

Tiered Adaptive Storage

An engineered system for large scale archives, tiered storage
and beyond

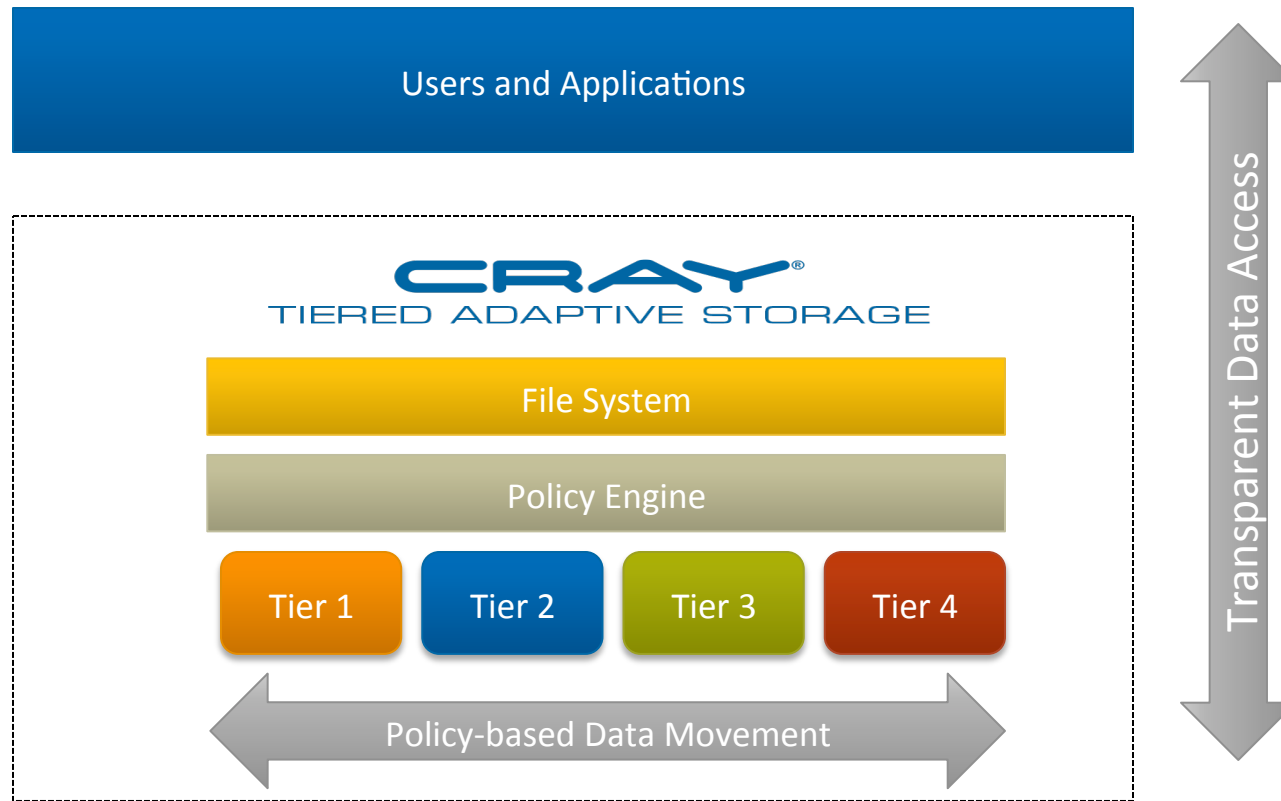


Safe Harbor Statement

This presentation may contain forward-looking statements that are based on our current expectations. Forward looking statements may include statements about our financial guidance and expected operating results, our opportunities and future potential, our product development and new product introduction plans, our ability to expand and penetrate our addressable markets and other statements that are not historical facts. These statements are only predictions and actual results may materially vary from those projected. Please refer to Cray's documents filed with the SEC from time to time concerning factors that could affect the Company and these forward-looking statements.



Tiered Adaptive Storage (TAS)



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Cray Tiered Adaptive Storage (TAS)

- **Integrated solution**

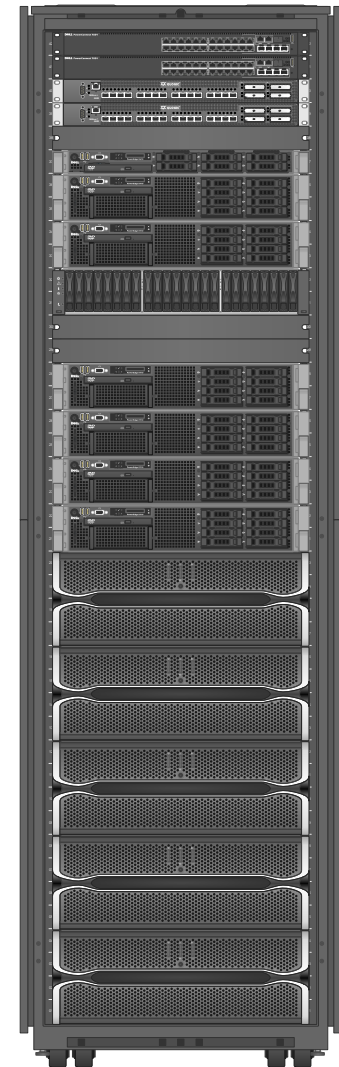
- Architected, configured and fully supported by Cray
- Including Versity Storage Manager software

