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Business without interruption.

The Road to Centralized Management

Realizing the Promise of SANs

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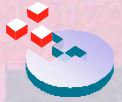
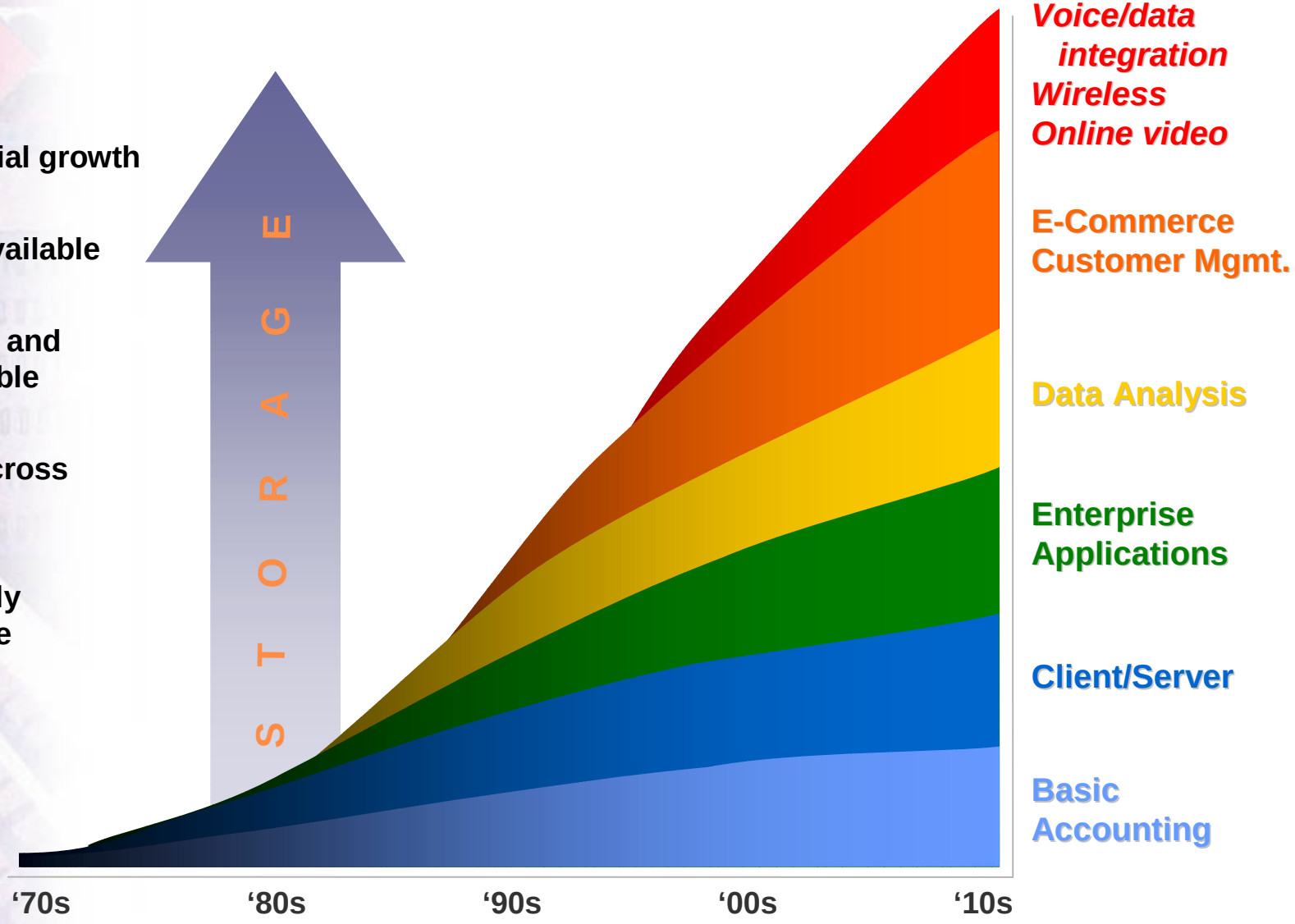
VERITAS Software

Education Committee Chairman
Storage Network Industry Association



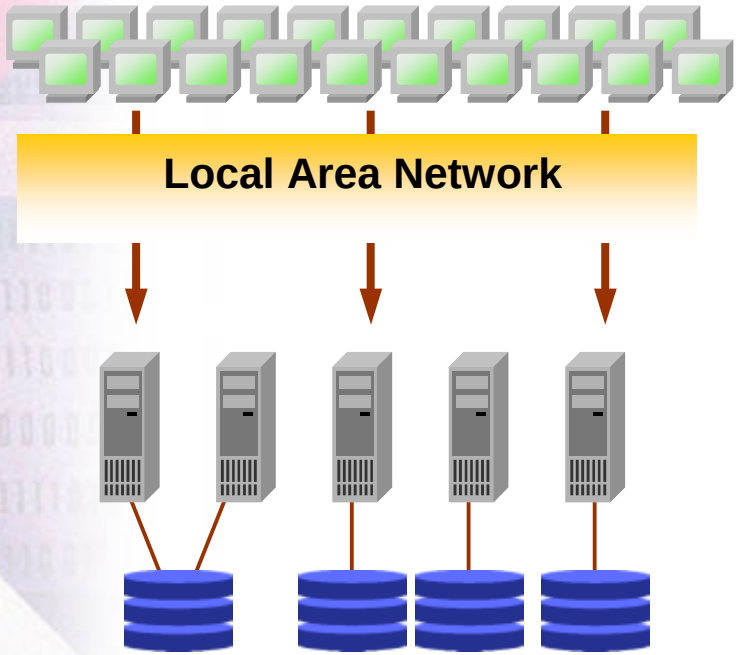
SNIA

Applications Drive Storage



Traditional LAN

Client/Server Architecture



"Any-to-any" LAN-based connectivity

but...

