

# Expanding Markets for NFS

Craig O'Sullivan  
Product Line Manager  
Sun Microsystems, Inc.

[craig.osullivan@sun.com](mailto:craig.osullivan@sun.com)

# The challenge?

- Massive scale
- High performance
- Distributed systems
- Continuous Availability

*No - These are the Requirements !*

# The Real Challenge

- Easy to manage
- Simple to integrate
- Multiple vendor support

*And meet the requirements!*

# The Solution

- High performance
- Massively scalable
- Standards based
- File sharing



# The Data Takes Center Stage

"...there is a progression from the physical data center, to a logical one. So, rather than focus on a room at a given location, the focus has shifted to the data itself. In effect, the data is at the center of things now, not the data center.

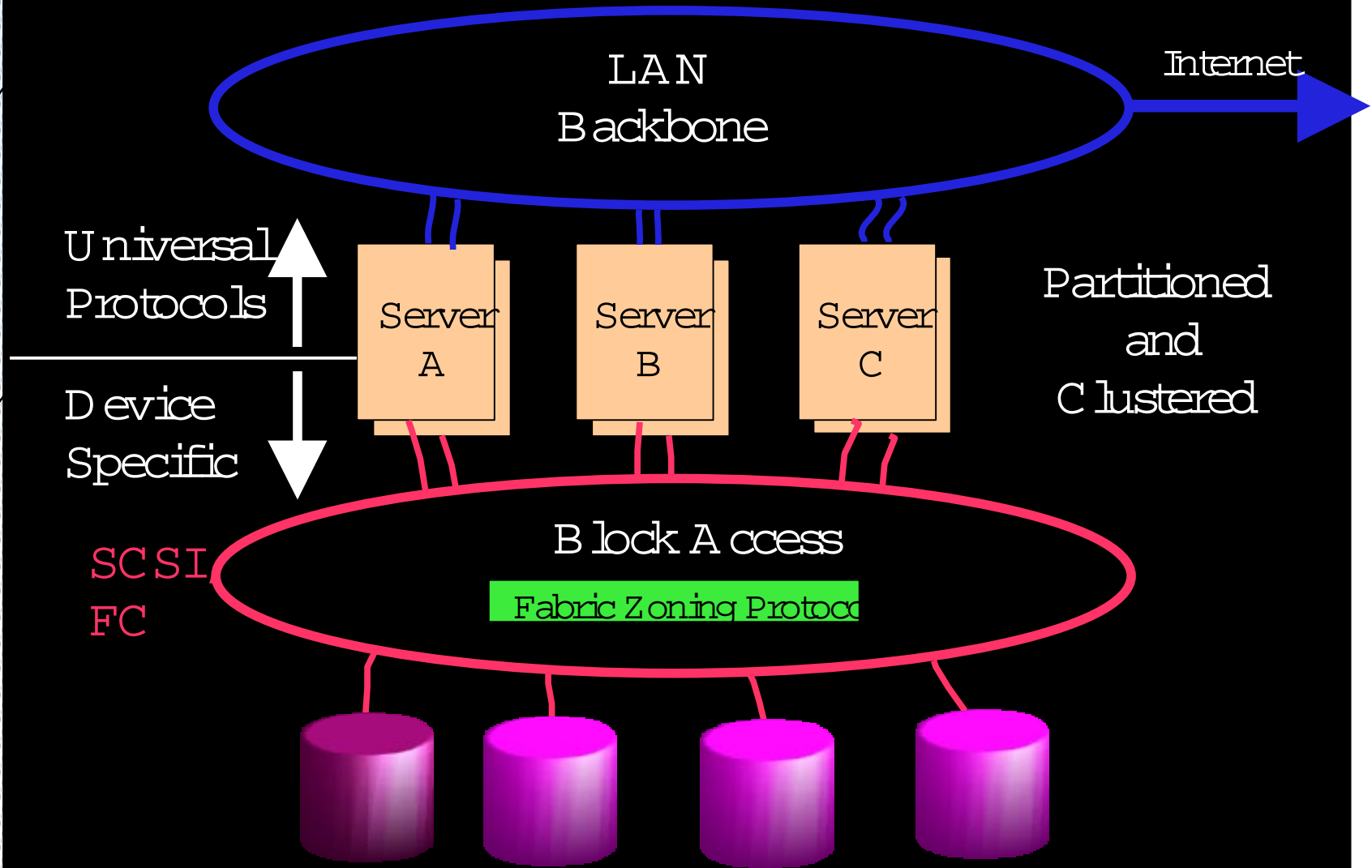
CIOs now worry about the central management of the all-important data, regardless of where it resides."

