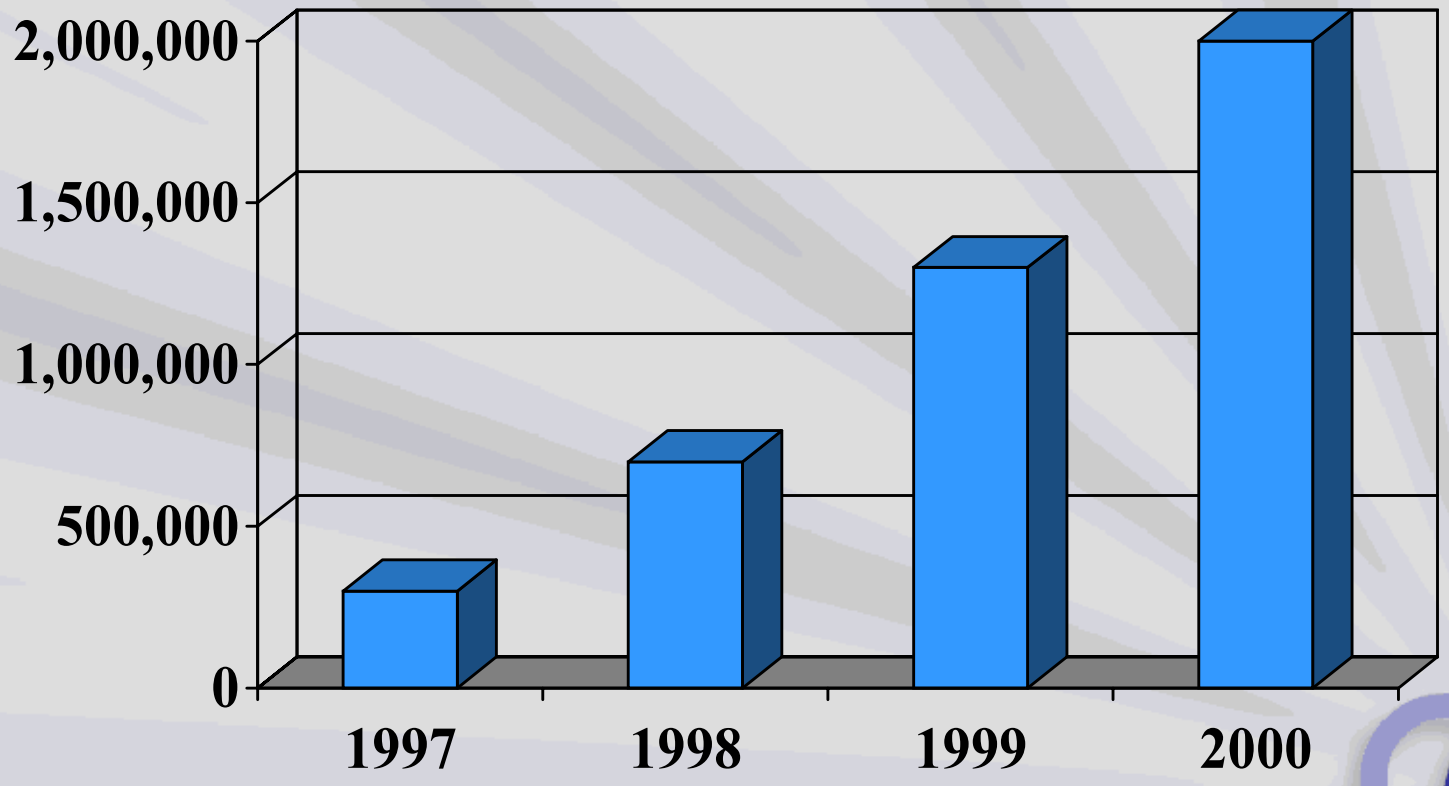
Enterprise Storage Networking

Could a SAN or NAS Solve Your Storage Problems?

Ken Walters, PBS Information Technology

The Storage Explosion

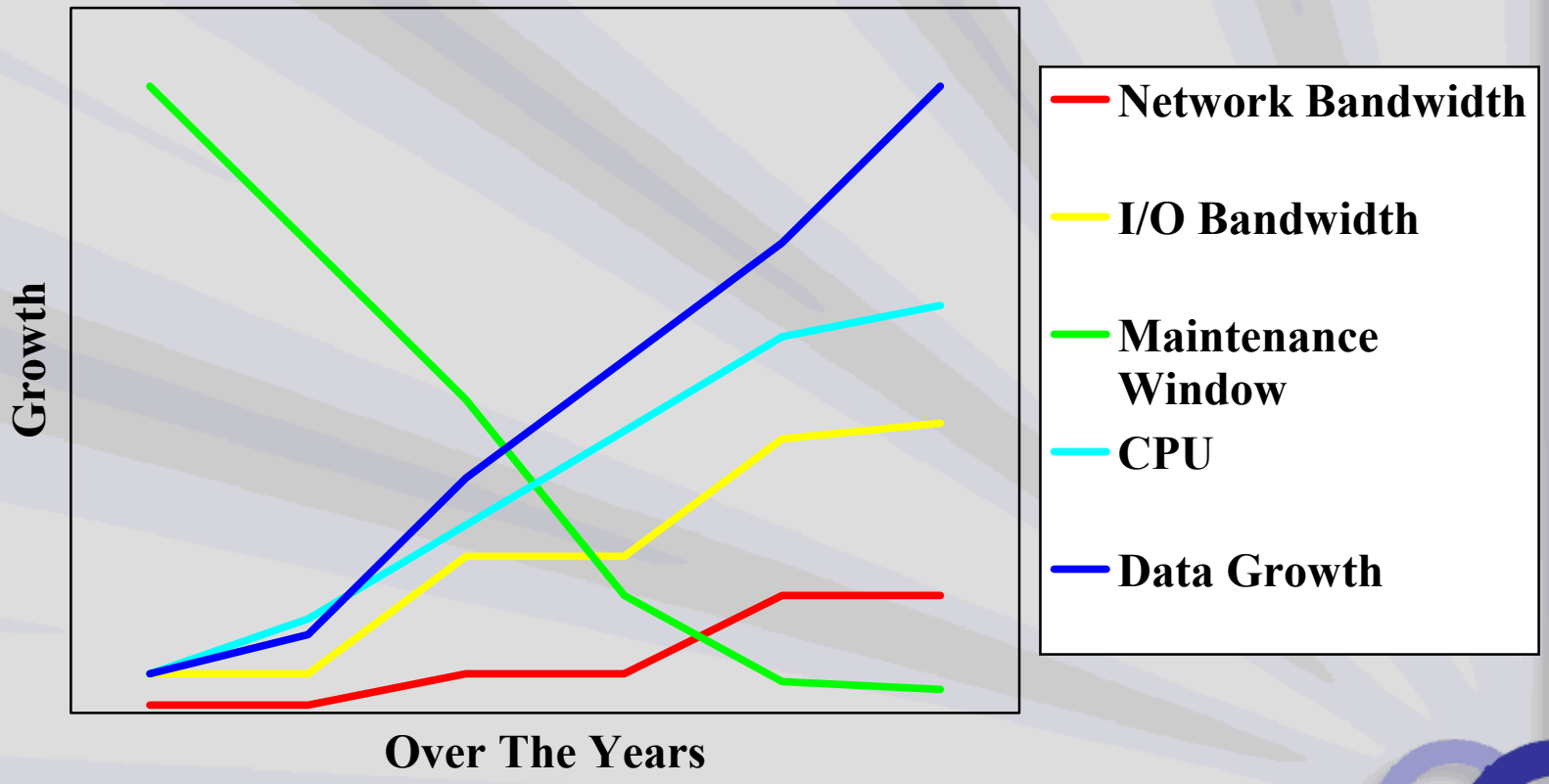
Terabytes Shipped



What is Fueling the Growth?

