OSG Storage Elements

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Storage Element Types

- “Classic” Storage Element(SE)
  - All OSG sites have a least one classic SE per gatekeeper
  - data is pre-staged into a shared area on a head node via GridFTP server
  - Read (sometimes write) access from the worker nodes (NFS)
  - Size limitation per non-owner VO (< 400GB)
- Storage Element has the following components:
  - Distributed File System
  - NFS, GPFS, PVFS, Lustre(POSIX)
  - xrootd, HDFS (POSIX-light with fuse)
  - dCache
  - GridFTP server(s)
  - Namespace service
  - Storage Resource Manager(SRM) endpoint
  - Available space per not-owner VO is negotiable (in TBs)

Statistics

- OSG : Number of sites providing Storage Elements: 54
  - dCache: 12
  - BeStMan: 42
    - HDFS: 6
    - Xrootd: 3
    - Lustre: 3
    - GPFS: 2
    - RedDnet: 1
    - All other sites: Local disk, NFS
- Average daily amount of data transferred ~800TB

SRM vs GridFTP

- Discovery:
  - SRM Endpoints are advertised in BDII and the SURLs are hardly ever changed
  - Almost all SEs have multiple GridFTP servers. TURLs are not advertised and could be changed at anytime
- Load Balancing:
  - SRM performs load balancing of GridFTP servers.
  - BeStMan provides means to do custom GridFTP servers selection (e.g plugin that selects GridFTP server that serves a particular storage area associated with a VO)
- Listing
  - Directory listing is guaranteed to work (not necessarily the case with gridftp-hdfs, gridftp-xrootd)

SRM v2.2 Interface

- SRM specs standardized the interface
  - https://sdm.lbl.gov/srm-wg/doc/SRM.v2.2.htm
- Provide uniform access to heterogeneous storage elements:
  - dCache
  - BeStMan
  - Castor
  - DPM
  - StoRM
- Interface Categories:
  - Space Management *
  - Data Transfer
  - Directory and Permission
  - Request Status
- Utilizes GSI
- Webservices implementation of published wsdl:
  - https://sdm.lbl.gov/srm-wg/srm.v2.2.wsdl

Known Client Implementations (JAVA)

- Fermi-srm client:
  - Implementation: Java
  - Source code:
  - http://svn.dcache.org/dCache/trunk/modules/srmclient/
- Bestman2-client:
  - Implementation: java
  - Source code:
  - https://codeforge.lbl.gov/scm/?group_id=54
- Srm-lbnl client:
  - Implementation: java
  - Source code: not available

Known Client Implementation (C)

- LCG-utils:
  - Implementation: C
  - Source code:
    - CVSROOT=:pserver:anonymous@jra1mw.cvs.cern.ch:/cvs/jra1mw
- Dependencies:
  - GFAL - Grid File Access Library, handles connection to replica catalog services and interacts with SRM endpoints
    - Modules org.glite.data.dm-util,org.glite.data.gfal
    - C API
      - Description: http://grid-deployment.web.cern.ch/grid-deployment/documentation/LFC_DPM/gfal/
      - Examples: https://grid.ct.infn.it/twiki/bin/view/GILDA/UsingGFAL
  - Client and server side library to secure gSOAP using the Globus Security Infrastructure.
    - http://jra1mw.cvs.cern.ch/cgi-bin/jra1mw.cgi/org.glite.security.cgsi-gsoap/