



Enabling Grids for  
E-science in Europe

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*Biomed Application Developer's Course*  
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# Storage Interfaces

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# Content

- Brief introduction to SE types
- Storage Resource Manager Interface
- Grid File Access Library

- Data are stored on disk [pool] servers or Mass Storage Systems
- At the moment LCG-2 supports several types of Storage Elements:
  - Classic SE (disk server with/out NFS access)
  - D-Cache disk pools
  - Castor Mass Storage Systems
- Applications demand for reliable storage and storage management capabilities:
  - Transparent access to files (migration to/from disk pool)
  - File pinning
  - Space reservation
  - File status notification
  - Security
  - Life time management
  - ...

# Storage Resource Manager Interface

## Original SRM design : LBL, JNL, FNAL, CERN

- Support for **local policy**
  - Each storage resource can be managed independently
  - Internal priorities are not sacrificed by data movement between grid agents
- Disk and tape resources are presented as a **single element**
- Temporary **locking/pinning**
  - Files can be read from disk caches rather than from tape
- **Reservation** on demand and advance reservation
  - Space can be reserved for registering a new file
  - Plan the storage system usage
- File **status** and **estimates** for planning
  - Provides info on file status
  - Provide estimates on space availability/usage

# Storage Resource Manager Interface

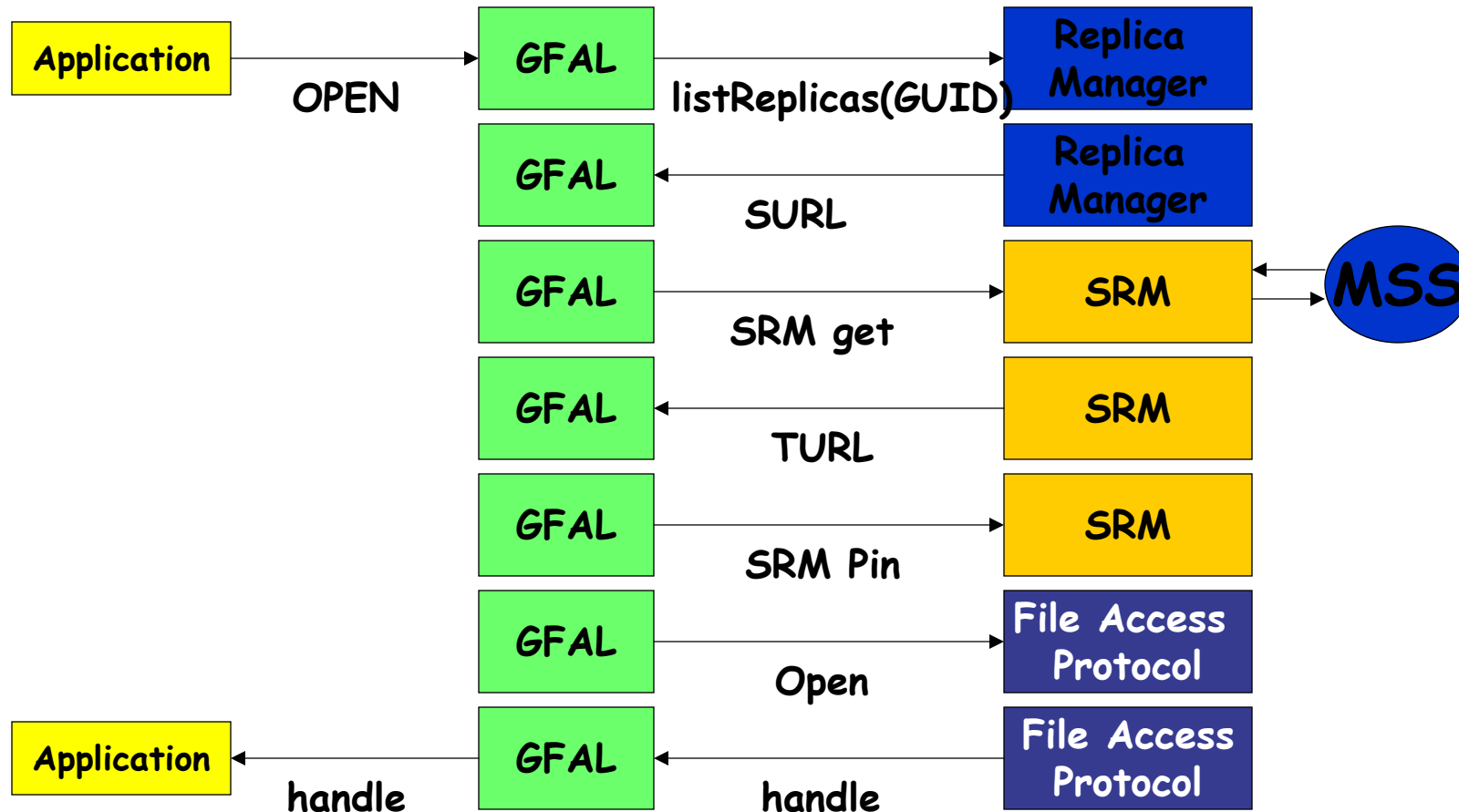
- **Life time** management
- **Interaction** with other grid services (Catalogue, grid agents, ...)
  - Notification of file additions, deletions, metadata changes
  - Bi-directional (could influence file deletion policy of SRM)
- **Pull/push** mechanism for read-only/new files (the server does not contact the client). **Multiple-file** requests.
- **Asynchronous** and **synchronous** operations
- **Multiple protocols**
  - Data Movement protocols (GridFTP, BBFTP, ...)
  - Request protocols (SOAP over HTTPS)
  - Security-related protocols (authority information kept on the SRM)

**SRM v2.1**

# Grid File Access Library

- LCG has made a proposal for File access: GFAL
- It hides the orchestration of interactions between the Replica Manager Services, the SRM and the file access mechanism between Worker Nodes and Storage Element
- Present a POSIX interface for normal file operations (Open/Seek/Read/Write/Close...)
- It assumes local accesses although the architecture permits local and wide-area access

# Grid File Access Library



# Grid File Access Library

Please check:  
% man gfal

Try to follow the examples





# Summary

- We illustrated various types of SEs available in LCG-2
- All SEs except the classic one present an SRM interface
- **SRM** present a common interface and allows for storage management
- **GFAL** is the Grid File Access Library that allows for file access over the Grid hiding the access protocol and storage details
- We tried some exercises with GFAL for file access.

And ....



Thank you!  
Hope you enjoyed this lecture.  
Please be nice with me !