"Point-to-point" storage architecture

- **Limited scalability**
- **High availability is prohibitively costly**
- **Difficult, costly management**
- **Fragmented and decentralized storage**

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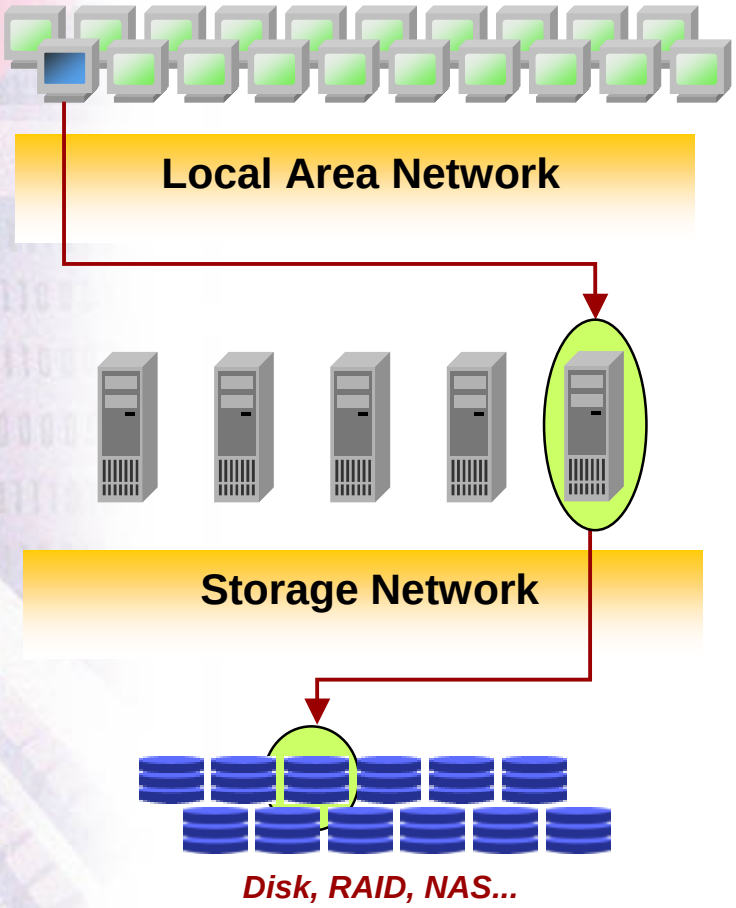
New Capabilities are Needed

- **Managing costs through physical centralization**
  - Sharing of costly peripherals
  - Capacity management across pools of storage
  - Optimize highly trained staff with central administration
- **Increased availability without escalating costs**
  - Virtualization permits non-disruptive on-line changes
  - Policy agents automate storage management tasks
  - Multiple paths between application and data
- **Data centers that grow at internet speed**
  - Adapt to rapid and unpredictable change
  - Re-purposing of application servers
  - Dynamic, demand-based allocation of storage and devices

A New Model

"Storage Area Network" Architecture



"Any-to-any" storage connectivity

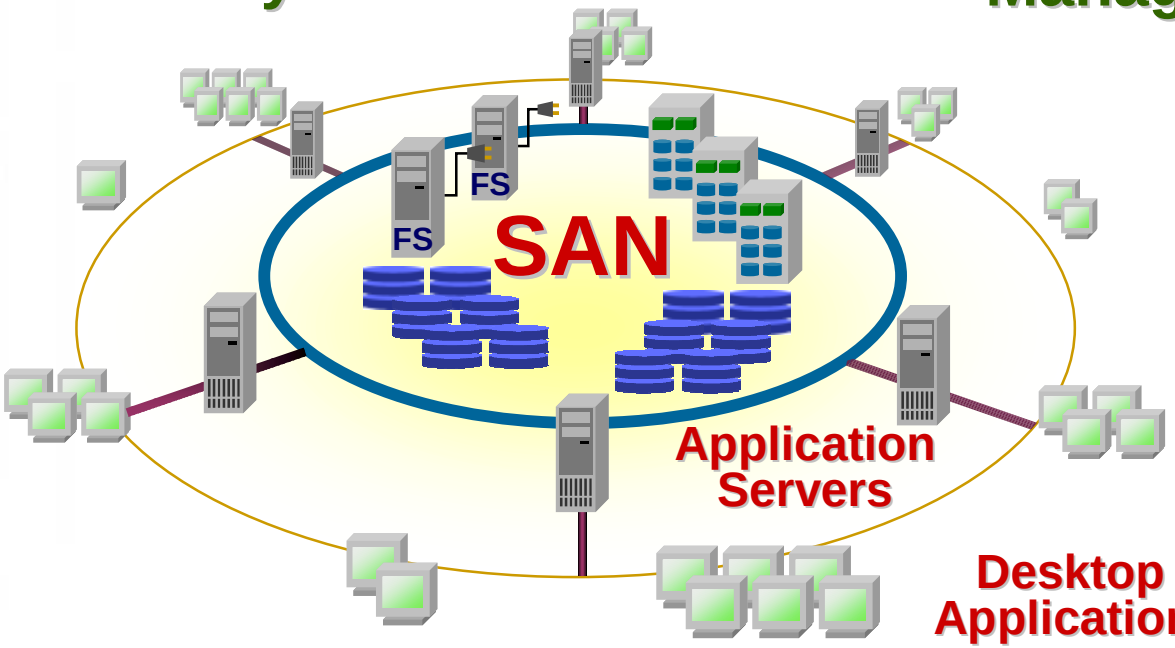
- Ubiquitous data access
- Higher availability — at significantly lower cost
- Easy and inexpensive scalability
- Reduced management costs

