



Enabling Grids for E-sciencE

# Data Management In the Grid

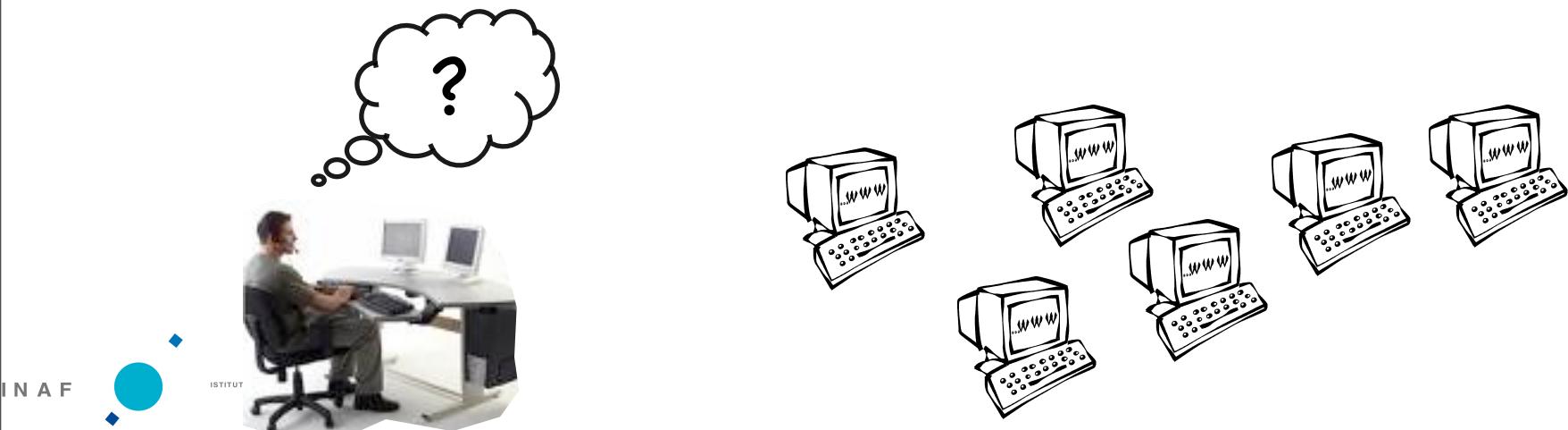
*Giuliano Taffoni*

[www.eu-egee.org](http://www.eu-egee.org)

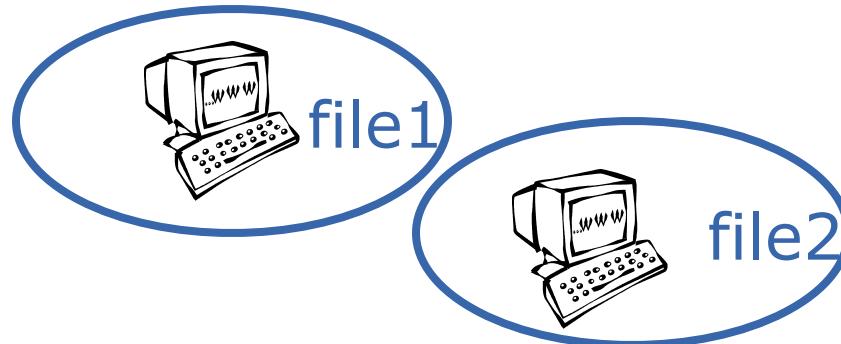


- **A view to the Data Management**
- **DMS in EGEE**
- **File Catalogue**
- **Data and Metadata**

- **Heterogeneity**
  - Data are stored on different storage systems using different access technologies
- **Distribution**
  - Data are stored in different locations



- Users and programs produce and require data;
- The lowest granularity of the data is on the file level
- Files are located in Storage Elements (**SEs**)
- Accessible by Grid users and applications from “anywhere”
- Locatable by the WMS (data requirements in JDL)

