



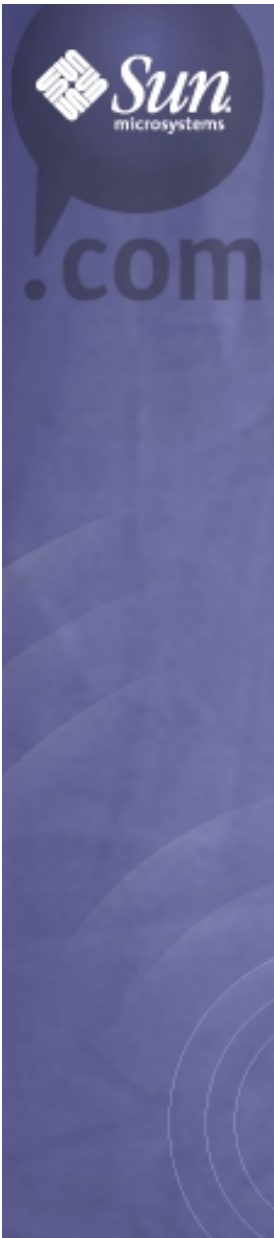
Bruce K. Haddon, William H. Connor



JIROTM

Storage Management

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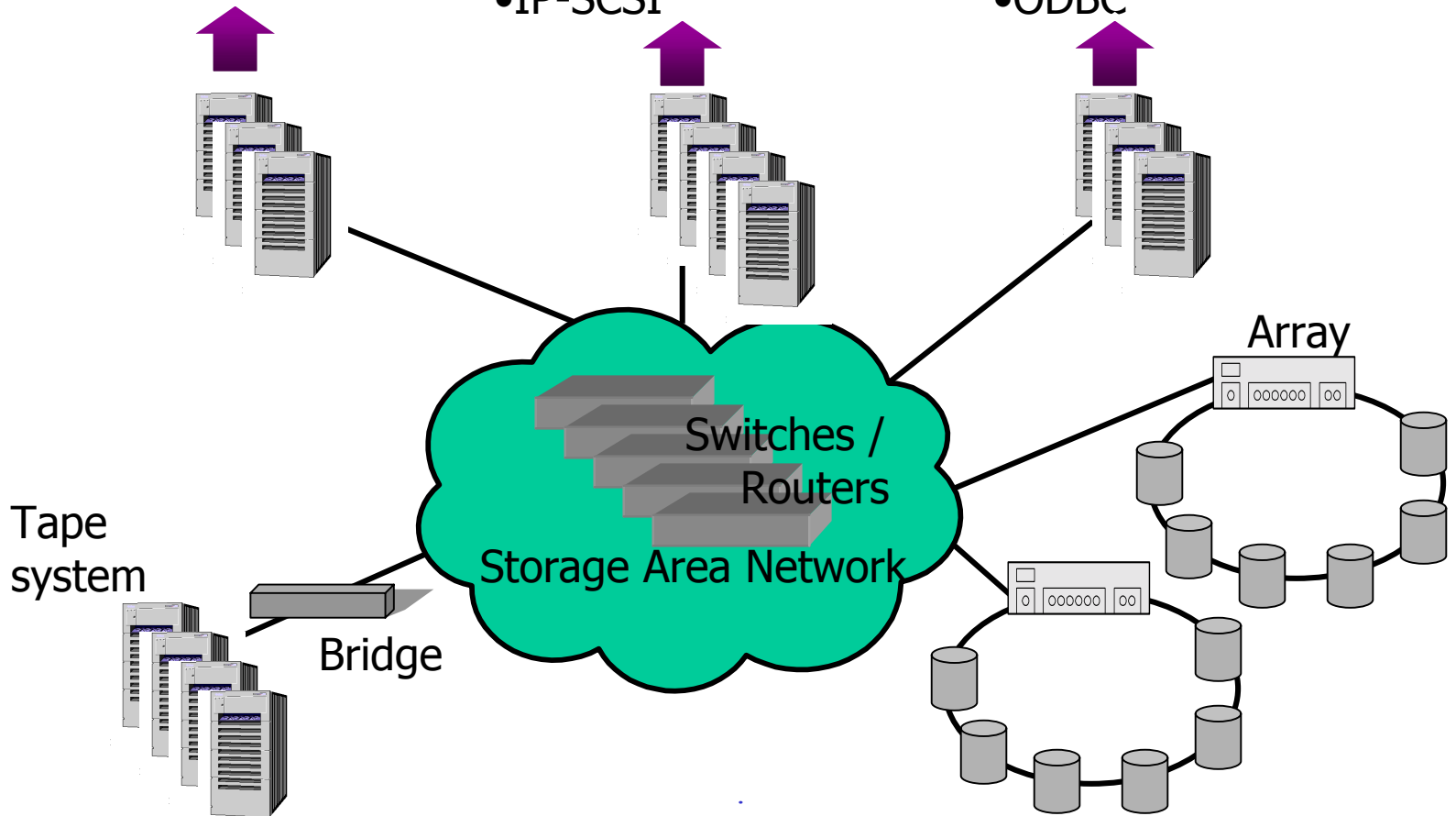


