



Storage in OSG and BeStMan

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Storages in OSG



- **OSG supports users!**
 - Storage Group in OSG
 - Packaging storage software for VDT
 - dCache, BeStMan, BeStMan-gateway/Xrootd
 - Develop/maintain/package accounting and monitoring tools
 - Support/test/package community tools
 - Simplify configuration/installation for OSG
 - Develop and run validation tests
 - Perform troubleshooting and debugging
 - Provide users and admins support
 - Help VOs to use storage on OSG sites
 - OSG liaison to storage developer groups
 - Educate OSG community about storage, provide documentation
 - Participate in grid schools organized by OSG
- **Two commonly used, very different storage services in OSG**
 - dCache (FNAL, DESY)
 - BeStMan (LBNL)

} **These are SRMs!**

And end-users do not see the differences in accessing these!



What is SRM?



- **SRM : Storage Resource Manager**
 - Well-defined storage management interface specification based on standard
 - Different implementations for underlying storage systems are based on the same SRM specification
 - Provides dynamic space allocation and file management on shared storage components on the Grid
- **Over 300 deployments of different SRM servers in the world**
 - Managing more than 10 PB



Why do you need SRM?



- **Suppose you want to run a job on your local machine**
 - Need to allocate space, and bring all input files
 - Need to ensure correctness of files transferred
 - Need to monitor and recover from errors
 - What if files don't fit space? Need to manage file "streaming"
 - Need to remove files to make space for more files
 - Need to remove files after the job is done for more jobs
- **Now, suppose that the machine and storage space is a shared resource**
 - Need to do the above for many users,
 - Need to enforce quotas
 - Need to ensure fairness of space allocation and scheduling
- **Now, suppose you want to do that on a Grid**
 - Need to access a variety of storage systems
 - mostly remote systems, need to have access privileges
 - Need to have special software to access mass storage systems
- **Now, suppose you want to run distributed jobs on the Grid**
 - Need to allocate remote spaces
 - Need to copy (or stream) files to remote sites
 - Need to manage file outputs and their transfer to destination site(s)



What does SRM do?

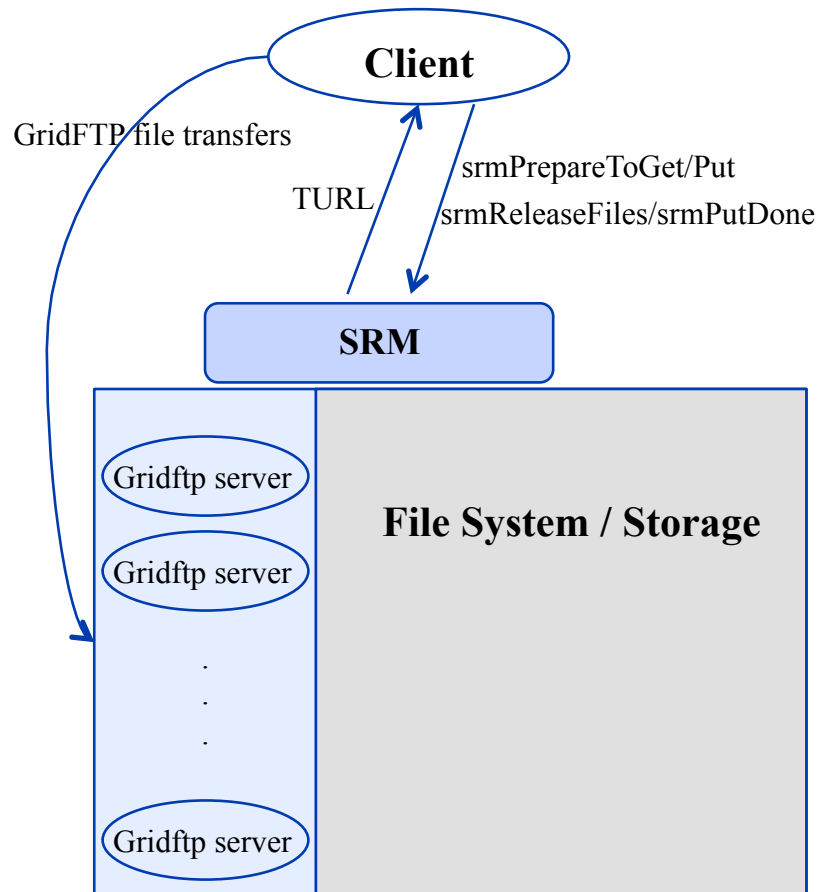


- **Support space management for files with lifetime**
 - Allocation of space, garbage collection
- **Support dynamic space reservation – opportunistic storage**
- **Support for multiple file transfer protocols**
 - Support for transfer protocol negotiation
 - Support for multiple file transfer servers
 - Incoming and outgoing file transfer queue management and transfer monitoring
- **Support for asynchronous multi-file requests**
- **Directory management and ACLs**
- **Support file sharing and file streaming**
- **Gives compatibility and interoperability based on standard**

