

SRMs client and servers in SRM version 1.1: Current Status for OSG

Alex Sim and Arie Shoshani, Lawrence Berkeley National Laboratory
Timur Perelmutov, Fermi National Accelerator Laboratory

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Basic concepts

The basic functions of SRMs are to manage space quotas and queue requests for files. Given a space quota for a client, SRMs support requests for multiple files to be copied into the space from local or remote sites, or copies out of the space to other sites. If all requested files do not fit into the space, the SRM brings into the space as many files as can fit, pins the files for a lifetime, and queues the remaining files. The files brought into the space are “pinned” for a certain lifetime. The client can release files before their lifetime expires (when it is finished using the file). When a file is released, the SRM can use the space that a released file occupied to bring in one or more additional files for the client, thus providing a “file streaming” functionality.

From the client’s point of view the three basic file movement functions are:

- srmGet: to get files from remote sites.
- srmPut: to put files into the SRM space.
- srmCopy: to copy files from remote sites to SRM space or vice versa.

SRMs are peer-to-peer components. That is, one SRM can communicate to another SRM to get/put files. Thus, srmCopy may be implemented as one SRM issuing an srmGet or srmPut request to another SRM.

Implementations of SRM servers and clients

It was agreed to provide web service interface to all SRM servers in SRM interface version 1.1. This is required so that all SRMs can communicate with each other. However, as far as clients are concerned, there is no agreed upon standard client. User’s can write their own clients to interact with SRMs. We describe next two specific implementations for servers and clients at LBNL and Fermilab.

LBNL’s DRM

The SRM server implemented at LBNL for a disk cache, called DRM, was originally developed with a CORBA interface. However, in order to provide peer-to-peer web services compatibility with other SRMs, web services gateway layers were added. The functionality specified in SRM version 1.1 is supported through the gateway (called WSG – for Web Services Gateway).

LBNL also provided command-line clients for the SRM functions – these include the above file movement functions. These clients communicate with the DRM at the

CORBA level. In future versions, only web services will be supported and the client will use the WS interface instead. However, this fact is not visible to client using command-line interface. Because of additional functionality needed, especially srmCopy of entire directories, the LBNL command-line clients support:

srm-ls – to get directory listing of a directory local to the DRM.

srm-mkdir – to make a directory in a directory local to the DRM

srm-remove – to remove a file or an empty directory in a directory local to the DRM

srm-ping – to check that the SRM is alive

srm-copy – was extended to support directory to directory copy from remote sites to local space.

There is also a version of SRM developed at LBNL that accesses HPSS, called an HRM. The HRM has exactly the same interface as the DRM, and thus the same clients work with HRMs. This facilitated the use of the srm-copy client to provide large-scale robust file copying between HPSS systems at different sites (used in production for two years now between BNL and NERSC)

Fermilab's SRM-dCache

The Fermilab storage system with an SRM interface is dCache Storage System, developed jointly by DESY and Fermilab. In Fermilab, dCache is mostly used as a disk cache in tertiary storage, consisting of dCache and Enstore tape storage system. dCache can work as a cache on top of various tape systems, including OSM and HPSS. It can also be used as standalone disk based mass storage system.

SRM-dCache implements SRM version 1.1 and provides all the data transfer functions (get, put and copy), which support load balancing and throttling of the transfers, fairness in the execution of the transfer requests, scalable replication mechanism via gridftp and http protocols, and automatic directory creation. The SRM functions achieve fault tolerance and reliability by providing persistent storage for transfer requests and retries on failures. Fermilab SRM has same web service interface (i.e specified by the same WSDL document) as LBNL's. Thus, in principle, the two implementation can inter-operate – but extensive tests were not conducted yet.

Fermilab implementation of SRM interface is now available as a standalone product, adaptable to work on top of another storage system through a well defined SRM-Storage interface. Fermilab also provides a reference implementation of the SRM-Storage. Fermilab has developed a command-line client for copying of files called srmcp. This client was tested with DRM. Srmcp provides access to the three basic file movement functions (srmGet, srmPut and srmCopy) via Web Service interface. Fermilab client distribution also includes the srm-advisory-delete and srm-get-metadata clients, which allow to remove the file from the space and to print file metadata respectively. Another client, developed by LCG CMS collaboration at CERN, called lcg-rm (rm for replica manager) is available to work with SRM-dCache.