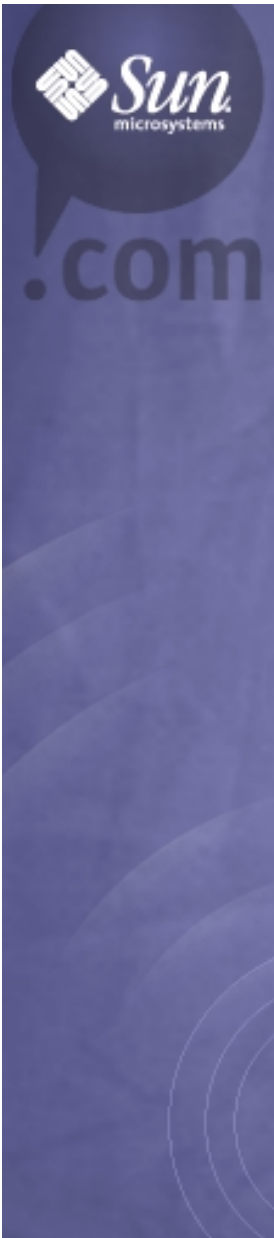
Storage Complexity

FC Storage Services
•Virtual Volumes

IP Storage Services
•NFS/CIFS
•IP-SCSI

DB Storage Services
•JDBC
•ODBC





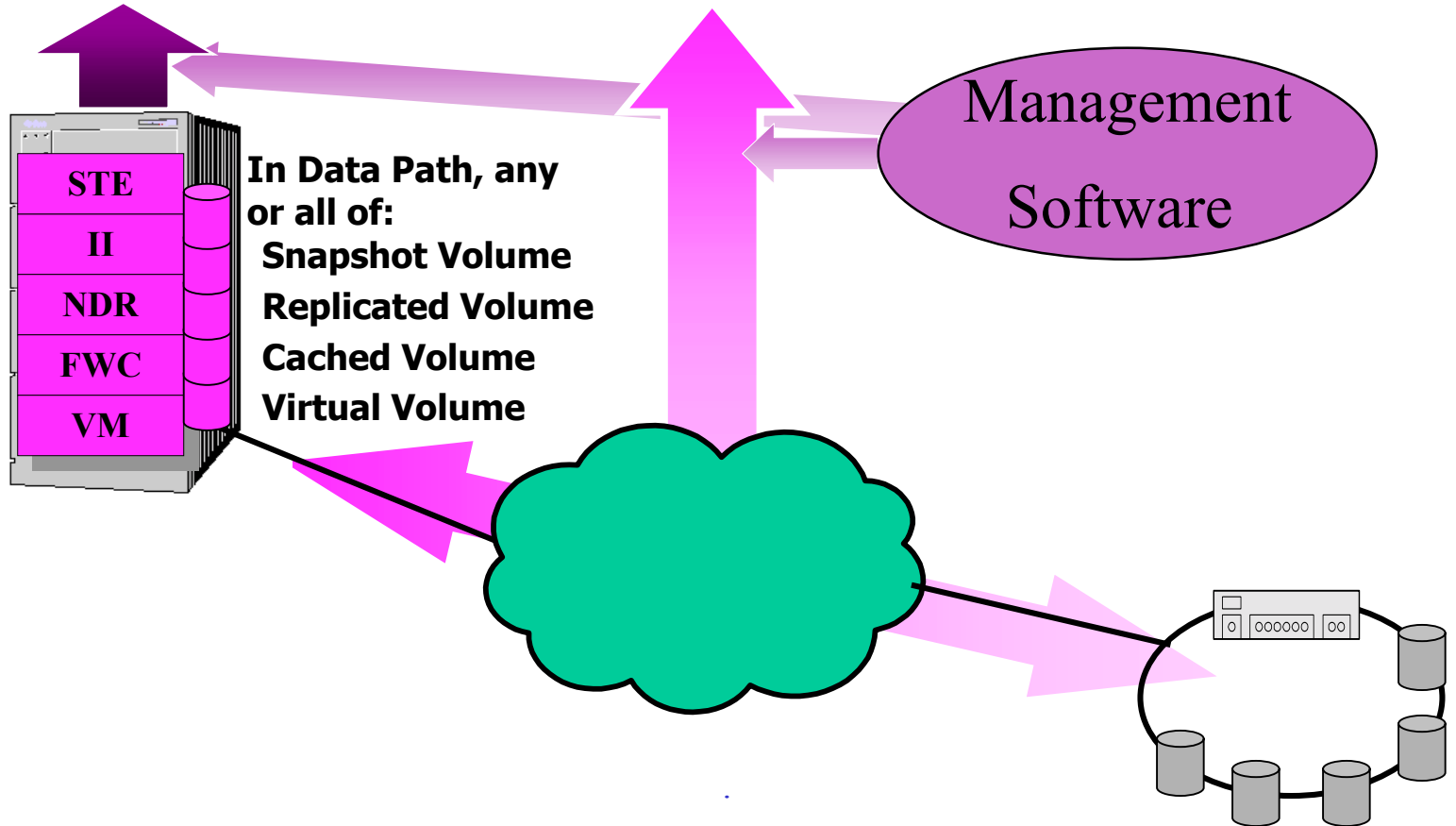
Management Needs to Happen

- Enhanced Virtual Volumes

Fibre Channel

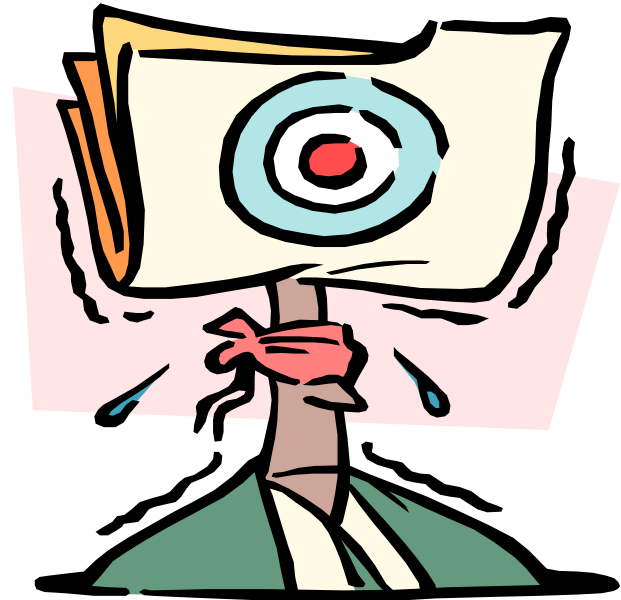
- RAW Virtual Volumes

Fibre Channel

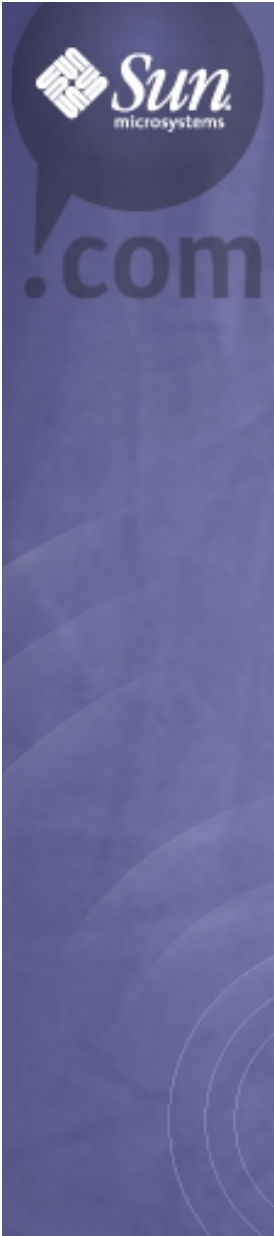


Problems in Management Software:

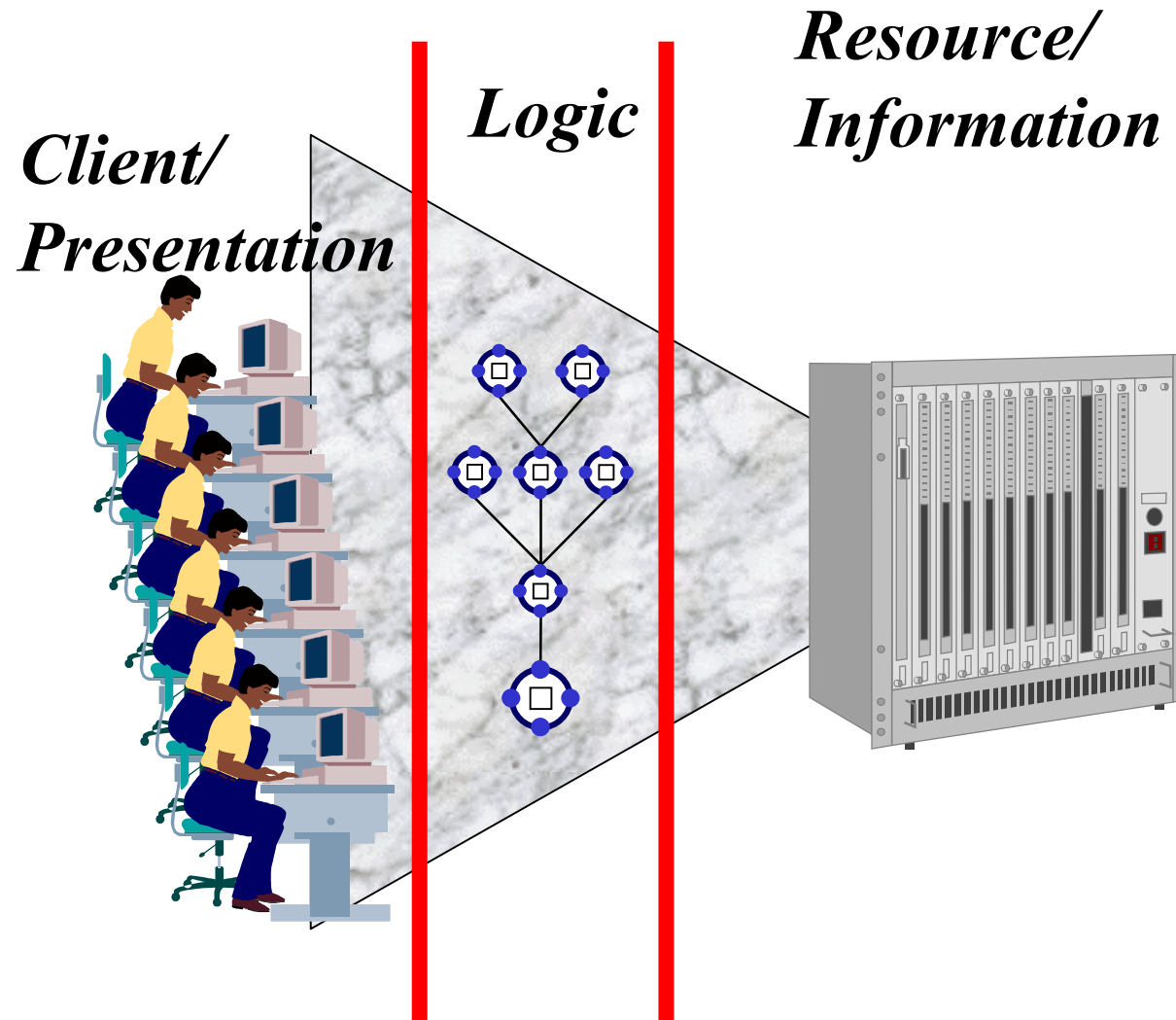
- ◆ Problem Partitioning
- ◆ Scalability
- ◆ Distribution
- ◆ Parallel activities
- ◆ Reliability
- ◆ Discovery
- ◆ Recoverability