VP of operations, large multivendor computer maintenance company

# Traditional NFS Market

- Applications
- Speeds 1MB/s to 100 MB/s
- Goals
- Markets

# Enterprise Data Center





# Enterprise Data Center Characteristics (1)

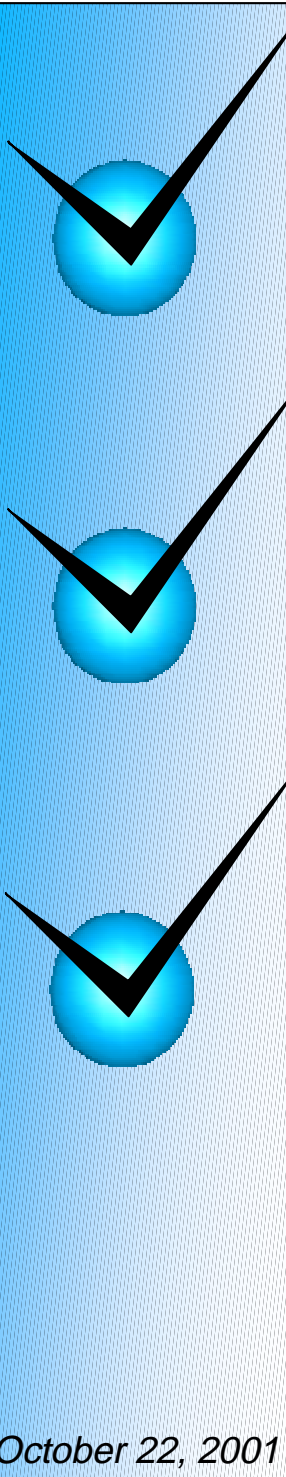
- Performance, data integrity and data availability are paramount
- Database a key application
- Block oriented
- Vendor specific solutions





# Enterprise Data Center Characteristics (2)

- SAN's for performance and storage pooling
  - LAN/SAN separation viewed as a plus
- Zoning
  - Enforced separation
  - Data protection
  - Presents a barrier to storage pooling



# Enterprise Data Center Characteristics (3)

- Run by "Techies" (specialists)
  - Explicit control of devices, performance tuning, data availability/protection, backup and recovery, etc.
- Limited deployment of file sharing within the EDC today
  - Performance
  - Perception

# Storage Virtualization

- No consistent industry wide definition
  - Storage pooling for efficiency & cost
  - Support of mixed vendor environment
  - Performance at least equal to current
  - Simplified management