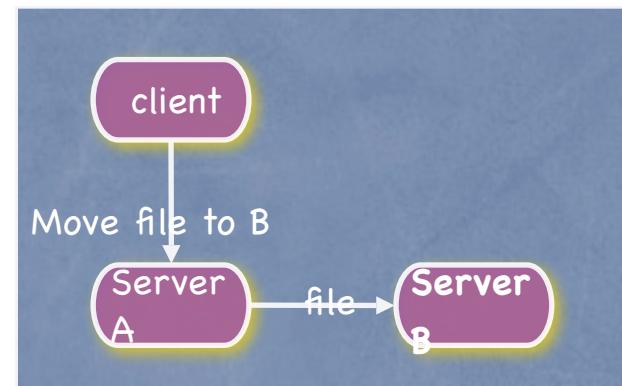


- **Different storage systems: disk, disks pool, CASTOR etc.**
- **File transfer protocol**
- **“filesystem” like operations**
- **Native I/O (remote file) access protocol**
- **Naming conventions**
- **etc.....**

- Need common interface to storage resources
- Need to keep track where data is stored
- Need scheduled, reliable file transfer

- **Classic SE:**
  - GridFTP server
  - Single disk or disk array
- **Mass Storage Systems (Castor)**
  - Files migrated between front-end disk and back-end tape storage hierarchies
  - GridFTP server
- **Disk pool managers**
  - manage distributed storage servers in a centralized way
  - GridFTP server

- **GRIDFTP**
  - Strong authentication, encryption via Globus GSI
  - Multiple, parallel data channels
  - Third-party transfers
- **CLIs + API**



- **GRIDFTP**
  - Strong authentication, encryption via Globus GSI
  - Multiple, parallel data channels
  - Third-party transfers
- **CLIs + API**

- **globus-url-copy sourceURL destURL**
  - [-help | -usage] [-version[s]] [-vb] [-dbg] [-b | -a] [-s <subject>] [-ds <subject>] [-ss <subject>] [-tcp-bs <size>] [-bs <size>] [-p <parallelism>] [-notpt] [-nodcau]

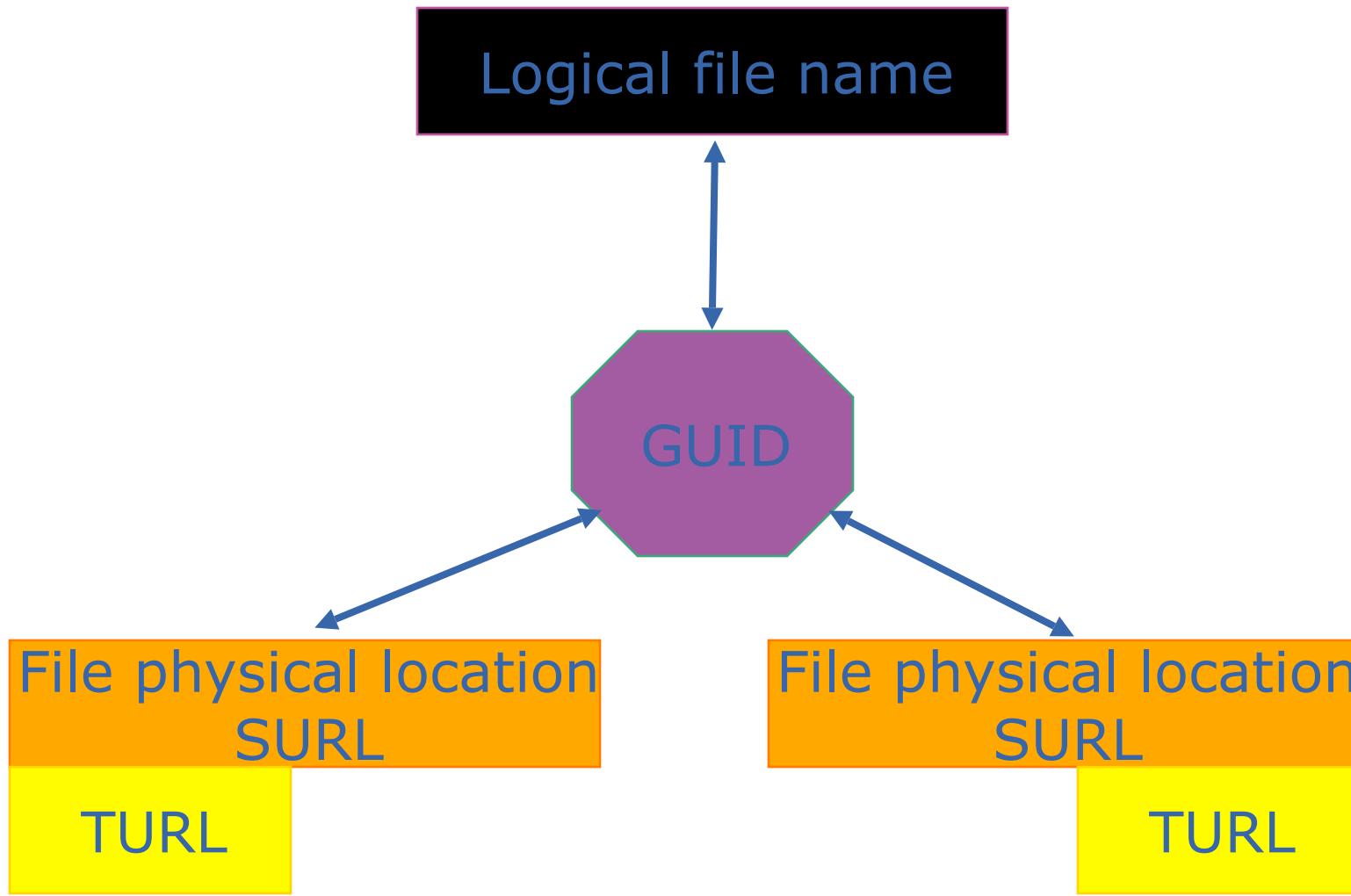
```
[morgan@grid001 SIMPLE]$ globus-url-copy file:absolute-path/test.f  
gsiftp://grid002.oat.ts.astro.it/tmp/test.txt
```