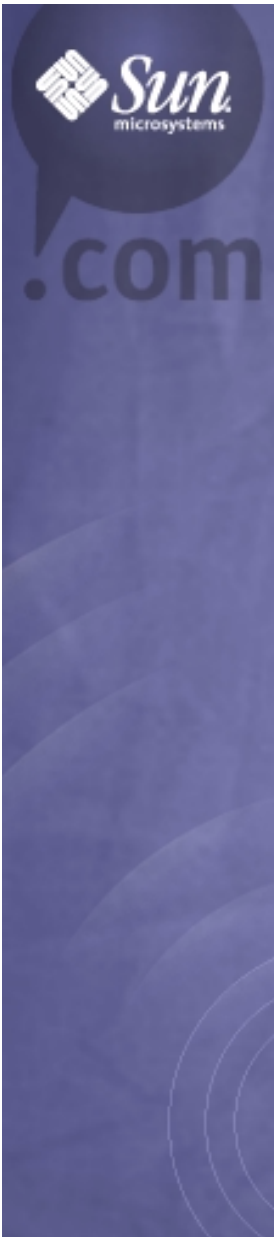


- ◆ Re-use / Leverage
- ◆ Availability
- ◆ Deployment

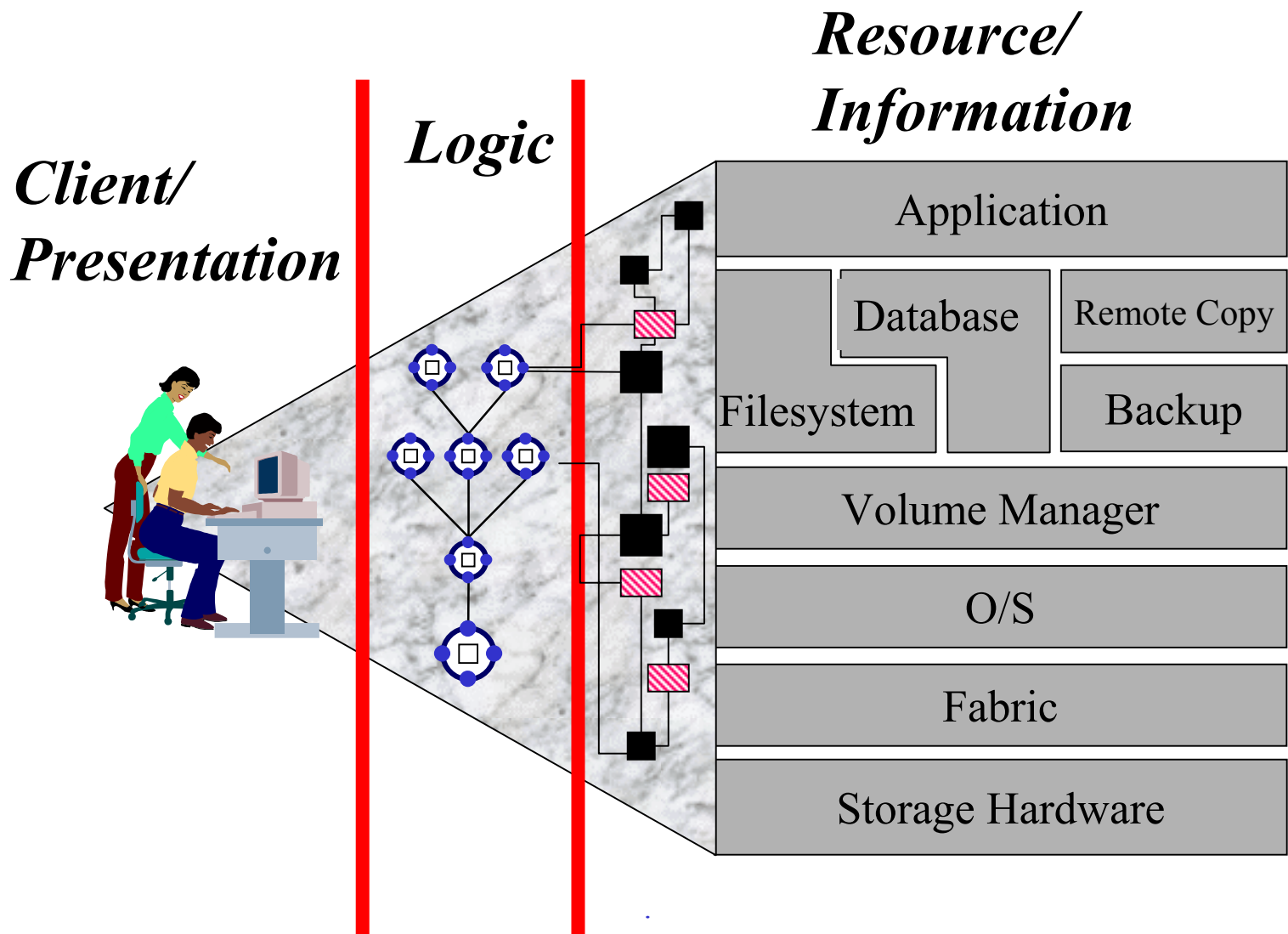


Three-Tier Architectures





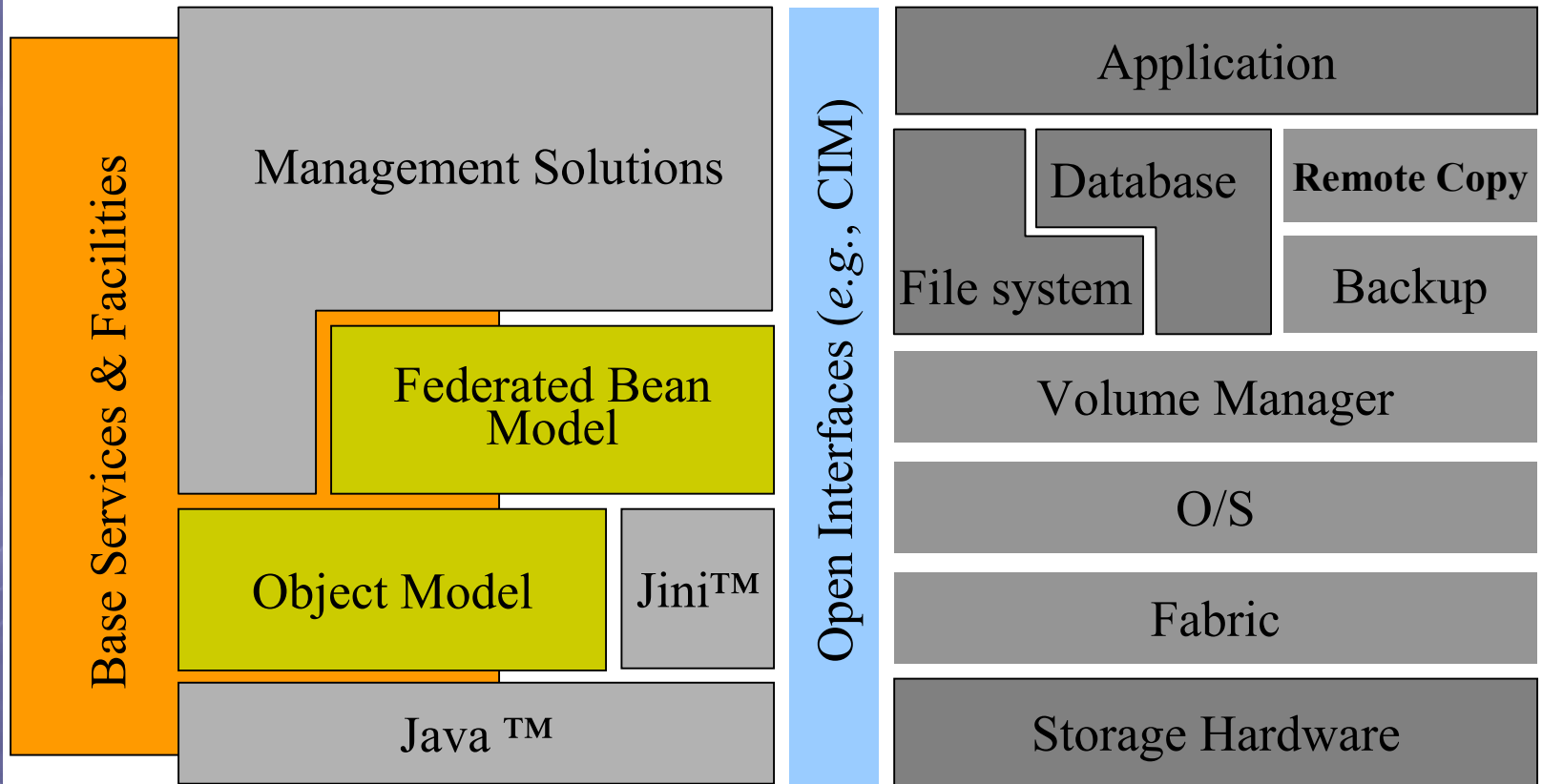
Management in Three Tiers





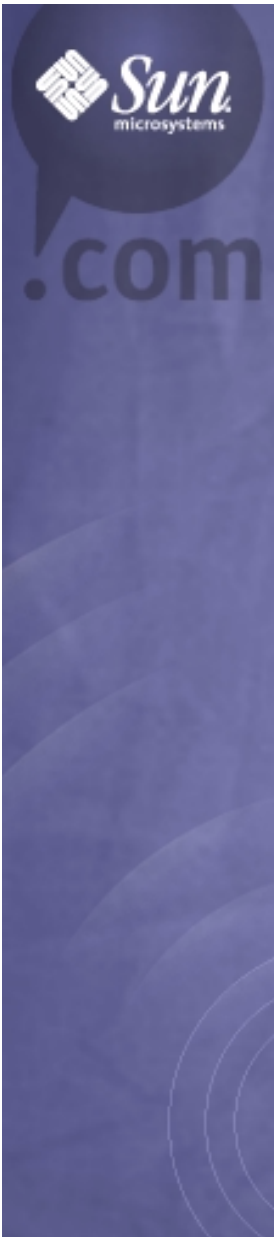
.com

Jiro Technology Platform Architecture

