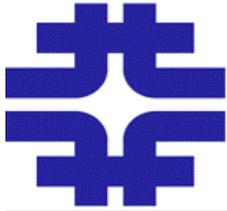# dCache Storage Resource Manager Status update

Timur Perelmutov, Fermilab

For the dCache Team

# What is new

- ☐ **SRM BOF at WLCG Workshop in Mumbai, February 06**
  - ■ SRM V2.1 does not express quality of retention and access latency, needs changes

- ☐ **WLCG SRM Workshop in Batavia, May 06**
  - ■ SRM V2.2 is accepted and WLCG requirements are defined, among new features:
    - ☐ AccessLatency := NEARLINE|ONLINE
    - ☐ RetentionPolicy := REPLICA|OUTPUT|CUSTODIAL
    - ☐ SpaceReservation is a vehicle for the above attributes
  - ■ dCache commits to PNFS Path independent support
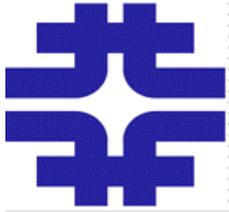
# Progress

- Work on V2.2 implementation since May 06

- Fall 06 - dCache 1.7 release
  - Greater stability and performance of SRM V1.1
  - Some v2.2 functionality
  - Monitoring
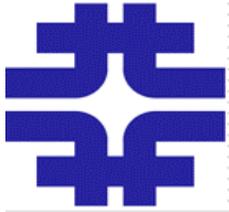
# Current Status

- ☐ Almost All (WLCG) V2.2 functionality is implemented
  - ■ Next 3 major tasks:
    - ☐ Functionality Tests
    - ☐ Compatibility Tests
    - ☐ Stress Test
  - ■ Will be available in dCache 1.8 , April 2007
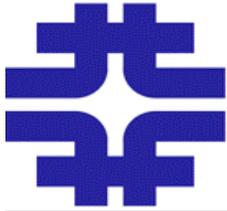
# Summary of S2 SRM v2.2 basic test - Wednesday 17 January 2007 07:52am CET dCache
## WLCG MoU SRM v2.2 methods

| Method | Status |
|--------|--------|
| Ping | StdOut Log |
| PrepareToPut | StdOut Log |
| StatusOfPutRequest | StdOut Log |
| PutDone | StdOut Log |
| PrepareToGet | StdOut Log |
| StatusOfGetRequest | StdOut Log |
| BringOnline | StdOut Log |
| StatusOfBringOnlineRequest | StdOut Log |
| Copy | StdOut Log |
| StatusOfCopyRequest | StdOut Log |
| AbortRequest | StdOut Log |
| AbortFiles | StdOut Log |
| Ls | StdOut Log |
| Mkdir | StdOut Log |
| Rmdir | StdOut Log |
| Rm | StdOut Log |
| Mv | StdOut Log |
| ReserveSpace | StdOut Log |
| StatusOfReserveSpaceRequest | StdOut Log |
| ReleaseSpace | StdOut Log |
| GetRequestSummary | StdOut Log |
| GetRequestTokens | StdOut Log |
| GetSpaceTokens | StdOut Log |
| GetSpaceMetaData | StdOut Log |
| GetTransferProtocols | StdOut Log |
| ExtendFileLifeTime | StdOut Log |
| ReleaseFiles | StdOut Log |
| ChangeSpaceForFiles | StdOut Log |
| StatusOfChangeSpaceForFilesRequest | StdOut Log |

Latest Results are at:
http://grid-deployment.web.cern.ch/
grid-deployment/flavia/basic/s2_logs/

Almost Ready
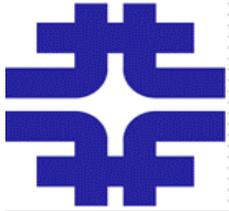
A bit more work

dCache SRM
Timur Perelmutov,Fermilab

dCache workshop
DESY, Hamburg 6
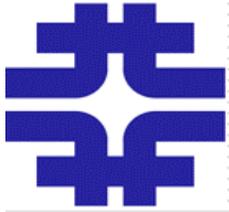
# SRM V2.2

- Directory Functions
- Space Management
- AccessLatency and RetentionPolicy support
- Better Error reporting
- Permission Management

# 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
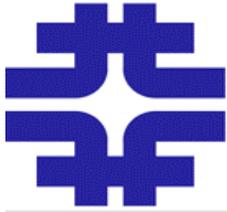
# AccessLatency support

- **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
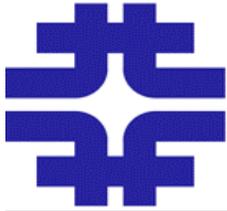
# Space Management

- 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
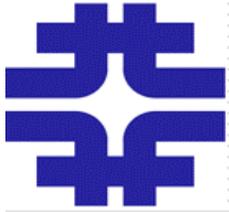
# WLCG usage of Space Management

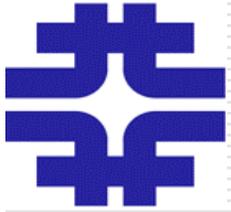- ☐ Reservations are made by administrators for particular experiment, group , etc.