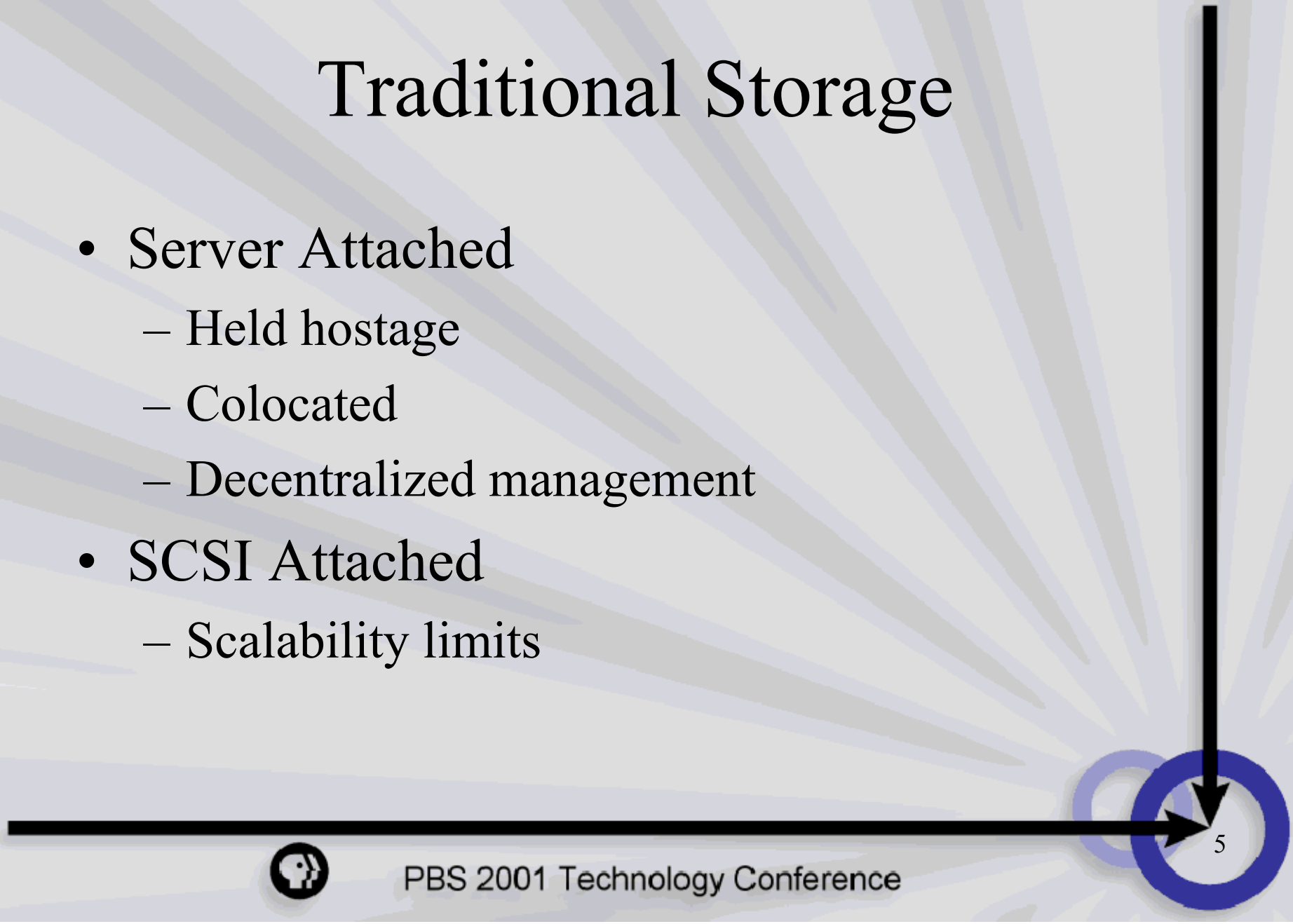
- The Internet and e-Commerce
- Data Warehousing
- Digital Media Assets
- Paper to Digital Conversion

Storage Growth vs. Supporting Technologies



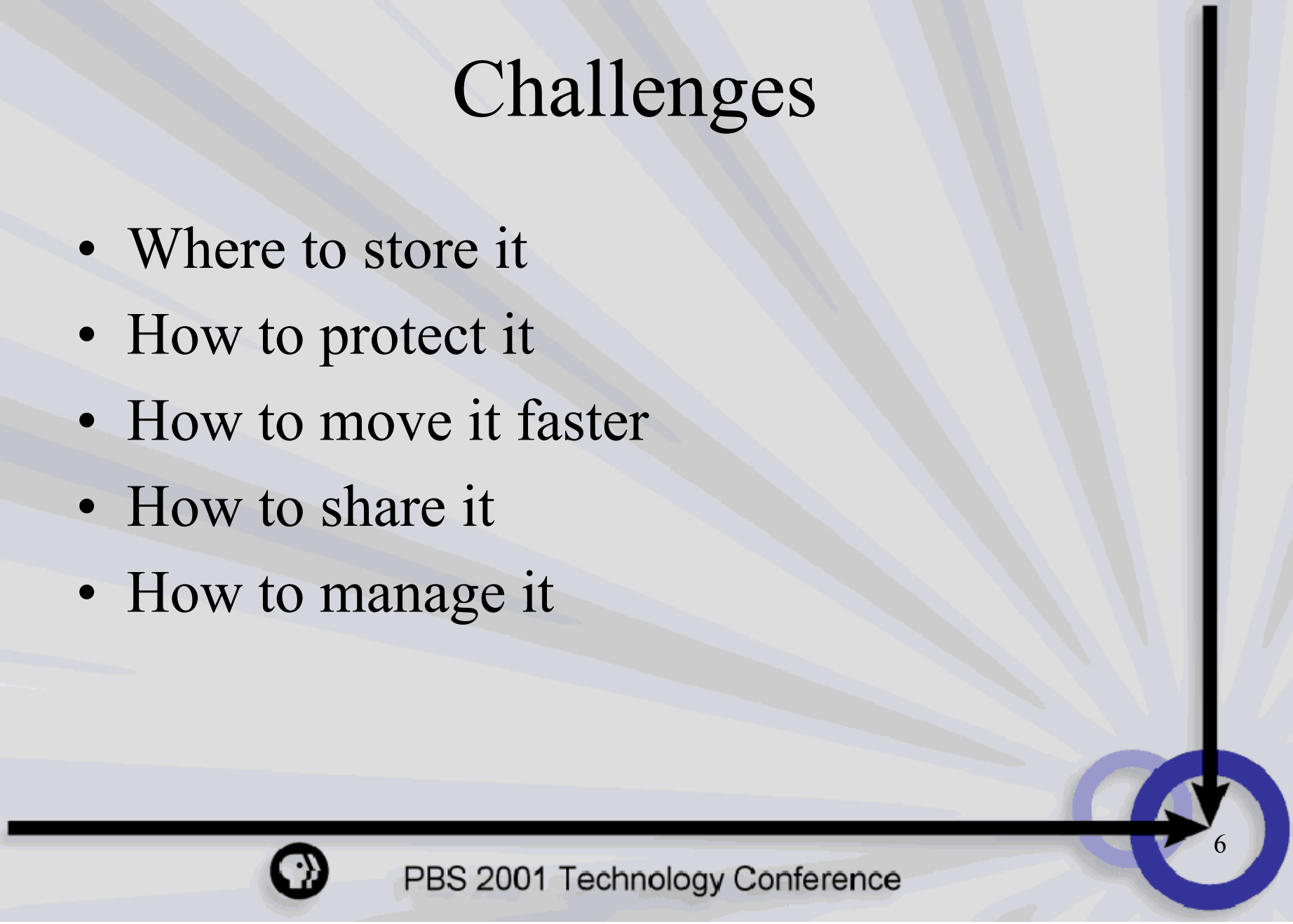
Traditional Storage

- Server Attached
  - Held hostage
  - Colocated
  - Decentralized management
- SCSI Attached
  - Scalability limits



Challenges

- Where to store it
- How to protect it
- How to move it faster
- How to share it
- How to manage it



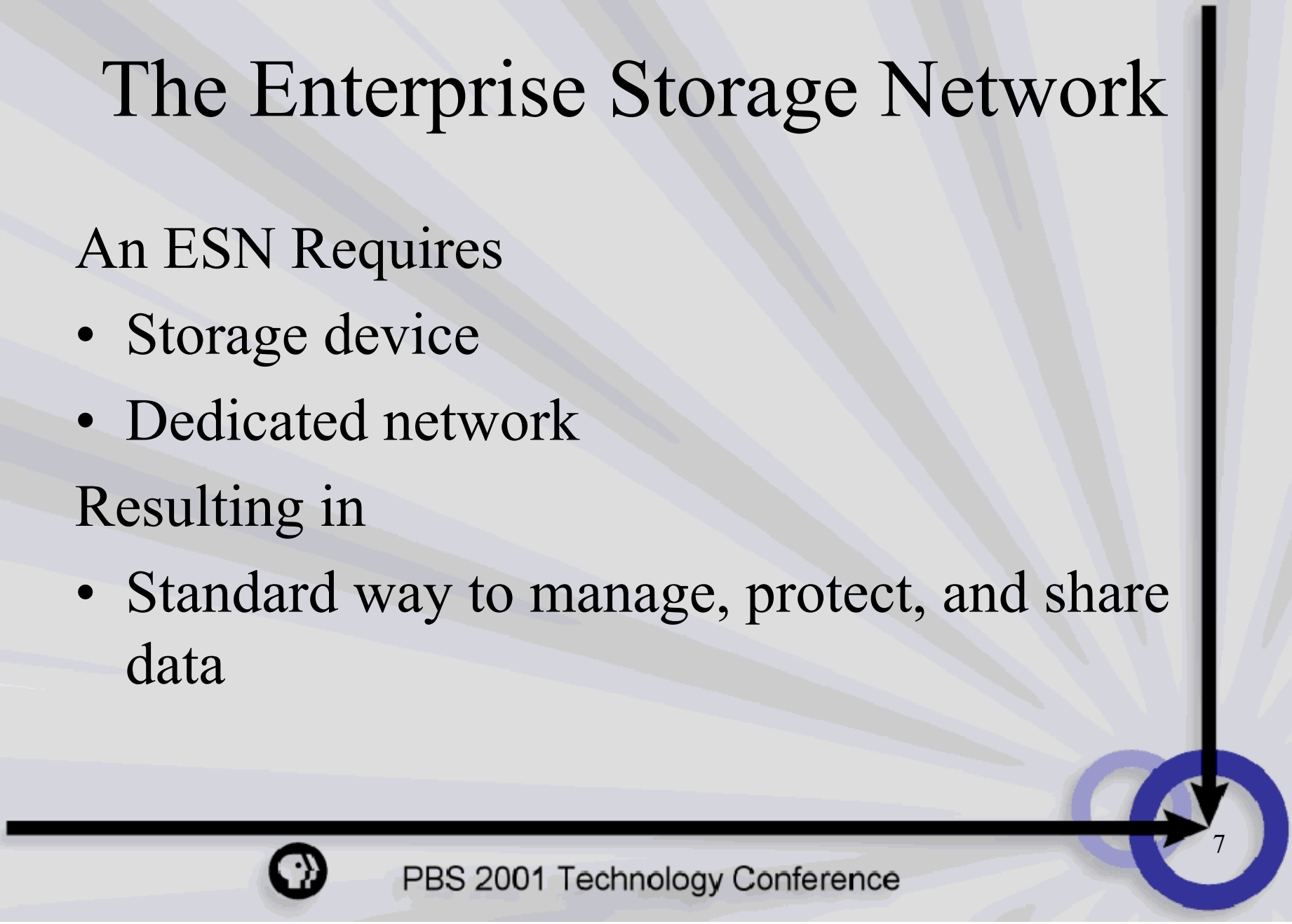
The Enterprise Storage Network

An ESN Requires

- Storage device
- Dedicated network

Resulting in

- Standard way to manage, protect, and share data



The Storage Device

- **NAS**
  - A server with attached storage tuned for file sharing and network performance
- **SAN**
  - Large, scalable, highly available disk array
  - Stand alone with heterogeneous connectivity
  - High throughput