SANs are at the Core of e-business Infrastructure

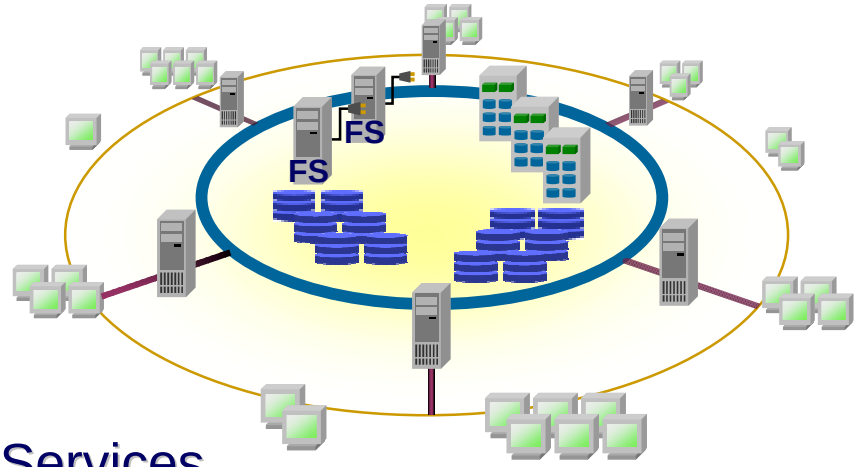
Data Protection & Recovery

On-Line Data Access

Automated Management



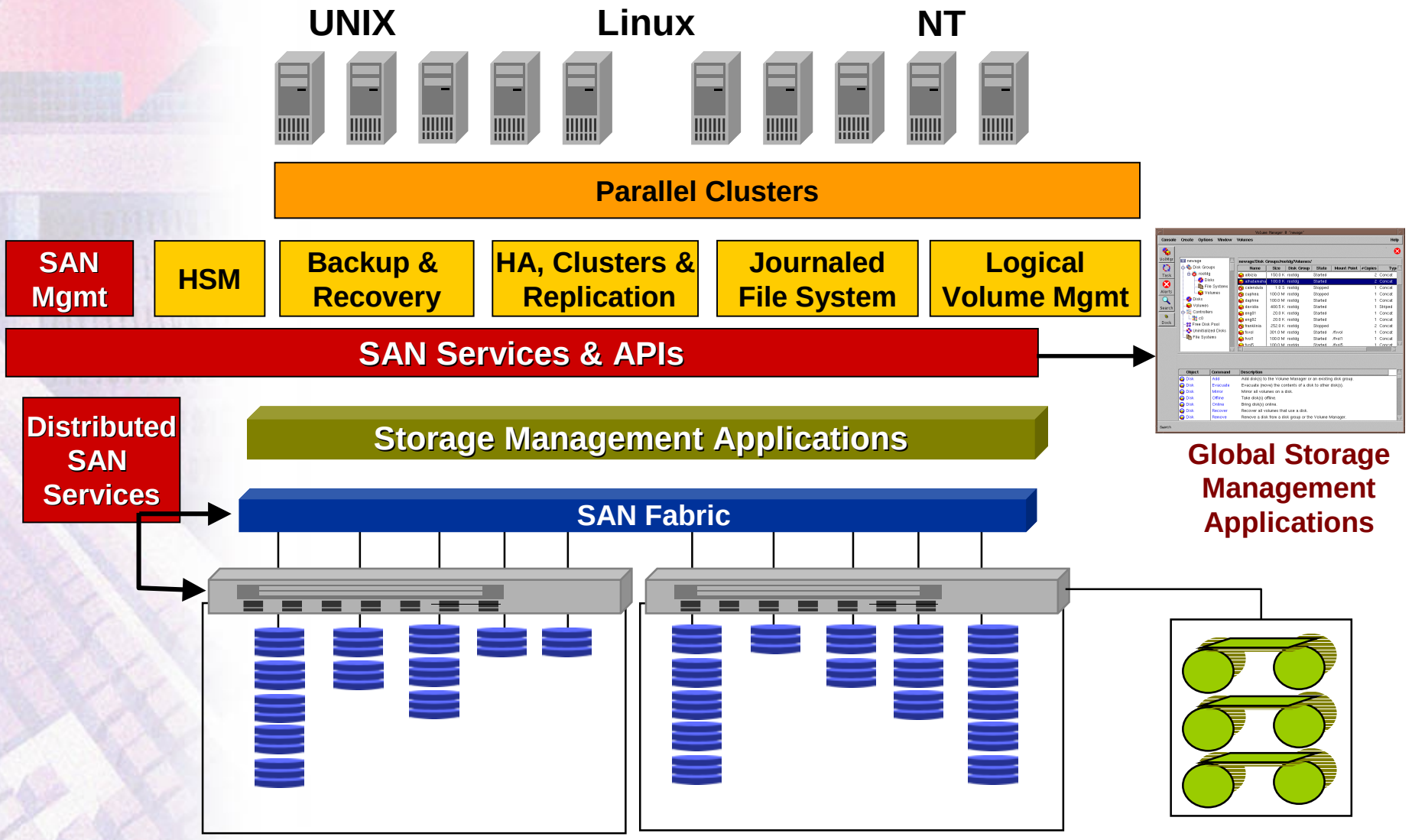
Ideal SAN Characteristics



- Thousands of devices
- Arbitrary interconnection
- Scalable bandwidth
- Dedicated to and optimized for storage I/O
- High Availability of Applications & Services
- Dynamic Device Management and Detection
- Long Distance Interconnects
- Fault tolerance
- Disaster Recovery
- Enterprise Class Access Control and Security
- Shared storage access between heterogeneous systems
- Current applications and OS's run without modification

But…
SANs are inherently more complex environments

SAN Management Architecture



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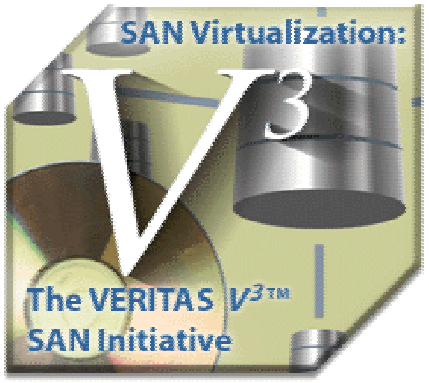
VERITAS V³ SAN Initiative

