BROCADE

DATA CENTER

Accelerating Oracle Databases with EMC Symmetrix V-Max Flash Drives and Brocade Connectivity

Solution Benefits:

- Ability to implement a Tier 0 storage layer capable of delivering very high I/O performance at very low latency
- Ability to dramatically improve Oracle OLTP throughput and maintain very low response times
- Seamless interoperability and Brocade advanced networking features via Brocade 8 Gbps Fiber Channel Connectivity

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THE CHALLENGE

In the drive to accomplish more with less time and fewer resources, achieving better performance, scalability, and response times have continued to be the challenge for companies seeking to optimize information access and delivery to their corporate databases.

With the availability of the EMC® Enterprise Flash Drives (EFD) for the EMC Symmetrix V-Max storage array and Brocade® 8 Gigabits per second (Gbps) Storage Area Network (SAN) products and advanced network capabilities, customers can now implement solutions with shared access to Oracle® databases running on flash drives to deliver millisecond response times and up to 20x greater I/O Operations Per Second (IOPS).

THE SOLUTION

By coupling the EMC Symmetrix V-Max with Brocade 8 Gigabits per second (Gbps) backbones, directors, and switches and Host Bus Adapters (HBAs), customers can take advantage immediately of the latest generation of disk drive technologies using high-performance, highly reliable storage area networking to access flash drives and FC disks.

As the flash drives are accessed using the standard Fibre Channel (FC) interfaces, the drives look like a standard FC disk allowing Brocade advanced networking features to be used and enabling the administrator to use all the standard management and administration tools available for an FC storage array. In addition, flash drives benefit from the advanced capabilities that Symmetrix provides, including local and remote replication, cache partitioning, and priority controls.

The enterprise flash solution allows database and application managers to improve the performance of their applications, which can directly increase business revenue and productivity. For these applications, two important benefits can be realized:

- A single flash drive can replace many short-stroked drives by its ability to provide very high transaction rates (IOPS). This reduces the total number of drives needed for the application, increases power saving by not having to keep many spinning disks, and eventually means reduced floor space in the data center.
- Flash drives provide very low latency, so applications for which a predicable low response time is critical and not all the data can be kept at the host or Symmetrix cache will greatly benefit from these drives. Because no rotating media exists in EFDs, their transfer rate is extremely high and data is served much faster than the best response time that can be achieved with short stroked hard disks.

ENTERPRISE FLASH DRIVE STRATEGIES

In summary, the EMC/Brocade solution provides a database and application manager the following enterprise EFD strategies:

- Place the entire database on EFDs when database performance is tied directly to business revenue.
- Place a portion of the database on EFDs as a storage Tier 0. Carefully identify the busiest portion that could benefit the most from EFDs based on joint EMC and Oracle guidelines. Examples are tablespaces, materialized views, indices, or temp.
- Place the active database partitions on EFDs with an Information Lifecycle Management (ILM) strategy in mind. As they get less active, migrate them to Tier 1, 2, or 3 storage, making room for the new active partitions on the EFDs.

In general, EFDs benefit random-read workloads the most and can easily be positioned for OnLine Transaction Processing (OLTP) applications. However, many Decision Support System (DSS) workloads also benefit, as they tend to become random by the time they reach the storage (due to multiple layers of

striping and high query concurrency). Pure sequential workloads benefit as well, although to a lesser degree than random workloads.

NOTE: By default Oracle ASM stripes the data everywhere and makes any workload random.

By improving the performance of the busiest database components, it is likely that the performance of the rest of the database will also improve as the HDDs are less busy and can perform better.

Remember that disks are not always the bottleneck and the overall performance benefits are in proportion to the time Oracle was waiting to serve I/O. However, almost any workload will benefit from EFDs. Ensure that there is enough CPU power, connectivity, and I/O concurrency to benefit from the new Tier 0 capabilities.

SOLUTION COMPONENTS

Oracle Database

Oracle Database 11*g* Enterprise Edition delivers industry-leading performance, scalability, security, and reliability on a choice of clustered or single servers running Windows, Linux, and UNIX. It provides comprehensive features to easily manage the most demanding transaction processing, business intelligence, and content management applications.

Oracle Database 11g offers innovation that enables organizations to adapt faster. Burdened by the high costs traditionally associated with changing business requirements, organizations can look to Oracle Database 11g for innovation that enables IT change in a controlled, cost-efficient manner.

