WP5

Mass Storage Management

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Outline

◆ Objectives (3') *(Summary of objectives for the whole project)*

◆ Achievements (5') *(Summary of all useful products)*

◆ Lessons learned (3')

◆ Future & Exploitation (4')

◆ Questions (10')

Objectives

- Develop uniform interfaces to mass storage
  - Control interface
  - Data Transfer interfaces
  - Information interfaces

- Develop back-end support for mass storage systems
  - Provide "missing" features, e.g. directory support
  - Provide Grid access control

- Integrate with EDG Replica Management services

- Publish information

Objectives

- Control interface
  - Original objective was "develop uniform interface to mass storage"
  - GSI authentication required
  - Later, providing web services interface became an objective
  - Later, providing specifically SRM version 1 became an objective

- Data Transfer interface
  - Globus GridFTP required
  - Must support both encrypted and unencrypted transfers

- Information interface
  - Publish to MDS and, later, R-GMA

Achievements – Storage Element

- EDG Storage Element

- Flexible architecture
    - Cope with changing requirements
    - Pluggable features such as access control
    - Easy to add support for new storage systems
    - Easy to add new interfaces

- Security
    - Encrypted Globus GSI-authenticated control interface
    - File level access control

- Currently supports CASTOR, HPSS, ADS, as well as disk

Achievements – site specific

- ◆ CASTOR SRM

  - Provided an SRM interface to CASTOR at CERN

  - Interoperability demonstrated with FermiLab

  - SRMCopy implemented

- ◆ CASTOR GridFTP

  - Provided a GridFTP interface to CASTOR's cache

  - Based on the Globus wu-ftpd GridFTP server

  - Files must be staged in before access

  - Transfer rates up to 30 MB/s (with specially tuned TCP settings)

- ◆ SARA

  - Porting SE to Irix, developing cache management tools

Achievements – other

- ◆ Contributions to international standards and fora
  - ▪ SRM
    - ◦ Collaboration between Fermilab, Jefferson Lab, Lawrence Berkeley, RAL, CERN
    - ◦ Contributed to the design of the SRM version 2 protocol
  - ▪ GLUE
    - ◦ Contributed to the design of GLUE storage schema
  - ▪ GGF
    - ◦ Tracked developments in appropriate working groups
  - ▪ Dissemination
    - ◦ Talks at conferences and in working groups, publications,…
- ◆ EDG
  - ▪ Participated in ITeam, ATF, SCG, QAG,…

Lessons learned

- ◆ Look for opportunities for component reuse

  - Used web services deployment and security components provided by WP2

  - Deployed and developed further information producers supplied by WP3

- ◆ Inter-WP integration requires a lot of effort !

  - At times, nearly 100% of WP5 devoted to ITeam work and site installation support

  - Storage interface machines are heterogeneous
    - More installation support was required

  - For example, effort required to support DICOM servers was significantly underestimated
    - Requires significant effort from WPs 2, 3, 5, 10 – plus of course SCG, ATF, and, eventually, ITeam

Lessons learned

- ◆ Prototype implementations live longer than expected
  - ■ SE's metadata system was implemented as prototype
  - ■ Needs modifications to scale – first step (of two) almost complete
  - ■ Second step : need to choose appropriate database

- ◆ Choice of architecture was definitely right
  - ■ Architecture has successfully coped with changing requirements

- ◆ Scalability
  - ■ Use on application testbed or in production found scalability problems not seen on development and integration testbeds

Exploitation

- Used successfully on all EDG testbeds by all EDG applications WPs at all participating sites

- "Atlas Data Challenge 1.5"
  - SE is currently used by Atlas to transfer data between ADS at RAL and CASTOR at CERN
  - About 1500 files; 2 TB in total
  - Files are copied by EDG RM and registered in an RC at RAL
  - This work is being done by Atlas outside the EDG testbeds

- Storage Element information producers
  - Information producers used independently, e.g. by LCG and DZero in the "classic" SE

Future and exploitation

- Storage Element SRM
  - SE will provide generic SRM 1 interface
  - This work is almost finished
  - Work will be carried on by RAL; later in GridPP 2
  - To be tested by LCG
  - Will investigate whether to build SRM version 2
    - Depends on uptake of protocol in international community
    - Current SRM implementation is built with also SRM 2 in mind
    - Some additional features required

- Storage Element – further mass storage systems
  - Scope for implementing support for AMS, DICOM, in EGEE?
  - Support for UK Tier-2 sites to be developed by GridPP2

Future and exploitation

- ◆ Storage Element and VOMS

  - Integrate VOMS support into SE – SE already works with VOMS proxies

  - Will enable more scalable access control

  - Fairly easy task – accomplished again by reusing components

- ◆ Integration with GFAL

  - LCG's Grid File Access Library – POSIX style interface

  - Planned integration using SRM 1 interface

- ◆ Automatic Grid mirroring

  - Looking into automatic mirroring data in UK NeSC – between Edinburgh and Glasgow

Questions?