# Database Storage Virtualization

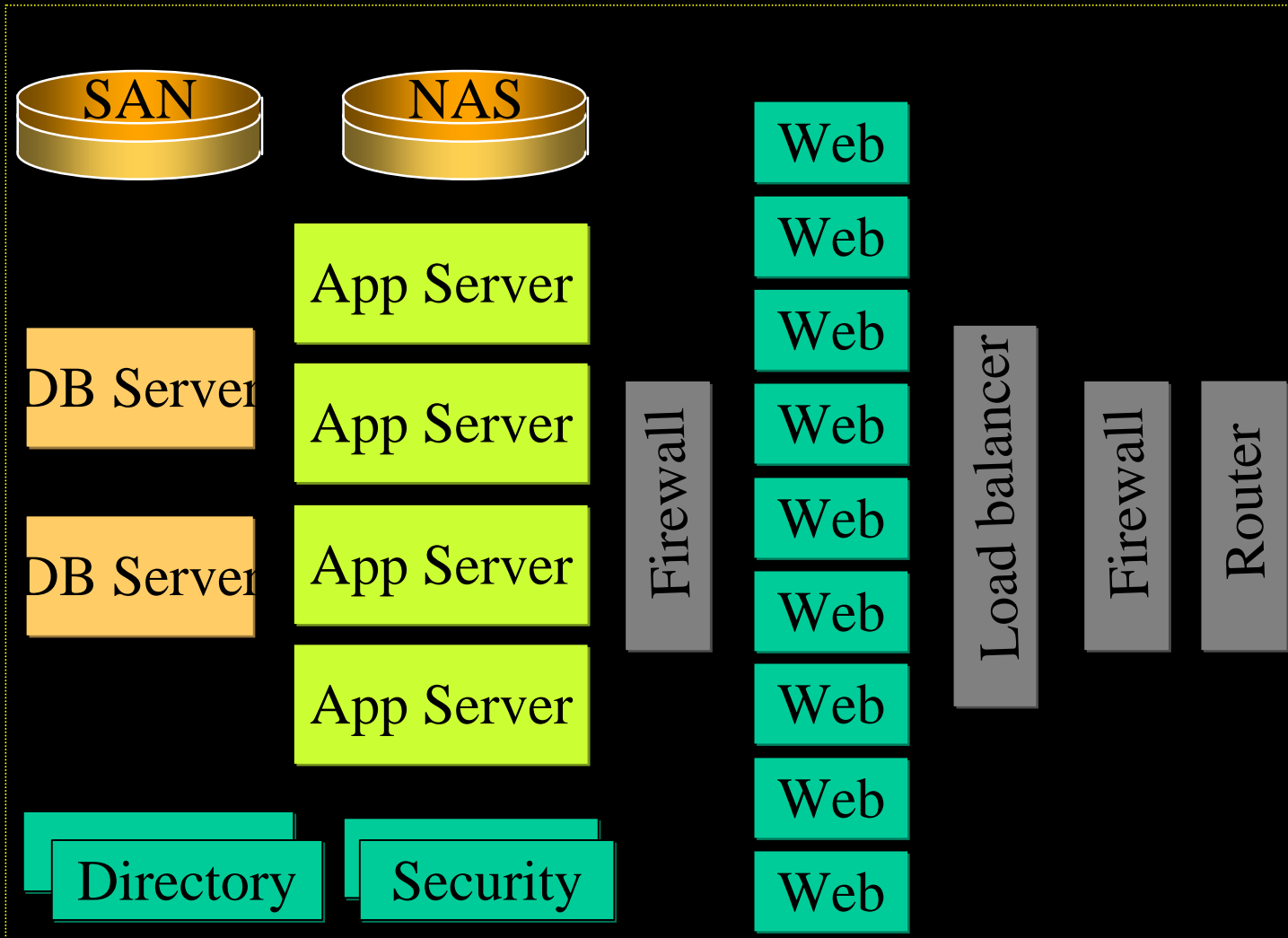
- File access for DBA convenience
  - Raw disk like interface for performance
  - DB controls write lock, logging, buffering, etc.
- Oracle ODM to get vendor specifics "out of the way"
- Solution limited to DB!



# Mixed File Sharing + Block Mode

- Products from major vendors now
  - FS protocol: Set up a data transfer
  - Data delivery: Over the SAN
- SAN performance & block mode device compatibility
- Mixed server environment
- Storage vendor specific solutions