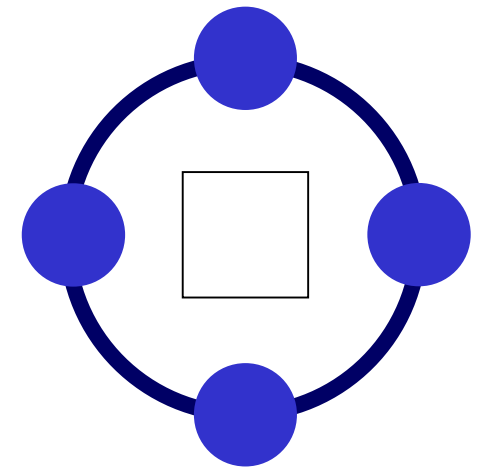
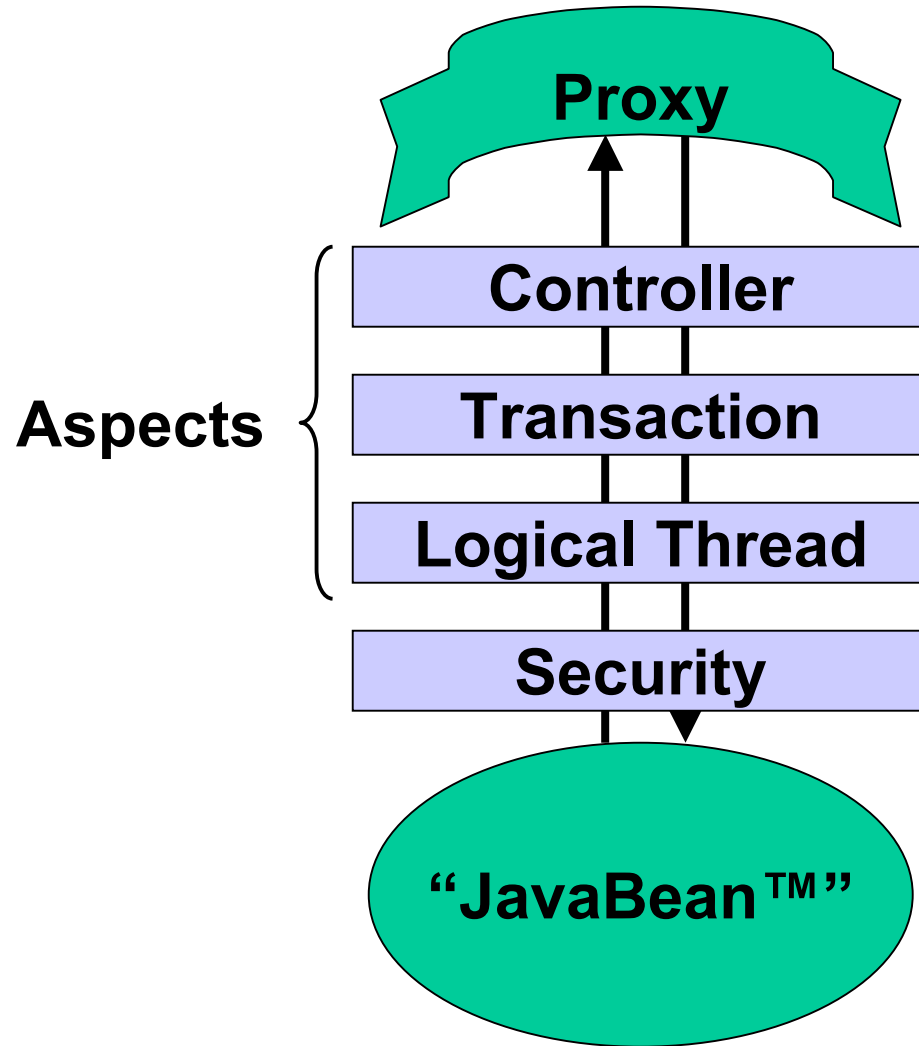


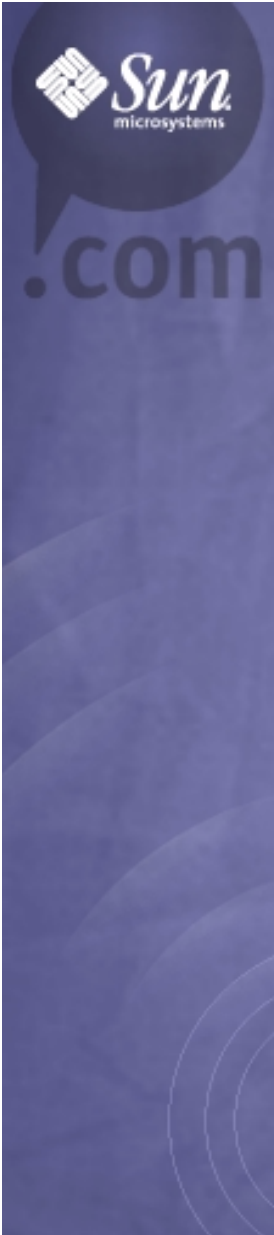
Federated Management Architecture

- ◆ Distributed component model
 - FederatedBeans
- ◆ Services to support applications
 - Jini Services
- ◆ Information model recommendation
 - CIM / WBEM
- ◆ Deployment scheme
 - Jiro