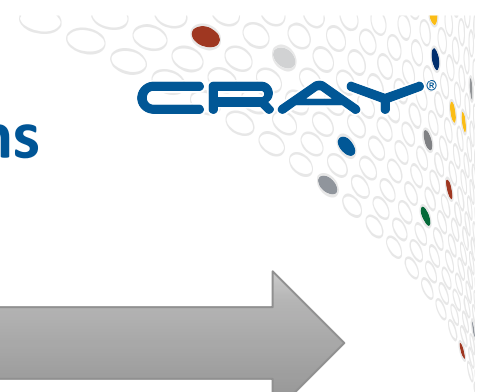
- **Features**

- Storage tier virtualization
 - Support for up to four storage tiers for data protection
 - Local and Remote storage tiers
 - Tape and Disk tiers
- Data managed round-the-clock automatically by policy
 - Flexible policy engine to provide maximum protection
- Optimized for performance, density and reliability
- Data Management Tools

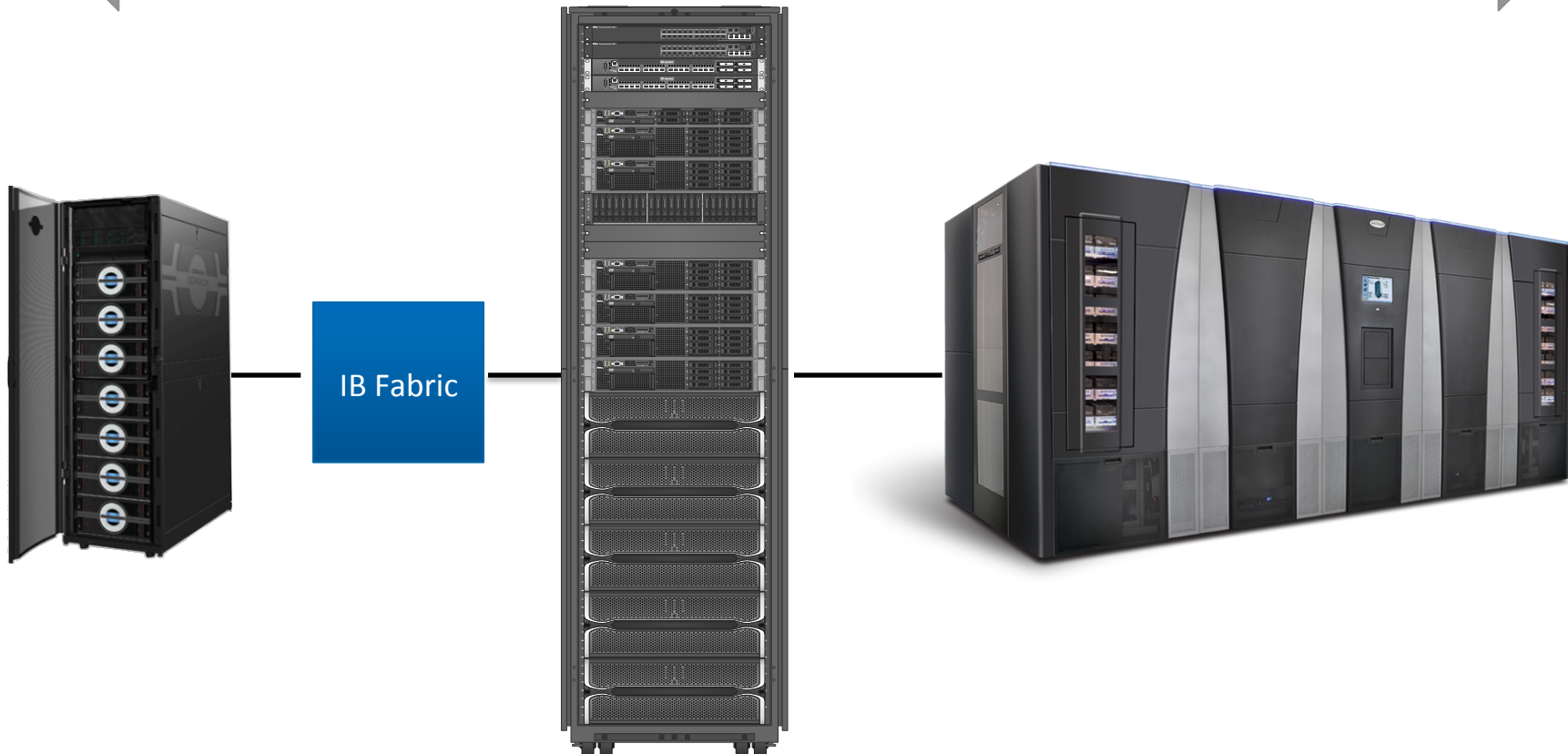
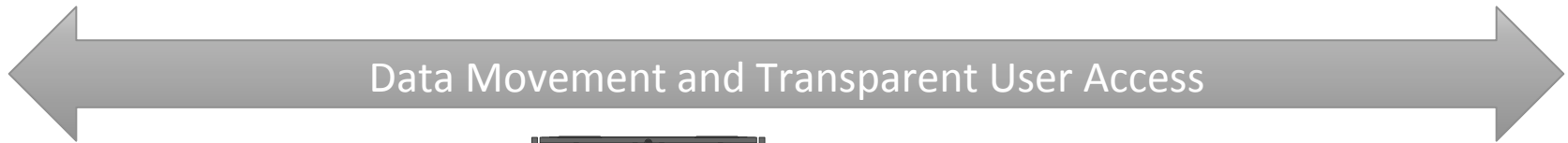
- **Goals**

