

Storage Resource Manager Present and Future

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SRM Motivation

Grid Architecture requires Reservation and Scheduling of the Following Shared Resources

- Computing Resources
- Network Resources
- Storage Resources (often neglected)

SRM provides Reservation and Scheduling of the Storage Resources

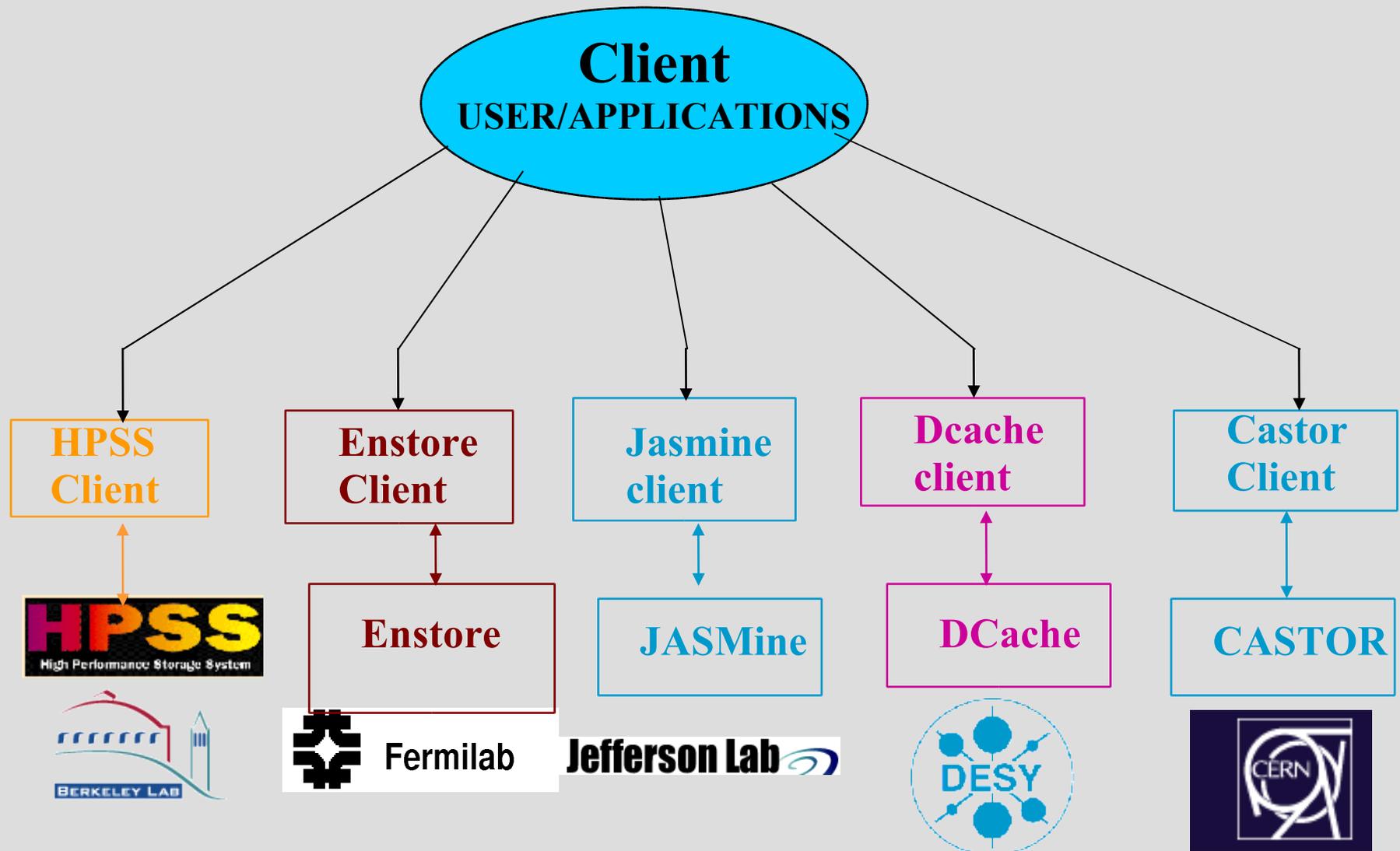
SRM Motivation

High Energy Physics Collaborations span multiple institutions where