Virtualization in a SAN Environment

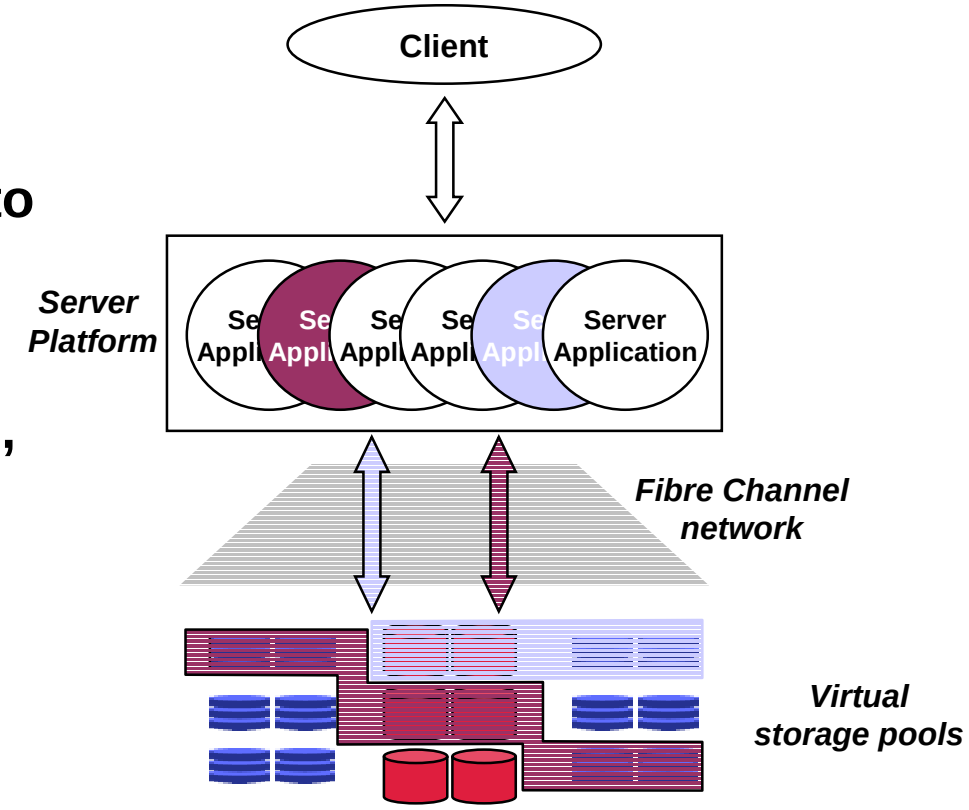
- **Delivering virtualization *technology* for the SAN environment**
- **Standards-based "glue" for SANs**



- **V³ SAN Access Layer**
- **V³ Storage Appliance Software Suite**
- **V³ SAN Management Tools**

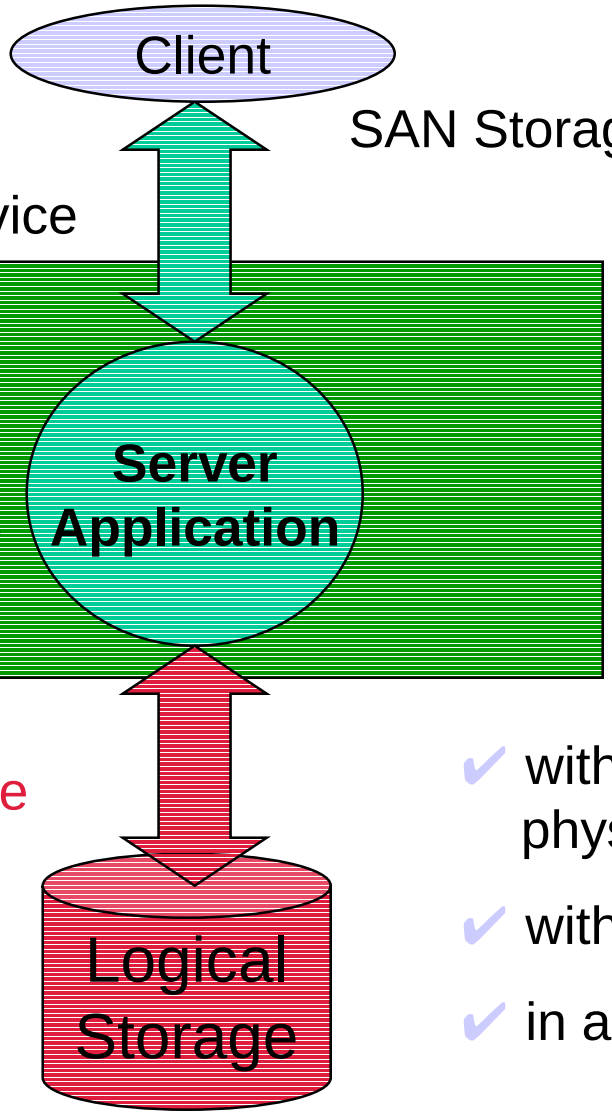
What *is* SAN Virtualization?

- **The process of organizing multiple *storage resources* into logical - or virtual - entities to better manage capacity, automate procedures, and increase performance**



- ***SAN virtualization enables management of more complex installations while controlling and reducing cost of ownership***

The Goal of "SAN Virtualization"
Dramatically Simplify Storage Management



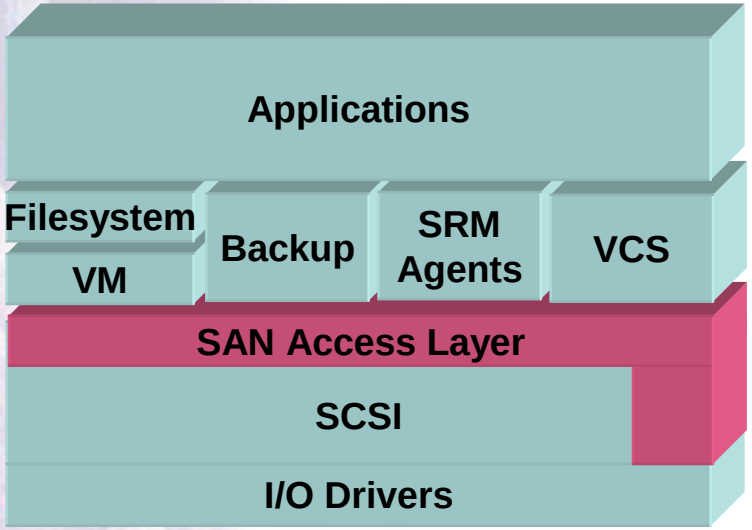
SAN Storage Management must be capable of these services….

