OSD: A Drive Perspective

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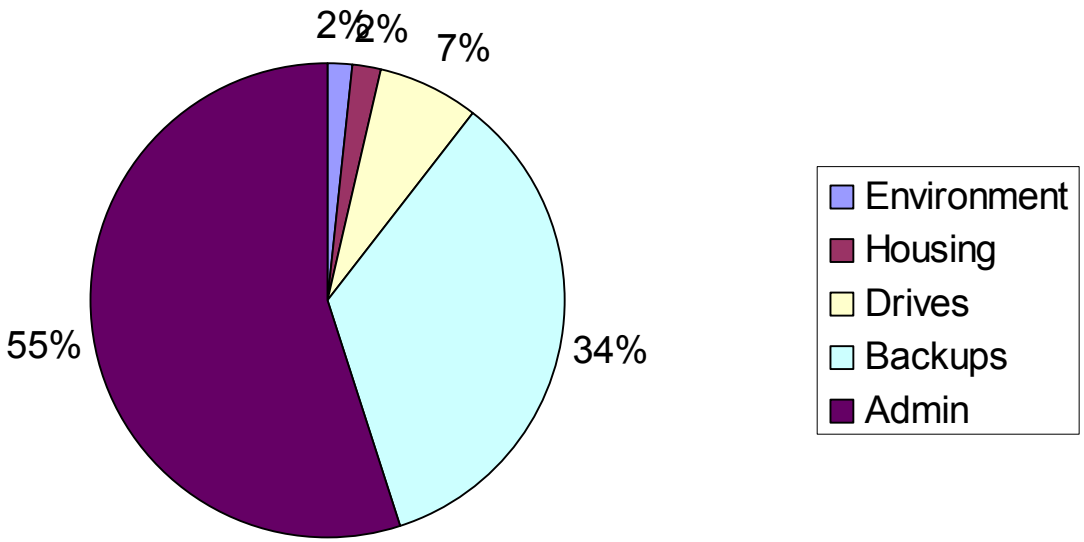
What's Needed: (20th anniversary of GUIDE GPP-106)

1. An Evolutionary Revolution
2. 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
7. Security Interface
8. removal without service interruption

Prepared by Bancohio, BoA, Standard Oil, Cities Service, Famland Ind., N.V. Phillips, State Farm Ins., American Airlines, Eastern Airlines, McDonnell Douglas, Exxon, Fireman's fund, Arco, IBM

User Perspectives

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



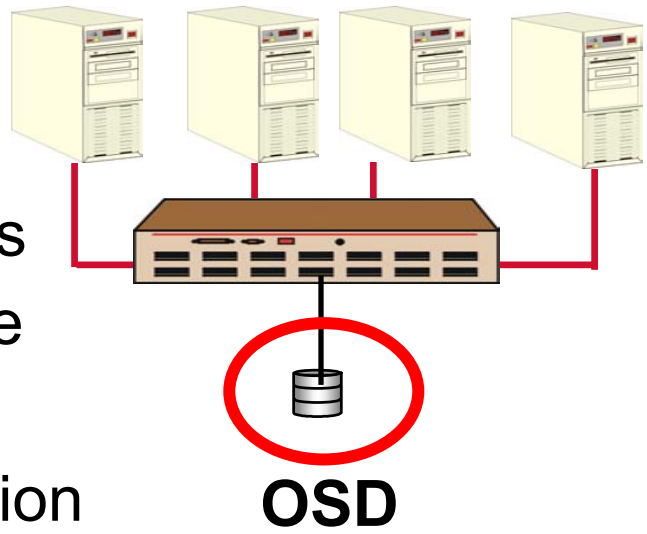
Estimated costs of operating a 2 TB NAS system used by 8000 users for one year
Total costs approximately $400,000. Hardware amortized over 3 years.