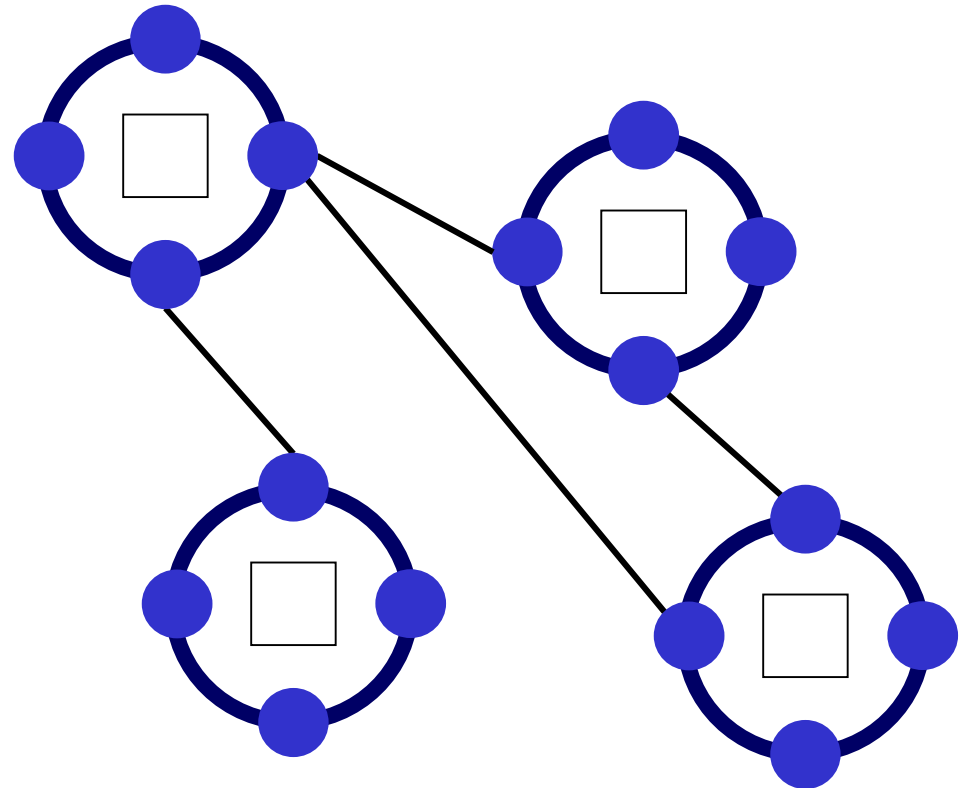
FederatedBeans

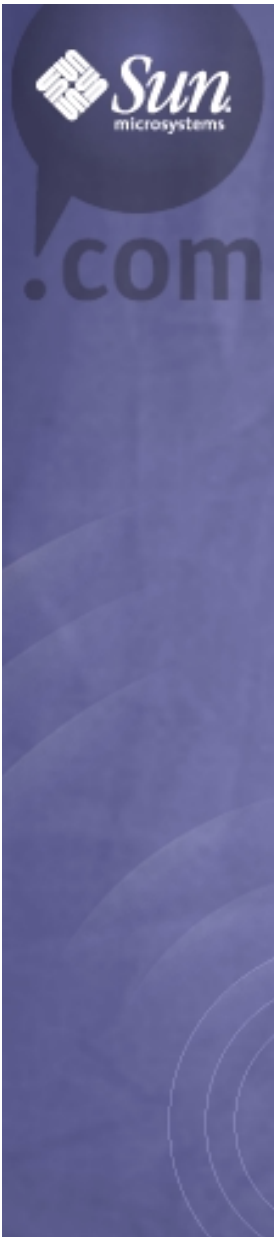




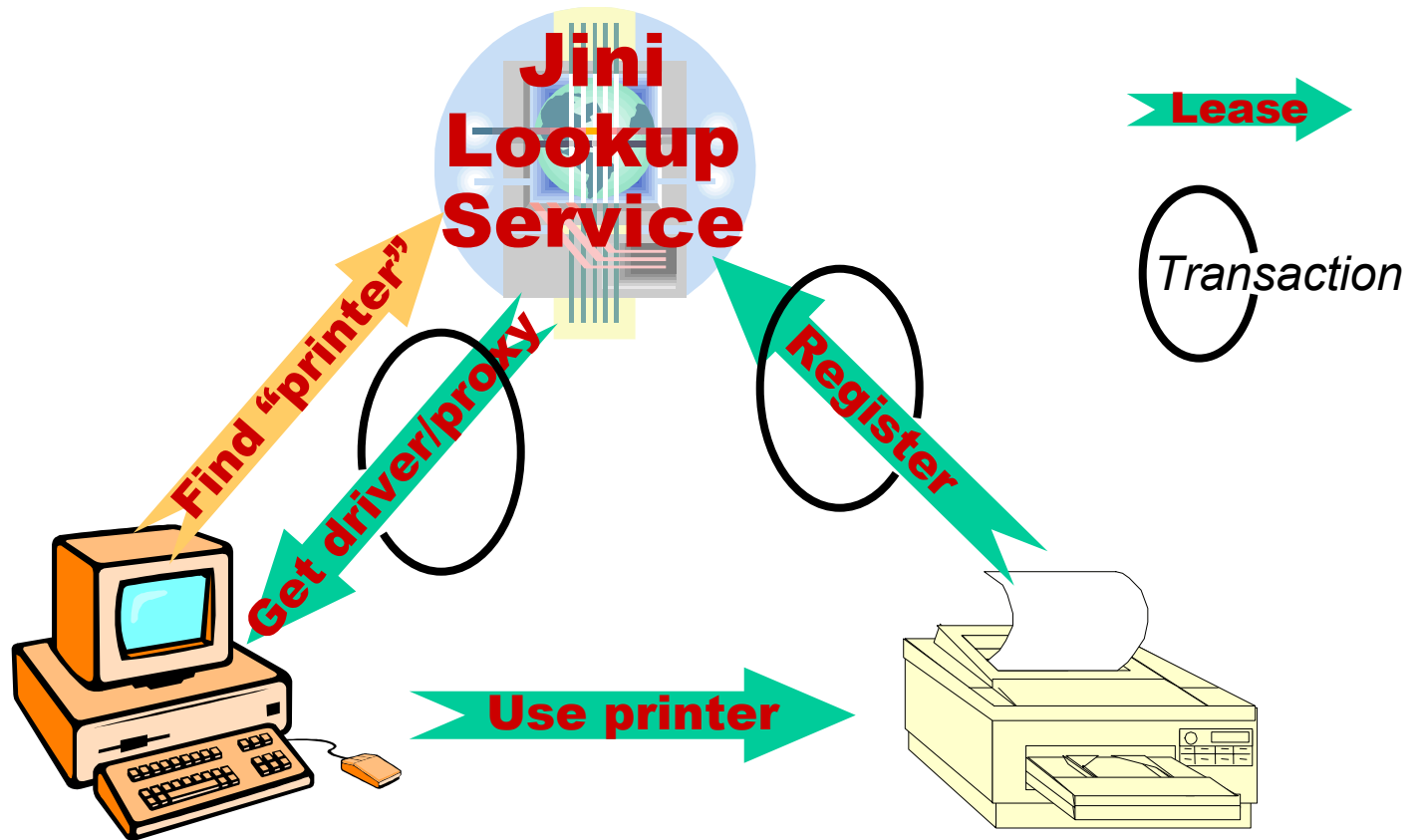
Services

- ❖ FederatedBeans federate to provide “Services”
- ❖ Management solutions use “Services”





Jini defines "Services"

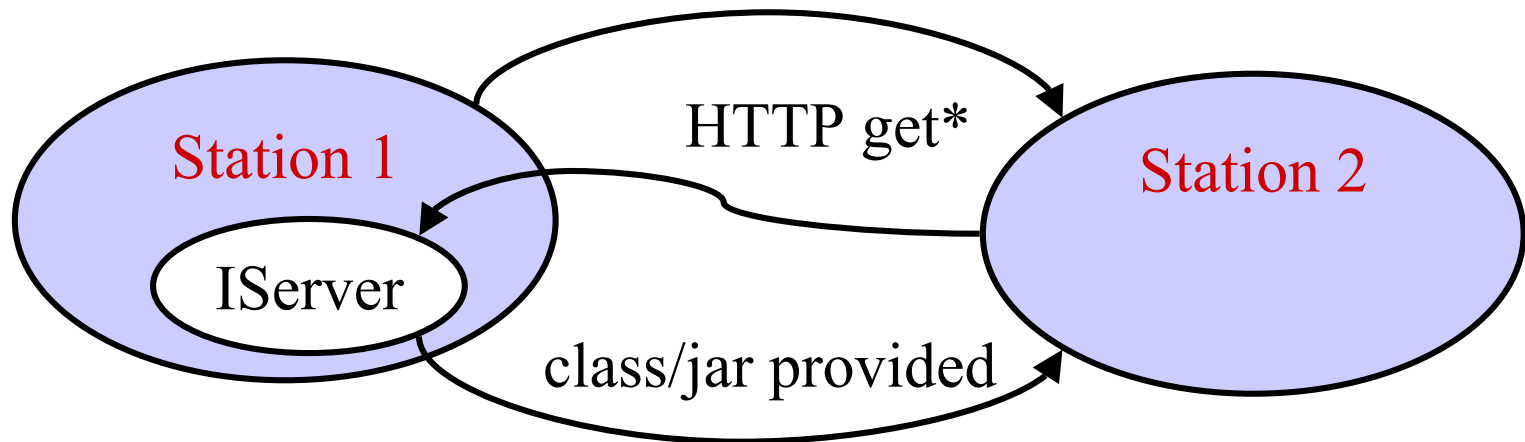


Jiro Services are Jini Services

- ❖ *E.g.*, FMA specifies a “Scheduling Service,” an “Event Service,” “Transaction Service,” Log Service,” *etc.*
- ❖ Third Party Service Market? (*e.g.*, event correlation service, mail service, *etc.*).
- ❖ Jiro Services are found by Jini look-up, delivering a FederatedBeansTM proxy.