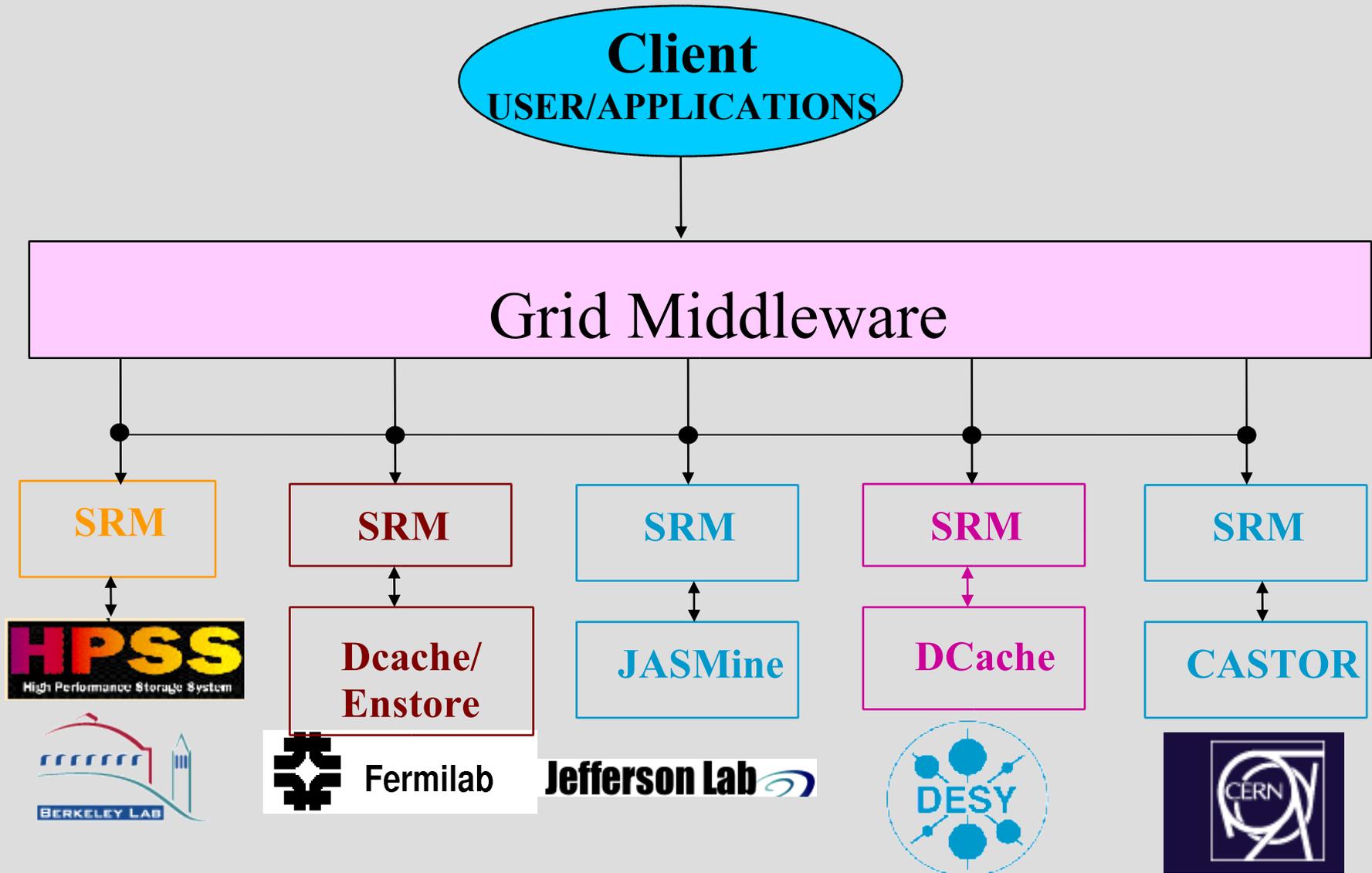
- A large variety of types of Storage Systems exist
 - Single Disk / Raid
 - Robotic Tape Storage System (Enstore, HPSS)
 - Distributed Disk Cache (dCache)
 - Hierarchical Storage System (dCache - Enstore)
- Heterogeneous environments and proliferation of custom Mass Storage Systems (MSSs) exist
- User applications often need to access data at multiple institutions on multiple MSSs