- ☐ Reservations are large and have long lifetime

- ☐ Well known descriptions are assigned

- ☐ Space Tokens are discovered by users on basis of the description
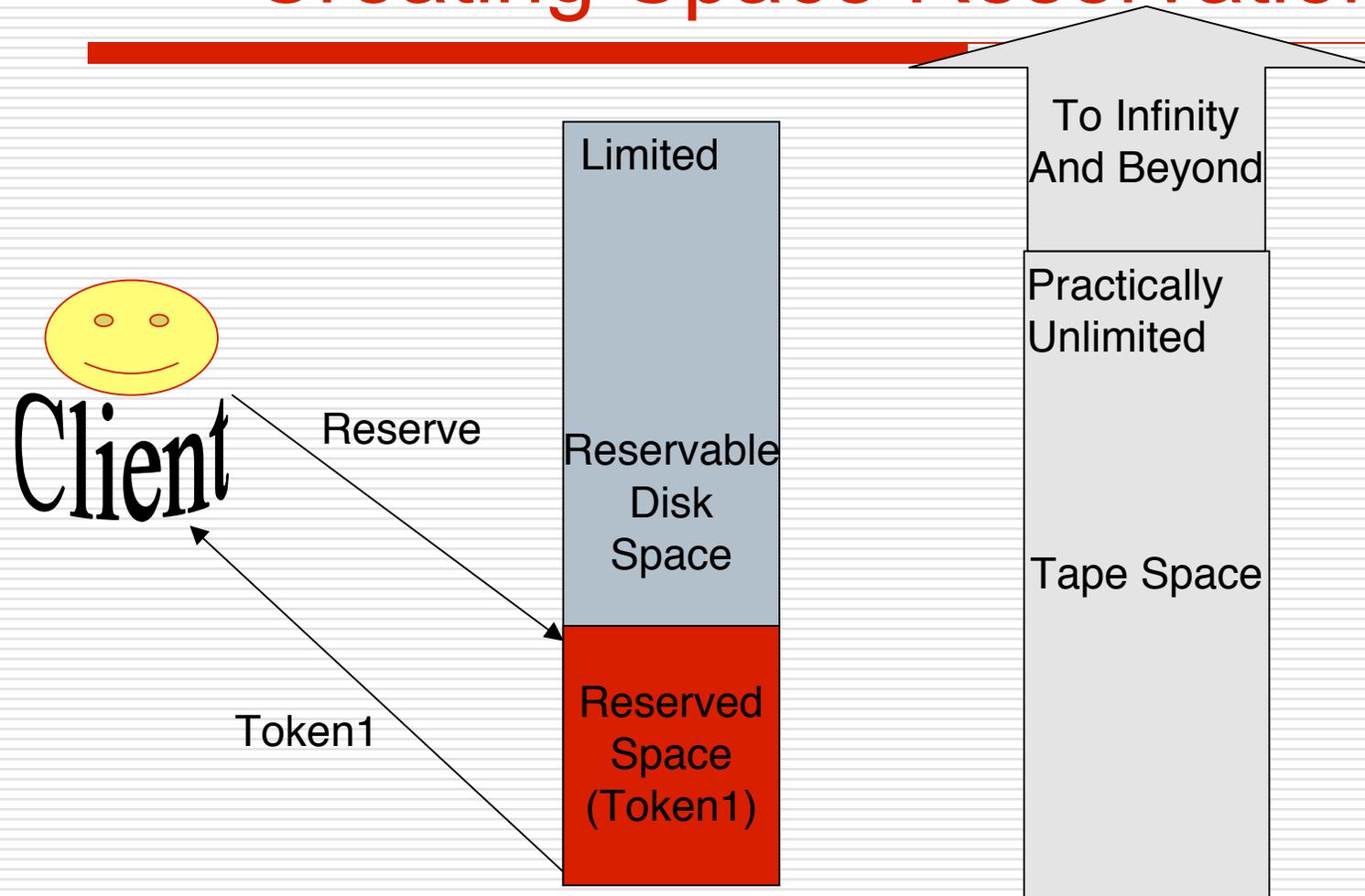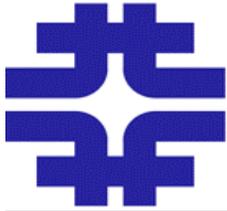
# SRM Space Reservatins are Managing Disk

