Embedded processing with iRODS and SFA10KE

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DataDirect NETWORKS
## Key Statistics

- Delivers highly scalable and highly efficient storage solutions that enable customers to accelerate time to results, scale simply as data sets continue to grow, and gain competitive advantage through resolving performance and capability scaling challenges
- **Established:** 1998
- **Financials:** Over $200M Annually, Profitable and Growing
- **Headquarters:** Chatsworth, California USA
- **Employees:** Approximately 400 Worldwide
- **Customers:** Over 1,000 Worldwide
- **Footprint:** 17 Industries, 4 Continents, 49 Countries
- **Go to Market:** Global Partners, VARs, Resellers
- **Key Market Segments:**
  - High Performance Computing & Life Science
  - Cloud & Web Content
  - Rich Media
  - Intelligence/Federal
  - Surveillance

## Industry Validation

- World’s Largest Privately-Held Storage Co.
- Fast500 Technology Company
- Inc. 500|5000 High-Growth Company
- Best HPC Storage Platforms
- Best Practice for Digital Media

1000+ World-Leading Customers

- Boeing
- Airbus
- Microsoft
- Oracle
- General Dynamics
- IBM
- Total
- Oak Ridge National Laboratory
- photobux
- boeing
- Mediaset
- yousendit
What is ‘Embedded Processing’?
And why?

• Do data intensive processing as ‘close’ to the storage as possible.
  • Bring computing to the data instead of bringing data to computing
  • HADOOP is an example of this approach.

• Why Embedded Processing?
  • Moving data is a lot of work
  • A lot of infrastructure needed

- Client sends a request to storage (red ball)
- But what we really want is:
- Storage responds with data (blue ball)

• So how do we do that?
Storage Fusion Architecture (SFA)

- Interface Virtualization
- Interface processor
- Interface processor
- Interface processor
- Interface processor
- System memory
- RAID Processors
- High-Speed Cache
- Cache Link
- Internal SAS Switching

8 x IB QDR or 16 x FC8 Host Ports

RAID Processors

RAID 5,6

RAID 6

Up to 1,200 disks in an SFA 10K
Or 1,680 disks in an SFA 12K
Repurposing Interface Processors

• In the block based SFA10K platform, the IF processors are responsible for mapping Virtual Disks to LUNs on FC or IB

• In the SFA10KE platform the IF processors are running VMs
• The OS running on those VMs uses a driver to access the RAID processors directly
• RAID processors place data (or use data) directly in the VM’s memory
• One hop from disk to VM’s memory

• Now the storage is no longer a block device
• It is a storage appliance with processing capabilities
One SFA-10KE controller

- 8 x IB QDR/10GbE Host Ports (No Fibre Channel)
- Interface Virtualization
  - Virtual Machine
  - Virtual Machine
  - Virtual Machine
  - Virtual Machine
- System memory
- RAID Processors
  - High-Speed Cache
  - Cache Link
- Internal SAS Switching
Example configuration

• Now we can put iRODS inside the RAID controllers
  • This gives iRODS the fastest access to the storage because it doesn’t have to go onto the network to access a fileserver. It lives inside the fileserver.

• We can put the iCAT on a separate VM with lots of memory and SSDs for DB storage

• Either use all VMs for iRODS or add a parallel filesystem such as GPFS for fast scratch

• The filesystem uses SAS for frequent used files and SATA for the rest

• The following example is a mix of iRODS with GPFS
  • The same filesystem is also visible from an external compute cluster via GPFS running on the remaining VMs

• This is only one controller, the 4 VMs on the other controller need some work too
  • They see the same storage and can access it at the same speed.

• On the SFA-12K we will have 16 VM’s available running on Intel Sandy Bridge processors. (available Q3 2012)
Example configuration

- **RAID Processors**
- **Internal SAS Switching**
- **System memory**
- **8x 10GbE Host Ports**
- **Interface Virtualization**
  - **Virtual Machine**: Linux
    - SFA Driver
    - 16 GB memory allocated
  - **Virtual Machine**: Linux
    - SFA Driver
    - 8 GB memory allocated
  - **Virtual Machine**: Linux
    - GPFS SFA Driver
    - 8GB memory allocated
  - **Virtual Machine**: Linux
    - GPFS SFA Driver
    - 8GB memory allocated
  - **Virtual Machine**: Linux
    - GPFS SFA Driver
    - 8GB memory allocated

- **RAID sets with 2TB SSD**
- **RAID sets with 300TB SATA**
- **RAID sets with 30TB SAS**

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Running Micro Services inside the controller

• Since iRODS runs inside the controller we now can run iRODS MicroServices right on top of the storage.
• The storage has become an iRODS appliance ‘speaking’ iRODS natively.
• We could create ‘hot’ directories that kick off processing depending on the type of incoming data.
An iRODS rule requires that a copy of the data is sent to a remote iRODS server.

All of this happened because of a few rules in iRODS that triggered on the incoming data. In other words, the incoming data drives the processing.

After the conversion another MicroService submits a processing job on the cluster to process the uploaded and pre-processed data. Here is a configuration with iRODS for datamanagement and GridScaler for fast scratch space. Data can come in from clients or devices such as sequencers.

Registering the data with iRODS...
Thank you!

Questions??

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