IBM i
SAN Functionality & Beyond!

**Symmetrix VMAX**

**Data Domain DD800 Appliance Series**

**Power Systems**
April 26, 2010 – EMC Corporation today announced the extension and expansion of a technology licensing agreement with IBM that provides EMC with certain interfaces for storage interoperability and technical support for the IBM i operating environment. The agreement was extended to 2016 and will allow customers to continue to deploy combinations of EMC storage and IBM Power Systems technologies.

- EMC has a defined relationship and interaction with System i engineering
- EMC has ‘digital signatures’ from IBM for any interaction with the base O/S
- EMC is part of the early release hardware program to qualify prior to GA from IBM
- EMC is part of the early release software program to qualify prior to GA from IBM

There is also a cooperative support agreement for all IBM host environments

- This approach provides clearly defined escalation flow for any on site problems
- TSAnet call flow has been defined for both companies usage
- This is designed to remove any friction at mutual customer locations
- Predefined contacts for problem resolution
EMC References in the System i market

EMC has a large install base across diverse vertical markets
Including some of the largest System i shops in the world…
Features and Hardware Connectivity
IBM Internal Disk Options Today

IBM has announced End of Sales Life!
August 2009 for Internal SCSI Disk

• IBM continues to sell and install internal disk solutions
  – Today this would be SAS based and have the same issue as the SCSI disk

  ➢ One of the major challenges to this is the size of the physical disk
    ➢ The smallest disk you can buy today is 300GB so your current storage profile may grow 2x, 3x or more just to maintain the correct disk arm count for performance in a single level storage environment

  ➢ Yes, large amounts of cache is available for the internal raid controllers
    ➢ But these have exposed many customers to cache module failures causing down time, or the loss of concurrent maintenance (Adaptive Assist feature)
    ➢ DRT or disk response times look great BUT application response suffers as the average I/O operations per disk have increased dramatically

  ➢ We have seen several different customers grow from 6TB to 25 TB with internal disk just to manage the arm count issue.
SAN Storage Options

Today

• With a SAN storage solution this problem does not exist!

  ➢ We can create logical volumes from the physical disk to maintain current capacity while providing the correct number of “disk arms” at the host to influence performance
    ➢ This has been our practice for years with many happy customers to reference
    ➢ Meta Volume technique allows multiple physical arms to service each logical volume

  ➢ Today, growth of information finds the average IBM System i is 25TB or more across multiple servers or partitions
    ➢ Tiered storage options can help reduce cost for the customer
    ➢ Enhanced backup solutions become available with SAN replication features (TimeFinder)

  ➢ SAN storage solutions allow you to maintain capacity while enhancing performance
EMC VMAX External Storage

SSD or Flash
- 200 GB
- 400 GB

Logical
- 17.5 GB
- 35.1 GB
- 70.5 GB
- 141 GB
- 282 GB

Physical
- 146-15K
- 300-15K
- 450-15K
- 600-15K
- 2TB SATA

Symmetrix VMAX

Allocate storage for each required use
- Tier 0 – EFD (SSD)
- Tier 1 – FC 15K disk
- Tier 2 – FC 15k disk high capacity
- Tier 3 – SATA disk archival
## Key differences – IOP-based Vs. Smart IOA

<table>
<thead>
<tr>
<th>Function</th>
<th>IOP-based</th>
<th>Smart IOA</th>
</tr>
</thead>
<tbody>
<tr>
<td>System i Support</td>
<td>All models (2847 req. POWER5 or later)</td>
<td>Power5 &amp; Power6</td>
</tr>
<tr>
<td>A/B mode IPL (boot from SAN)</td>
<td>Yes (with 2847 IOP only)</td>
<td>Yes</td>
</tr>
<tr>
<td>D mode IPL (from tape)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Direct-Attached protocol</td>
<td>FC-AL or FC-SW (FC-SW only for boot from SAN)</td>
<td>FC-AL</td>
</tr>
<tr>
<td>Disk LUNs per port</td>
<td>32</td>
<td>64</td>
</tr>
<tr>
<td>Max. Concurrent I/O’s</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>ESS (2105) Support</td>
<td>Yes (#2847 Supports ESS model 800 only)</td>
<td>No</td>
</tr>
<tr>
<td>DS6000 Support</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>DS8000 Support</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Multipath Load Source</td>
<td>Yes (with i6.1) *</td>
<td>Yes (with i6.1)</td>
</tr>
</tbody>
</table>

*Note: Multipath for load source is dependant on i6.1 and not the hardware*
IBM Boot From SAN
Option for load source on SAN reduces front end connections
Best Practices POWER5 with i5/OS

- EMC Preferred Setup
  - Improve hardware availability
  - Eliminate “Single Points Of Failure”
  - IBM 2847 Boot from SAN
  - Dynamic Multipath (DMP)
  - Load Source Mirroring - 2x #2847 IOP
IBM Multipath including the Load Source
With POWER6 hardware and i6.1 OS you can now define the load source as one of the data drives, so it is no longer a dedicated device
Best Practices POWER6 with i6.1