- Simplify archive management and
- Shorten the time to deployment
- All data management tools available





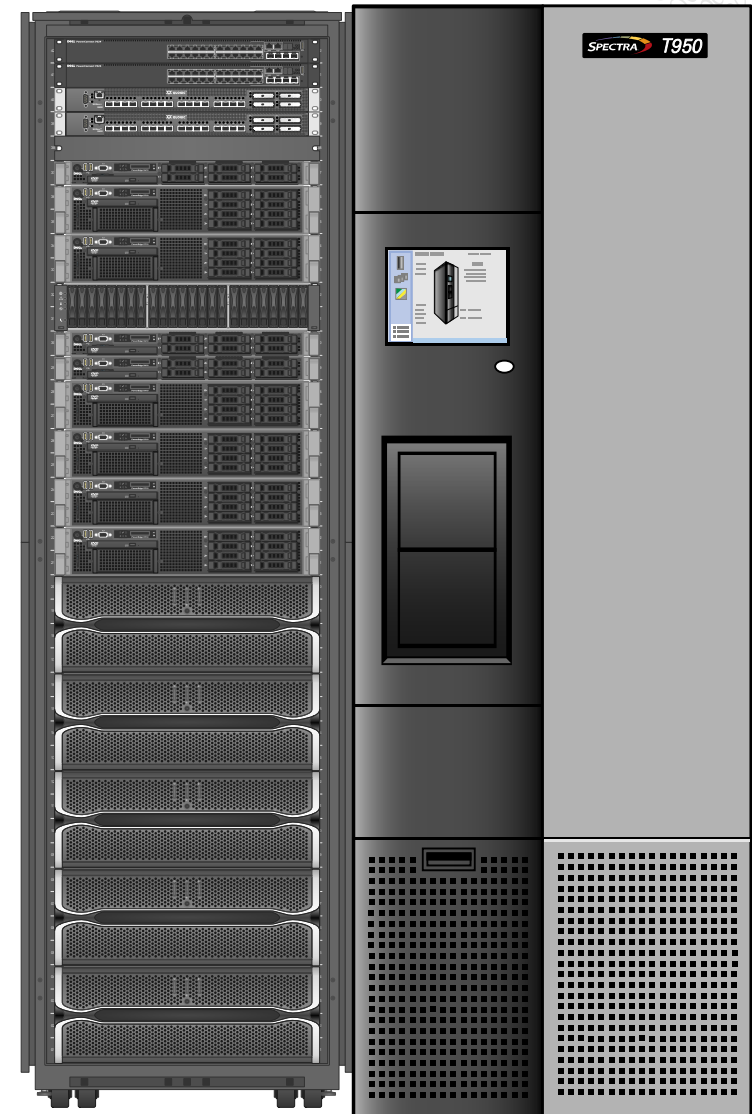
Cray Tiered Adaptive Storage - Simplifying Solutions



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TAS Components

- **Cray TAS Gateway**
 - Two (2) file system servers (MDC)
 - VSM metadata storage
 - One (1) management server (CIMS)
- **Data Movers (DM)**
 - Interface to user
 - Scalable
- **Archive Resources**
 - SCSI Attached Libraries
 - Disk archives
 - Tiers 0-4
- **Disk Cache**
 - Tier 0 of HSM
 - LUNs pre-configured
 - One or more file systems



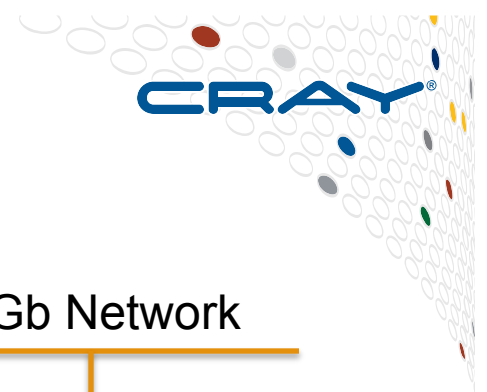
Versity Storage Manager (VSM)

- **Based on open source SAM-QFS**
 - Versity has strong heritage with data management solutions
- **Data management**
 - Policy driven to provide constant management of user data
 - Flexible options to classify data
 - Tightly integrated into file system
- **Shared file system**
 - POSIX SAN shared file system
 - Support for hundreds of native file system clients
 - Native interface to storage tiers
 - Integrated volume management with performance configurations
- **Integrated and configured by Cray**
 - Pre-validated systems
 - Cray support for all hardware and software