- ✔ *Capacity Allocation*
- ✔ *Failure Recovery*
- ✔ *Data Protection*
- ✔ *Performance Management*
- ✔ *Asset Optimization*

- ✔ without manual management of physical devices
- ✔ with minimal disruption to application
- ✔ in a heterogeneous environment

The VERITAS V³ SAN Access Layer Creates SAN-Aware Storage Management

V³ SAN Access Layer is a new host-based technology that provides a virtual interface into the more complex SAN environment

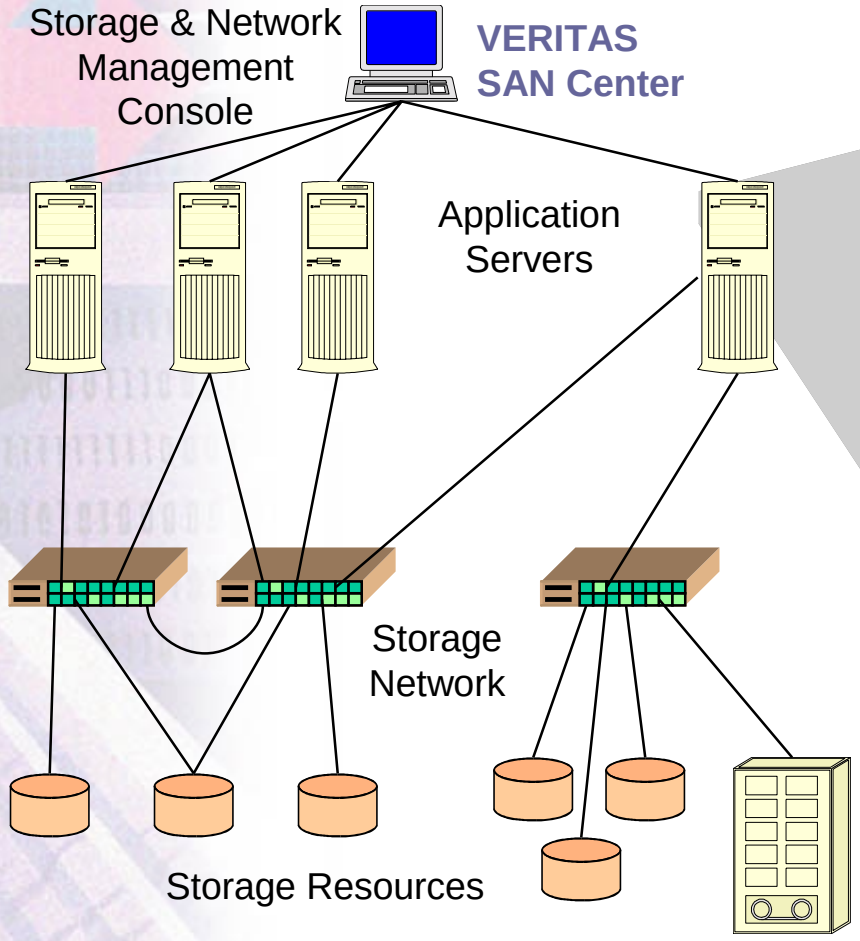


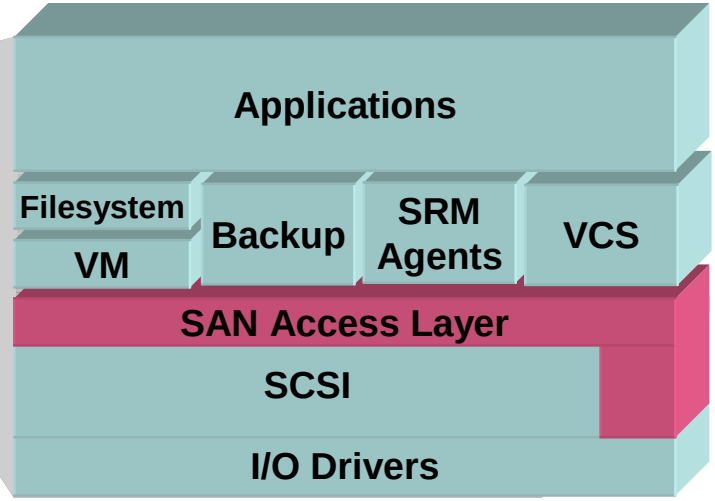
- ✔ "Client API" for host applications are common across NT/UNIX
- ✔ "SAN API" for communication with SAN Fabric,Devices, Services
- ✔ Complements more limited legacy SCSI I/O services

Enables SAN Discovery Services

SAN APIs based on de-facto and formal standards… with vendor specific extensions added as needed

The VERITAS SAN Access Layer Creates SAN-Aware Applications





Discovery Services

- Topology & Distance
- Zoning
- Storage Attributes and Agents

Common APIs for NT and UNIX

- SAN APIs
- Client APIs for SAN Management or storage management applications

Foundation for SNIA Discovery Working Group

SAN Discovery Services

SAN Discovery Services capture, correlate, and maintain capabilities & attributes of a SAN configuration and presents a common service API

- **Properties that are discovered and used….**
  - ✔ **Device and host names**
  - ✔ **Topology/distance & SAN configuration state changes**
  - ✔ **Zoning Configuration & Control**
  - ✔ **Off-host Agents and Services (ie 3rd Party Copy)**
  - ✔ **Storage Attributes (cost, RAID level, performance)**

Using the V³ SAN Access Layer to Enable SAN Capabilities

- **V³ SAN Management Tools**
  - ✔ **Single centralized application for zone administration**
- **High Availability Cluster Server**
  - ✔ **Automatically re-configures zone to provision a new path to failed application's storage**
- **Logical Disk / Volume Manager**
  - ✔ **Finds free disks to allocate to a growing application based on cost/performance needs**
- **Backup and Storage Migration**
  - ✔ **Finds the best 3rd Party Copy agent for LAN-free data movement**