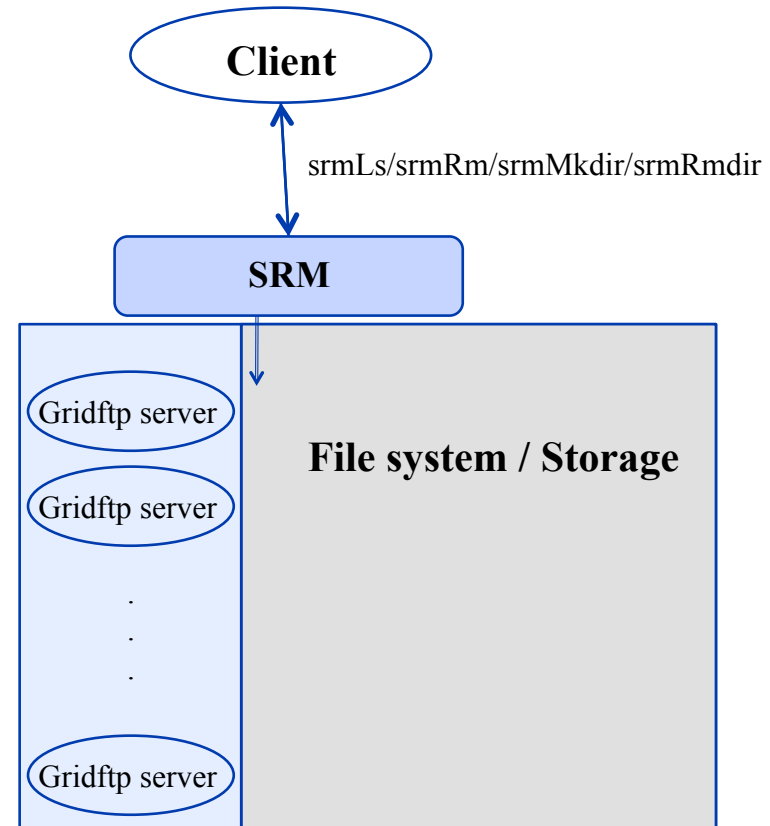


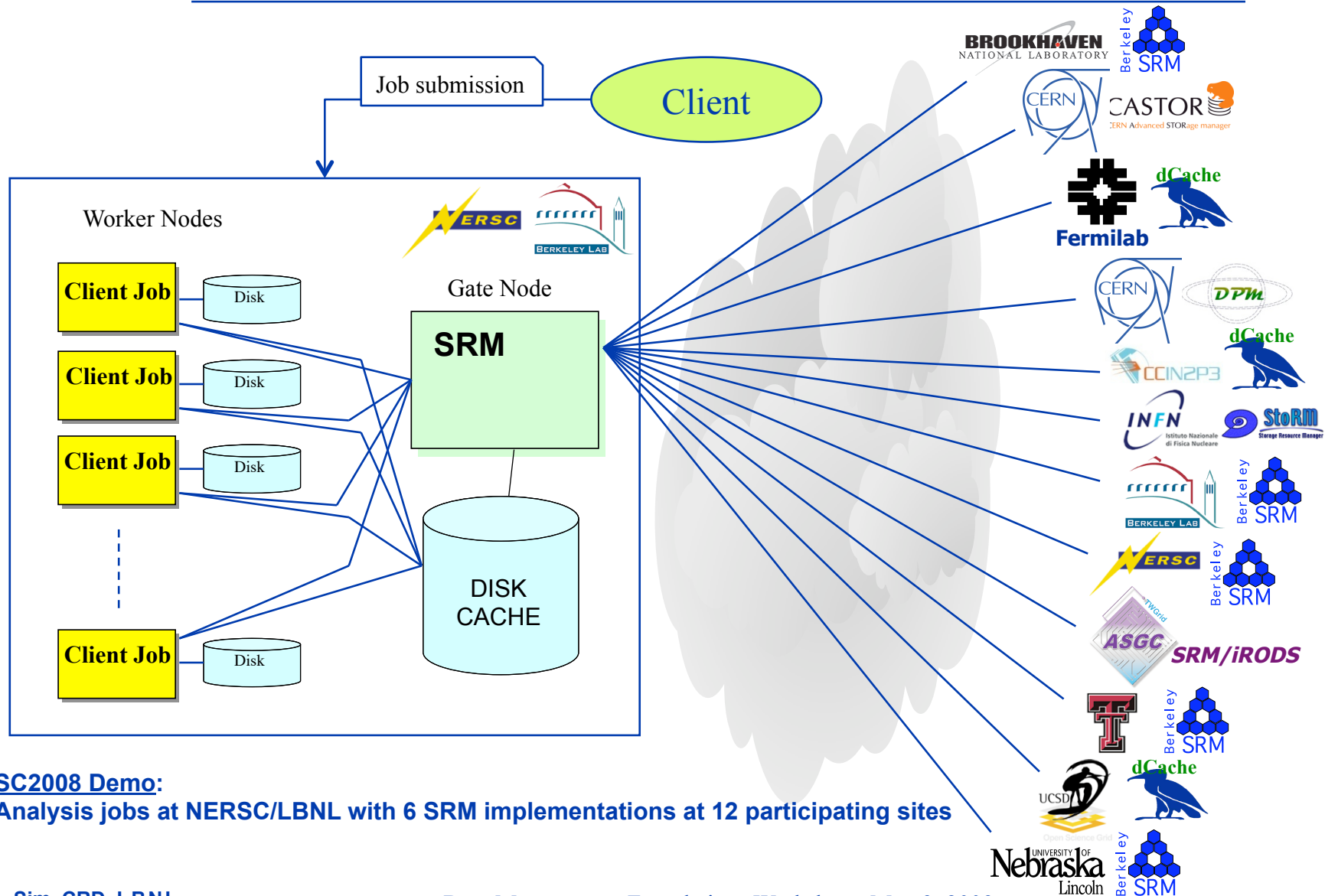
What do users do with SRM?