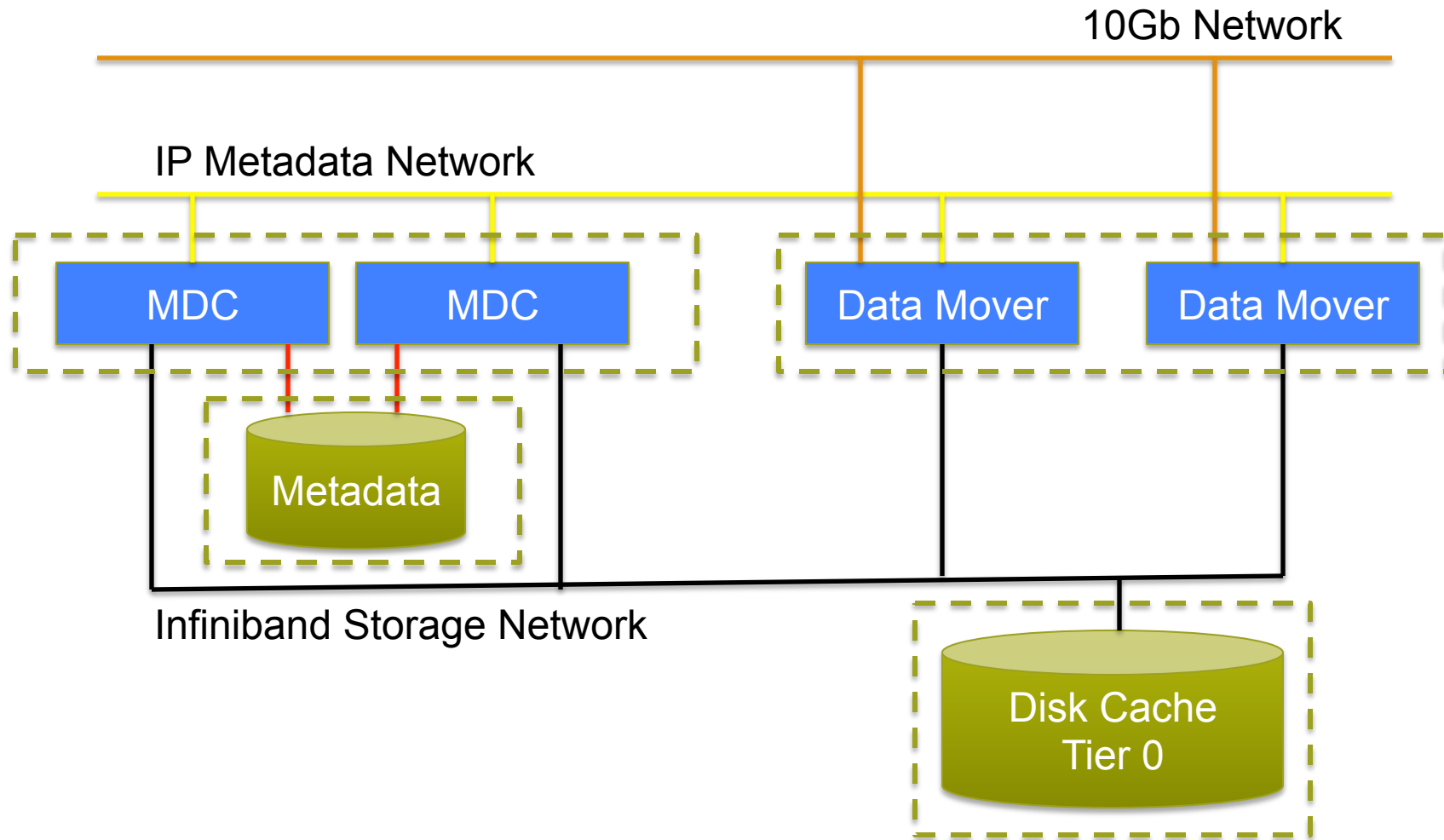


Versity Storage Manager Features

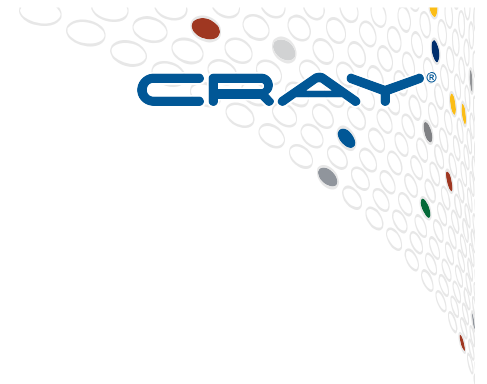
- **Policy Driven Archiver**
 - Automated movement of data between performance and protection tiers
 - Completely policy based and event driven from the file system
- **Archive Functions**
 - archive
 - stage
 - release
- **Archiving Transparent to user**
 - No operator or user intervention to recall data from archive media
 - If needed users can see where their data is located
- **Disk Cache**
 - Tier 0
 - Mounts natively on Metadata and Data Mover Servers
- **Four Data Copies**
 - Tier 1-4
 - Disk or Tape archives