The Dedicated Network

NAS

- Shared IP network
- Dedicated IP network

SAN

- Completely separate Fibre Channel Network dedicated to storage I/O

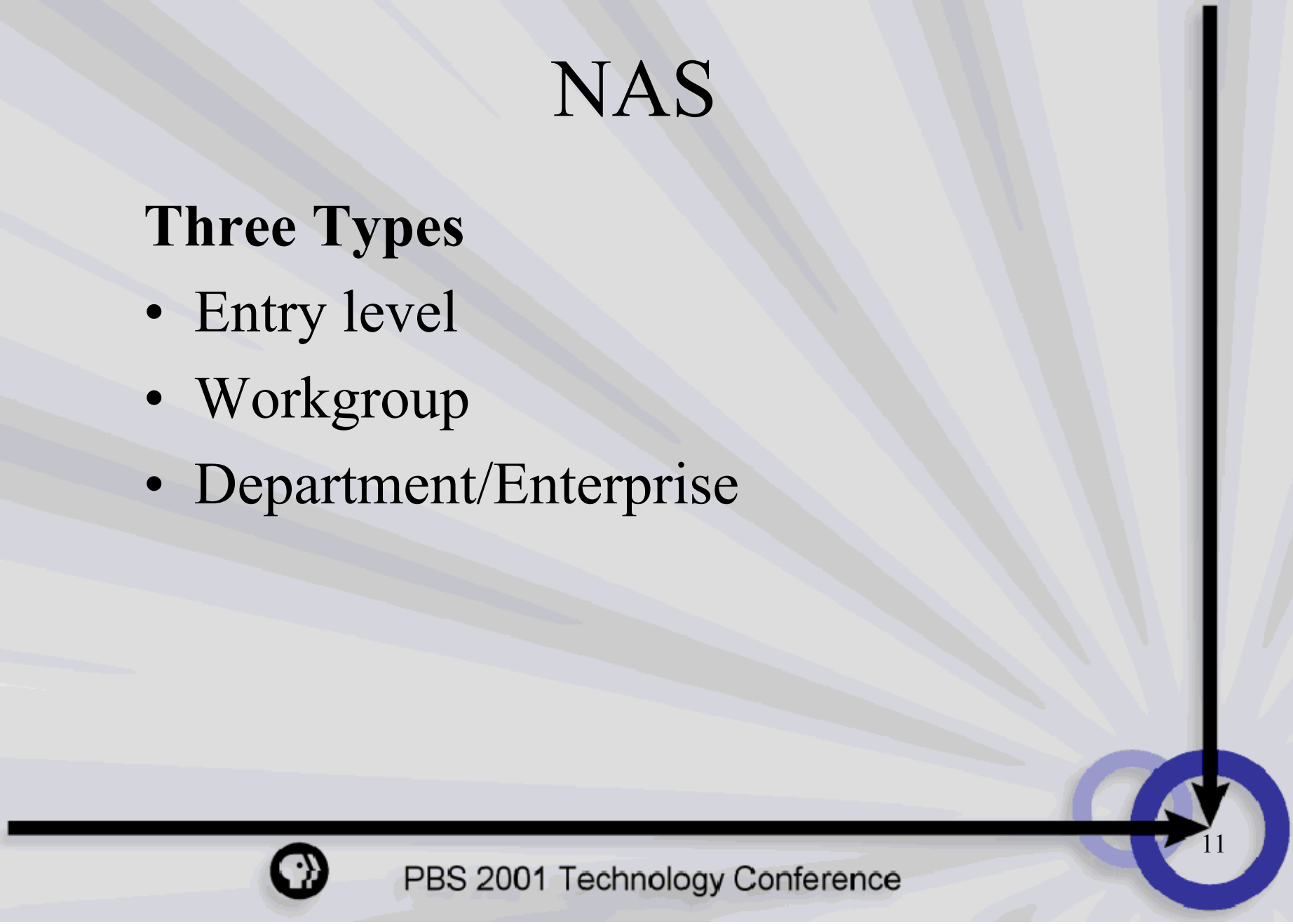
What Is A NAS?

- Turnkey file server
- File system based storage
- TCP/IP provides the networking protocol
- Objects transferred are **complete files**
  - http, nfs,Cifs
- Tuned thin OS

NAS

Three Types

- Entry level
- Workgroup
- Department/Enterprise

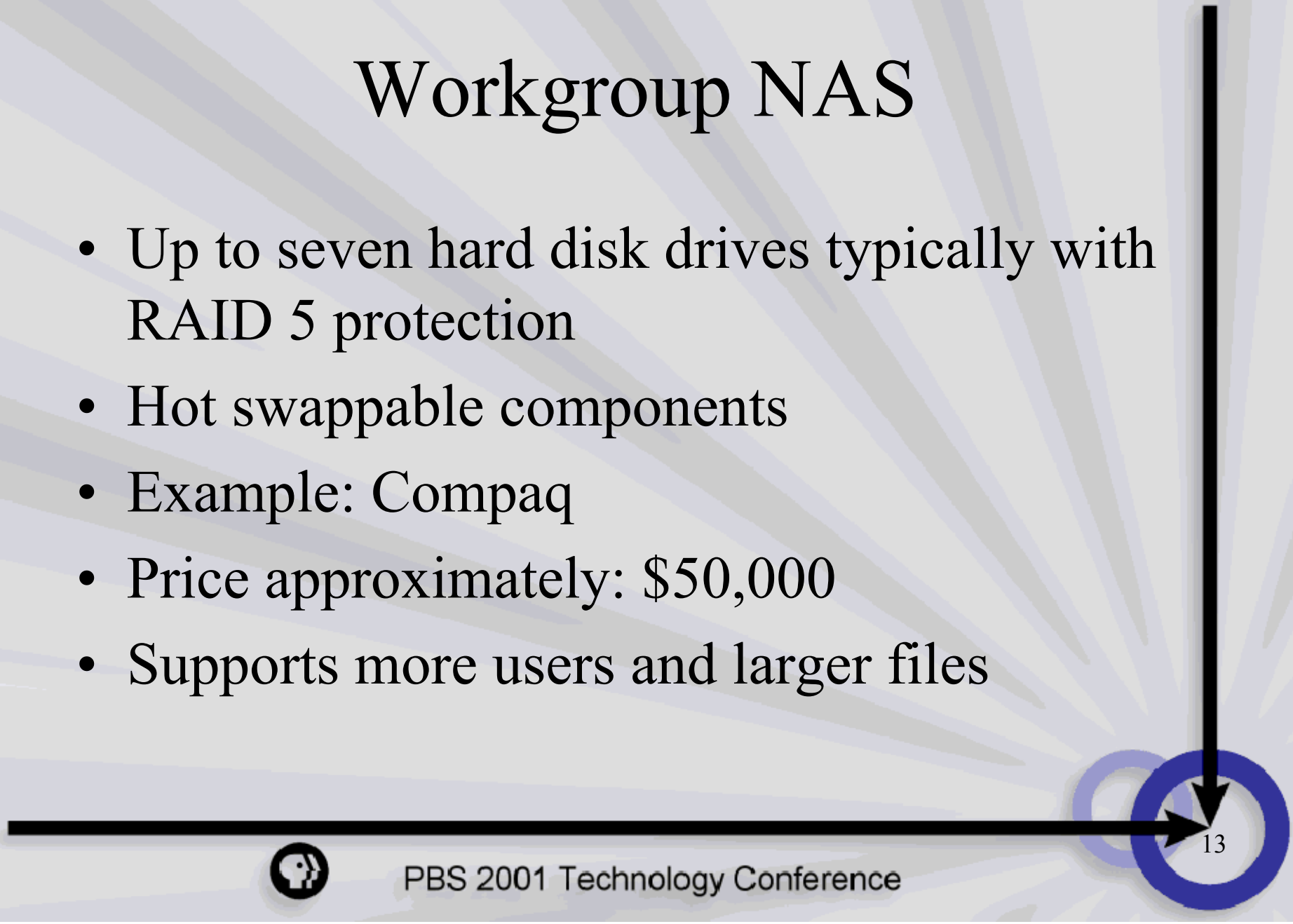


Entry Level NAS

- One or two hard disk drives
- Limited RAID functionality, expandability, and fault tolerance
- Examples: Quantum, Maxstor
- Price: approximately $2000
- Serves: about 12 users