Distribution: remote pass-by-value

- ◆ Not just state, behavior also
- ◆ Classes definition loaded from HTTP servers



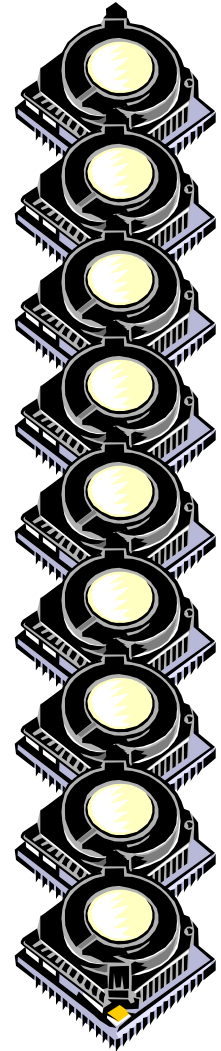
- ◆ Enables agents, remote monitoring, *etc.*

Context

- ◆ Associated with a thread
- ◆ Information passed in context
 - Controller ID
 - Transaction
 - Logical thread ID
 - Security
- ◆ Logical thread automatically associated
- ◆ Security uses Java 2 model

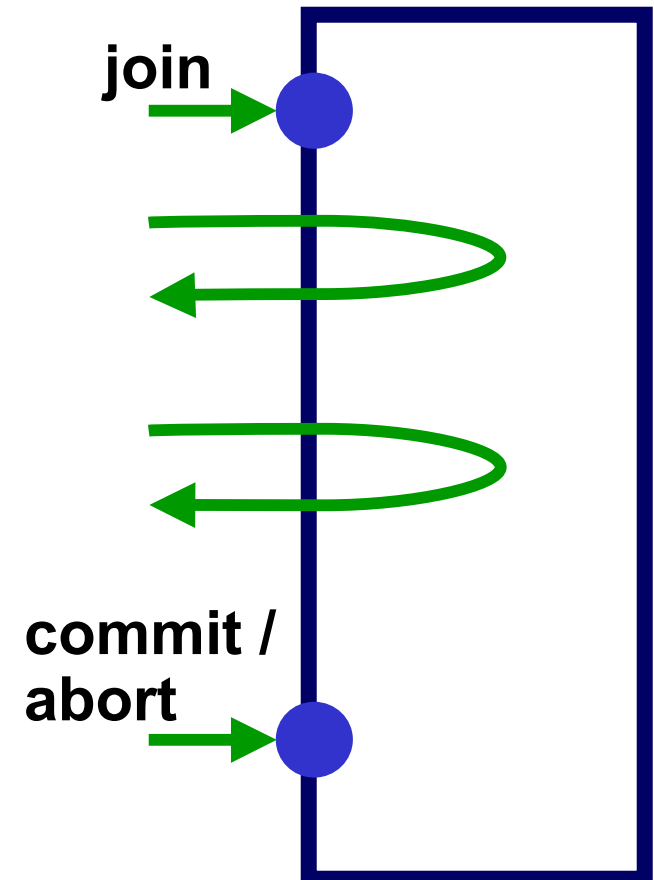
Controller: Locking is *per Object*

- ❖ An object should contain all methods that access a given unit of state (cohesion)
- ❖ An controlled object should not be so large as to limit control opportunities
- ❖ First in wins is not always appropriate
- ❖ Reservation system (recursive)

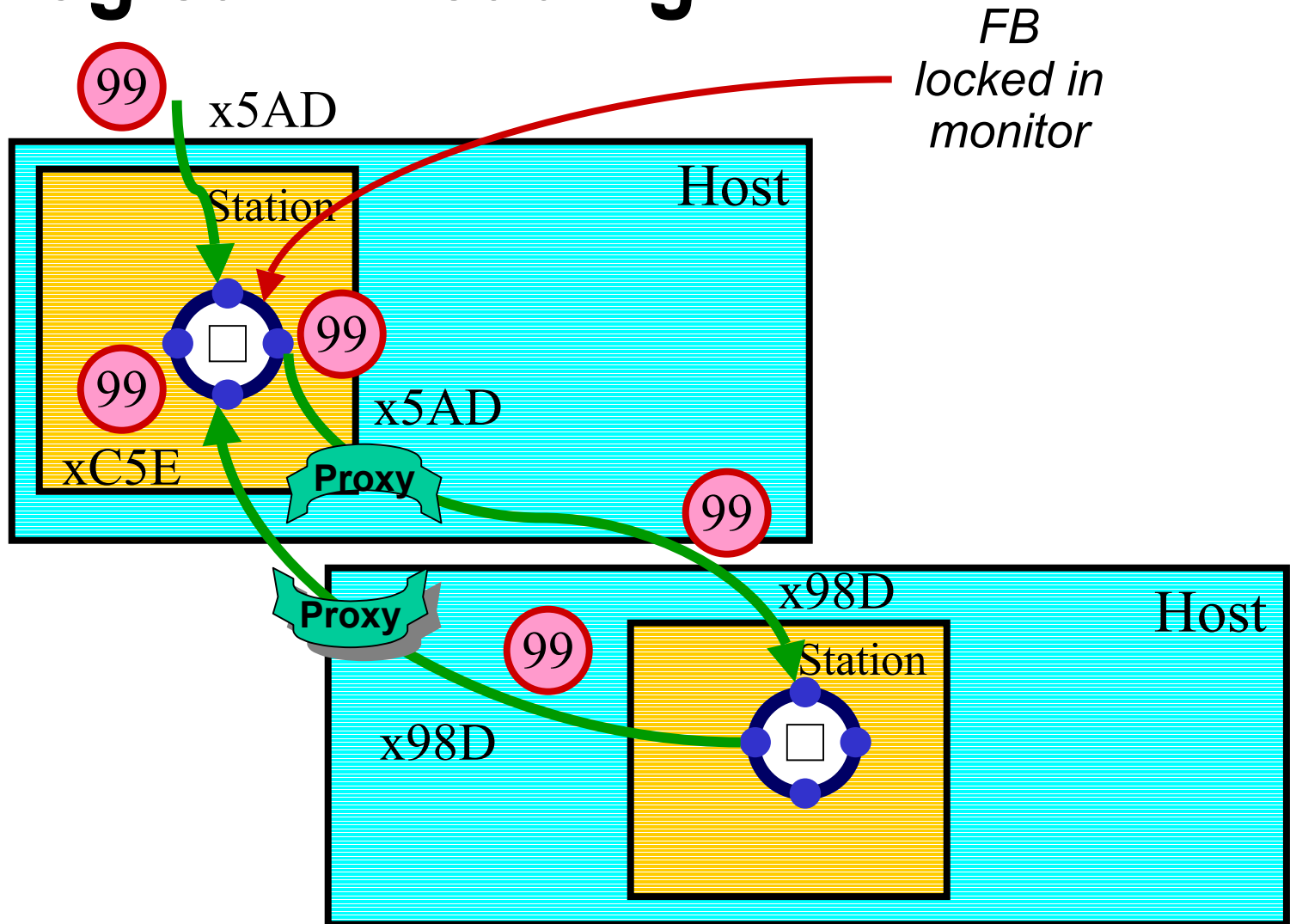


Transactions

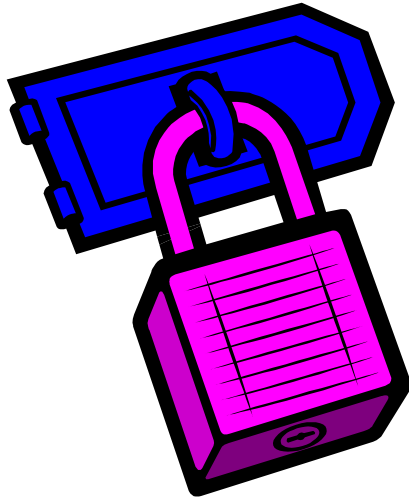
- ◆ Delegated to Jini transactions
- ◆ Discretionary (commit/abort)
- ◆ Object in only one transaction at a time
- ◆ Based on logical threads