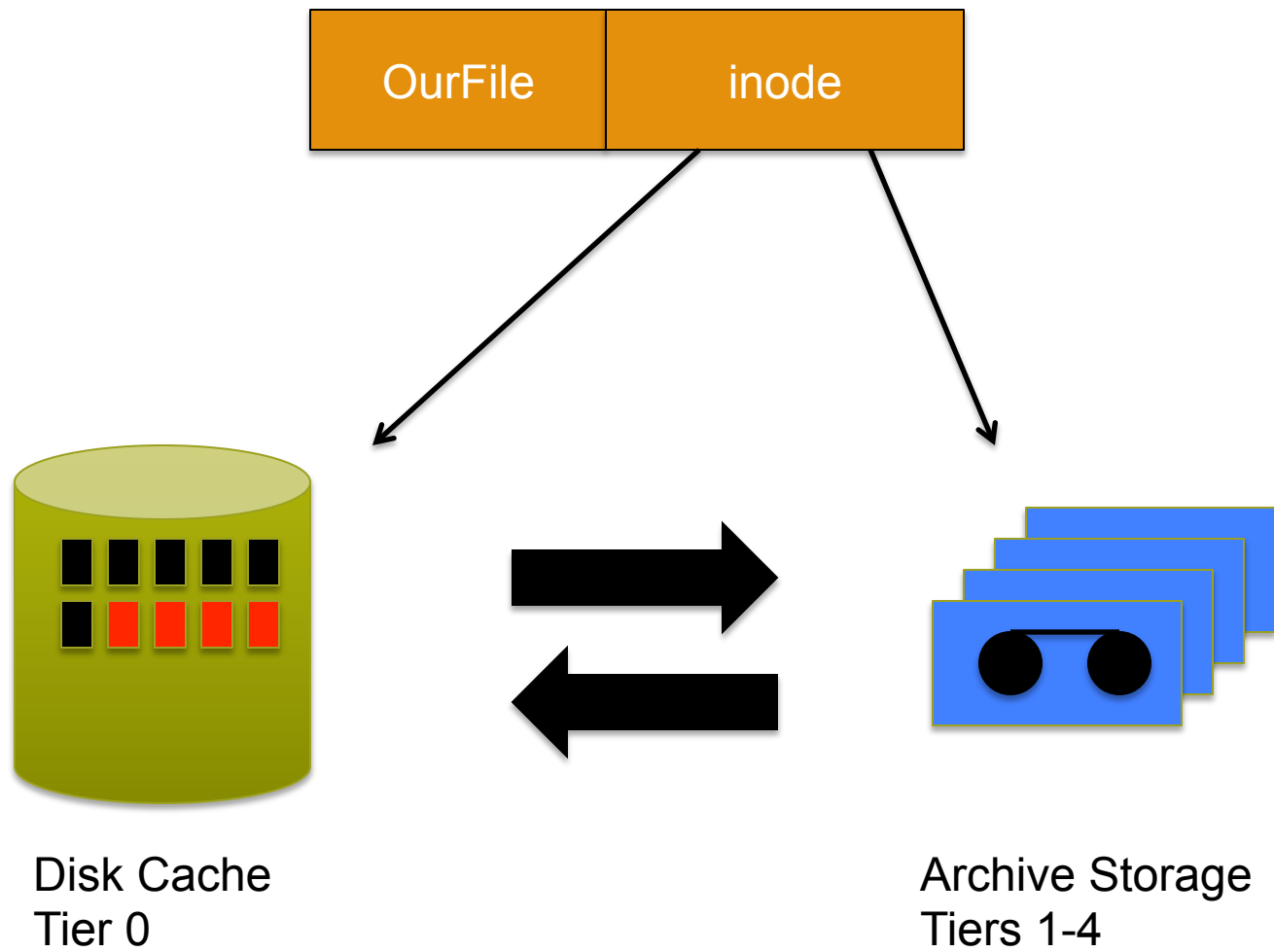
TAS Network Connections



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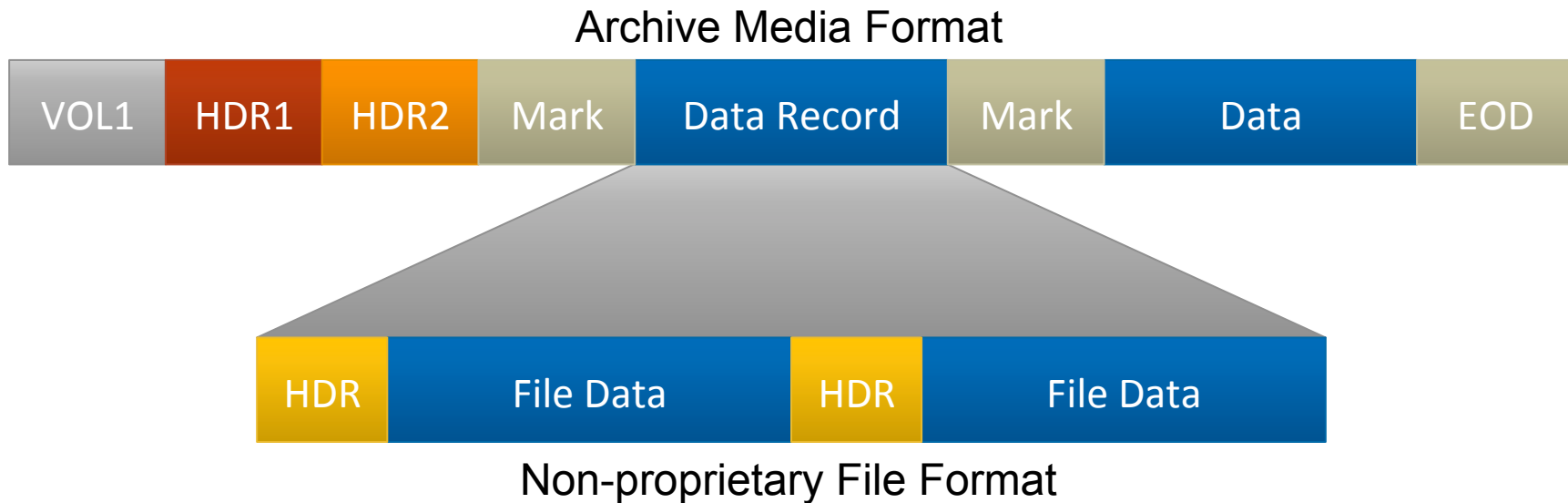