☐ Space Reservation is for managing write disk space

☐ Multiple subsequent space reservations might be needed for large ingests

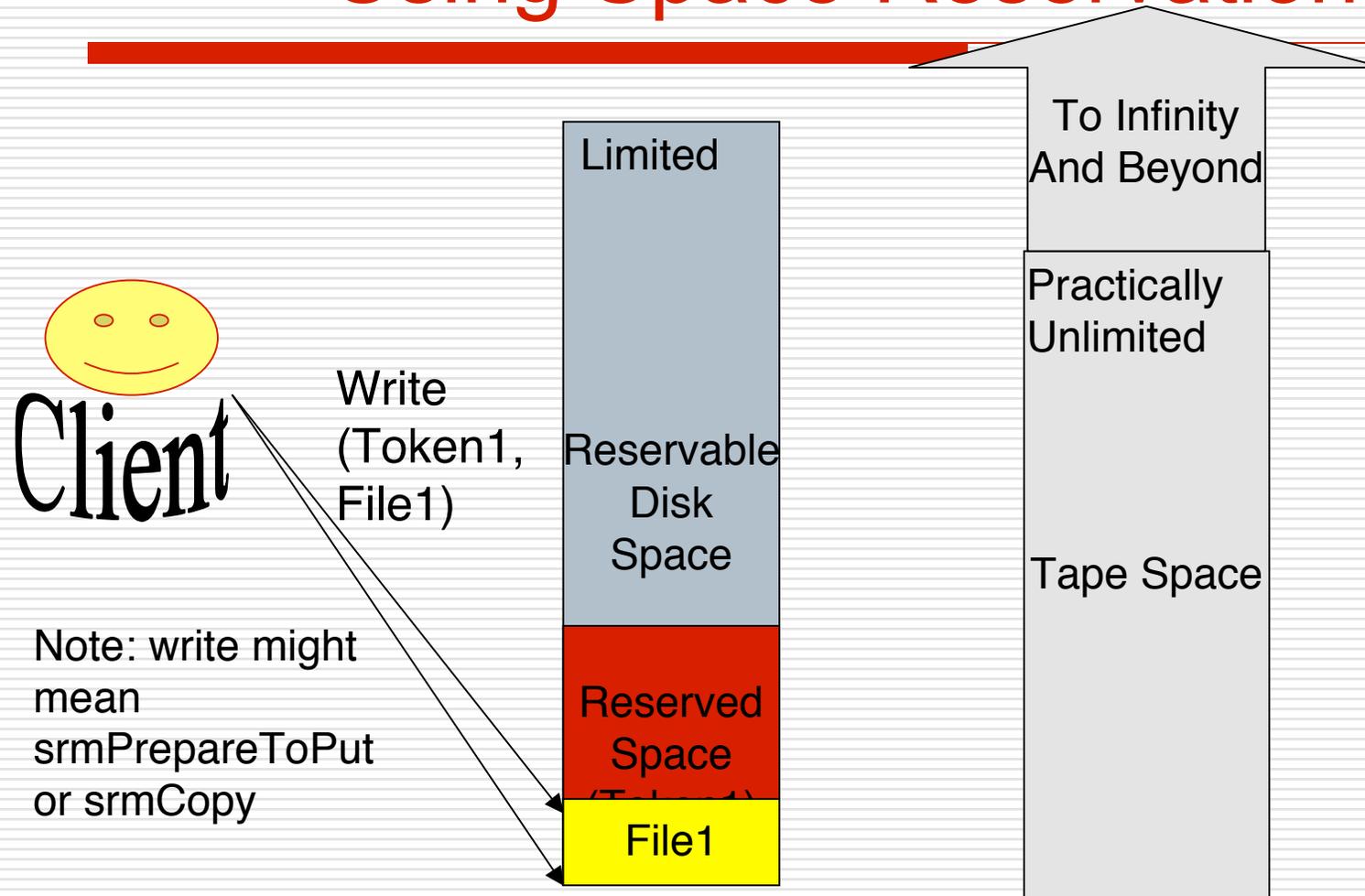☐ Using same Space Description String makes usage of Multiple Space Reservations (tokens) transparent to the users