PUT/GET



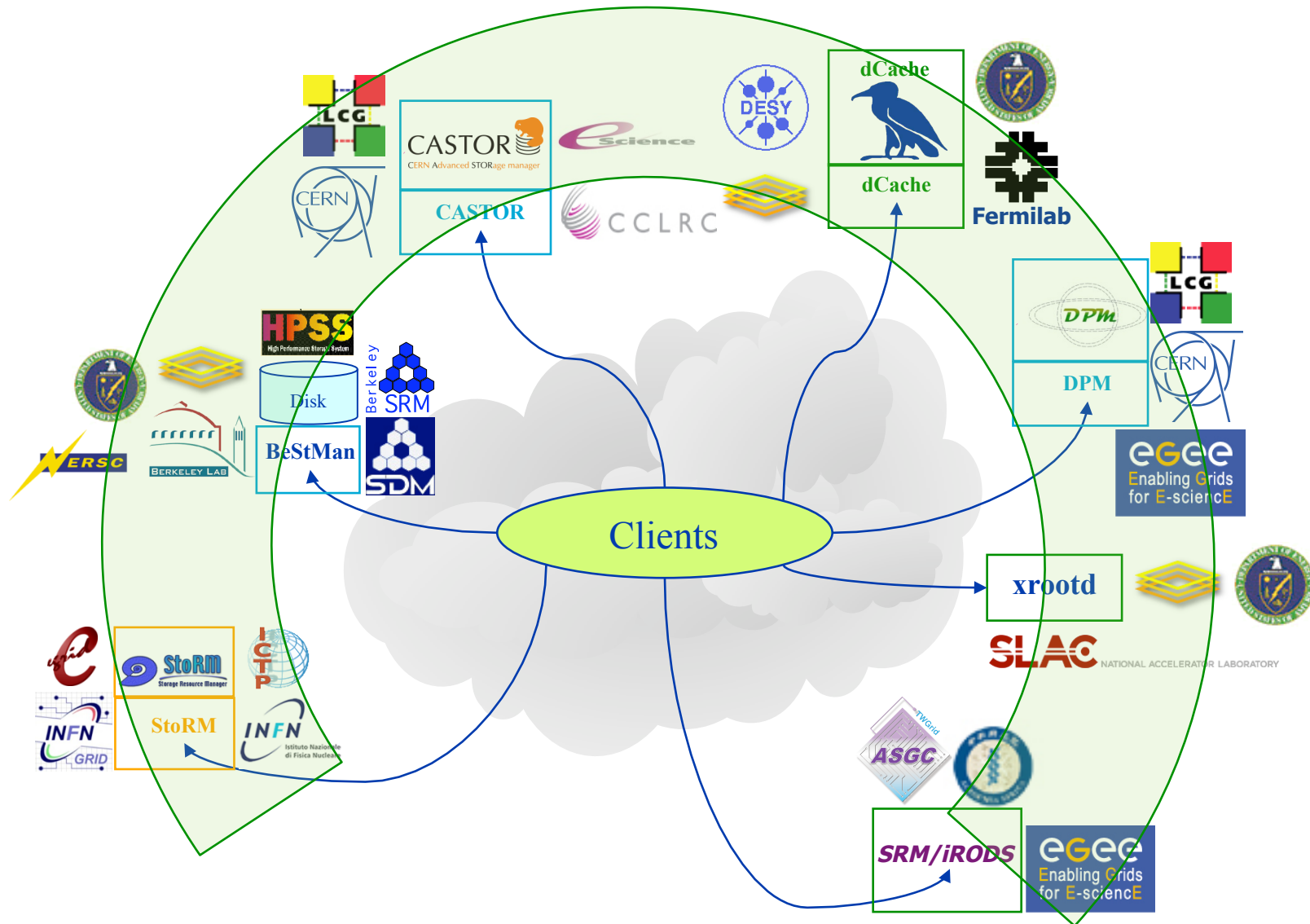
Ls/Rm/Mkdir/Rmdir





Analysis jobs at NERSC/LBNL with 6 SRM implementations at 12 participating sites

Interoperability in SRMs





Berkeley Storage Manager (BeStMan)



- **Light-weight implementation of SRM v2.2**
 - Works on existing disk storages with posix compliant file systems
 - E.g. NFS, GPFS, GFS, NGFS, PNFS, HFS+, PVFS, Lustre, Xrootd, Hadoop, Ibrix
 - Supports multiple partitions
 - Adaptable to other file systems and storages
 - Supports customized plug-in for file system access
 - Supports customized plug-in for MSS to stage/archive such as HPSS
 - Easy adaptability and integration to special project environments
- **Supports multiple transfer protocols**
 - Supports load balancing for multiple transfer servers
- **Scales well with some file systems and storages**
 - Xrootd, Hadoop
- **Works with grid-mapfile or GUMS server**
- **Simple installation and easy maintenance**
- **Packaged in VDT using Pacman**
- **Who would benefit from BeStMan?**
 - Sites with limited resources and/or limited admin effort



What can BeStMan do?



- In addition to what SRMs do....
- **Dynamic installation, configuration and running**
 - If the target host does not have an SRM, BeStMan can be installed, configured, and started with a few commands by the user.
- **BeStMan can restrict all user access to certain directory paths through configuration**
- **BeStMan (full mode) can be configured to restrict user access to files by owners/creators only without external service component**
- **A site can customize the load-balancing mechanism for transfer servers through plug-in**



Some BeStMan Use Cases



- **CMS**
 - BeStMan Gateway as an SRM frontend for Hadoop at UNL