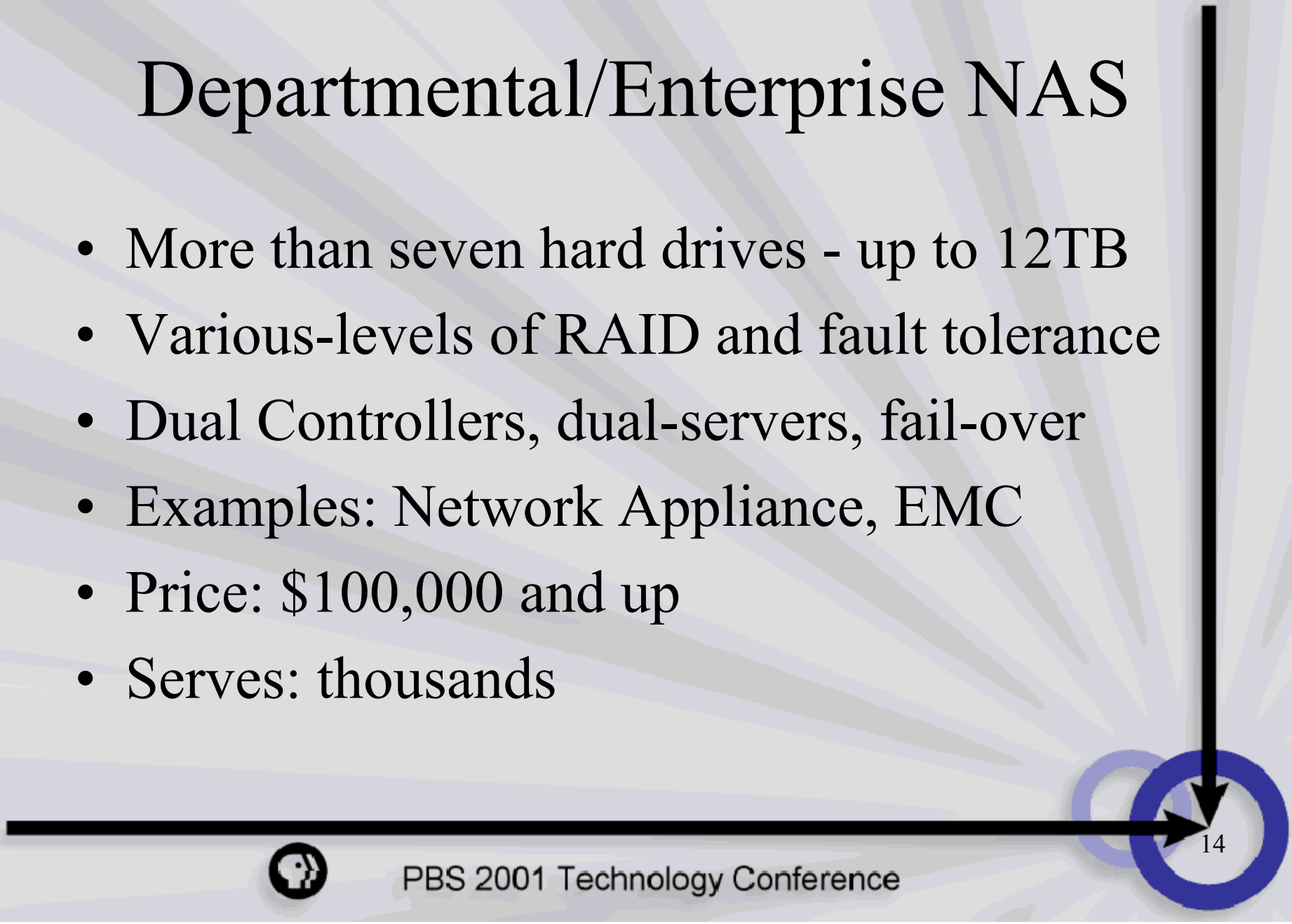
Workgroup NAS

- Up to seven hard disk drives typically with RAID 5 protection
- Hot swappable components
- Example: Compaq
- Price approximately: $50,000
- Supports more users and larger files



Departmental/Enterprise NAS

- More than seven hard drives - up to 12TB
- Various-levels of RAID and fault tolerance
- Dual Controllers, dual-servers, fail-over
- Examples: Network Appliance, EMC
- Price: $100,000 and up
- Serves: thousands

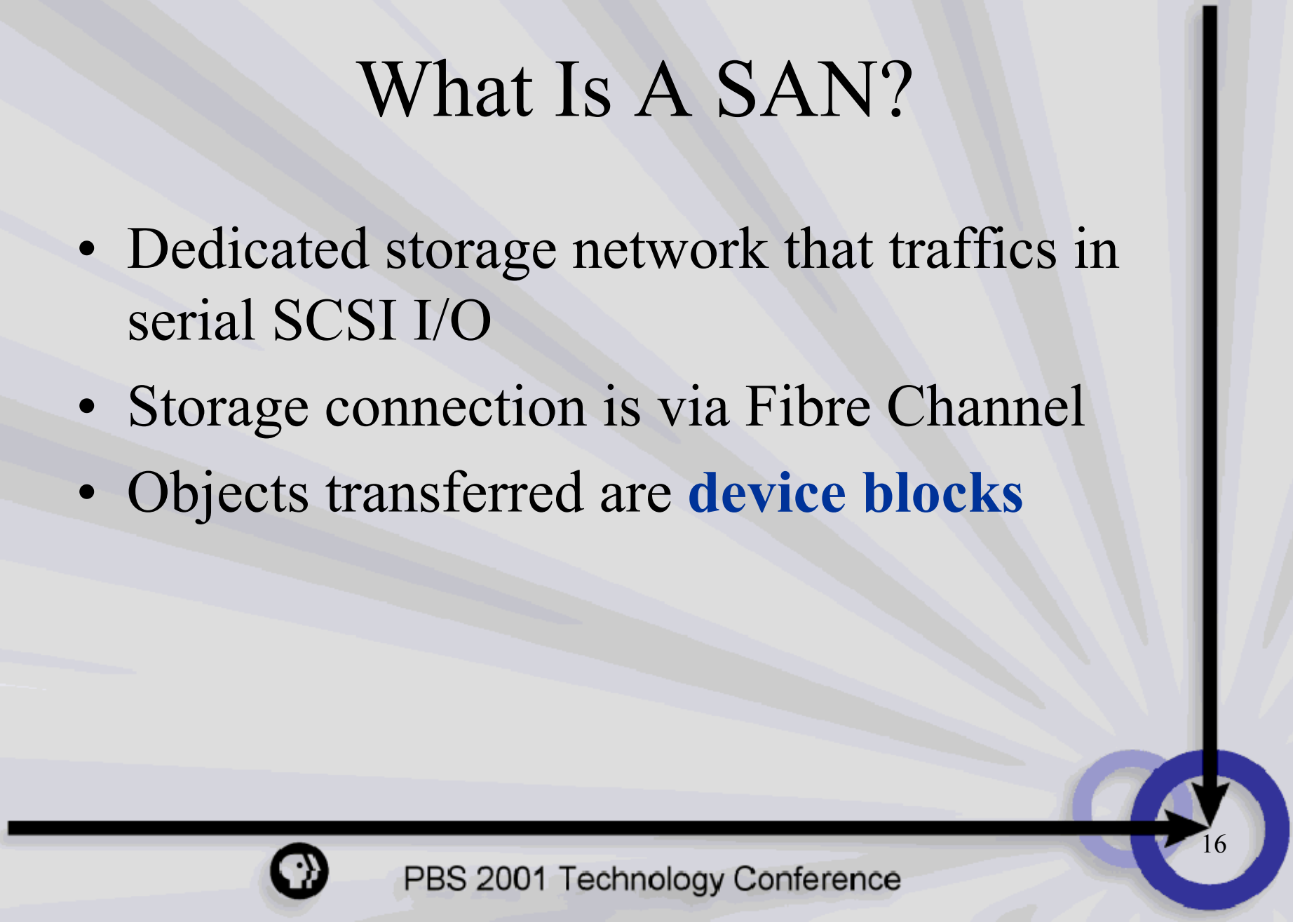


NAS Advantages

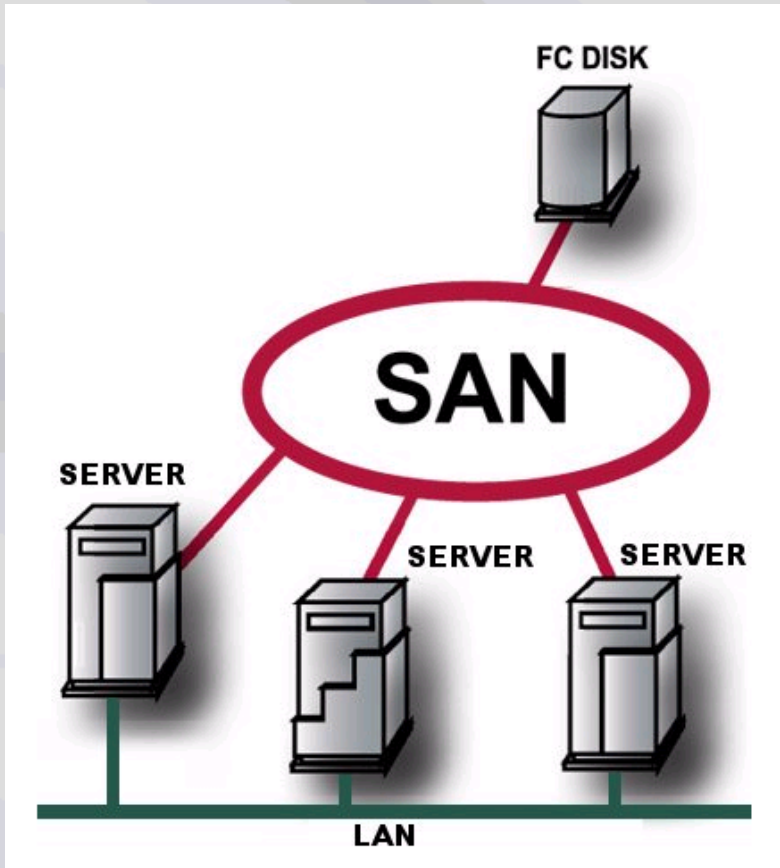
- Simple installation & administration
- Ideal for ASP/ISP model
- Perfect for content delivered by Internet or Intranet
- Centralized point of management
- Good for sharing same data by many hosts

What Is A SAN?