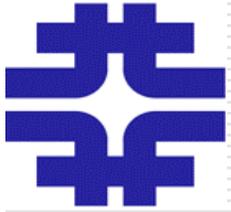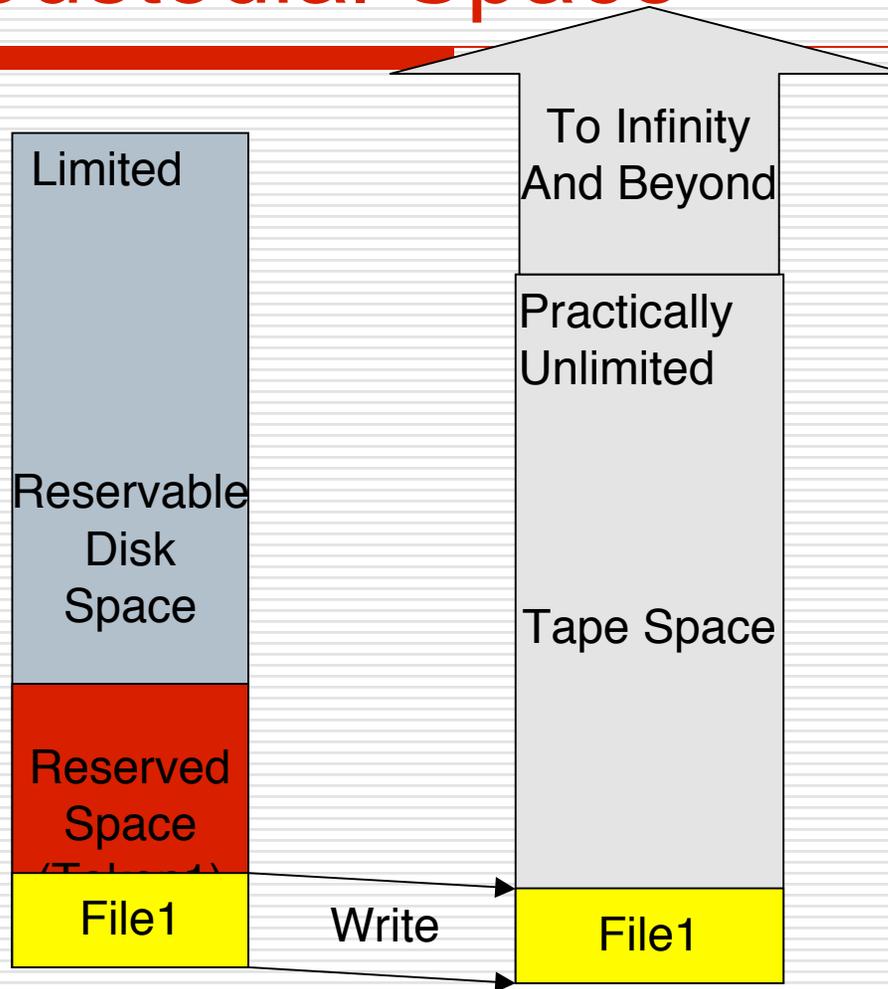# Creating Space Reservations

*dCache*

Client

Reserve

Token1

Limited

Reservable
Disk
Space

Reserved
Space
(Token1)

To Infinity
And Beyond

Practically
Unlimited

Tape Space

# Using Space Reservation *dCache*

Limited

Reservable
Disk
Space

Reserved
Space
(Token1)

File1

To Infinity
And Beyond

Practically
Unlimited

Tape Space

Write
(Token1,
File1)

Note: write might
mean
srmPrepareToPut
or srmCopy

Client

# Writing Data to Tape using Custodial Space

Client

Limited

Reservable Disk Space

Reserved Space (Tape1)

File1

Write

To Infinity And Beyond

Practically Unlimited

Tape Space

File1

# Nearline Space Reservations

*dCache*

**Client**

Limited

Reservable
Disk
Space
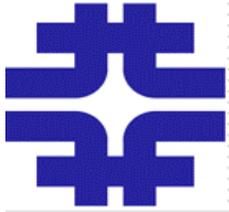
**Reserved
Space
(Token1)**

Nearline File
Can be removed
from Disk

Reservable

To Infinity
And Beyond

Practically
Unlimited

Tape Space

Written

**File1**

# Online Space Reservations

**Client**

**Limited**

Reservable Disk Space

Reserved Space (Token1)

