

A decorative background on the left side of the slide, featuring a blurred pattern of binary code (0s and 1s) in white and light blue against a dark background. A white curved line separates this area from the dark grey content area.

# OSD: A Drive Perspective

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# What's Needed: (20<sup>th</sup> anniversary of GUIDE GPP-106)

## 1. An Evolutionary Revolution

[redacted] 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

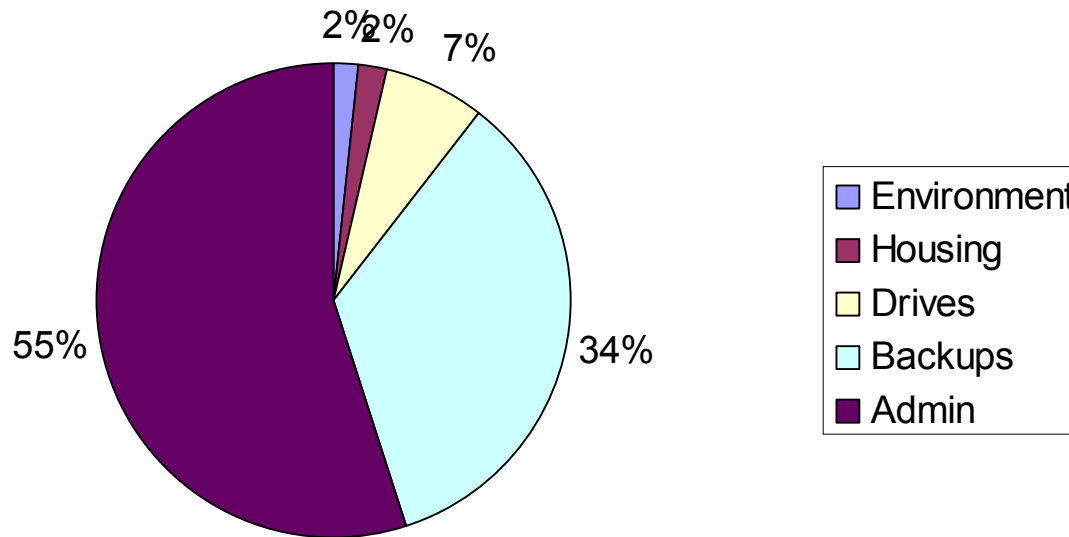
## 7. Security Interface

[redacted] removal without service interruption

Prepared by Bancohio, BoA, Standard Oil, Cities Service, Famlnd 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**



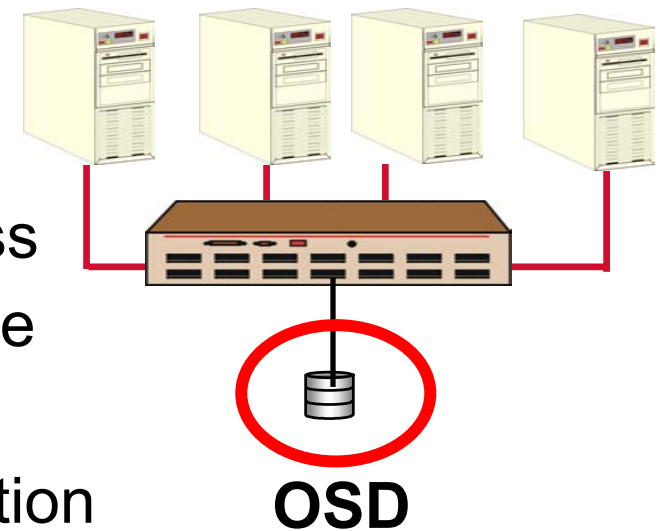
Estimated costs of operating a 2 TB NAS system used by 8000 users for one year  
Total costs approximately \$400,000. Hardware amortized over 3 years.