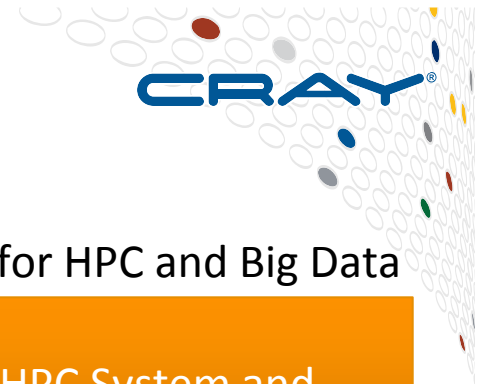
TAS File Lifecycle



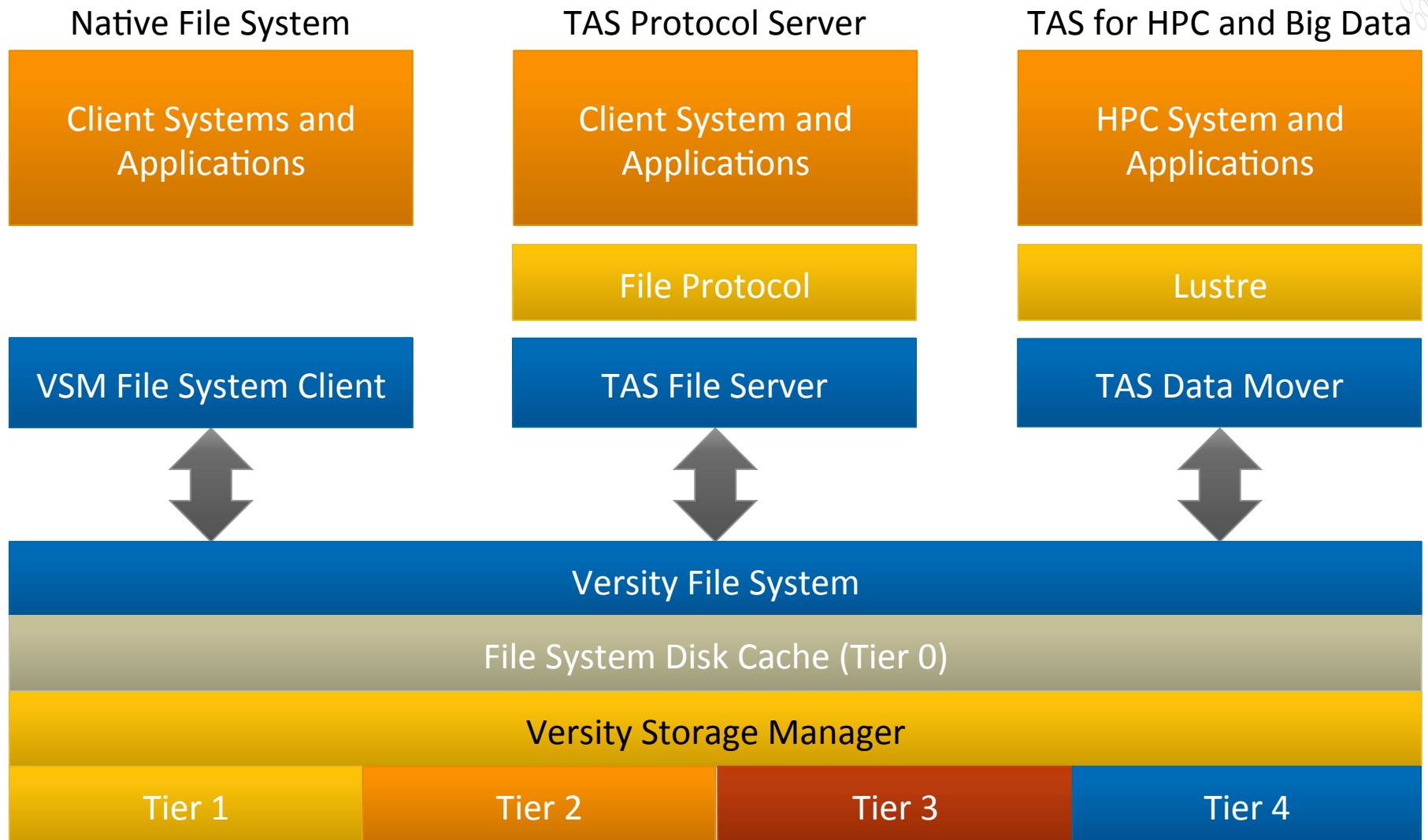
Open Data Format

- **Files written to archive media are in an open format**
 - Format is self describing
- **Files recoverable without TAS**
 - Standard Linux utilities and physical access to media is all that is required
