Designing Storage Architectures for Preservation Collections

Designing for Large Scale

Dave Fellinger, Chief Scientist
dfellinger@ddn.com
26 September 2011

DataDirect™
N E T W O R K S
I N F O R M A T I O N   I N   M O T I O N™

Storage Technology

The Good News

- Disk drives have progressed from 1TB to 4TB in 3 years.

- SATA Bus transfer rates have gone from 300MB/s to 600MB/s.

- SATA drives still operate within the 10W range.

The Bad News

- Average building block sizes are still 12 to 24 drives in a server.

- Motherboards capable of high speed data service are in the 400W-600W range.

Building Block Size

If each building block is efficient will the system be efficient?

- Let's move 60 people from point A to point B using Smart Cars

- If each car gets 40M/G the resultant motorcade gets 0.67M/G

- A better choice is a bus even if it gets less than 10M/G

Let's build a storage system with 1200 disk drives

- We can use 50 servers with 24 drives each

  - We need 30kW just for the motherboards without considering power supply efficiency

  - The drives consume 12kW so the total is 42kW

A better choice is a bigger building block

- A dedicated dual control system running efficient state machine code can control the entire access with less than 500W added for switching

- The total is 12kW+1.2KW+500W=13.7KW

DataDirect
N E T W O R K S
INFORMATION IN MOTION

Architect for the Use Case

The 50 Server System

- Data service at 100GB/s peak 50GB/s with data recovery.
- CPU to storage ratio allows for map reduce applications.
- Distributed management and external switching.

The Dedicated Data Service Module

- Data service at 40GB/s.
- High degree of efficiency since internal data channels are less than 2W each.
- High level of consistency due to aggregation.
- Highly simplified and centralized management.
- Increased MTBF.
- 50% reduction in space requirements.
- Dynamically manageable power conservation control.
- Centralized service channels allowing on the fly data reduction.

DataDirect
N E T W O R K S
INFORMATION IN MOTION

Summary

Build with "right-sized" blocks.

- Balancing the requirements of availability, capacity, and bandwidth with the constraints of space, power, and cooling is non-trivial.

- The decision of CPU utilization per storage unit is crucial in considering a power budget.

- Select storage elements based upon usage;
    - Solid state storage for metadata and indexing
    - High speed rotating media for data mining and processing
    - Lower speed rotating media for general service

The system size and use should dictate the scale and flexibility of the incremental module.

DataDirect
N E T W O R K S
INFORMATION IN MOTION

Thank You

Questions?

DataDirect™
N E T W O R K S
INFORMATION IN MOTION™