# OSD: Let Storage Help Manage Storage

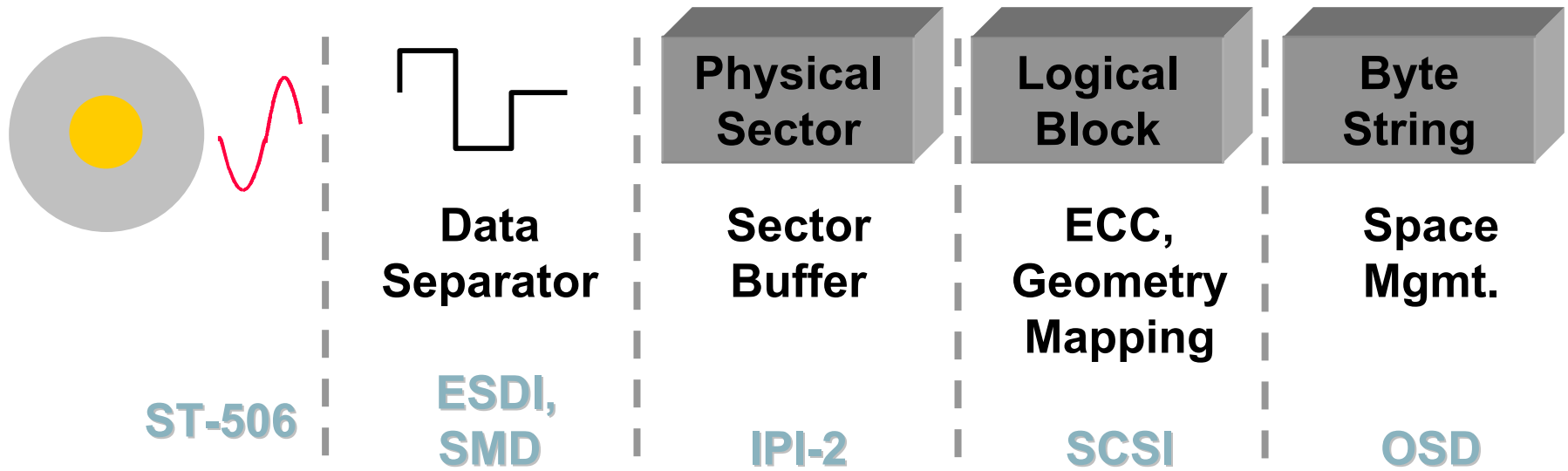
Does almost nothing today

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

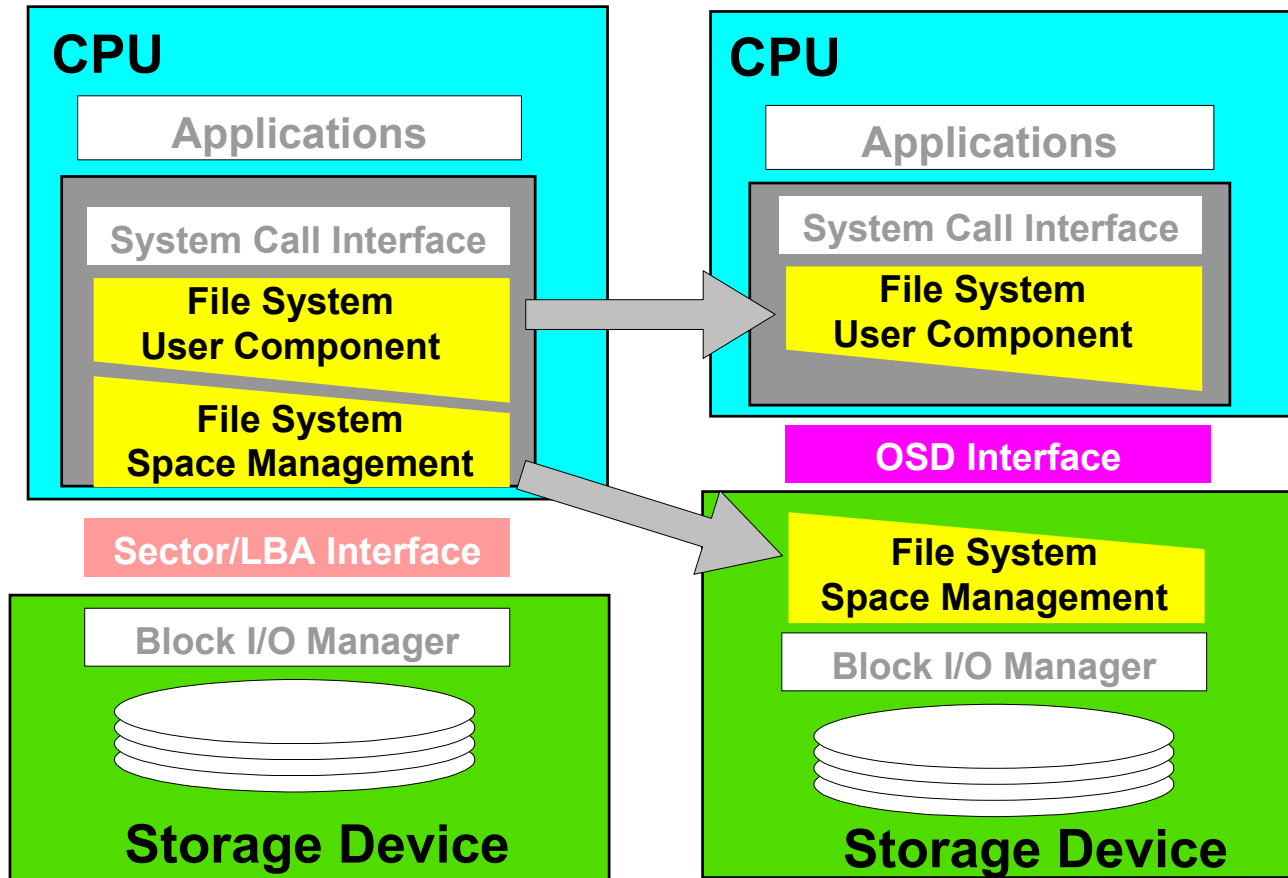


Each change represents intelligence moving from host to drive