- **Ultimate disaster recovery**
 - No file system metadata required

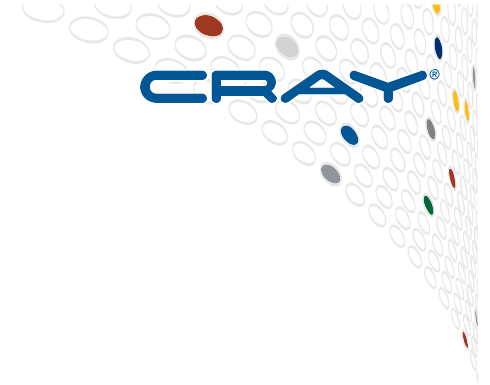




Tiered Adaptive Storage Models



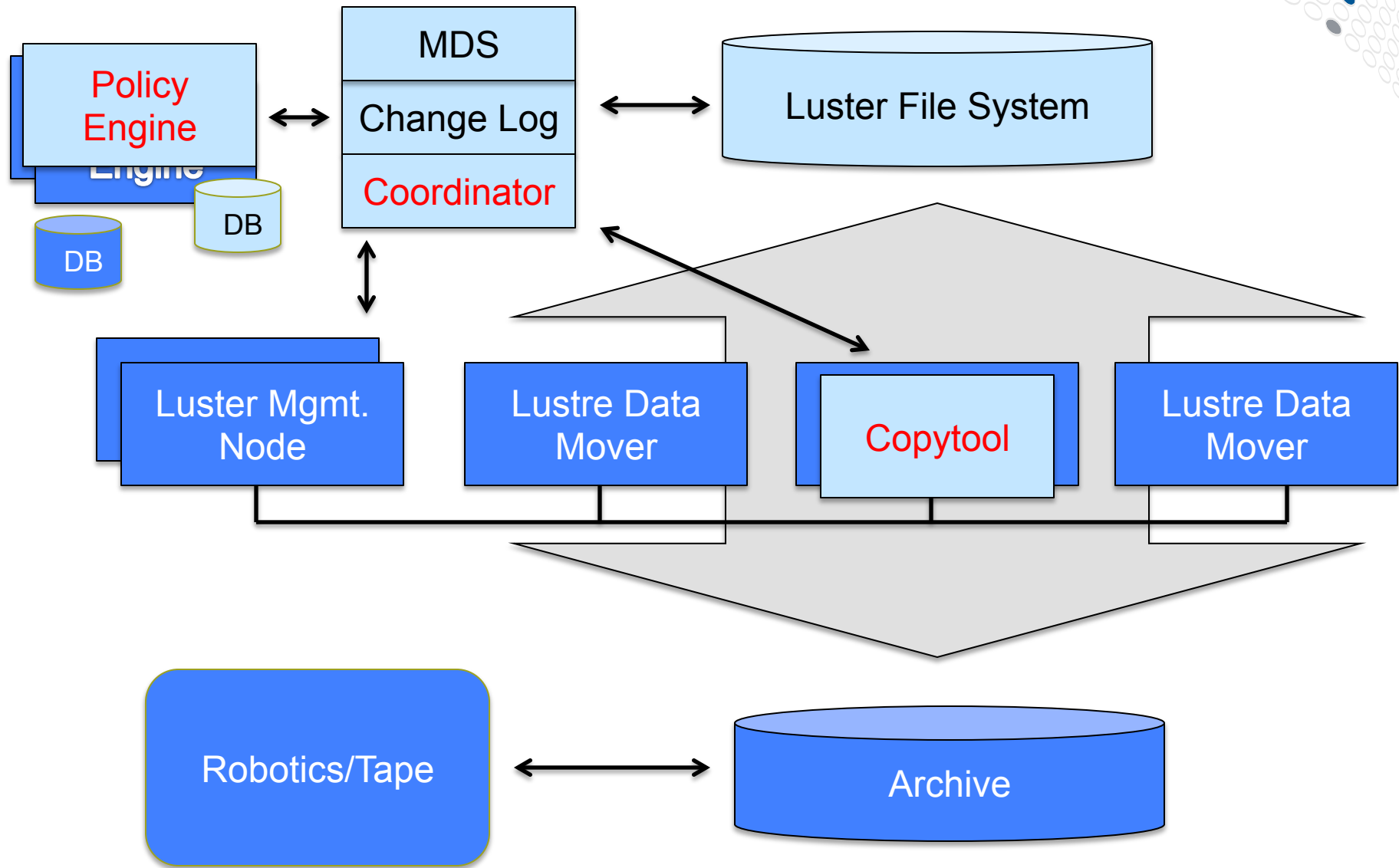
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Lustre HSM Feature