# Service Point Architecture

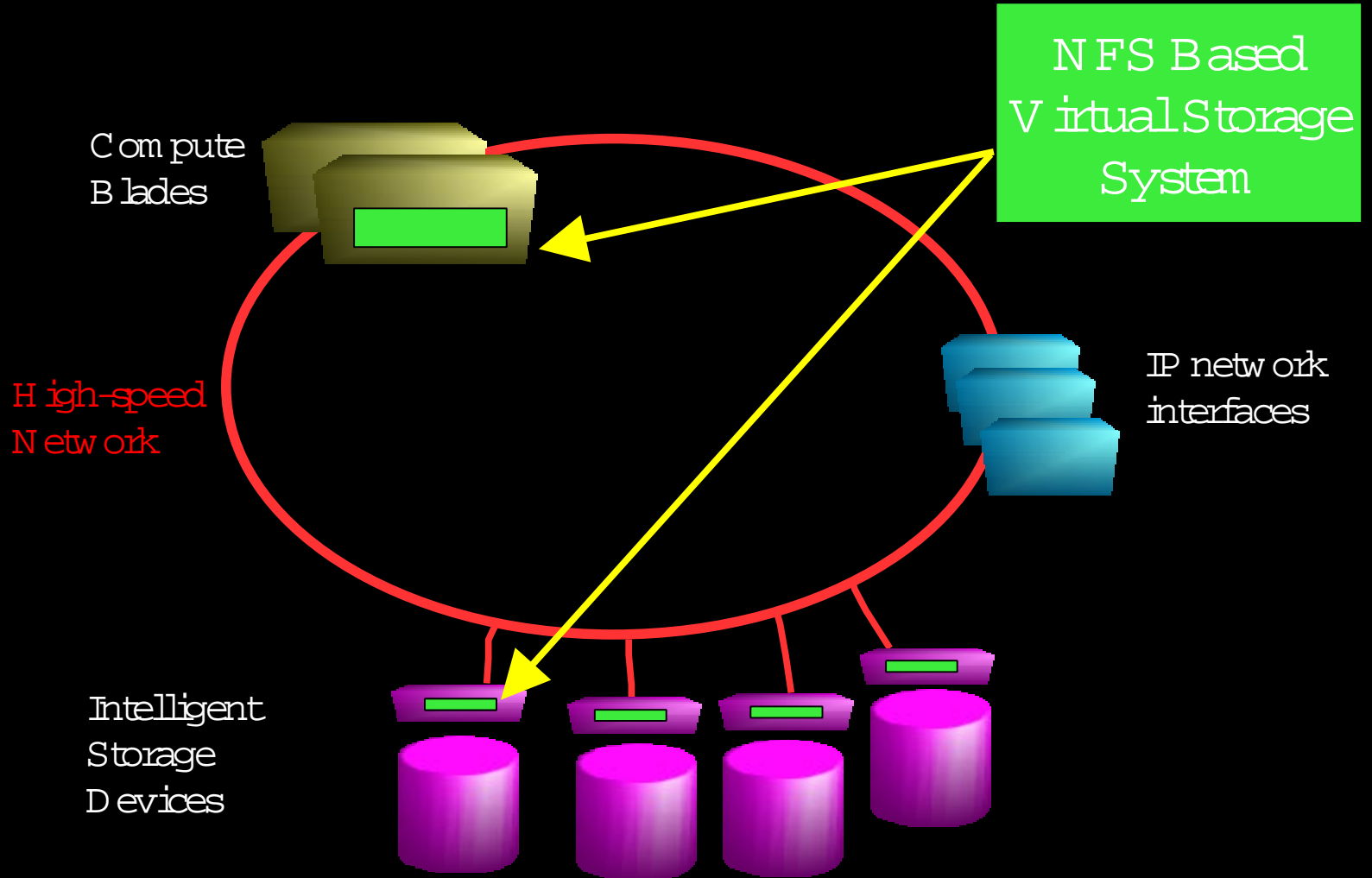




# Breakthroughs and Enablers

- Blade computing
- Computer "bus" replaced by a very high speed packet switched network with memory-to-memory (RDMA) transfer capability.
- High performance NFS over RDMA

# Future Data Center







# Future DC Characteristics (1)

- Modular "building block" approach
- Policy driven, flexible assignment of resources to meet application quality of service goals
  - Compute
  - Storage
  - Network access



# Future DC Characteristics (2)

- High performance, low overhead file sharing
  - Storage virtualization
  - Database performance
  - Universal file oriented view of the data
  - Standards based management
  - Mixed vendor support

# NFS in the WAN

- IP network speeds increasing
- NFSv4 provides the tools to efficiently extend the future data center's capability across the net
  - Delegation
  - Replication
  - Security
  - Compound operations
  - Firewall friendly



# NFS has Broad Based Support

- Major vendor participation
  - IBM
  - HP
  - EMC
  - Network Appliance
  - Hummingbird
  - Linux
  - And more



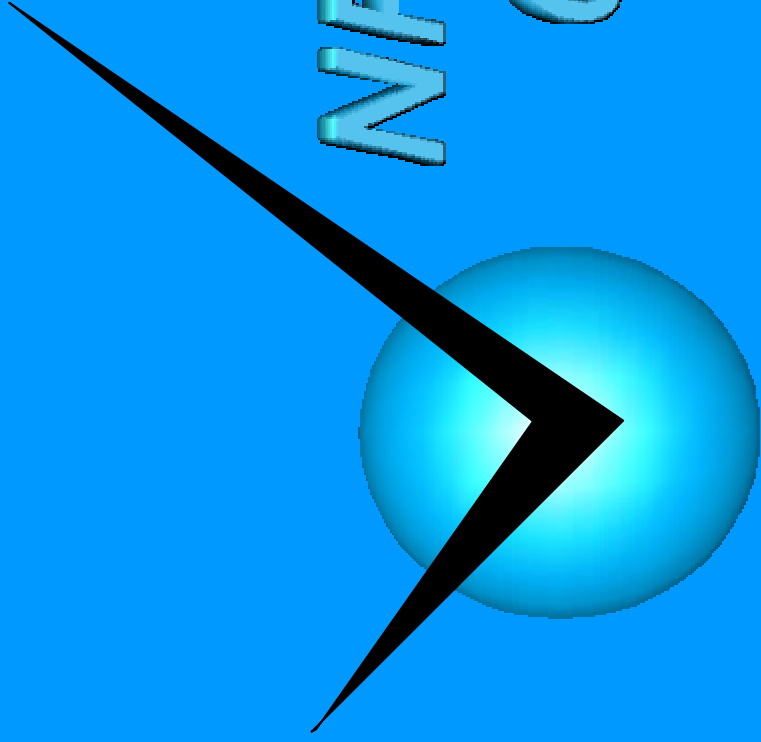
# NFS Meets the Challenge

- NFS over RDMA for performance
- NFS virtualizes the storage
- NFS massively scalable
- NFS standards based
- NFS management