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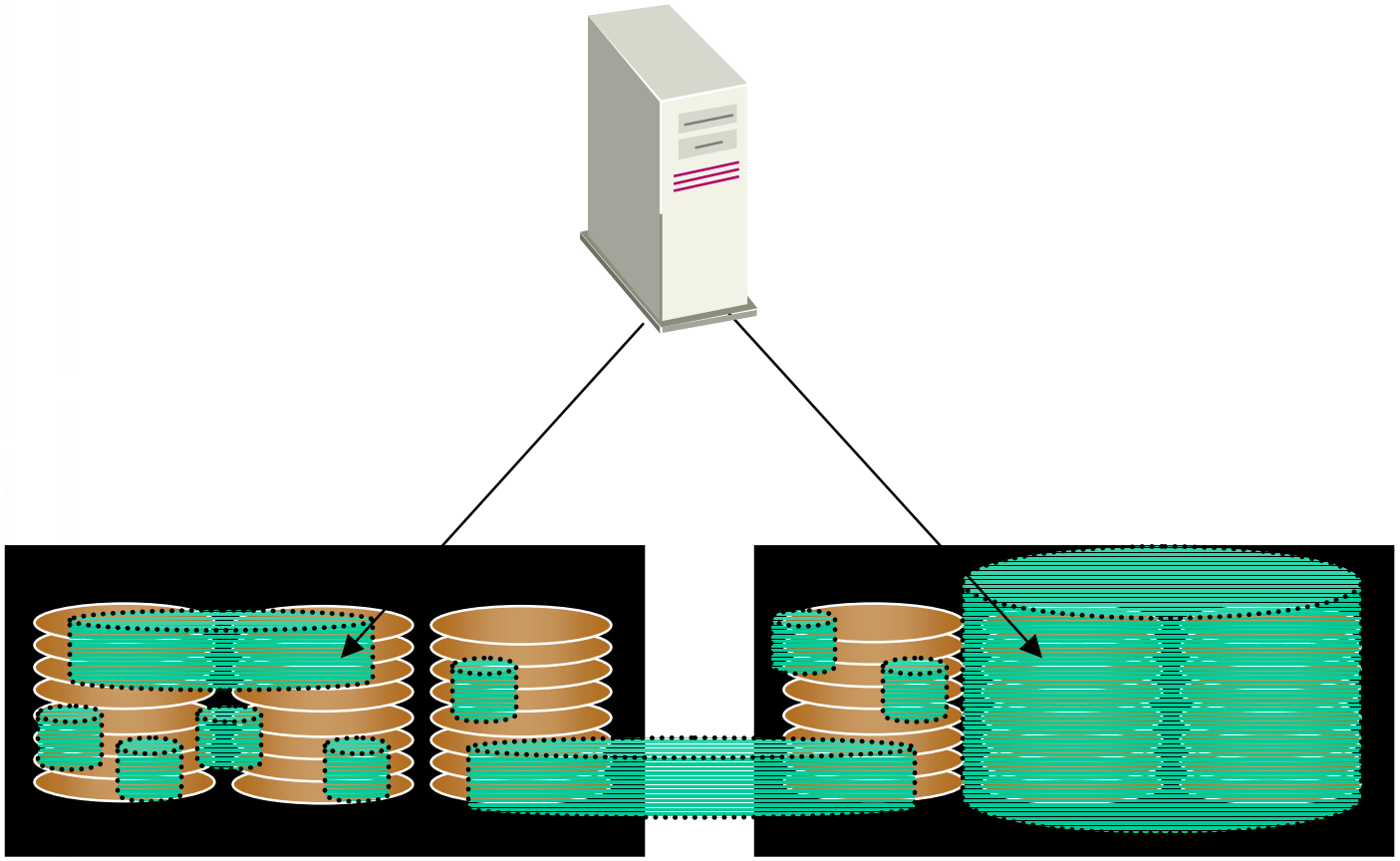
Logical Volume Manager
An Example of Storage Virtualization

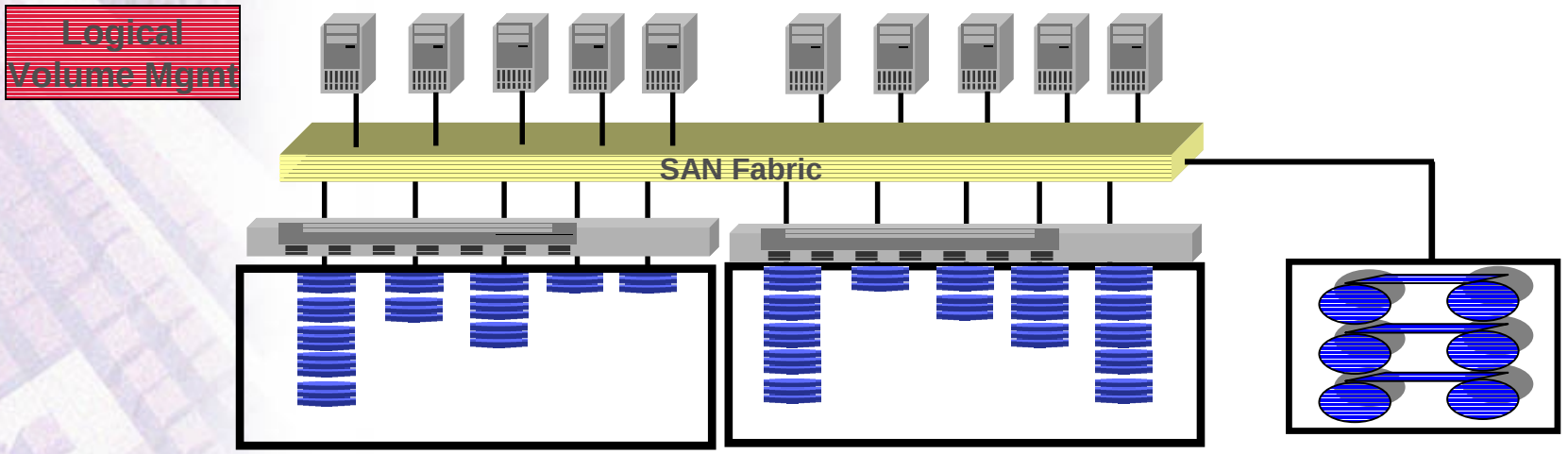


Virtualizes **disk storage to allow creation and online modification of logical storage free of hardware and OS restrictions**

VERITAS Logical Volume Manager (VxVM) in SAN Environments

Non-Disruptive On-Line Storage Management

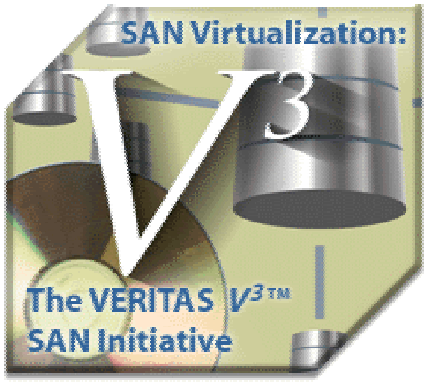
- Remote Mirror to peripheral 10km away
- “LUN ownership” in multi-host environment
- Add-storage on-line to FC hubs/switches
- DMP provides path fail-over and load balancing
- Performance Optimization across a SAN