- EMC Preferred Setup
  - Improve Availability / Eliminate SPOFs
    - Smart IOA
    - Reduced footprint at the host side
  - Dynamic Multipath (DMP)

Symmetrix VMAX

Min. i6.1 OS

Max. 128 LUNs

Switch

#5749 IOA

Switch

#5749 IOA
Leverage VMAX multi controller and scale-out Architecture

A high-availability Symmetrix director pair (VMAX Engine) provides the base configuration

Virtual Matrix architecture enables CPU, memory, disks, and host ports to be shared across all directors

Additional Symmetrix director pairs can be added to scale-out system resources
VMAX Functionality at a Glance

Innovation, availability, compatibility, performance and reliability

Replication Solutions
- TimeFinder
- SRDF
- Combinations/Variations

Symmetrix Performance
- Tier 0, 1, 2, 3
- High performance enterprise Flash drives

Ease-of-Use – Storage and Replication Management
- Symmetrix Management Console (SMC)
- SRDF/TimeFinder Manager (STM)

Symmetrix Reliability and Scalability
- World’s #1 trusted platform
- World’s first scale-out enterprise storage array

Host Integration
- Support IOP-less architecture
- Boot from SAN Qualified
- iASP
- PowerVM - Virtual I/O Server Connectivity

VMAX offers the Best
- Scalability
- Performance
- Functionality

for System i environments
Today with PowerVM you can use CLARiiON SAN solutions

- IBM has provided a virtual storage interface that enables the use of 512 FBA storage with the IBM i OS version i6.1 and newer.
  - This solution allows small or mid size Power 6 servers as well as Blade servers to use the CX SAN solution for moderate to low I/O workloads

- Today with the growth of information the average IBM System i customer is trying to store and manage 20TB or more across multiple servers or partitions
Questions?
Replication Solutions
TimeFinder Family of Solutions with Next-Generation Symmetrix System

Industry Leading Local Replication

- Highly integrated with all industry leading applications including
  - Oracle
  - Microsoft
  - VMware
  - SAP
- Highly recommend with SRDF to enhance application availability for disaster restart requirements
- Overall best functionality when compared to other major array based local replication products
- Tens of thousands of licenses shipped

Most breadth and depth for array based local replication
TimeFinder/Clone Overview
IBM i Specific Options

• High-performance full-volume copies
  – Volume level
• RAID protected
  – RAID 1, RAID 5, and RAID 6
• Up to 10 copies of a production volume
  – Immediately readable and writeable
• Immediate host access during restore
  – Immediate application restart with access to data

[Diagram showing Production Volume, Clone 1, Clone 2, Clone 3 with arrows for Backup/restore, Data warehousing, Application testing]
System i Backup with TimeFinder

**Features**
- Backups run independent of Production systems
- Maximize application availability
- Provides test copies of Production data

**Requirements**
- Requires all Prod data to be part of the BCV image, including Load Source
  - Production taken to restricted state
  - Hold active jobs to split BCV
  - Split While Active
- Backups run on secondary server or LPAR to complete the backup

**Source Host Commands:**
1. Three options for host actions to split (See Requirements)
2. Split BCV’s
3. Restart Prod (depending on option used)
4. Resynch BCV’s (When backup is complete)

**Backup Commands:**
1. Save User Objects/Libraries
2. TimeFinder BCV Copy
3. PROD Source
4. PROD BCV
5. Target System i
6. VMAX SE
7. TAPE
EMC Symmetrix Remote Data Facility (SRDF)

Industry-Leading Remote Replication

- Protects against local and regional disruptions
- Increases application availability by reducing downtime
- Minimizes/eliminates performance impact on applications and hosts
- Independent of hosts and operating systems, applications, and databases
- Improves recovery point and recovery time objectives (RPOs and RTOs) with automated restart solutions
- Mission-critical proven with numerous testimonials and references
- Tens of thousands of licenses shipped

**SRDF Family**

- **SRDF/S**
  - Synchronous for zero data exposure
- **SRDF/A**
  - Asynchronous for extended distances
- **SRDF/DM**
  - Efficient Symmetrix-to-Symmetrix data mobility

**SRDF/Star**
- Multi-site replication option

**SRDF/CE**
- Cluster Enabler option

**SRDF/AR**
- Automated Replication option

**SRDF/CG**
- Consistency Groups

**SRDF/DM**
- Efficient Symmetrix-to-Symmetrix data mobility

Cascaded SRDF and SRDF/EDP
- Extended Distance Protection

Concurrent SRDF
- Concurrent

EMC offers choice and flexibility to meet any service-level requirement
SRDF: Deployment Options to Fit Your Needs

The World’s Most- Trusted Remote Replication Solution

SRDF/Synchronous
- No data exposure
- Limited distance
- Supports higher-tier applications
- Consistency Group – Ensures dependent-write consistency of the data remotely mirrored by SRDF

SRDF/Asynchronous
- Seconds of data exposure
- Unlimited distance
- Supports multiple application tiers
- Consistency Group - Ensures dependent-write consistency of the data remotely mirrored by SRDF
SRDF/Synchronous Mode Operations