SRM provides Standardized Uniform Access to Heterogeneous Storage

Access to Multiple MSS



Uniform Access via SRM



Storage Classification

Storage systems can be classified by:

- Persistence of data
 - Permanent
 - Temporary
- Data access availability
 - Data immediately available
 - Data needs advanced reservation before utilization (tapes need to be mounted, files need to migrate to disks, etc.)
- Supported transfer protocols
 - File transfer protocols
 - POSIX like access protocols

Need management interface that supports all of the above

Storage Resource Managers

SRMs Are Middleware Components That Manage Shared Storage Resources on the Grid and Provide:

- Uniform Access to Heterogeneous Storage
- Protocol Negotiation
- Access to Permanent and Temporary Type of Storage
- Advanced Space and File Reservation
- Reliable Transfer Services

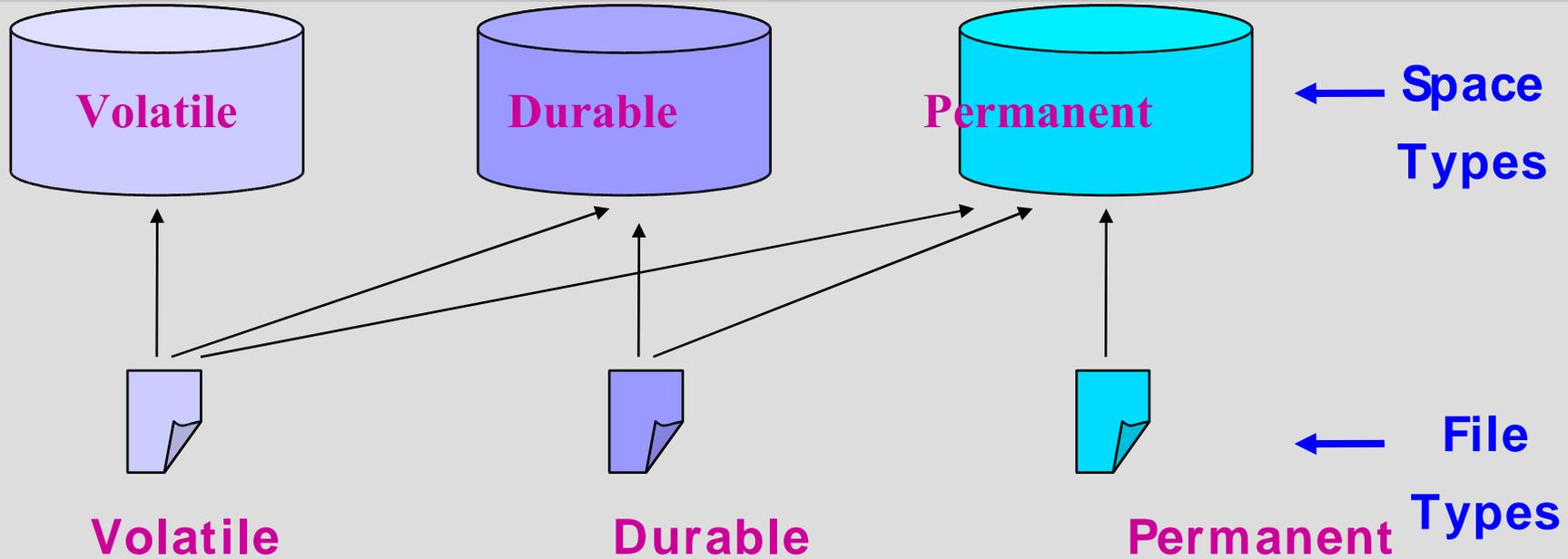
Storage Resource Managers

SRM is a Management Interface to Storage on the Grid

- SRMs do not provide Transfer Protocol Implementations
- Storage Element client performs transfer protocols, and transfer urls (turls) negotian with srm, but it is client's responcebility to utilize these turls
- Grid Storage Element (SE) should have SRM interfaces as their part, but they are more that just SRMs, they also have many other Storage System Services like Implementations of File and Posix Transfer protocols.

SRM

File and Space Types



File Type Property	Volatile	Durable	Permanent
Archived	No	No	Yes
Lifetime	Yes	Yes	No
AutoDeleted	Yes	No	No

SRM

Groups of Functions

SRM interface consists of the following groups of functions:

- Space Management Functions
- Data Transfer Functions
- Directory Functions
- Permission Functions
- Status Functions

SRM Interface Details

Space Management

Functions

- SrmReserveSpace
- SrmReleaseSpace
- srmUpdateSpace
- srmCompactSpace
- srmGetSpaceMetaData
- srmChangeFileStorageType
- srmGetSpaceToken

Directory

- SrmMkdir
- srmRmdir
- srmRm
- srmLs
- srmMv

Data transfer functions

- srmPrepareToGet
- SrmPrepareToPut
- srmCopy
- SrmRemoveFiles
- srmReleaseFiles
- srmPutDone
- srmAbortRequest
- srmAbortFiles
- srmSuspendRequest
- srmResumeRequest