Each advancement was met with resistance

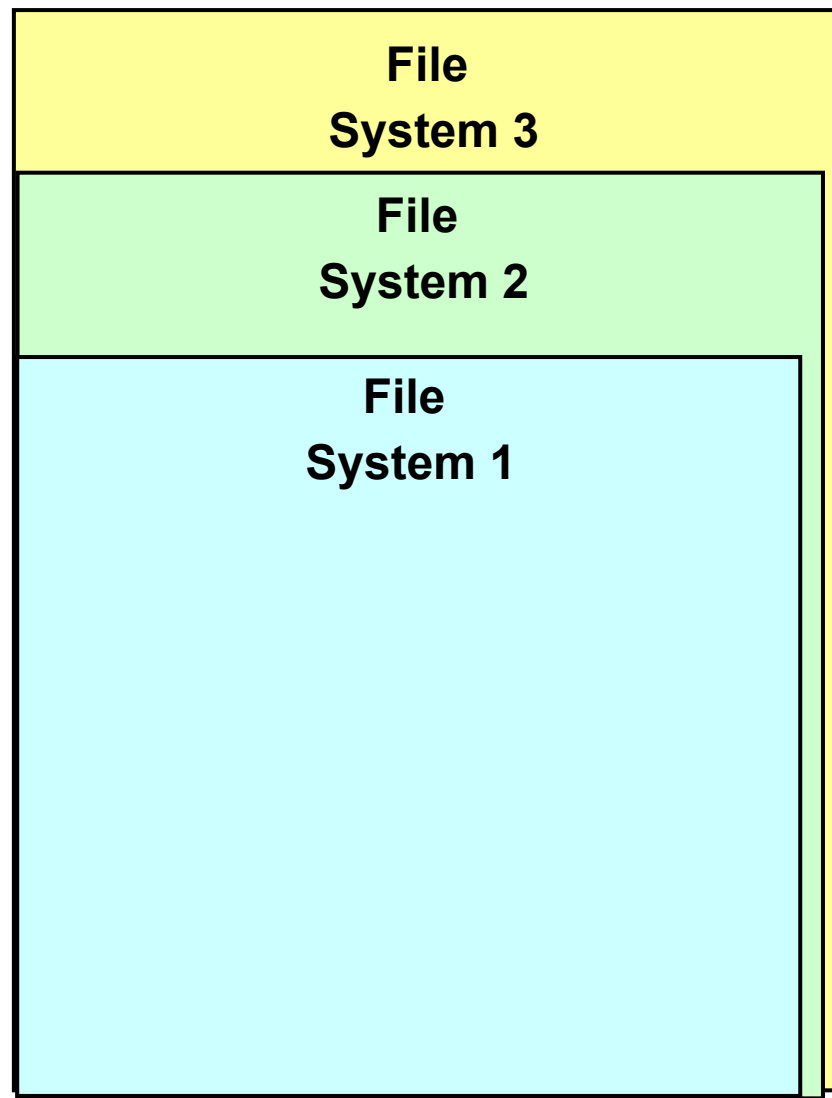
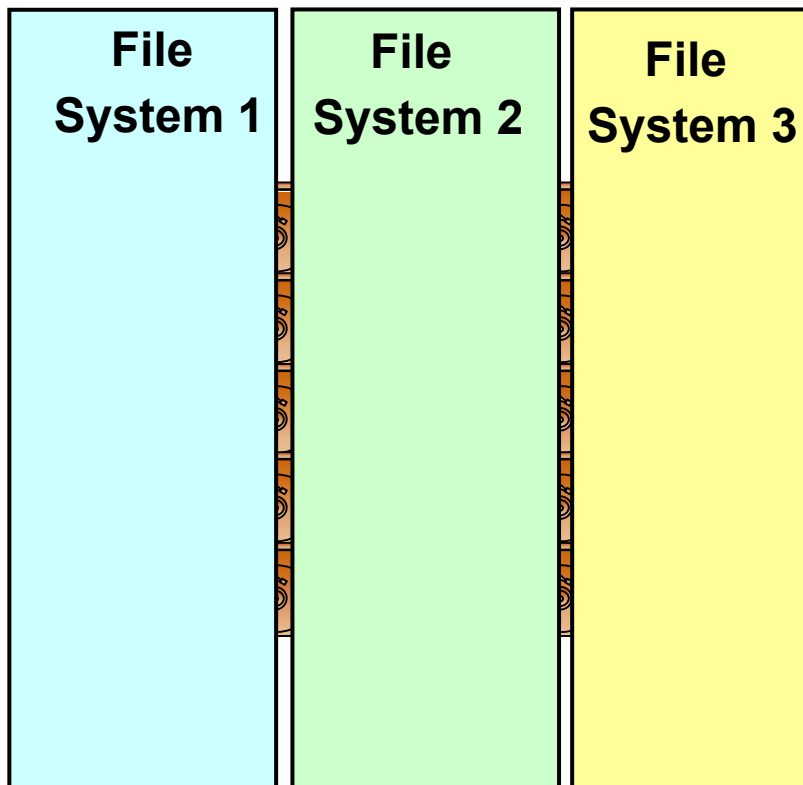
Eventually advantages of new intelligence were compelling

# Enter OSD: A New Standard Interface



Completes Device Abstraction

# Resource Independent Data Organization



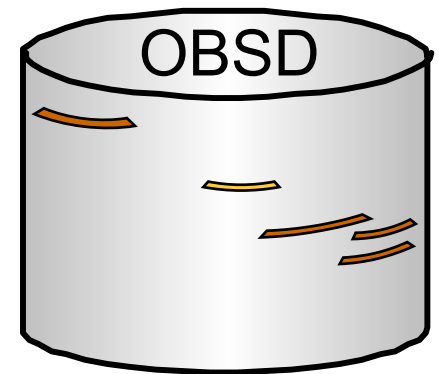
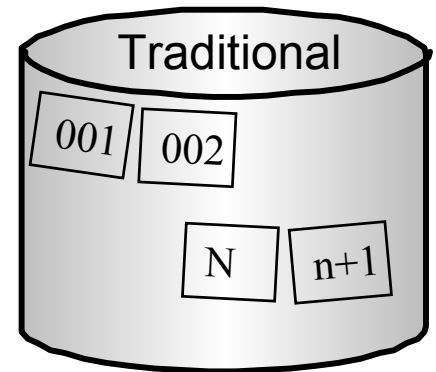
# OSD: Storage Objects

## 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