File1

**To Infinity And Beyond**
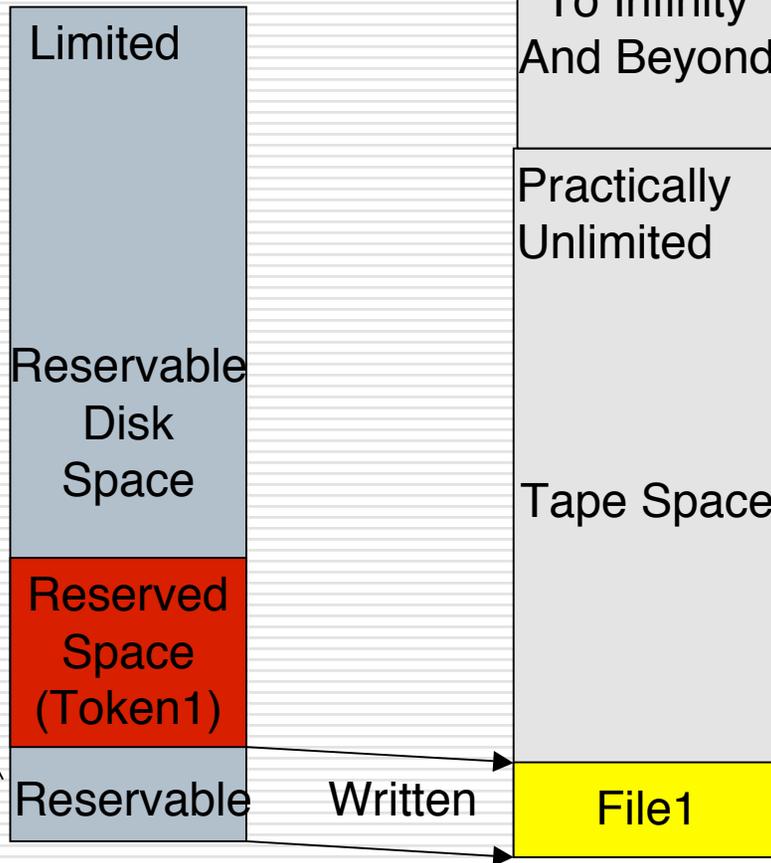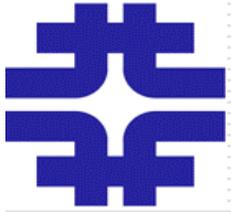
**Practically Unlimited**

Tape Space

File1

Online File Stays on Disk
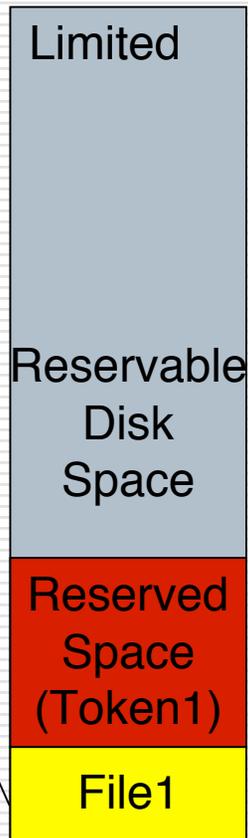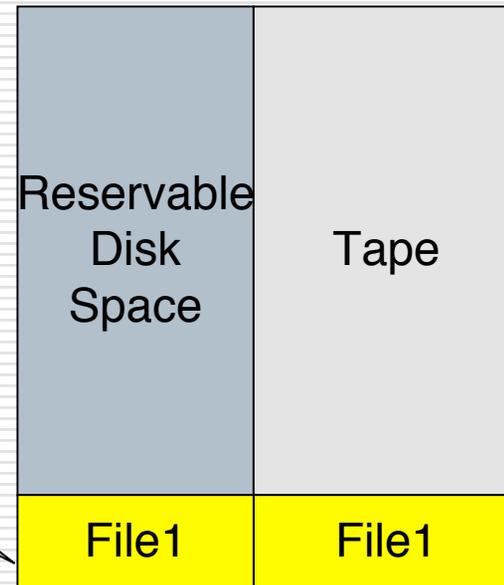
Data resides on Disk and Tape In case of Online Custodial space
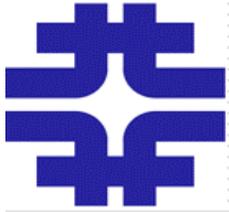
# ChangeSpaceForFiles
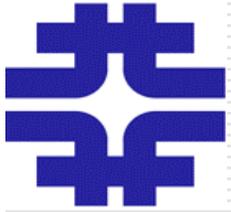
- Custodial,Online (Tape1Disk1) to Custodial,Nearline (Tape1Disk0) without internal copying