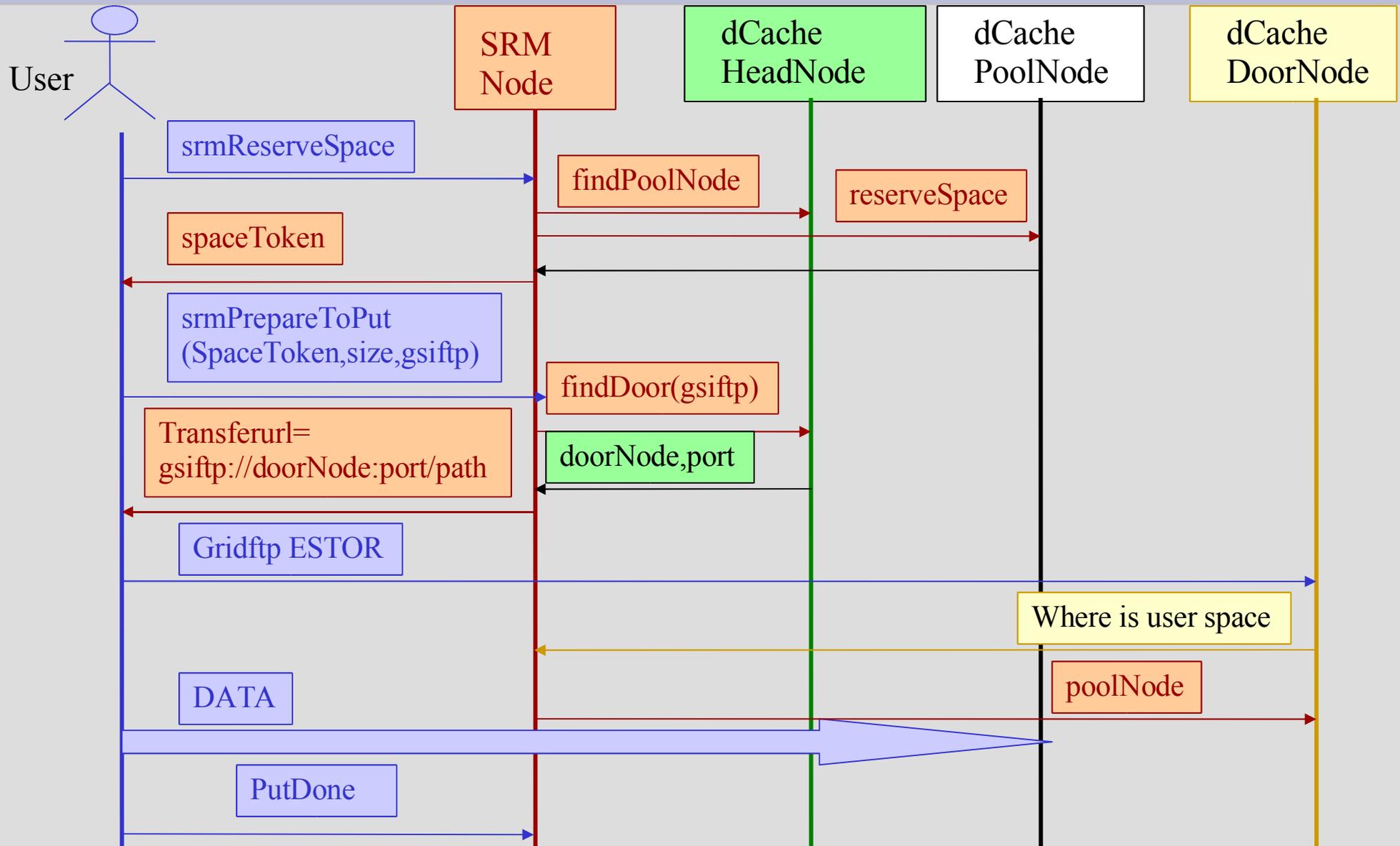
Status Functions

- srmStatusOfGetRequest
- srmStatusOfPutRequest
- srmStatusOfCopyRequest
- srmGetRequestSummary
- srmExtendFileLifeTime
- SrmGetRequestID