- Dedicated storage network that traffics in serial SCSI I/O
- Storage connection is via Fibre Channel
- Objects transferred are **device blocks**



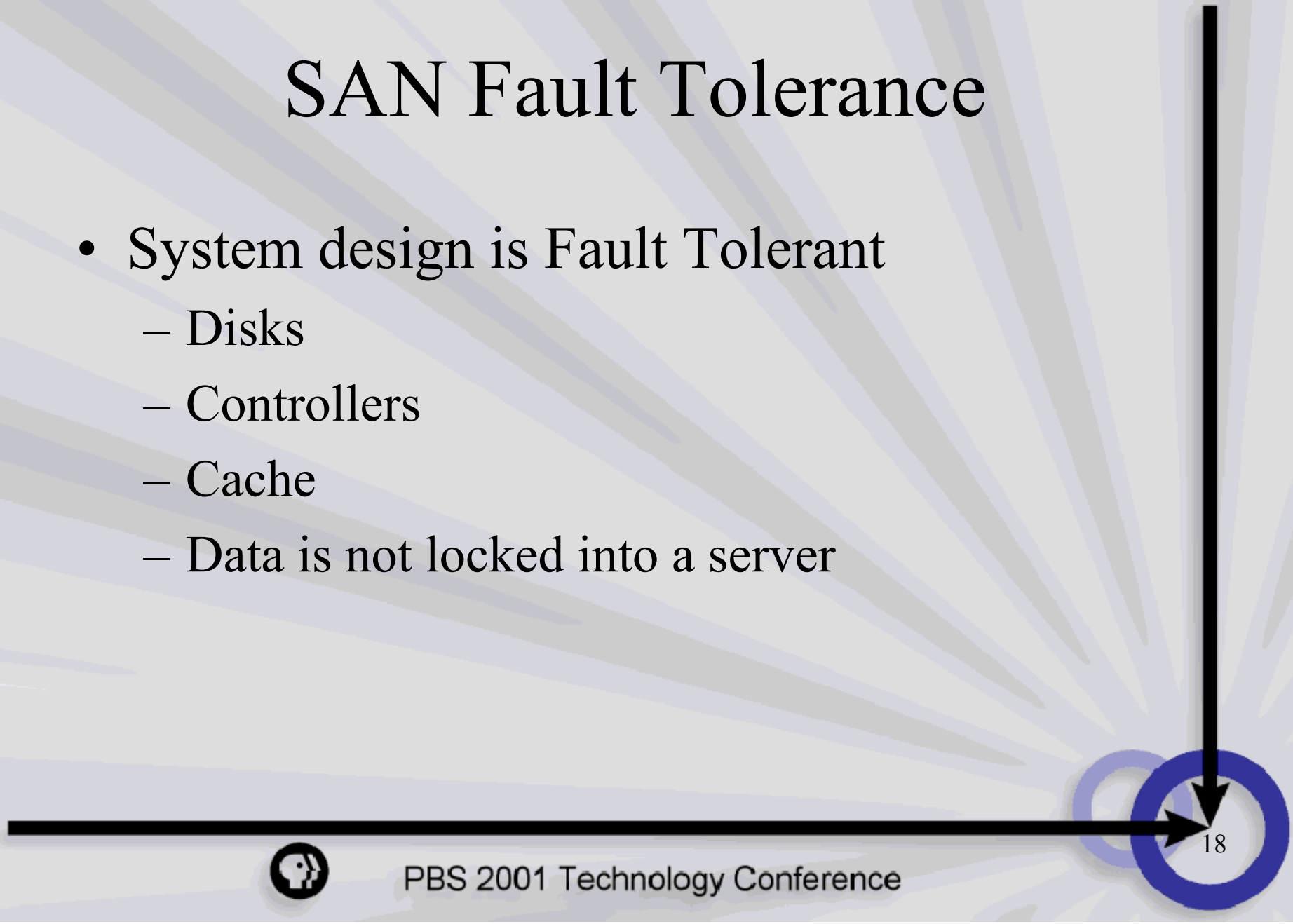
SAN



- Servers
- Host Bus Adapters
- Storage Devices
- FC Switches & Hubs
- Tape Devices
- FC to SCSI routers

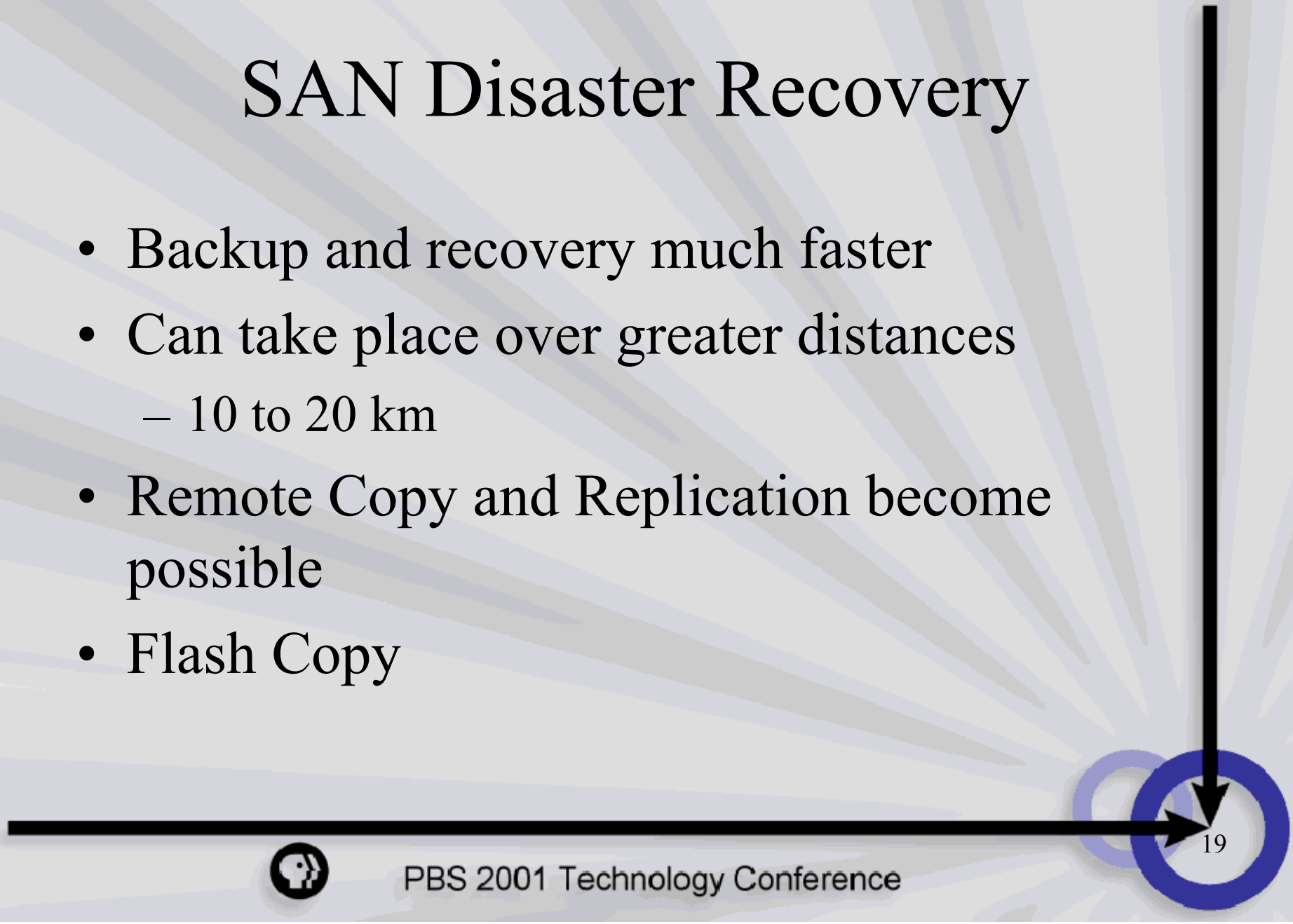
SAN Fault Tolerance

- System design is Fault Tolerant
  - Disks
  - Controllers
  - Cache
  - Data is not locked into a server



SAN Disaster Recovery

- Backup and recovery much faster
- Can take place over greater distances
  - 10 to 20 km
- Remote Copy and Replication become possible
- Flash Copy