File1 Is "Online" Can't be removed

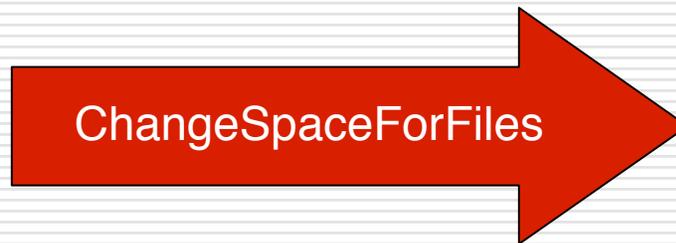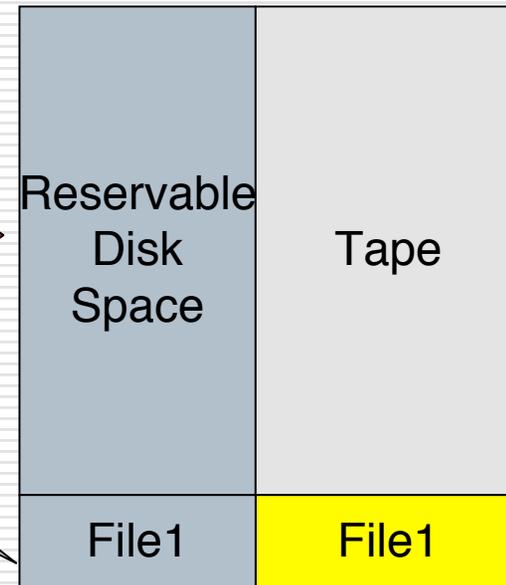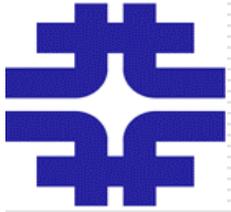| Reservable Disk Space | Tape |
|---|---|
| File1 | File1 |

# ChangeSpaceForFiles

☐ Custodial,Online (Tape1Disk1) to Custodial,Nearline (Tape1Disk0) without internal copying

ChangeSpaceForFiles

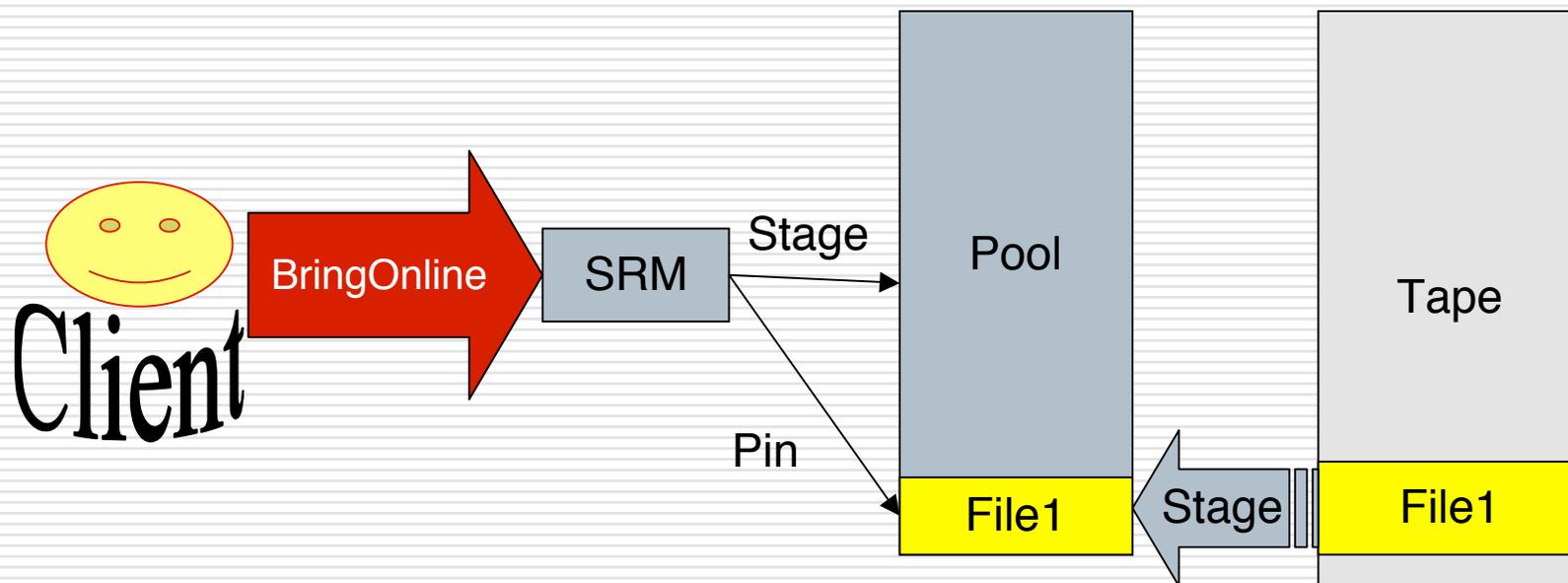| Reservable Disk Space | Tape |
|---|---|
| File1 | File1 |

File1 space is reservable

Client
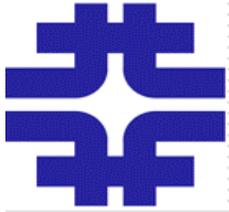
# BringOnline

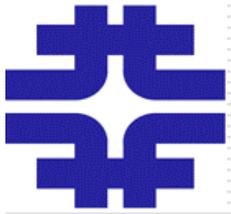☐ srmBringOnline allows to bring file online and to keep it online for the duration of the lifetime