EMC Symmetrix V-Max

The Symmetrix V-Max system is a high-end, scalable storage array comprising a system bay and separate storage bays. The system scales from a single high availability (HA) node configuration to an eight-node configuration and a maximum of 10 storage bays. Online system upgrades are achieved by adding HA nodes. Each HA node contains two integrated director boards with multi-core CPU processing power, cache memory, front-end ports, and back-end ports.

The Symmetrix V-Max presents a simplified, modular hardware design that is available in two models, the entry point Symmetrix V-Max SE Series with Enginuity™, and the high-end, scalable Symmetrix V-Max system. Both systems support host connectivity to IBM mainframes, System i, and open system hosts over HDD, FICON, iSCSI and Gigabit Ethernet. Symmetrix V-Max Enginuity software provides many enhancements to the Symmetrix feature portfolio such as Symmetrix Remote Data Facility (SRDF), TimeFinder, and others. For example, SRDF enhances support to two-site DR solutions over extended distances with zero or near zero data loss. In this configuration the storage cache alone is used on the intermediate site for a temporary pass-through data store of the modified tracks before copying them over to the tertiary site.

The Symmetrix V-Max system's back-end design includes expandable storage capacity (drive enclosures and bays), with support for 1 TB SATA drives, 10k rpm and 15k rpm HDD drives, and 200 / 400 GB enterprise Flash drives.

Enterprise Flash Drives

With the introduction of the Symmetrix V-Max running Enginuity 5773, EMC now supports enterprise flash drives (EFDs). Enterprise flash drives are constructed with nonvolatile semiconductor NAND flash memory and are packaged in a standard 3.5-inch disk drive form factor used in existing Symmetrix V-MAX drive array enclosures. These drives are especially well suited for low-latency applications that require consistently low read/write response times. These drives exhibit as much as 30x improvement in IOPS over 15k rpm HDD technology.

EFDs can be leveraged with the advanced capabilities that Symmetrix provides, including local and remote replication, cache partitioning, and priority controls.

Brocade DCX Backbone and Brocade 5300 and 5100 Switches

Brocade has the largest installed base of networked storage infrastructure supporting Oracle applications running in thousands of Brocade production environments worldwide. Today, there are more than 13 million Brocade SAN ports in data centers, representing approximately 75 percent of the overall networked storage market.

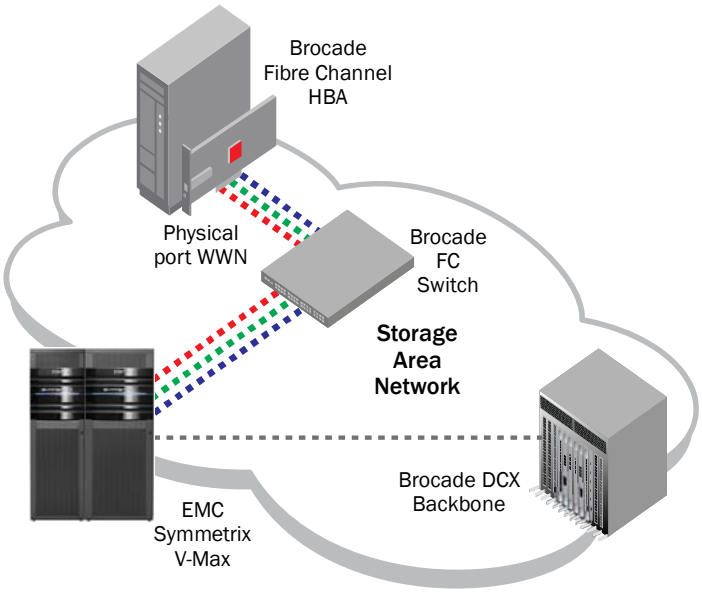

Figure 3. Brocade data center fabric with Adaptive Networking Quality of Service (QoS)

The Brocade DCX Backbone , shown in Figure 3, is available in two modular form factors. Built for large enterprise networks, the 14U Brocade DCX has eight vertical blade slots to provide up to 384 Fibre Channel ports using Brocade-branded 4 Gbps or 8 Gbps SFPs. Built for midsize networks, the 8U Brocade DCX-4S has four horizontal blade slots to provide up to 192 Fibre Channel ports.