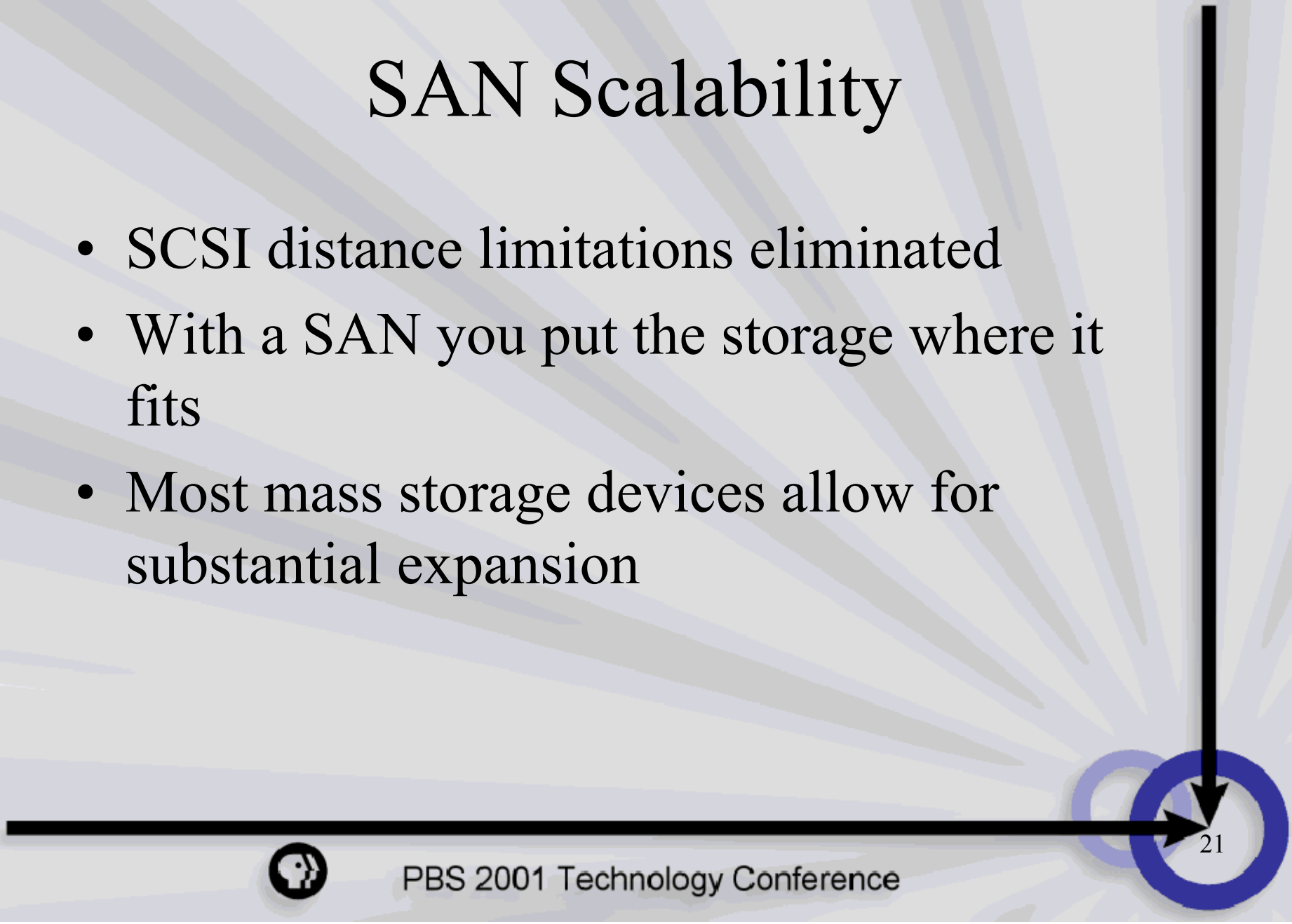


SAN Network Performance

- SAN network moves only I/O data
- 100MB/sec, 200MB/sec Full Duplex
- 2 Gbit FC starting to ship
- Data only uses the Ethernet to serve the client

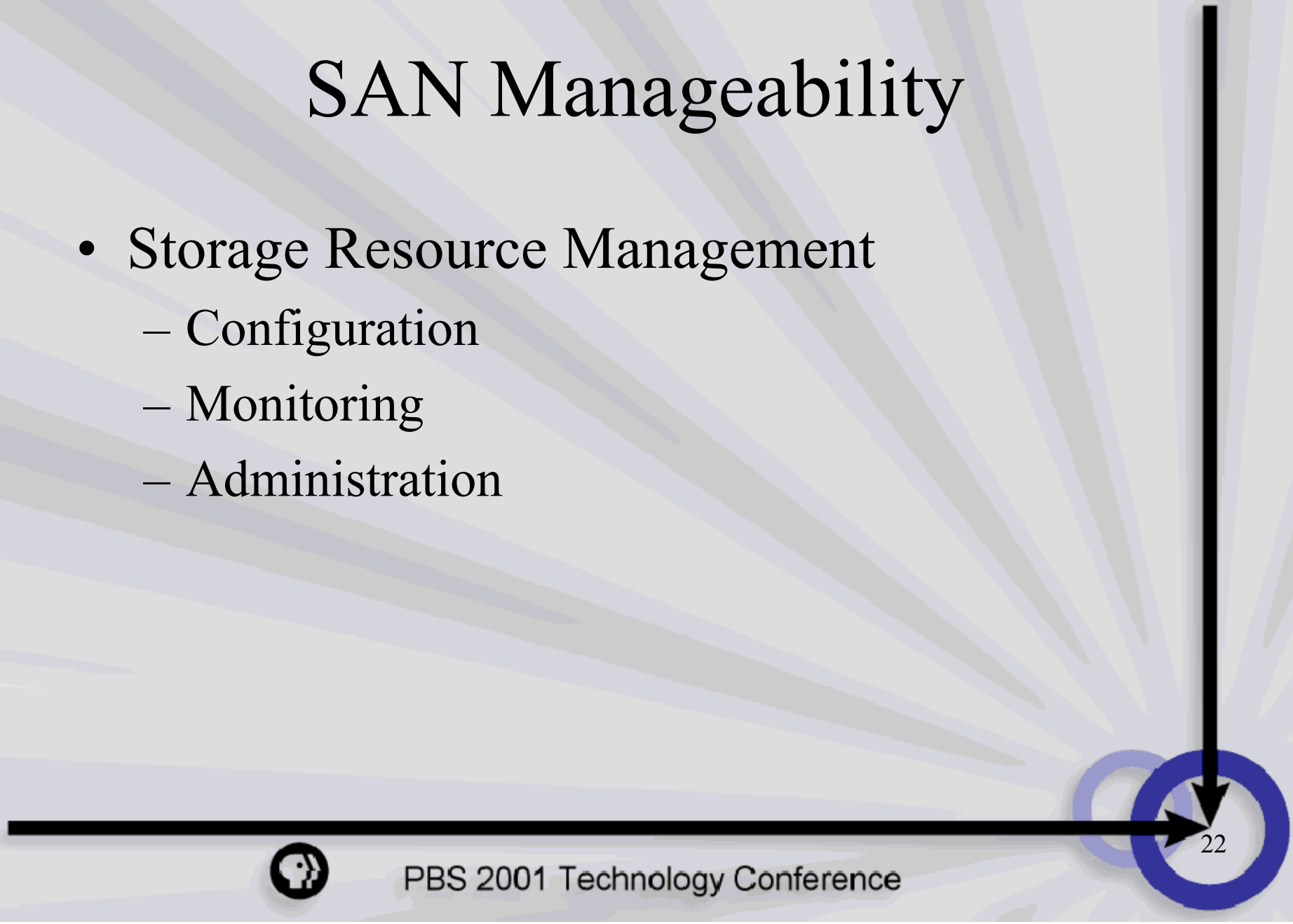
SAN Scalability

- SCSI distance limitations eliminated
- With a SAN you put the storage where it fits
- Most mass storage devices allow for substantial expansion



SAN Manageability

- Storage Resource Management
  - Configuration
  - Monitoring
  - Administration