1. I/O write received from host/server into source cache
2. I/O is transmitted to target cache
3. Receipt acknowledgment is provided by target back to cache of source
4. Ending status is presented to host/server
SRDF/A Operation

1. Capture
2. Transmit
3. Receive
4. Apply

Asynchronous Mode

SRDF/A performs “Write Folding”—only sends Transmits of the final writes from the Capture Delta Set
SRDF Family Multi-Site Protection Options

SRDF Family Addresses the Broadest Range of Replication Use Case

**Concurrent SRDF**
Multi-site protection leveraging a single source and concurrently replicating to two remote sites

- **Near Site**
- **Far Site**
- **Source**

**Cascaded SRDF**
Multi-site protection SRDF/S between Source and Near Site; SRDF/A between Near Site and Far Site
Eliminates need for BCV cycling at Near Site; improves recovery-point objectives at Far Site

- **Near Site**
- **Far Site**
- **Source**

**SRDF/Star**
Multi-site protection
Includes SRDF/A link between two remote sites to continue protection if a site fails
Can be configured either concurrent or cascaded

- **Near Site**
- **Far Site**
- **Source**
Questions?
EMC Data Domain Virtual Tape Library Support for IBM i Environments

- Fastest backup throughput for IBM i
  - Up to 8.1 TB/hr
- Broad scalability
  - 75 TB to 14.2 PB logical capacity
- Seamless integration for IBM i and open systems environments
  - IBM BRMS support
    - Backup Recovery and Media Services
  - IBM Power Systems 5, 6, 7
  - IBM i 5.4, i6.1
  - TS3500 Tape Library Emulation
- Network-efficient disaster recovery
## Industry’s Most Scalable Inline Deduplication Systems

<table>
<thead>
<tr>
<th></th>
<th>DD140</th>
<th>DD610</th>
<th>DD630</th>
<th>DD670</th>
<th>DD860</th>
<th>DD890</th>
<th>Global Deduplication Array</th>
<th>DD Archiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (DD Boost)</td>
<td>490 GB/hr</td>
<td>1.3 TB/hr</td>
<td>2.1 TB/hr</td>
<td>5.4 TB/hr</td>
<td>9.8 TB/hr</td>
<td>14.7 TB/hr</td>
<td>26.3 TB/hr</td>
<td>9.8 TB/hr</td>
</tr>
<tr>
<td>Speed (other)</td>
<td>450 GB/hr</td>
<td>675 GB/hr</td>
<td>1.1 TB/hr</td>
<td>3.6 TB/hr</td>
<td>5.1 TB/hr</td>
<td>8.1 TB/hr</td>
<td>10.7 TB/hr</td>
<td>4.3 TB/hr</td>
</tr>
<tr>
<td>Logical capacity</td>
<td>9–43 TB</td>
<td>40–195 TB</td>
<td>84–420 TB</td>
<td>0.6–2.7 PB</td>
<td>1.4–7.1 PB</td>
<td>2.9–14.2 PB</td>
<td>5.7–28.5 PB</td>
<td>5.7–28.5 PB</td>
</tr>
<tr>
<td>Raw capacity</td>
<td>1.5 TB</td>
<td>Up to 6 TB</td>
<td>Up to 12 TB</td>
<td>Up to 76 TB</td>
<td>Up to 192 TB</td>
<td>Up to 384 TB</td>
<td>Up to 768 TB</td>
<td>Up to 768 TB</td>
</tr>
<tr>
<td>Usable capacity</td>
<td>0.86 TB</td>
<td>Up to 3.98 TB</td>
<td>Up to 8.4 TB</td>
<td>Up to 55.9 TB</td>
<td>Up to 142 TB</td>
<td>Up to 285 TB</td>
<td>Up to 570 TB</td>
<td>Up to 570 TB</td>
</tr>
</tbody>
</table>

Software options: DD Boost, DD Virtual Tape Library, DD Replicator, DD Retention Lock, and DD Encryption
Solution Overview - Example

- Data Domain system is FC SAN connected to IBM i server
- IBM i sees the Data Domain VTL the same as it does with a physical tape library
- Data Deduplicated at primary site and replicated to the D/R site
- Encrypted Data in flight during replication
- Weekly & Monthly tape out at DR Site
System i Global Practice

Dedicated team of System i experts
Host specific domain knowledge

Pre-sales
Performance analysis
Configuration/architecture assistance
Technical resource
POCs/demos

Post-sales
Installations
Solution implementation
Script customization

Solutions
SAN storage
Replication – local/remote (DR)
Tape replacement - VTL
EMC Professional Services for IBM i

IBM i host specific services

- Host hardware knowledge for review and guidance during the sale
- SAN and switch configuration and zoning
- BC & DR Automation (SymCLI & CL)
- Migration Planning and Implementation
- Performance Analysis – Presales and Post sales
- Consolidation and Data Center Migration Planning and Implementation
- Centera Implementation with Custom Scripting
- VTL Implementation & Backup Automation – Data Domain