Intelligent Storage Appliances

Virtual Consolidation of SAN Resources

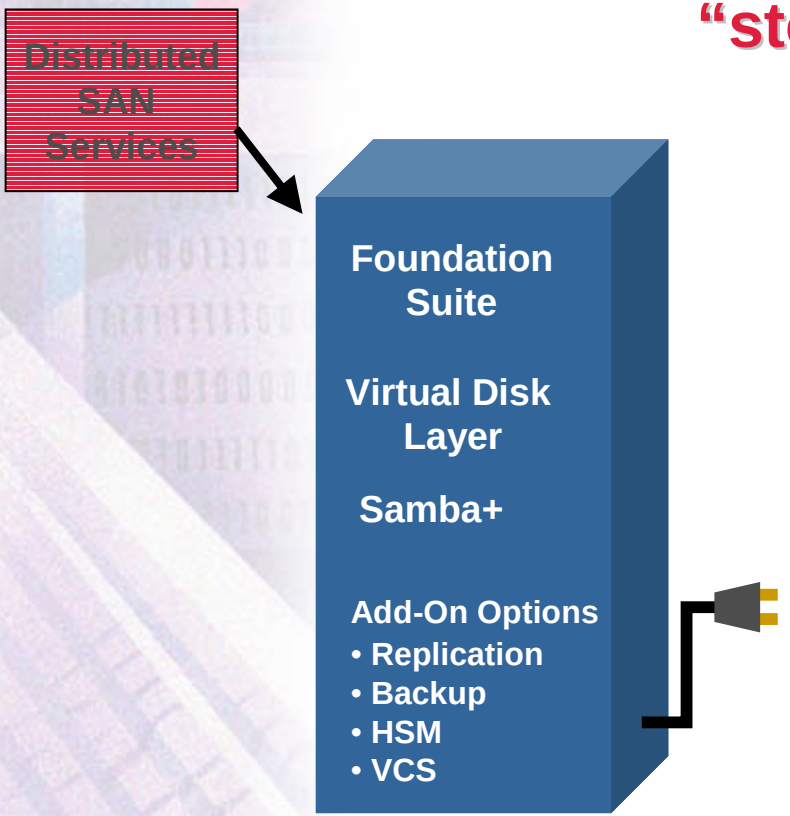
V^3 Storage Appliance Software Suite



- **The power of VERITAS products together in one software suite and integrated into 3rd party intelligent storage servers (or *appliances*)**
- **All centrally managed via V^3 Storage Appliance's *Virtual Disk Manager***
- **Based on FS, allows multiple virtual disks to be more efficiently managed**
  - **Other VERITAS products such as Backup and VCS to be provided as options -- all managed via one central console**
- ***Virtual consolidation point improves manageability***
- ***Maximizes uptime by minimizing impact of physical SAN configuration changes***
- ***Provides the basis for "host free" data movement between intelligent storage devices***

VERITAS StorageCentre
Intelligent Storage Appliance

Embedding VERITAS software on the "storage" side of the SAN



- SAN Attached Storage Server based on VERITAS Foundation Suite
- Commodity HW & Commercial OS for variety price/performance points
- VDISK layer represents "server" as a virtual disk over a SAN
- Optional Samba+ layer allows file access to storage over a LAN port
- Add-on storage management functions as needed for availability or scalability

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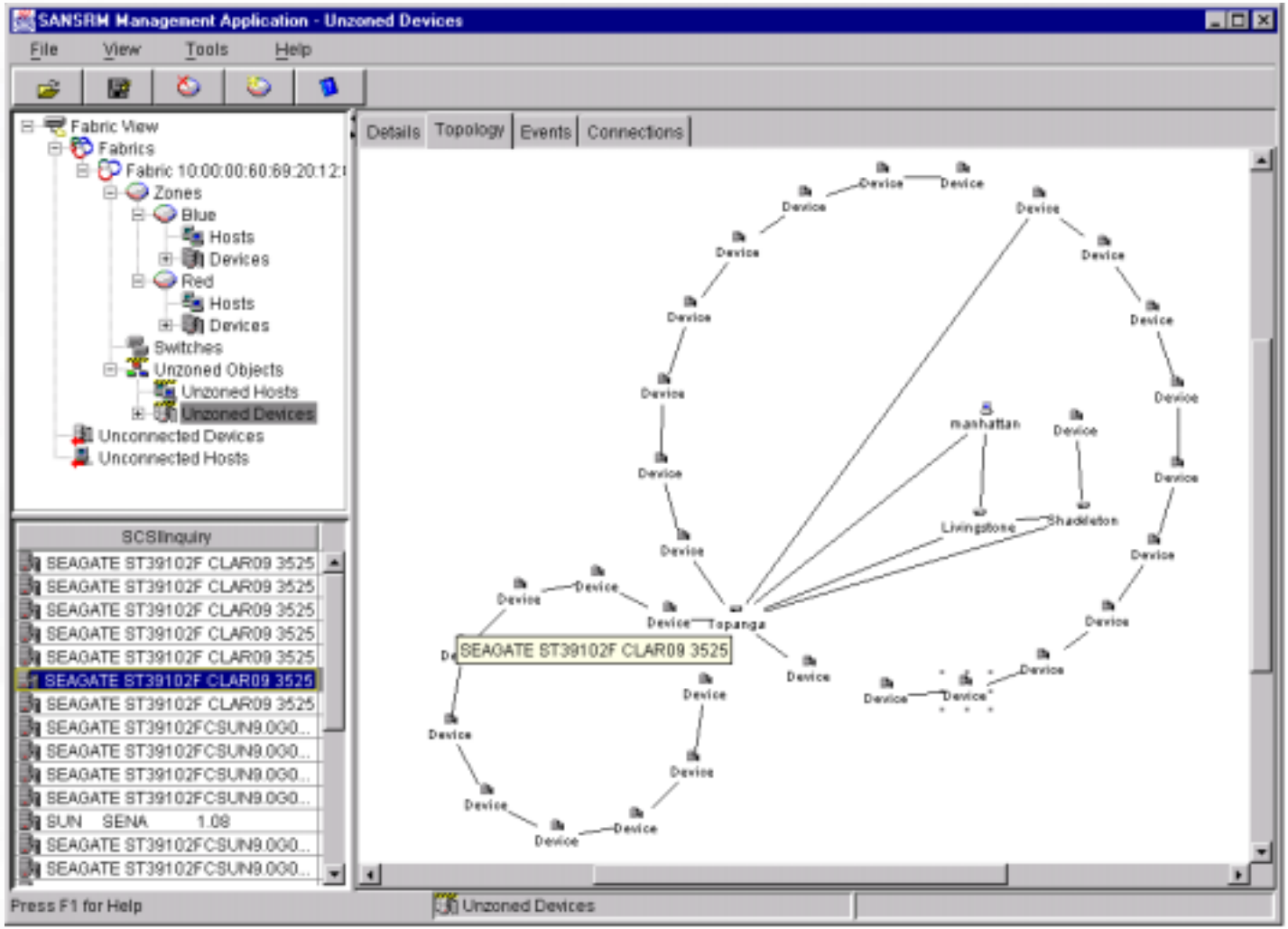
SAN Center