Client → BringOnline → SRM

SRM → Stage → Pool

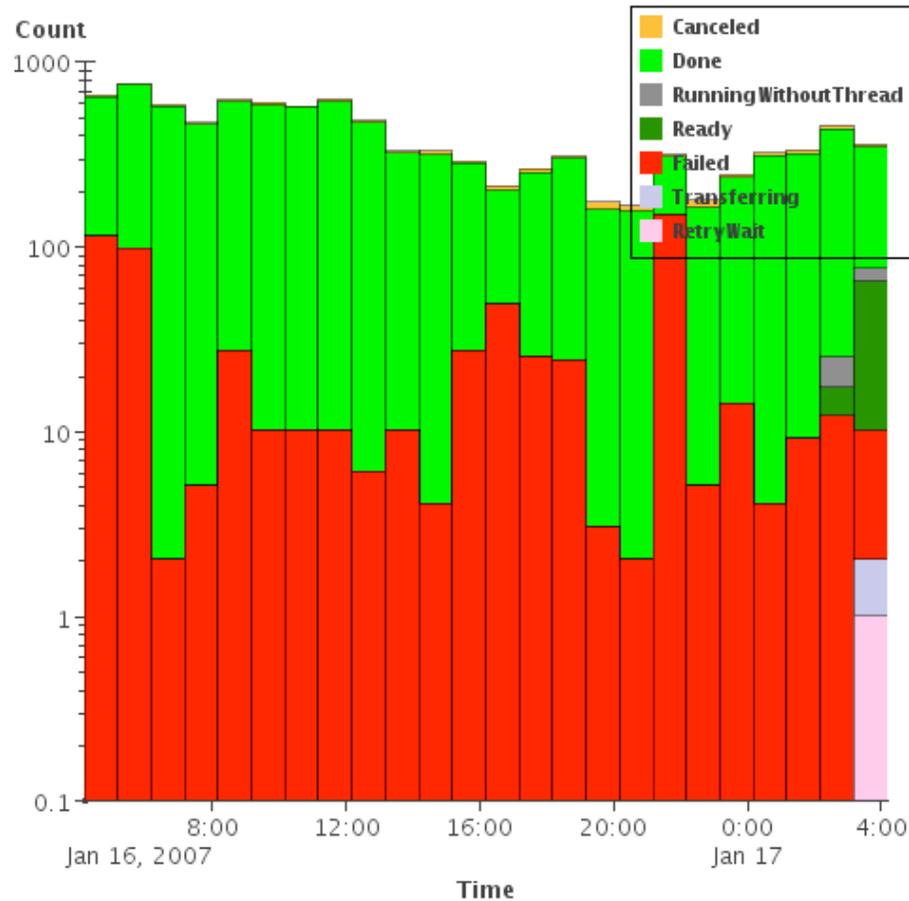SRM → Pin → File1

Tape → Stage → File1 (in Pool)