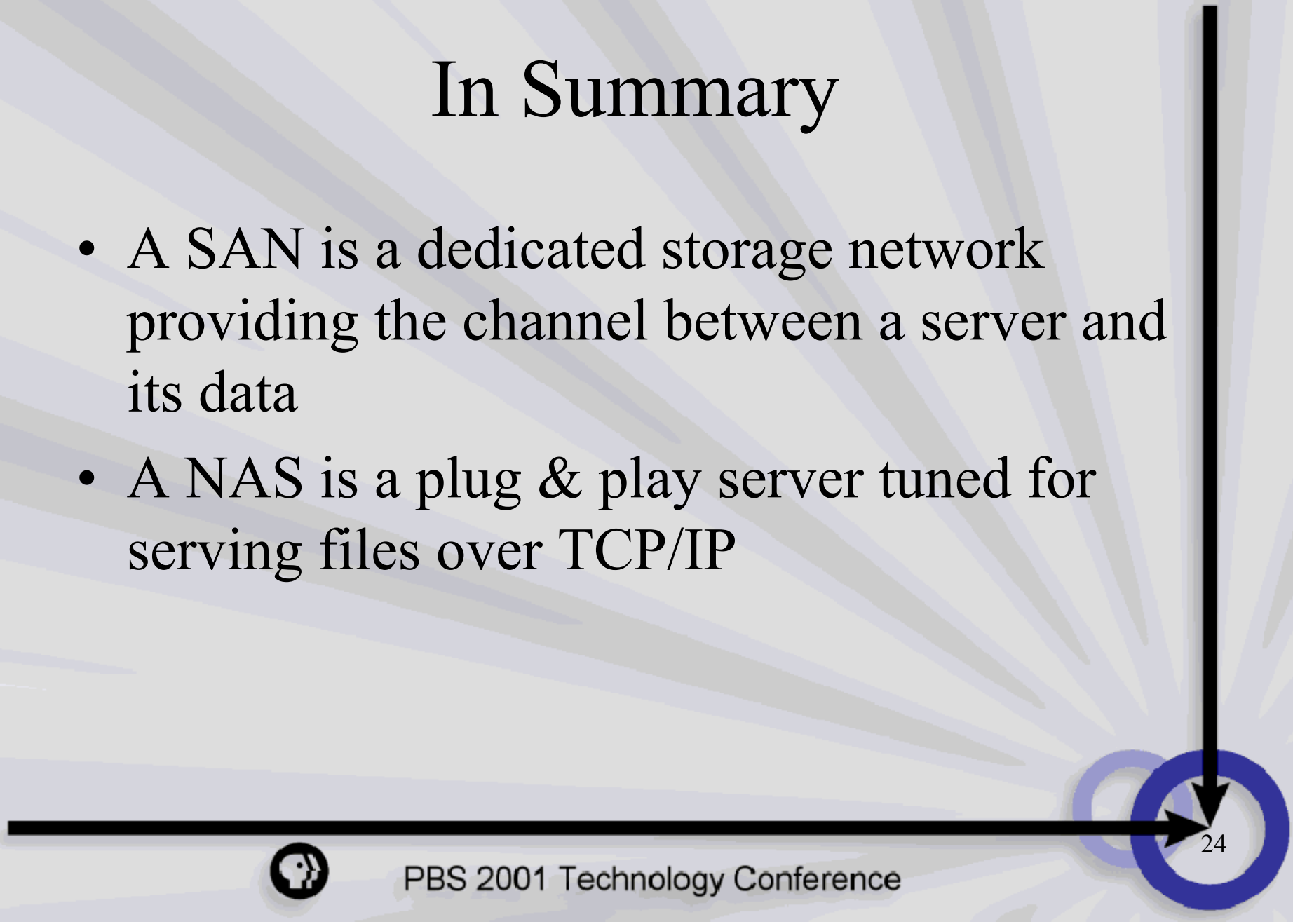


SAN Cost Effectiveness

- Economies of scale
- Less orphaned space
- Supports heterogeneous environment
- Capacity can be redistributed as needed
- Unused space is centrally pooled

In Summary

- A SAN is a dedicated storage network providing the channel between a server and its data
- A NAS is a plug & play server tuned for serving files over TCP/IP