 - Passed all the automated CMS tests through EGEE SAM
- **ATLAS**
 - BeStMan on NFS
 - BeStMan Gateway on Xrootd/FS, GPFS, Ibrix
- **STAR**
 - Data replication between BNL and NERSC/LBNL
 - HPSS access at BNL and NERSC
 - SRMs in production for over 4 years
 - Part of analysis scenario to move job-generated data files from PDSF/NERSC to remote BNL storage
- **Earth System Grid**
 - Serving about 6000 users
 - Over a million files and 170TB of climate data
 - from 5 storage sites (LANL, LLNL, NCAR, NERSC, ORNL)
 - Uses an adapted BeStMan for NCAR's own MSS



Summary



- **SRM is an essential part of Grid and OSG**
 - Users have uniform access to Grid storages
 - OSG supports users!
- **BeStMan is an implementation of SRM v2.2**
 - Great for disk-based storage and file systems
 - BeStMan Gateway mode gives scalable performance on some file systems and storages
 - Easy installation and maintenance through VDT or tar file
 - Works with other SRM v2.2 implementations
 - Servers: CASTOR, dCache, DPM, StoRM, SRM/SRB, ...
 - Clients: PhEDEx, FTS, glite-url-copy, lcg-cp, srm-copy, srmcp, ...
 - In OSG, WLCG/EGEE, ESG, ...



Documents and Support



- **OSG Storage documentation**
 - <https://twiki.grid.iu.edu/twiki/bin/view/Documentation/WebHome>
- **BeStMan**
 - <http://datagrid.lbl.gov/bestman>
 - <https://twiki.grid.iu.edu/bin/view/Documentation/BestmanGateway>
 - <https://twiki.grid.iu.edu/bin/view/Documentation/BestmanGateway-Xrootd>
- **Xrootd and XrootdFS**
 - <http://xrootd.slac.stanford.edu>
 - <http://wt2.slac.stanford.edu/xrootdfs/xrootdfs.html>
- **SRM Collaboration and SRM Specifications**
 - <http://sdm.lbl.gov/srm-wg>
- **Contact and support**
 - osg-storage@opensciencegrid.org
 - SRM@LBL.GOV