# Where is my request?

- [ ] Monitoring interface "SRMWatch"
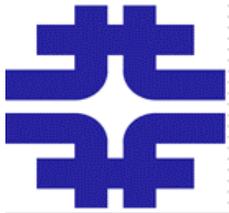    - List of active request
    - History of the Request and File state transitions
    - Plots of usage and errors
    - Query requests by DN, source or destination SURLs, creation time etc.
    - Rpm is available at
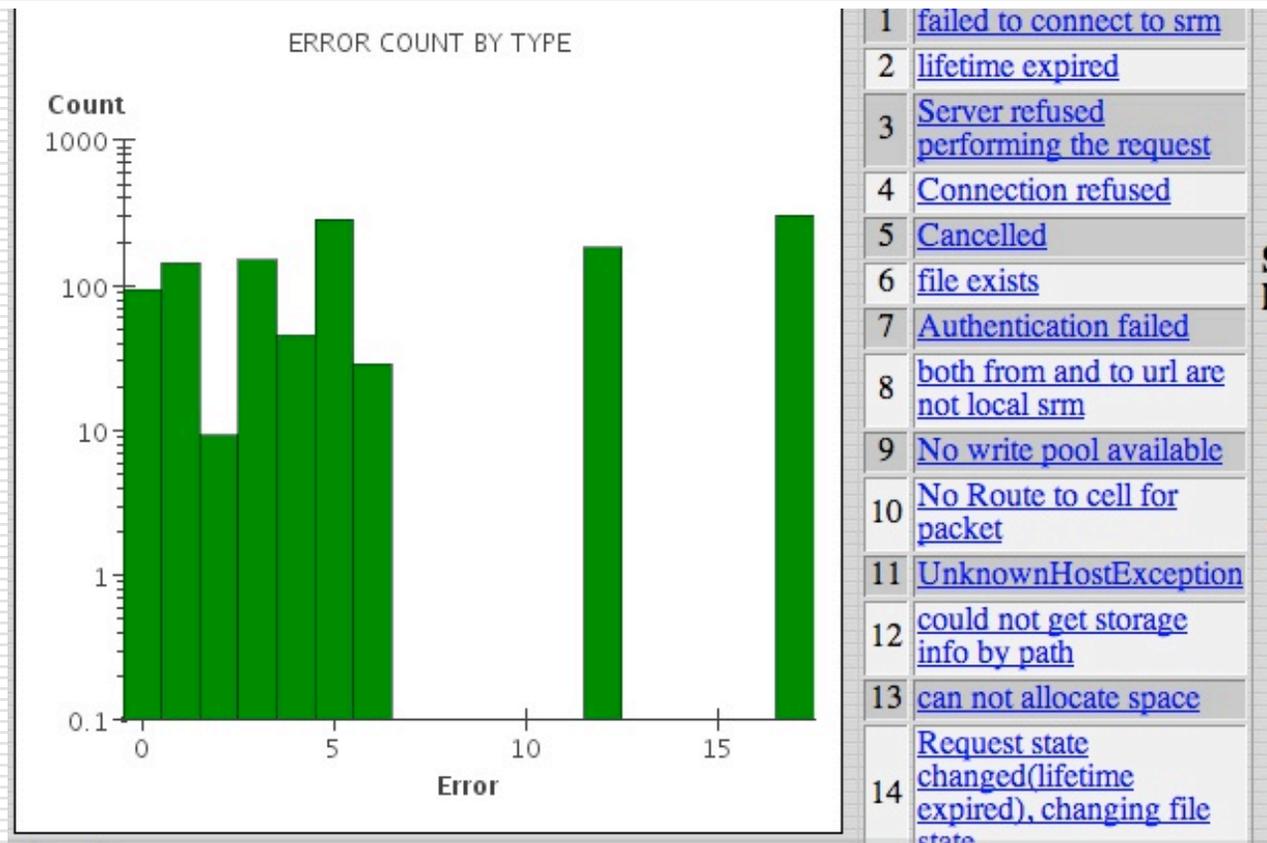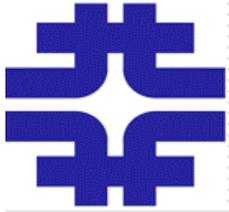      https://srm.fnal.gov/twiki/bin/view/SrmProject/SrmMonitoring

- [ ] US-CMS T1 srmwatch is at
  http://cmsdcam3.fnal.gov:8080/srmwatch

# Monitoring
# Count histogram

# Monitoring
# Error Count by Type



ERROR COUNT BY TYPE

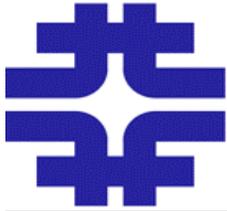| 1 | failed to connect to srm |
| 2 | lifetime expired |
| 3 | Server refused performing the request |
| 4 | Connection refused |
| 5 | Cancelled |
| 6 | file exists |
| 7 | Authentication failed |
| 8 | both from and to url are not local srm |
| 9 | No write pool available |
| 10 | No Route to cell for packet |
| 11 | UnknownHostException |
| 12 | could not get storage info by path |
| 13 | can not allocate space |
| 14 | Request state changed(lifetime expired), changing file state |

# How To make it work

- Run SRM on separate node
  - US CMS T1 - Dual Intel Xeon Duo, 4 GB RAM, 3ware raid disk array
- Configure kernel for optimal database performance
  - kernel.shmmax=1073741824
  - kernel.shmall=1073741824
- JVM 1.5
- More details at https://srm.fnal.gov/twiki/bin/view/SrmProject/DcacheSrmInstallation (includes instructions for monitoring installation)

# Resources

- dCache http://www.dcache.org
- dCache SRM http://srm.fnal.gov
- Fermilab dCache project http://dcache.fnal.gov
- SRM WG http://sdm.lbl.gov/srm-wg/
- SRM V2.2 spec http://sdm.lbl.gov/srm-wg/doc/SRM.v2.2.html
- WLCG SRM V2.2 MoU
  https://srm.fnal.gov/twiki/pub/WorkshopsAndConferences/GridStorageInt erfacesWSAgenda/SRMLCG-MoU-day2.doc
- S2 SRM V2.2 tests http://grid-deployment.web.cern.ch/grid-deployment/flavia/basic/s2_logs/
- LBNL SRM V2.2 tester http://sdm.lbl.gov/srm-tester/v22daily.html