- **Archive Backend Store For Lustre**
 - Archive/Release/Restore
- **Lustre 2.5**
 - HSM Components
- **Data protection/Storage Tiering**
- **High Speed Storage ↔ Low Cost Media**
- **Requires 3rd Part Implementation**
 - Not an HSM in itself, only HSM aware

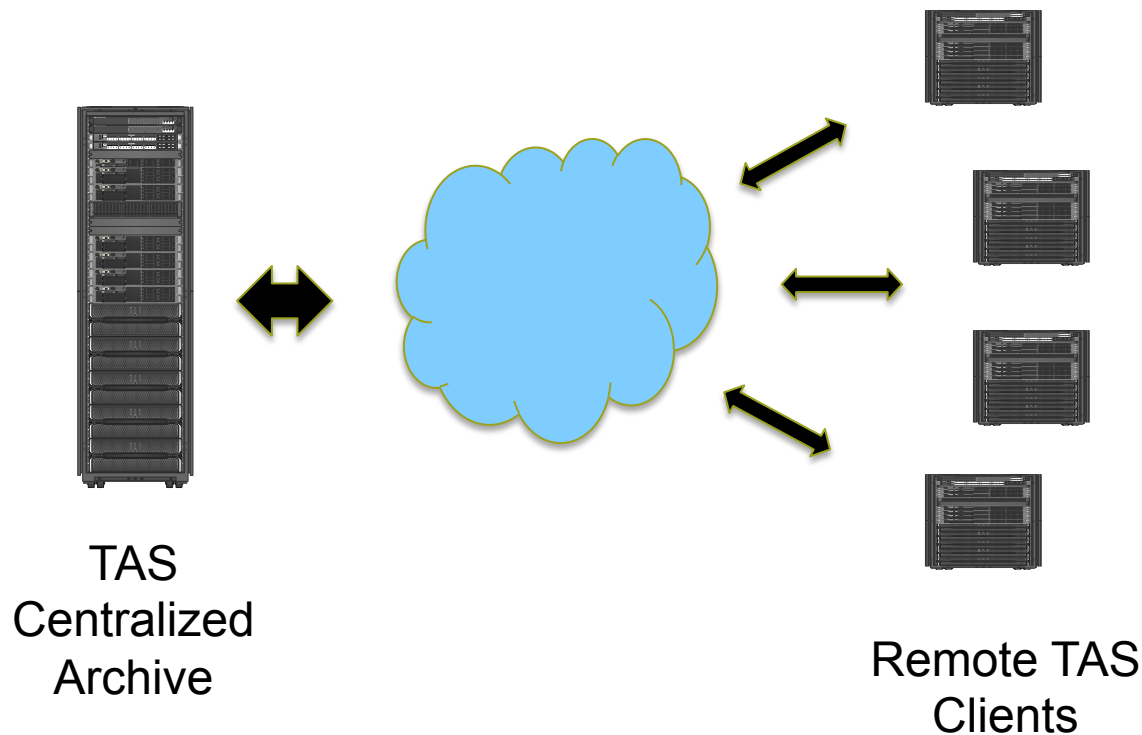
Cray Lustre HSM Connector



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Remote Configurations – Consolidated Resources

- Expensive Archive Resource Centralized
- Clients archive/stage over long distance
- Simplifying archive resource management



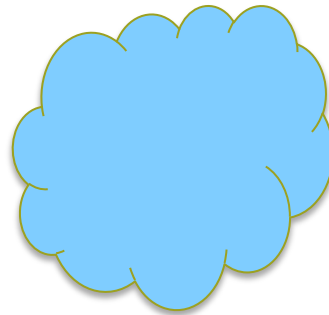


Remote Configurations – Disaster Recovery

- Single site archiving remotely to DR site
- Multiple sites sharing resources
 - Act as DR site for each other



TAS
Site A



TAS
Site B

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Cray Tiered Adaptive Storage Roadmap

1H 2014	2H 2014*
GA release	Enhanced tape checksum
Lustre HSM integration	Automated media refresh
Manual failover	SMB/Samba Gateway
16 Gbps FC	Parallel Archiving
FDR InfiniBand	Automatic Failover

* Current plan of record 2014

Tiered Adaptive Storage - Summary

- **Fully Engineered Data Management Solution**
 - Servers and Storage
 - Data Management Software
 - Administrative Tools
- **Policy Based Archiving**
 - Transparent to users
 - Data Protection
 - Multiple Storage Tiers
- **Deployed in many scenarios**
 - File protocol Server
 - Disaster Recovery
 - Centralized Archive
 - Integrated with Lustre 2.5
- **Questions?**