Both the Brocade 5100 and 5300 Switches support 1, 2, 4, and 8 Gbps technology in efficient 1U and 2U designs respectively. The Brocade 5100, shown in Figure 3, is available in of 24-, 32-, or 40-port configurations and the Brocade 5300 in 48-, 64-, or 80-port configurations. The combination of port density, performance, and "pay-as-you-grow" scalability enables higher throughput and greater storage utilization, while reducing complexity for virtualized data centers. The evolutionary design makes it very efficient with regards to power consumption, cooling, and rack density—enabling medium- and large-scale server and storage consolidation for greater cost savings, better price/performance, and manageability. Compared to competitive SAN switches, Brocade provides greater power efficiency; more effective rack consolidation, and a significantly lower carbon footprint.

Brocade SAN switches feature a non-blocking architecture with ports concurrently active at 8 Gbps (full duplex) with no over-subscription. This level of performance and connectivity is ideal for expanding virtual server environments. In addition, enhanced Inter-Switch Link (ISL) Trunking can supply up to 64 Gbps of balanced data throughput in a single logical link.

Brocade DCX Backbone and Brocade 5300 and 5100 Switches offer Top Talkers (Advanced Performance Monitoring) and Adaptive Networking services, a suite of tools that includes Ingress Rate Limiting (IRL), Traffic Isolation (TI), and Quality of Service (QoS). These advanced capabilities help optimize fabric utilization and allocate ample bandwidth for mission-critical Oracle applications. Providing maximum flexibility, both products have Integrated Routing (IR) capabilities to connect switches across fabrics. Also, Virtual Fabrics enables the partitioning of a physical SAN into Logical Fabrics. This provides fabric isolation based on applications, business groups, customers, or traffic types without sacrificing performance, scalability, security, or reliability.

Brocade switches utilize cost-effective management solutions to optimize storage network resources, improve efficiency, and reduce Total Cost of Ownership (TCO). The Brocade EZSwitchSetup wizard is designed to simplify deployment. For multi-switch environments, Brocade Data Center Fabric Manager (DCFM™) Professional streamlines management and provides fabric-wide monitoring capabilities.

Brocade 815 and 825 Fibre Channel HBAs

The Brocade 815 (single-port) and Brocade 825 (dual-port) FC HBAs lay the foundation for extending fabric intelligence to servers, virtual machines, applications, and services—providing end-to-end storage network management. This approach enables tighter integration across the enterprise, including both physical and virtual networks.

By installing Brocade HBAs, organizations have a foundation to leverage N_Port ID Virtualization (NPIV) and maintain QoS from the virtual port throughout the fabric. And to reduce administrative workload, they can automate the SAN boot process to quickly deploy diskless servers and operating systems.

From SAN switches and directors to Host Bus Adapters (HBAs) and fabric management software, Brocade provides industry-leading SAN solutions for the largest, fastest, and most efficient Oracle installations.

SUMMARY

Magnetic disk drive technology no longer defines the performance boundaries for mission-critical storage environments. The combination of EMC, Oracle, and Brocade products creates an enterprise solution that offers a tier 0 storage layer capable of delivering very high I/O performance at very low latency, which can dramatically improve OLTP throughput and maintain very low response times.

LEARN MORE

Brocade partners with companies of all sizes to deliver innovative solutions that help organizations maximize the value of their most critical information. To learn more, visit www.brocade.com/alliance.

About Brocade

Brocade connects the world's most important information—delivering proven networking solutions for today's most data-intensive organizations. From the data center to high-performance Ethernet networks, Brocade is extending its near-15-year heritage as a leading partner for advanced storage and networking solutions.

The innovative Brocade approach to networking facilitates strategic partnerships by providing:

- Standards-based solutions that streamline qualification and help ensure interoperability
- Leading-edge technology that enables comprehensive, best-in-class solutions
- The best alternative choice in terms of overall business value

The world's largest enterprise networks, government entities, and global service providers rely on Brocade to maximize the business return on their data. It's no wonder 90 percent of the world's most critical business information flows through Brocade solutions. Quite simply, Brocade enables today's complex businesses to run. Where other vendors produce networking that's ordinary, Brocade is committed to delivering the extraordinary.

About EMC

EMC Corporation (NYSE: EMC) is the world's leading developer and provider of information infrastructure technology and solutions that enable organizations of all sizes to transform the way they compete and create value from their information. Information about EMC's products and services can be found at www.EMC.com.

About Oracle

Oracle (NASDAQ: ORCL) is the world's largest business software company. For more information about Oracle, please visit our Web site at http://www.oracle.com.