OSD: Let Storage Help Manage Storage

Does almost nothing today

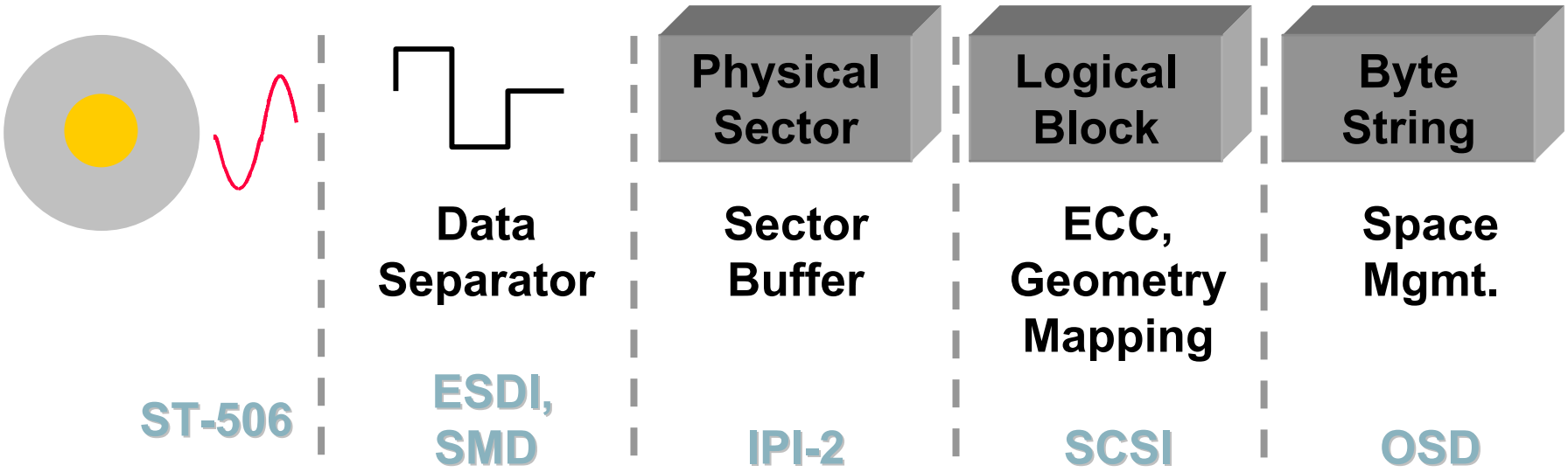
Could do a lot more

- 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

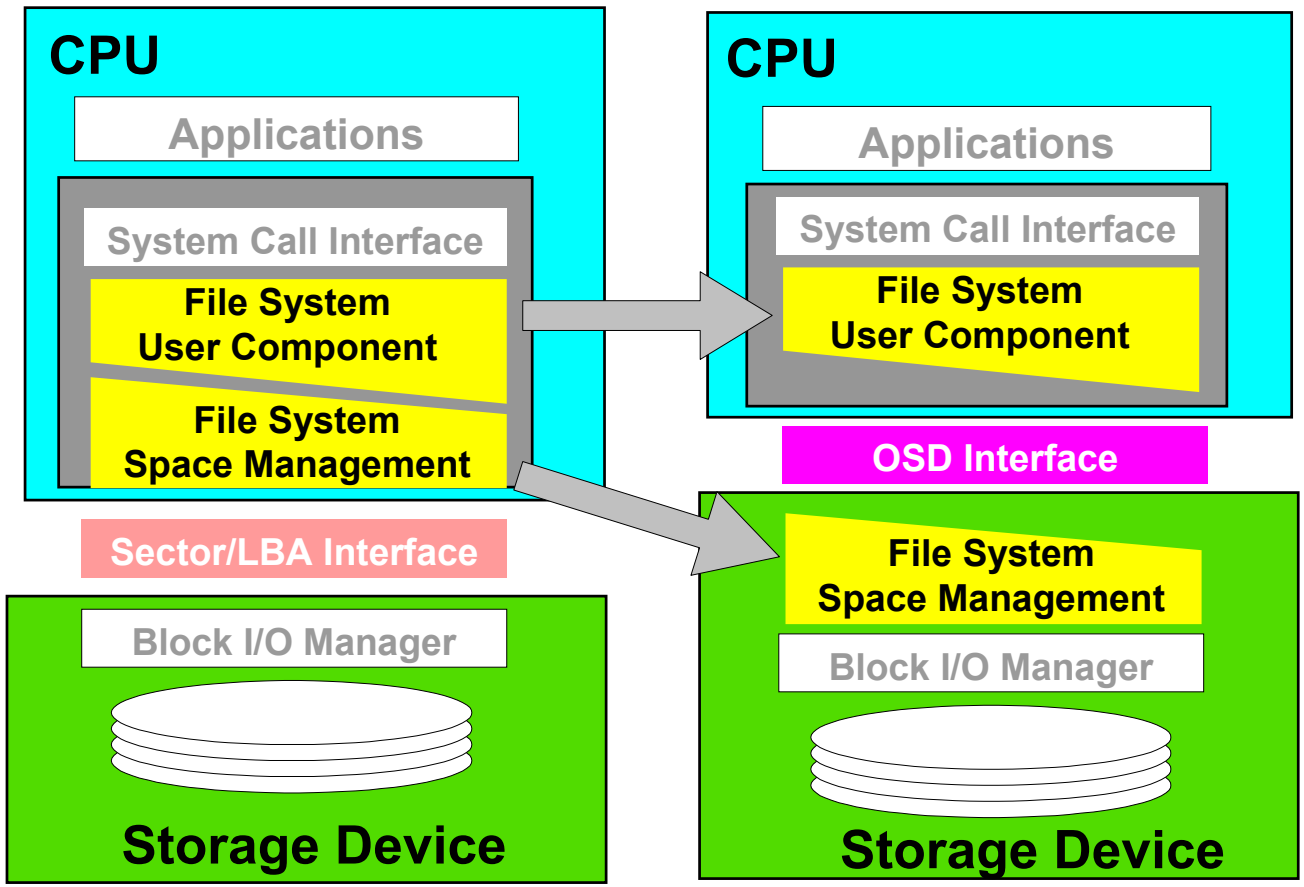


Each change represents intelligence moving from host to drive

