Storage Resource Managers

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* Slide borrowed from A. Sim (LBNL) presentation

Storage Resource Managers

SRMs are middleware components that manage shared storage resources on the Grid and provide:

- Uniform access to heterogeneous storage
- File Transfer Protocol negotiation
- Dynamic Transfer URL allocation
- Access to permanent and temporary types of storage
- Advanced space and file reservation
- Reliable transfer services

SRMs in the data grid *

- Shared storage space allocation & reservation
  - important for data intensive applications
- Get/put files from/into spaces
  - archived files on mass storage systems
- File transfers from/to remote sites, file replication
- Negotiate transfer protocols
- File and space management with lifetime
- support non-blocking (asynchronous) requests
- Directory management
- Interoperate with other SRMs

* Slide borrowed from A. Sim (LBNL) presentation

Storage Resource Manager versions

- Two SRM Interface specifications
  - SRM v1.1provides
    - Data access/transfer
    - Implicit space reservation
  - SRM v2.2 adds
    - Explicit space reservation
    - Namespace discovery and manipulation
    - Access permissions manipulation
    - AccessLatency and RetentionPolicy support
    - Better Error Handling

SRM Protocols and Groups of Functions

- SRM interface consists of the following groups of functions:
  - Space Management Functions – v2.2
  - Data Transfer Functions – v1.1 and v2.2
  - Directory Functions – v2.2
  - Permission Functions – v2.2
  - Status Functions – v1.1 and v2.2

TapeXDiskY vs. AccessLatency and RetentionPolicy

- From SRM v2.2 WLCG MOU
  - the agreed terminology is:
    - TAccessLatency {ONLINE, NEARLINE}
    - TRetentionPolicy {REPLICA, CUSTODIAL}
  - The mapping to labels ‘TapeXDiskY’ is given by:
    - Tape1Disk0: NEARLINE + CUSTODIAL
    - Tape1Disk1: ONLINE + CUSTODIAL
    - Tape0Disk1: ONLINE + REPLICA

AccessLatency support

- AccessLatency = Online
  - File is guaranteed to stay on a dCache disk even if it is written to tape
  - Faster access but greater disk utilization
- AccessLatency = Nearline
  - In Taped backed system file can be removed from disk after it is written to tape
  - No difference for tapeless system
- Property can be specified as a parameter of space reservation, or as an argument of srmPrepareToPut or srmCopy operation

RetentionPolicy support

- RetentionPolicy=Custodial
  - Tape Backed pool will be selected, file will be written to tape
- RetentionPolicy=Replica or Output
  - Tapeless pool will be selected, fill will not be written to tape.
- Property can be specified as a parameter of space reservation or as an argument of AccessLatency or RetentionPolicy

Space Management

- SrmReserveSpace allows to reserve space with given Size, Lifetime, AccessLatency, RetentionPolicy, [description].
- User gets back SpaceToken
- SpaceToken can be specified as an argument to srmPrepareToPut or srmCopy.
- Dcache Manages diskSpace only.
- Space Reservation for writes only, no space management of read pools.
- SpaceTokens are discoverable by their description

SRM V2 Interface Details

Space Management Functions

SrmReserveSpace
SrmReleaseSpace
srmUpdateSpace
srmCompactSpace
srmGetSpaceMetaData
srmChangeFileStorageType
srmGetSpaceToken

Directory Functions

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 Client Server Negotiation - PrepareToGet/Put

1. (Optional) Client or VO Admin reserves space
2. SRM Client issues get/put, gets request id back
2. while request status is “Pending”, Client updates request status
3. once status is ready and TURL(s) is available, Client performs transfer(s) from/to TURL(s)
4. Once transfer completes, Client set sfile status to “Done”
5. (Optional) Client or VO Admin releases space reservation

SRM Client Server Negotiation - COPY

1. (Optional) Client or VO Admin reserves space
2. SRM Client copies a file from one SRM server to another
3. Client issues srmCopy, gets request id back
2. while request status is “Pending”, update request status
3. once status is “Done” transfer has completed, report result and exit.
4. (Optional) Client or VO Admin releases space reservation

Resources

- The Storage Resource Manager Collaboration, http://sdm.lbl.gov/srm-wg
- Fermilab SRM Project , http://srm.fnal.gov
- DCache, Disk Cache Mass Storage System, http://www.dcache.org