Logical Threading



Security

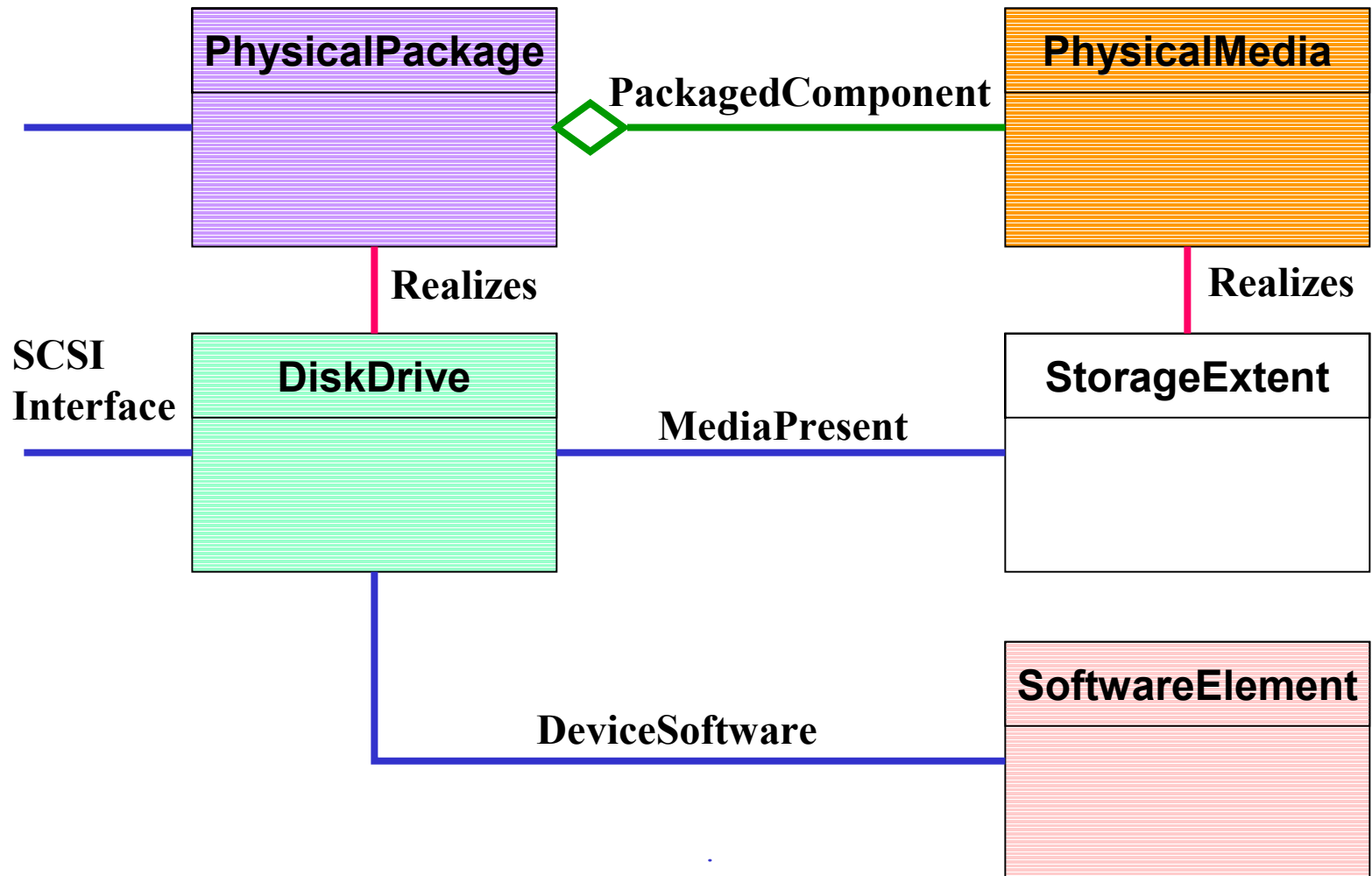


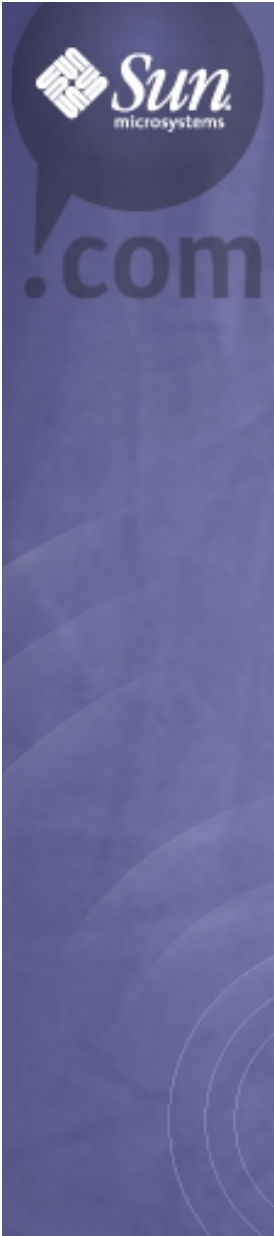
- ◆ Based on permissions, roles, and policies
- ◆ Consistent with Java Authentication and Authorization Service (JAAS)
- ◆ Principal implicit in Context
- ◆ Permits fine-grained security

The Resources

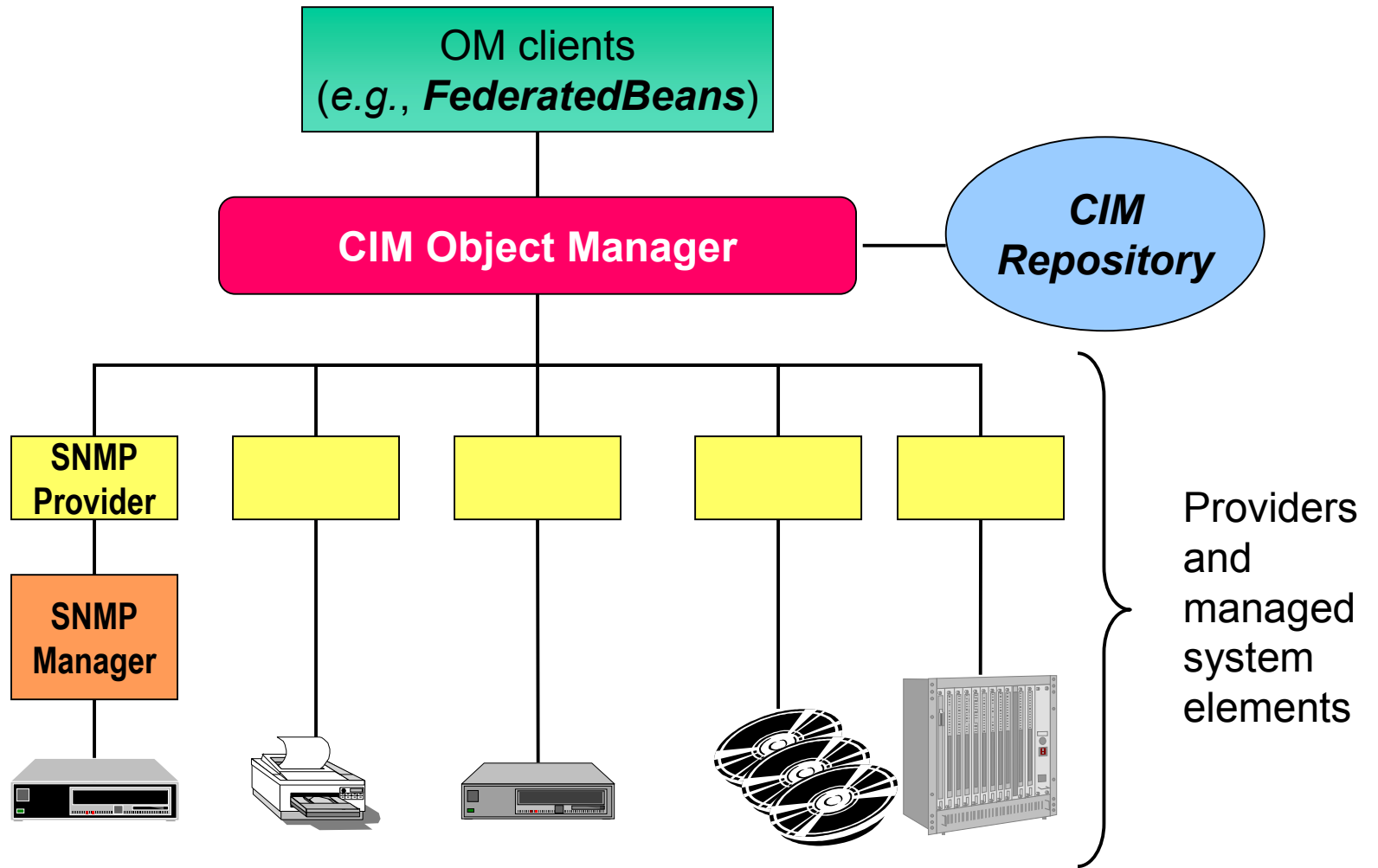
- ◆ Functionality modeled as FederatedBeans (*façades*)
- ◆ Information model based on Distributed Management Task Force (DMTF) Common Information Model (CIM)
- ◆ CIM models resources *and* their relationships