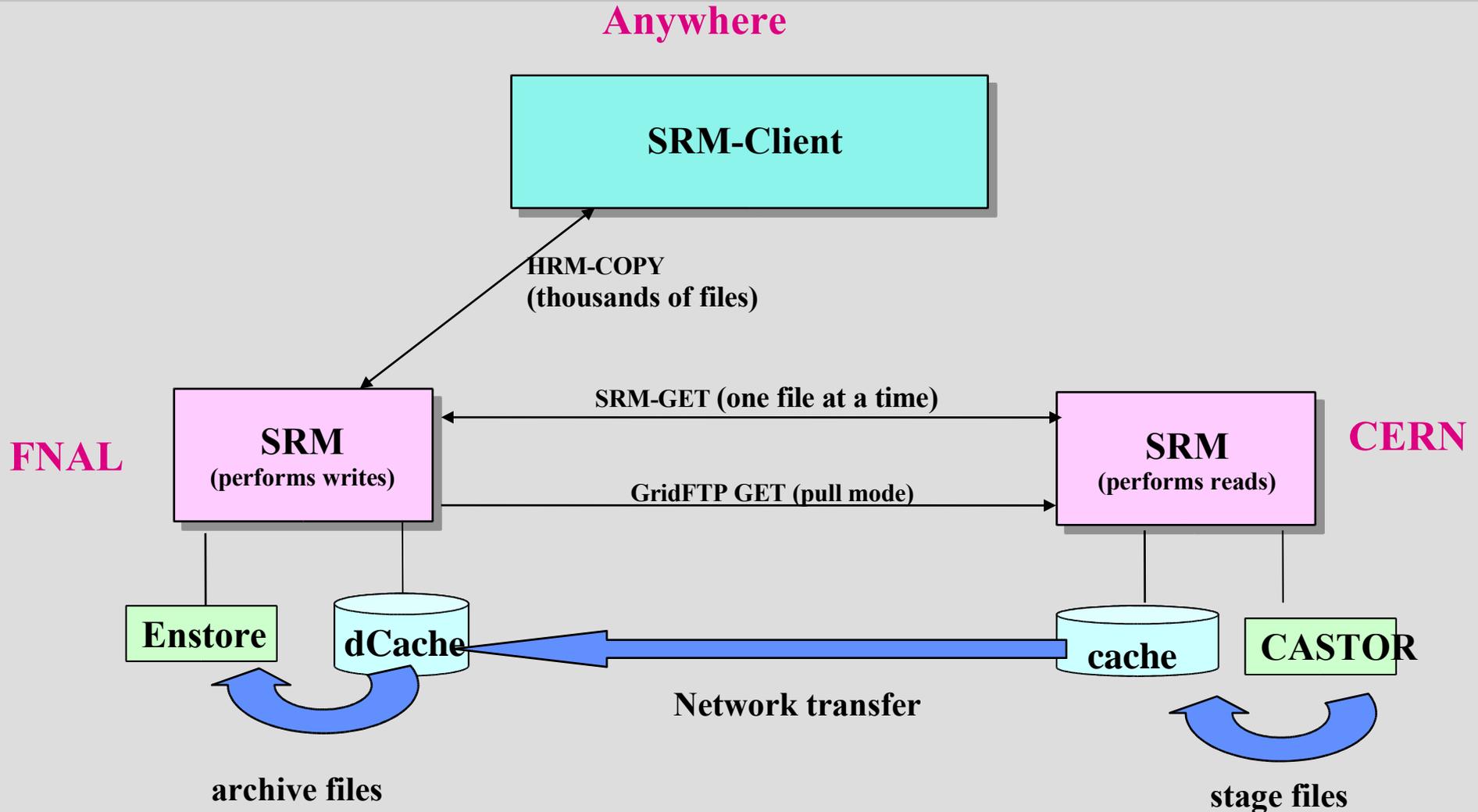
Permission

- srmSetPermission
- srmReassignToUser
- srmCheckPermission

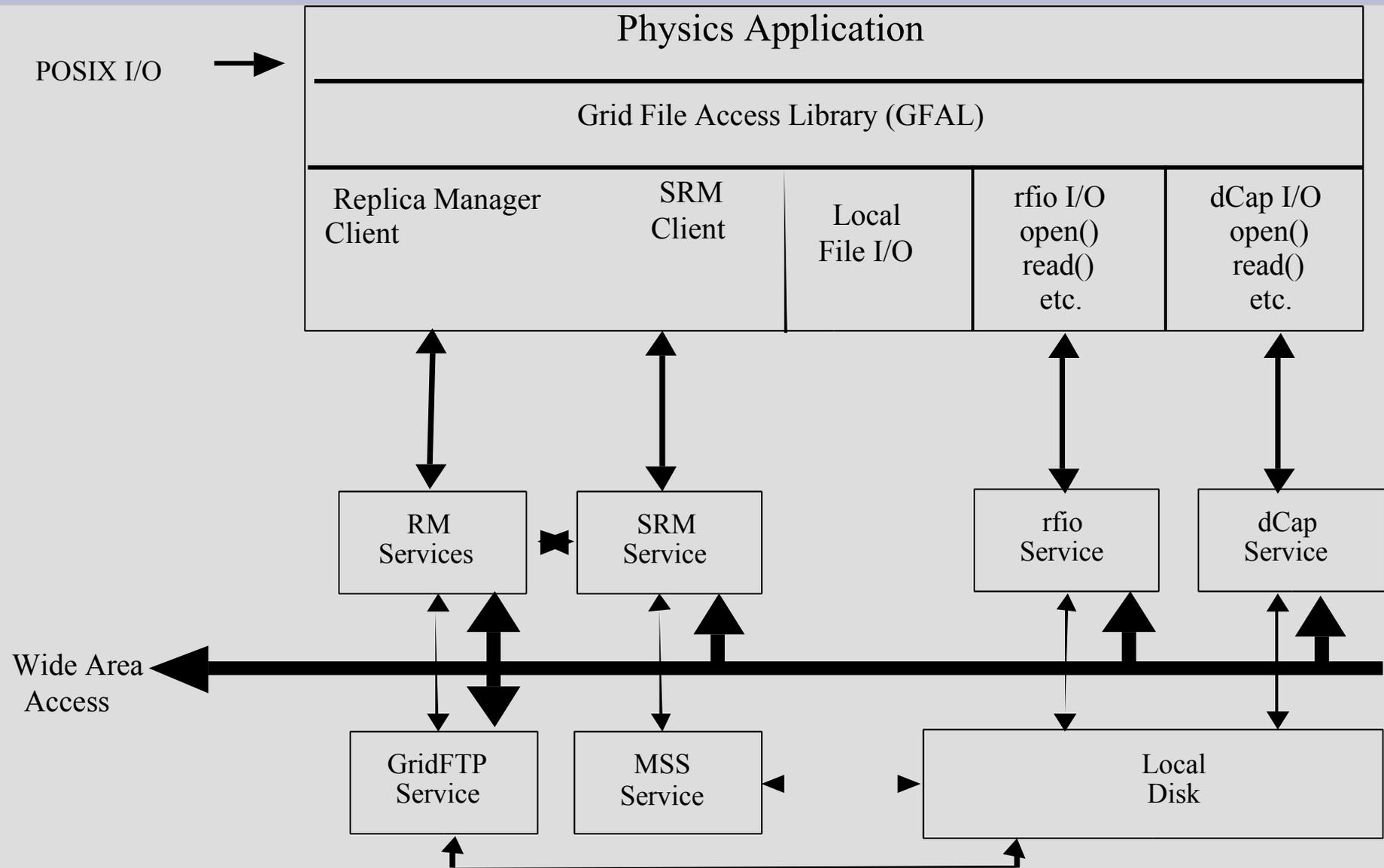
Srm Example - srmPrepareToPut



Srm Example - Robust Replication



Grid File Access Library and SRM



Role of SRM in Grid

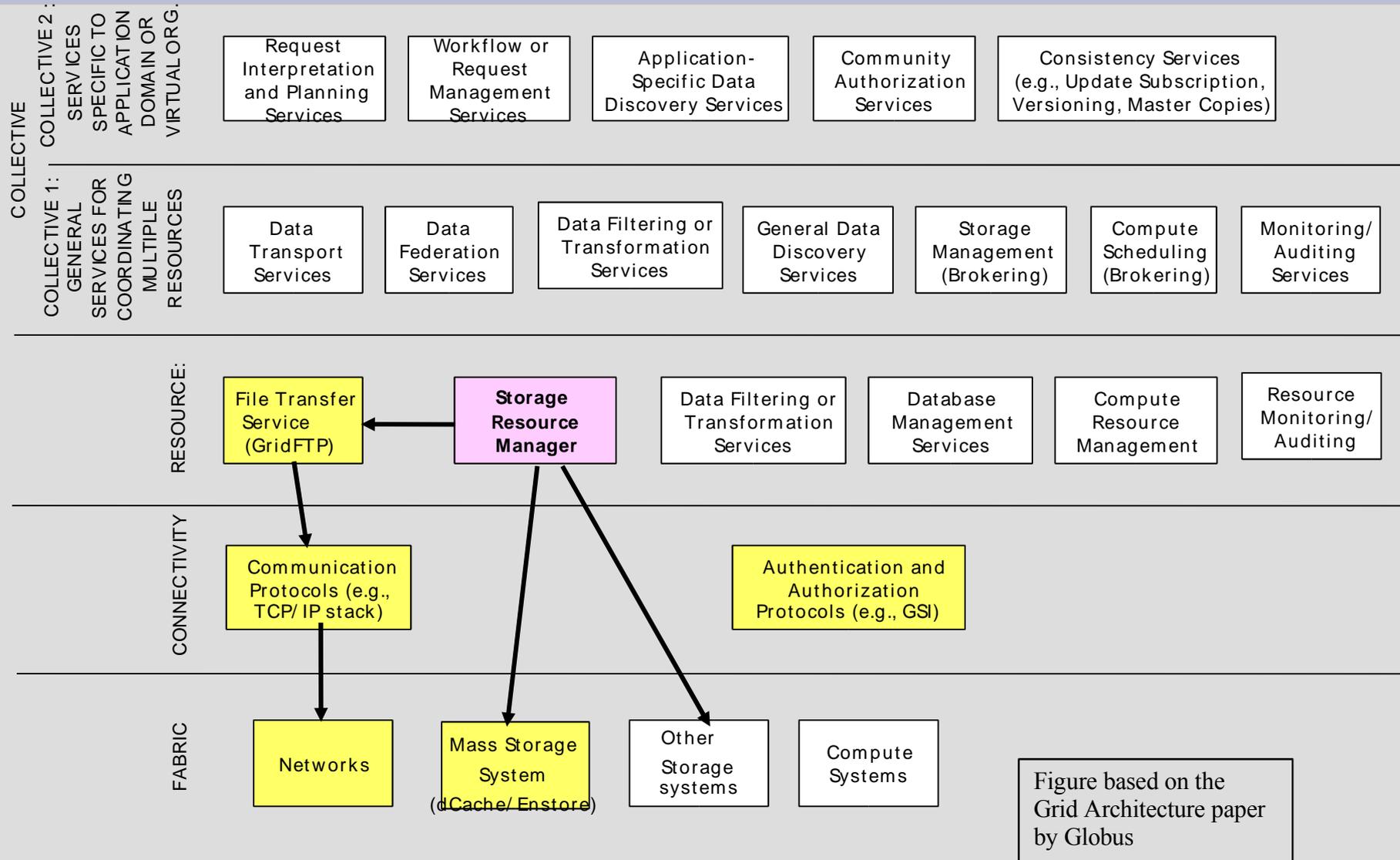


Figure based on the Grid Architecture paper by Globus

SRM Project Latest Developments

- Centralized Persistent Pin Manager in dCache
- Persistent Storage for SRM Requests
- New Scheme for Scheduling SRM Requests
- New Reliability Features

(last three items still need testing)

- Parametrization of the Underlying Storage and Decoupling from dCache
- Standalone File System SRM Implementation (work is in progress)

SRM Plans for the next 6 months

- Completion of the stand alone srm
- Space Manager dCache module
- Implementation of the space reservation functionality, (Show Stopper for CMS)
- SRM V2.1 Interface (Client and Server)
- SRM - SAM integration

Resources

- <http://www-isd.fnal.gov/srm>
- The Storage Resource Manager Collaboration Web Site
<http://sdm.lbl.gov/srm-wg/>
- The Storage Resource Manager Interface Specification, version 2.1, Edited by Junmin Gu, Alex Sim, Arie Shoshani, LBL,
<http://sdm.lbl.gov/srm/documents/joint.docs/SRM.spec.v2.1.final.doc>.
- Dcache documentation by Patrick Fuhrmann, DESY, Germany,
www.dcache.org
- US-CMS <http://www.uscms.org>
- US-CMS Data Challenge 2004
<http://www.uscms.org/s&c/dc04>