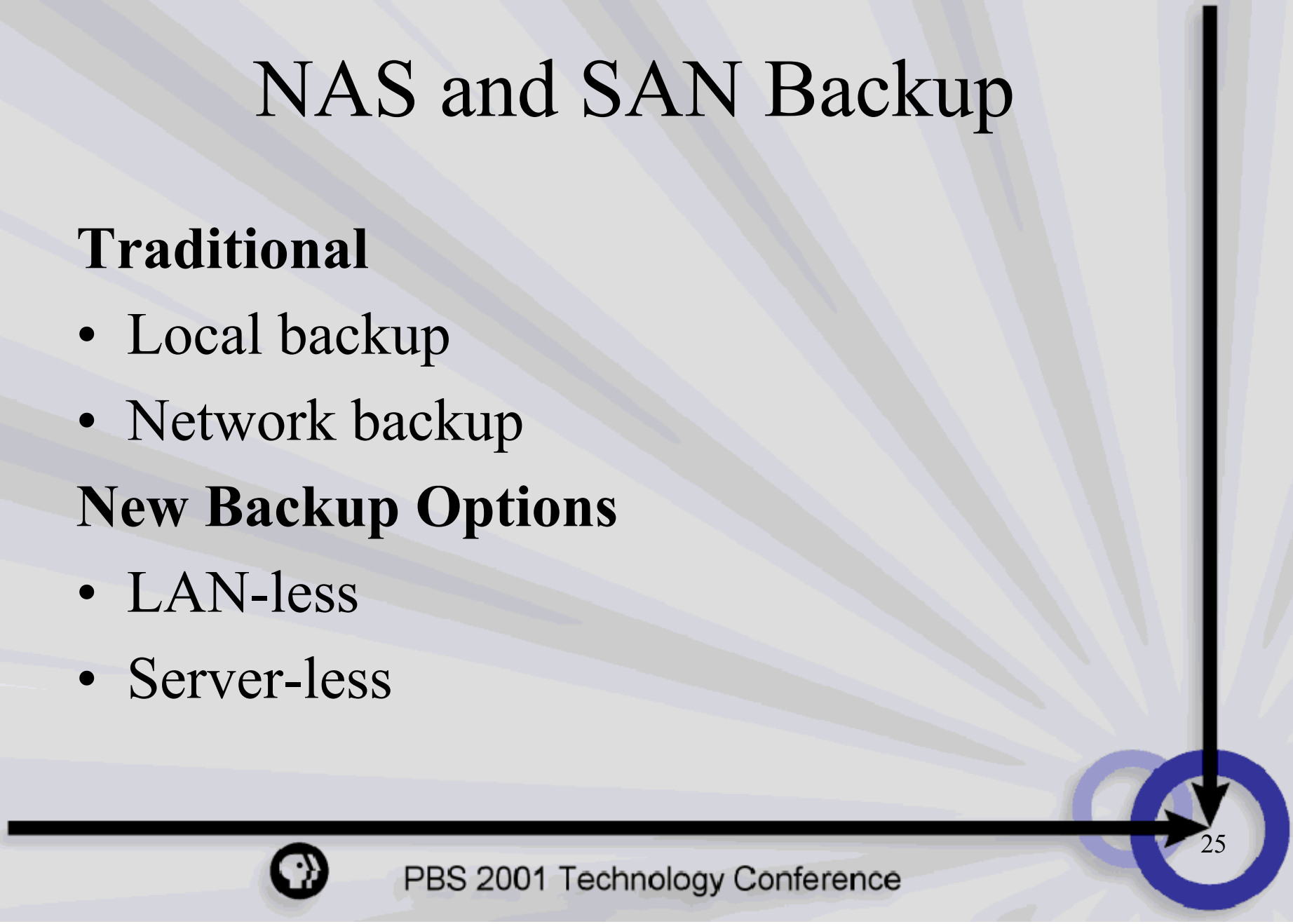
NAS and SAN Backup

Traditional

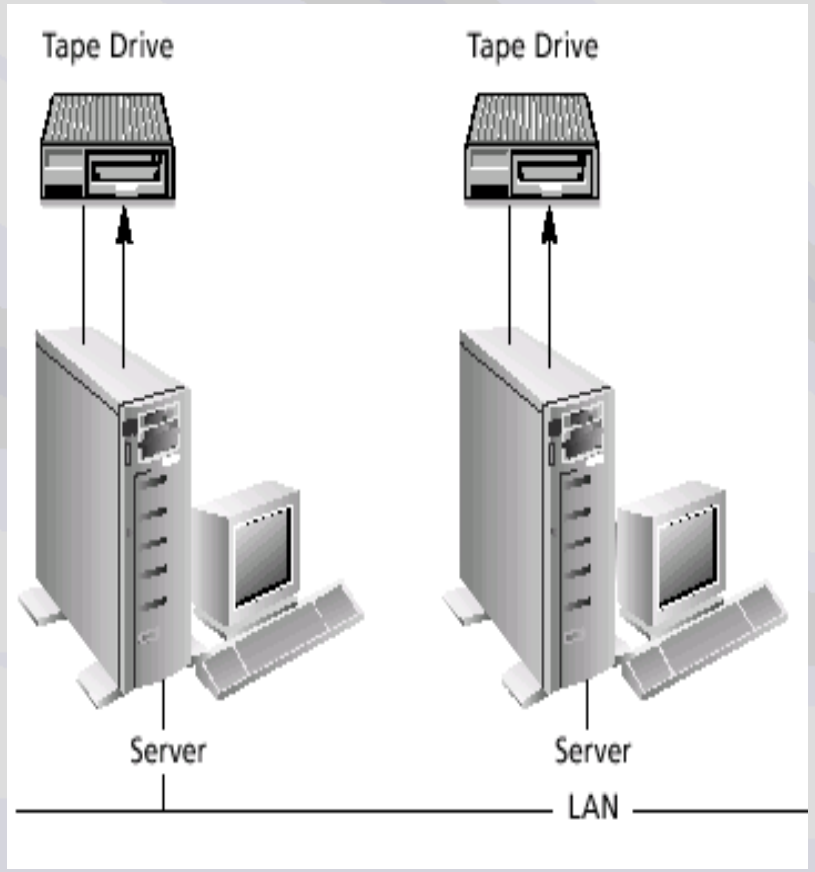
- Local backup
- Network backup

New Backup Options

- LAN-less
- Server-less



Local Backup

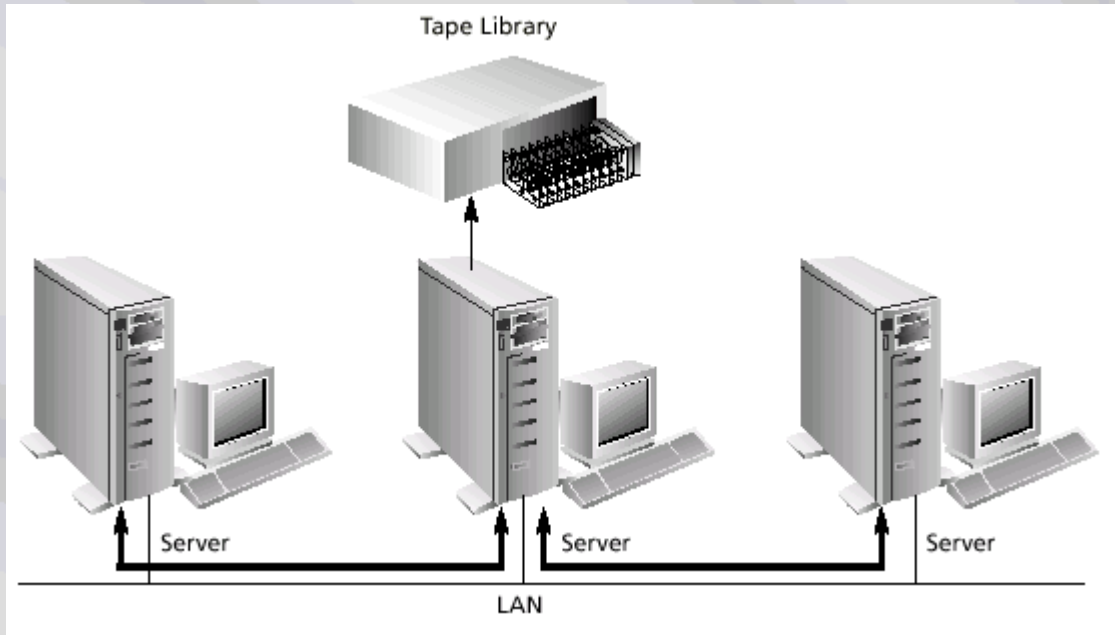


- Low network utilization
- Good performance

But…

- Management headache
- High failure rate

Network Backup



Network Backup Pros

- Greater automation
- Centralized administration
- Lower administrative costs

Result: More reliable backups

Network Backup Cons

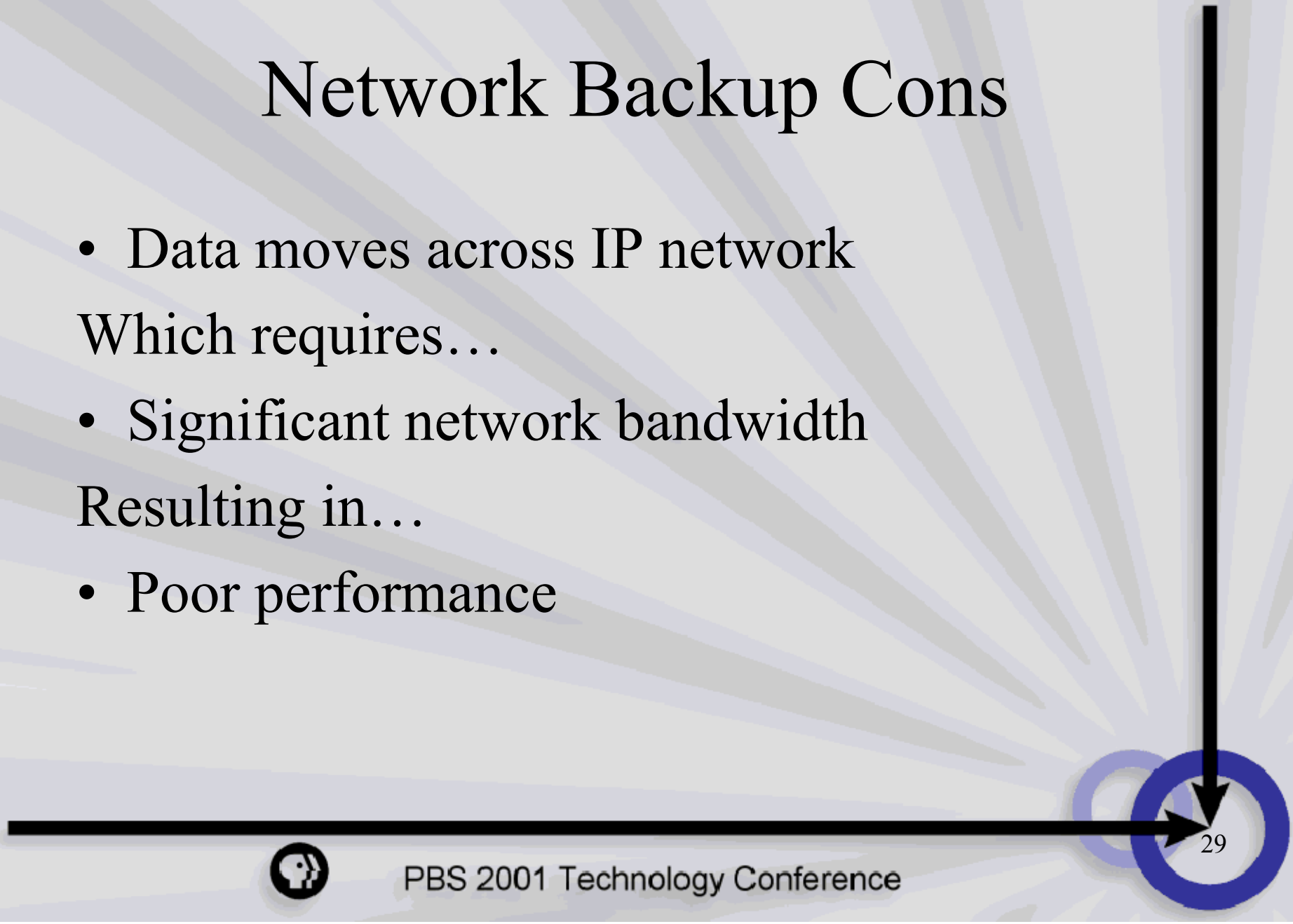
- Data moves across IP network

Which requires…

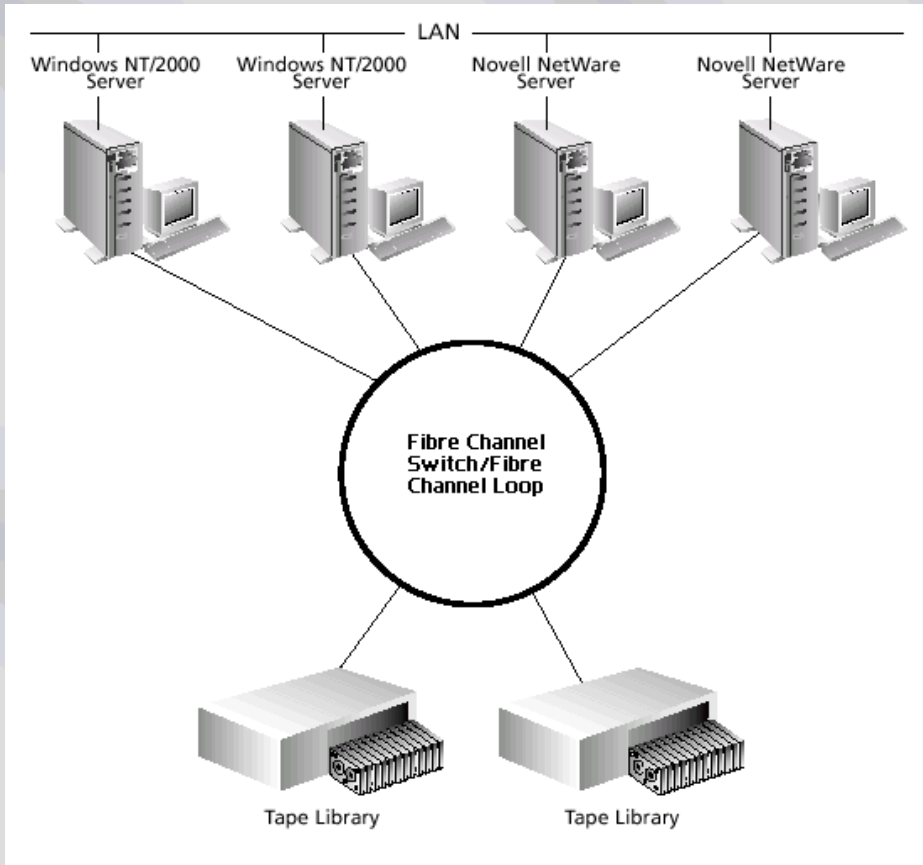
- Significant network bandwidth

Resulting in…

- Poor performance



LAN-less Backup



Backing Up a NAS

- Too much data to backup over LAN in most cases

What are your choices?

  - Local Backups
  - Add an Host Bus Adapter to NAS server and go LAN-less

Backing Up a SAN

- Network backups become unmanageable
- Local backup of many servers unmanageable

Leverage your SAN investment

- Go LAN-less as soon as possible
- Move to LTO or FC based tape technology

The Future of SAN Backups

- Integrated Media and Devices
  - Add performance & capacity policies into tape device selection
- Server-less Backups
  - Data moves between storage device and tape device
  - This is the one to wait for

Future Directions

- Improved SAN management
- iSCSI
  - Ubiquitous IP Protocol
  - Currently slow compared to FC
- Gigabit Ethernet
- 2 and 4Gb FC, 10Gb FC and Ethernet by 2005

Resources

Books

– *Building Storage Networks*, Marc Farley

White Papers

– veritas.com, jni.com, qlogic.com, emulex.com, inrange.com

Periodicals

– wwpi.com, infostore.com

Gartner Group

Questions

kwalters@pbs.org