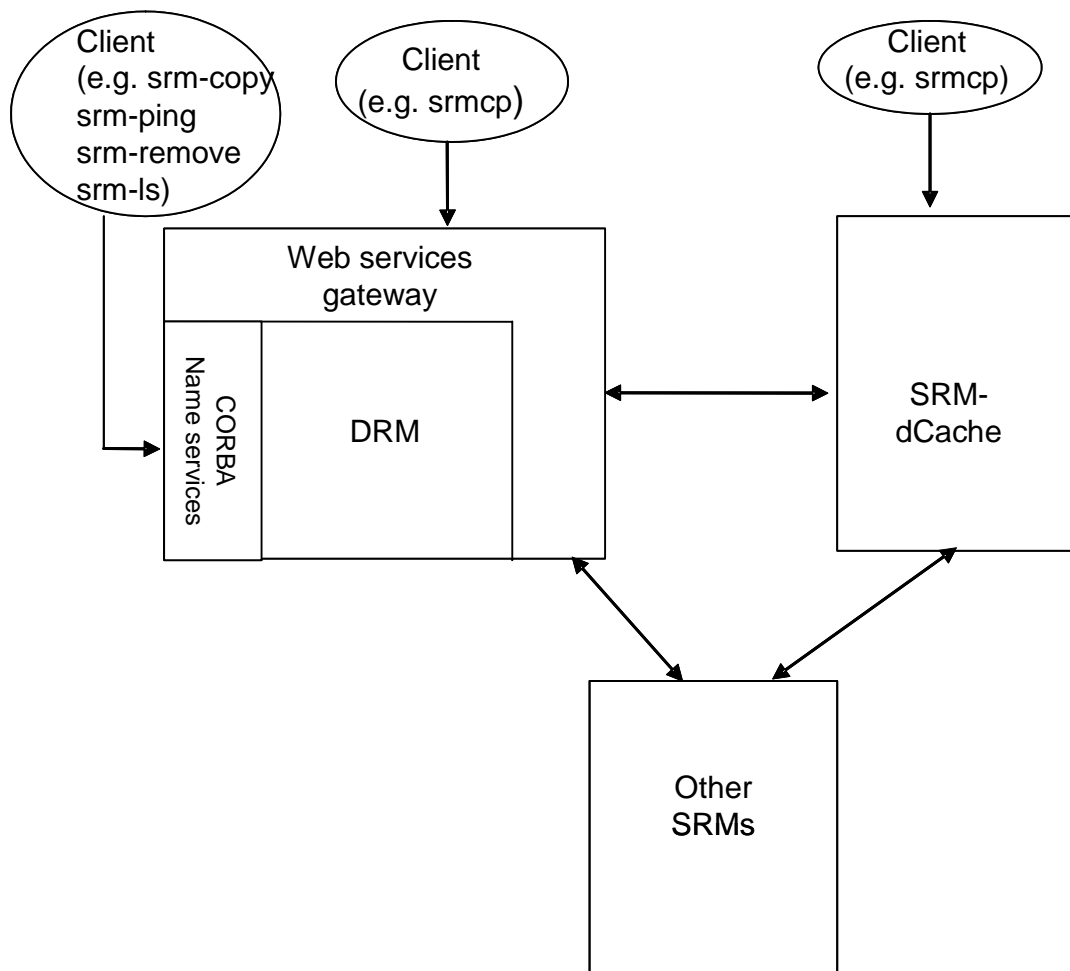
Summary

All implementations of SRM version 1.1 support WS interfaces. This includes LBNL's DRM and HRM, Fermilab's SRM-dCache, and CERN's SRM-Castor.

Fermilab's client (srmcp) works at the WS level, but provides srmcp for files only as far as we have tested. srmcp could be used with LBNL's DRM. The LBNL clients work with DRM (or HRM) only, but provide richer functionality, including the srm-copy of directories and the srm-ping, srm-ls, srm-mkdir, srm-remove functions mentioned above.

See the enclosed diagram for a graphical representation of these SRM implementations.

In the next version, version 2.1, LBNL will use WS only. All clients using WS should be interchangeable.



A diagram showing the current status of SRM v1.1 servers and clients for DRM and SRM-dCache