Each advancement was met with resistance

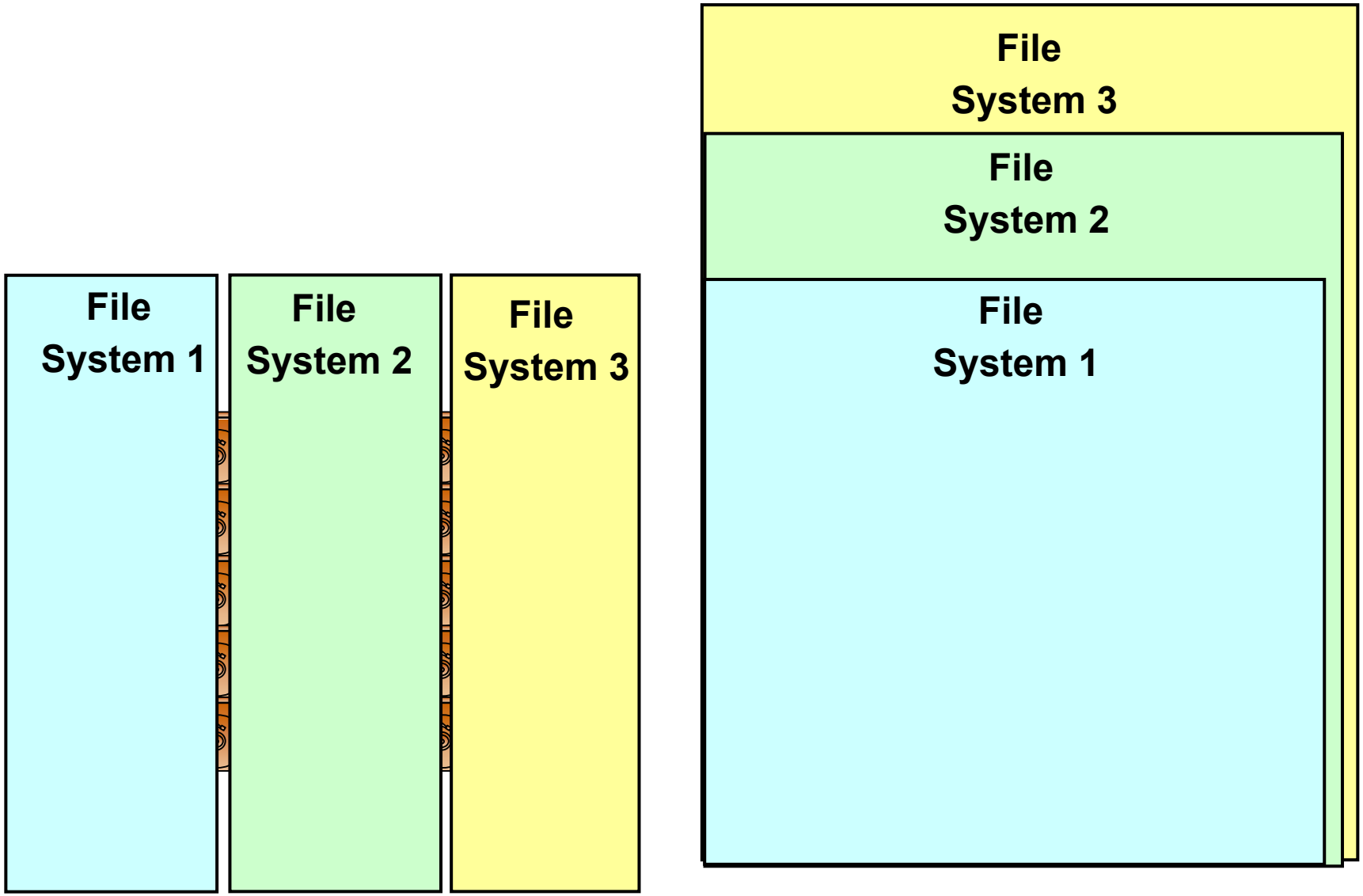
Eventually advantages of new intelligence were compelling

Enter OSD: A New Standard Interface



Completes Device Abstraction

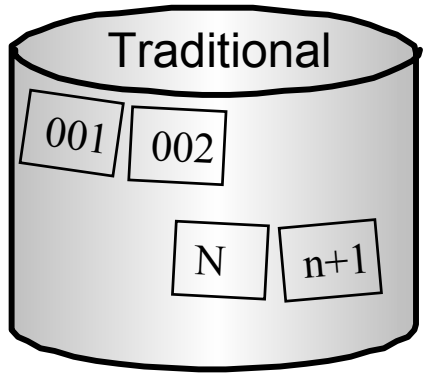
Resource Independent Data Organization



OSD: Storage Objects

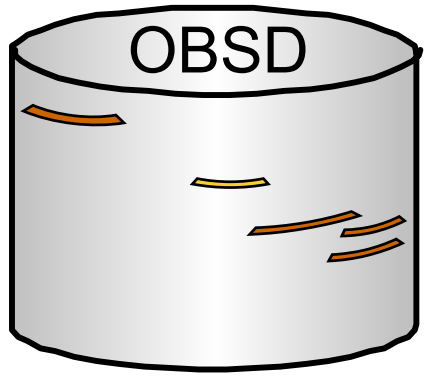
Traditional Sector Based Storage

- 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)



Yellow Object: ID = 627

Red Object: ID = 54

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