# Conclusion

- NFS has the potential to play a much, much wider role
- Join Sun in defining the solution for storage virtualization in the coming world of blade based computing
  - SNIA file sharing working group
  - IETF
  - IB Trade Association

# NFS Vendors Conference

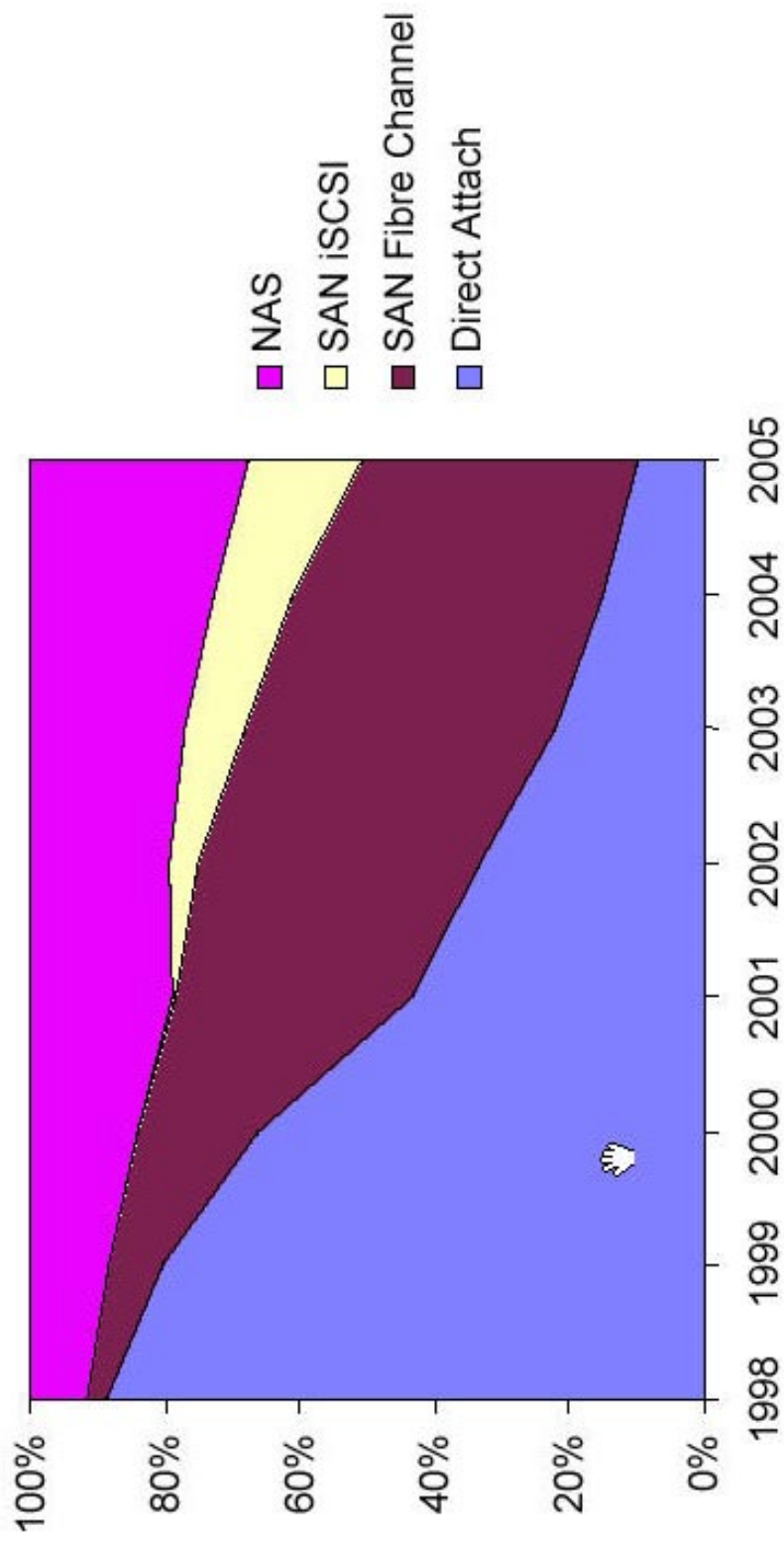


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# Storage Network Adoption Rate



Gartner