CIM: Hard Disk Drive





The W B E M Architecture





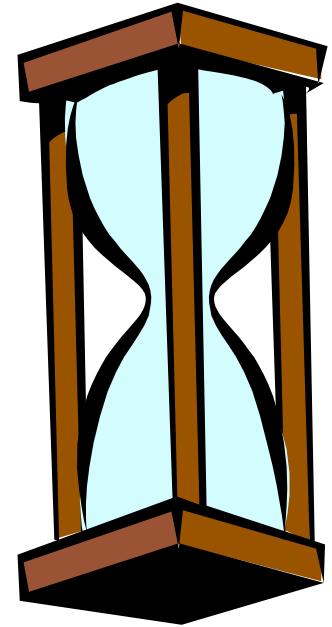
Where does it come from:

❖ DMTF Current Versions

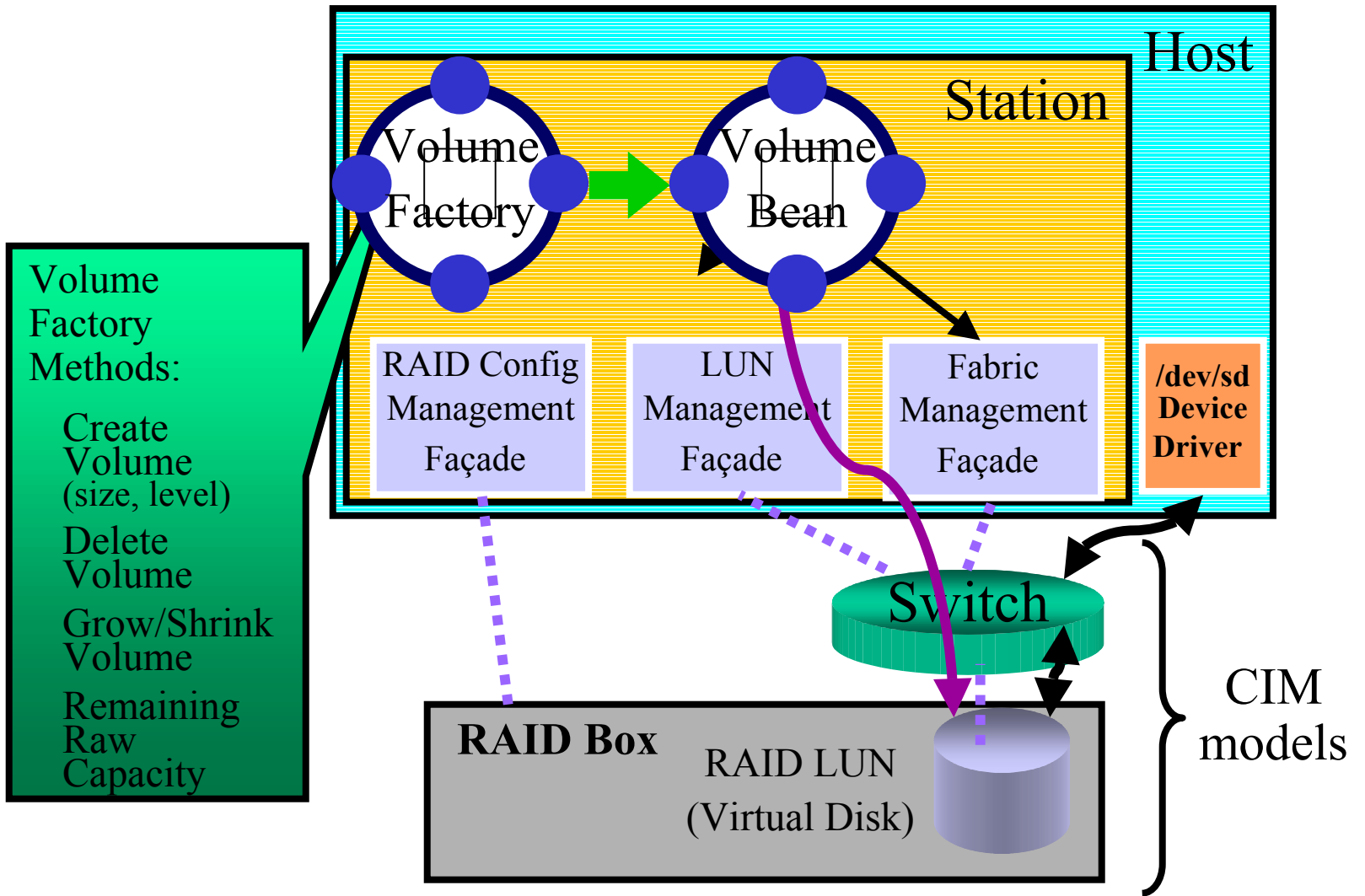
- CIM Version 2.2
- xmlCIM Version 2.0
- CIM over HTTP 1.0
- <http://www.dmtf.org/>

❖ Extensions contributed by Storage Networking Industry Association (SNIA)

- Disk Resource Management (DRM)
- Storage Media Libraries (SML)
- <http://www.snia.org/>



RAID Volume Factory



Stakeholders

- ◆ Resource Vendor
- ◆ Component Vendor
- ◆ Management Application Vendor
- ◆ Information / Data Application Vendor
- ◆ The Customer



The FMA Expert Group

- ◆ Ancor Communications
- ◆ Exabyte
- ◆ Fujitsu Computer Products of America
- ◆ Hitachi Ltd. subsidiaries
- ◆ Legato
- ◆ Quantum
- ◆ StorageTek
- ◆ Sun Microsystems
- ◆ VERITAS





Supporters

A stylized illustration of a group of people in a meeting. There are five figures: a man in a white suit on the left, a woman in a white top and blue skirt in the center, a woman in a red top and yellow skirt on the right, and two other figures partially visible behind them. They are all looking towards the center, suggesting a collaborative discussion.

Ancor Communications
ATL Products
BMC Software
Bridges for Islands
CNT
CDS
Crossroads
CrosStor
DPT
ECCS Inc.
Exabyte
Fujitsu Computer Products of America
Gadzoox
G2 Networks
Hitachi Ltd. subsidiaries
Legato
Nishan Systems
Pathlight Technology Inc.
Plasmon
QLogic
Quantum
Prisa Networks
Reservoir Labs
Seagate
SER
Solid Data Systems
Spectra Logic
StorageTek
Sun Microsystems
Tandberg
Terascape
Tracer
VERITAS
Vixel.





Time Line



- ◆ January, 2000
 - FMA Final Specification
 - Reference Implementation
 - Compliance Test Suite

- ◆ February, 2000
 - Jiro Developer's Release, Version 0.9

- ◆ March, 2000
 - NASA/IEEE Mass Storage Conference



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