of 2+1R5;
- Spread over 3 DAEs (not counting base DAE for vault drives and hot spares);
- 6TB of test data stored 50% compressed;
- Total of 6U SAN storage footprint for the three DAEs holding the test data

Figure 5. Cisco UCS B250 M2 Blade Server Using VNX with 24 Fixed LUNs



Comparison Results

Comparing the new full width blade deployment against the previously tested configuration, the new system delivers:

- More than twice the concurrent supported user streams (35 versus 16);
- Fully uses the added power of the full width Westmere blade, plus the big memory supported by the blade;
- Uses the new UCS support for 8gb FC uplink connections to drive the higher sustainable read bandwidth from the VNX 5300;
- Better space and power utilization: 4 DAEs and a total of 10U of storage space footprint in the VNX5300 compared to 19U of storage space for the 5 DAEs and the CX4-960 SPs and battery;
- Lower total system hardware cost

Conclusion

Prominent DBMS vendors have been stressing the importance for storage systems to continue to improve and innovate to satisfy the following:

- Higher sustained MB/s read/write bandwidth from the storage system
- More MB/s per drive (reducing the number of drives required)
- Increased storage density and performance per storage footprint (MB/s bandwidth per storage U form factor achievable)
- Higher usable storage capacity
- Ease of storage configuration, deployment and calibration for proper server/storage balance
- Lower overall system cost

The combination of the new VNX storage matched to the new Cisco UCS B-Series blade servers offers a major deployment platform boost that is urgently needed to contend with the rapid increase in data volume and processing demand for most of the new strategic DW projects that few enterprises can afford to delay, given today's highly competitive global business environment.

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Document number: UCS-TR100027