SAN Visualization and Zone Administration



SAN Management Strategy

Enabling New Global Storage Applications

- **Goal : Reduce Complexity of SAN Administration**
  - ✔ **Manage *logical* SAN storage resources**
    (use device views as the exception)
  - ✔ **Deploy functional applications for zone management and capacity allocation**
  - ✔ **Make policy management pervasive to reduce reactive and manual management**

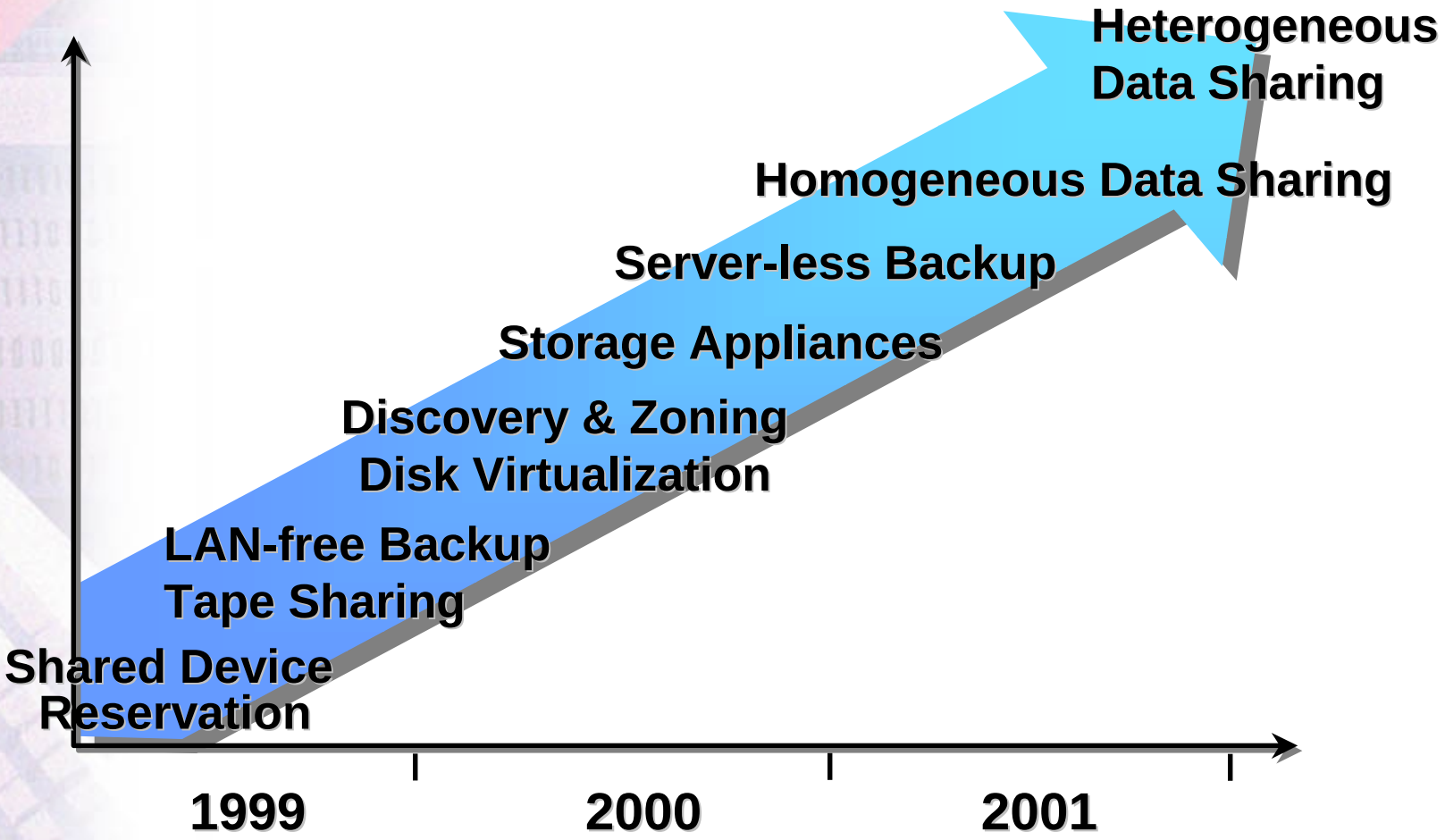
- **Modular Agent/Application architecture**
  - ✔ **Scales from point application management to large SANs using optional central repositories**
  - ✔ **Built on standards (JIRO, CIM, WMI, DMTF, SNIA) & installed base of frameworks (Tivoli,CA, HP, BMC)**

V³ SAN Management Tools

Components used in VERITAS and OEM products

- **Administration built on V³ SAN Access Layer**
  - SAN Visualization with multiple views
  - Zone management from a single application
- **VERITAS Application Management**
  - "SRM" agents and JAVA applications for VM, VxFS, NetBackup
  - Reporting, monitoring, policy automation
- **Common Services**
  - Event notification : e-mail, pager, SNMP
  - Policy administration and enforcement
  - Platform adapters: Systems Mgmt or OEM

SAN Evolution

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