OSD:
A Drive Perspective

Dave Anderson
Seagate Technology
What’s Needed: (20th anniversary of GUIDE GPP-106)

1. An Evolutionary Revolution
2. Productivity of personnel must exceed storage growth rate
3. User must be aware only of data attributes, not physical
4. Self adjusting to a changing environment
5. Data access access multiple execution environments
6. Recovery from Failure
7. Security Interface
8. Allow addition, removal without service interruption

User Perspectives

– Storage is expensive. Hardware costs are only a small part of operations.

Estimated costs of operating a 2 TB NAS system used by 8000 users for one year.
Total costs approximately $400,000. Hardware amortized over 3 years.
OSD: Let Storage Help Manage Storage

Does almost nothing today
Could do a lot more
• Point of convergence for shared access
• Only detail knowledge of storage usage
• Only knowledge of storage geometry
• First awareness of intersystem contention
• Uncircumventable gate to data access

• Its position in multi-system architecture is unique
• Let it help!
Storage Interface Progression

Each change represents intelligence moving from host to drive
Each advancement was met with resistance
Eventually advantages of new intelligence were compelling
Enter OSD: A New Standard Interface

Completes Device Abstraction
Resource Independent Data Organization

File System 1

File System 2

File System 3

File System 1

File System 2

File System 3
OSD: Storage Objects

Traditional Sector Based Storage
- Access: Starting block, length
- OS builds all structures on LBA model

Object based Storage Devices
- No direct LBA I/O
- Access: Object ID, starting byte, length
- Objects are allocated by Drive
- All reads & writes are within an Object
- OS Directories are Objects
- No visible space metadata (FAT, extents, etc)
- File system independent
- Storage management scales with drives
- Storage could help with management work:
  - Copy, backup objects
  - Adjust objects for performance
  - Manage data: en/decrypt, compress, index (i frames)
OSD: Could a Drive Manage Space?

Drives have managed data for years

- Physical to Logical LBA mapping
  - Indirection transparent to host (OSD would add additional layer)
  - Changed many times over the years
- Firmware - downloads & overlays
- Multiple flaw tables
- Physical parameters
  - Servo & seek parameters
  - Zone specific read/write parameters

Drive definitely could support OSD protocol

- Performance, recovery requirements need definition
- **DANGER:** Functionality could be a slippery slope to unrealistic req’s

Another benefit: get rid of 512 byte sector dependency
OSD: Cool Stuff!

Addresses key user requirements
Follows natural interface progression
Builds on component capability growth