- Glite-gridftp-ls
- Glite-gridftp-exists
- Glite-gridftp-rm
- Glite-gridftp-mkdir
- Glite-gridftp-size

```
[morgan@grid001]$ glite-gridftp-ls gsiftp://grid002.oat.ts.astro.it/tmp/test.txtt  
/tmp/test.txt
```



- **Logical File Name (LFN)**
  - An alias created by a user to refer to some item of data, e.g. “lfn:/grid/gilda/20030203/run2/track1”
- **Globally Unique Identifier (GUID)**
  - A non-human-readable unique identifier for an item of data, e.g. “guid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6”
- **Site URL (SURL) (or Physical File Name (PFN) or Site FN)**
  - The location of an actual piece of data on a storage system, e.g. “srm://grid009.ct.infn.it/dpm/ct.infn.it/gilda/output10\_1” (SRM) “sfn://lxshare0209.cern.ch/data/alice/ntuples.dat” (Classic SE)
- **Transport URL (TURL)**
  - Temporary locator of a replica + access protocol: understood by a SE, e.g.  
“gsiftp://lxshare0209.cern.ch//data/alice/ntuples.dat”



- **Save a file in the grid: Copy and registry**
- **Backup a file to a new location: replica**
- **Delete a file: from one location or from the Grid**
- **Find a file SURL from its LFN/GUID**
- **Get aliases of a file**

lcg-cp	Copies a grid file to a local destination
lcg-cr	Copies a file to a SE and registers the file in the catalog
lcg-del	Delete one file
lcg-rep	Replication between SEs and registration of the replica
lcg-gt	Gets the TURL for a given SURL and transfer protocol
lcg-sd	Sets file status to “Done” for a given SURL in a SRM request

lcg-aa	Add an alias in LFC for a given GUID
lcg-ra	Remove an alias in LFC for a given GUID
lcg-rf	Registers in LFC a file placed in a SE
lcg-uf	Unregisters in LFC a file placed in a SE
lcg-la	Lists the alias for a given SURL, GUID or LFN
lcg-lg	Get the GUID for a given LFN or SURL
lcg-lr	Lists the replicas for a given GUID, SURL or LFN

- **Note that:**
  - ~~LCG\_GFAL\_INFOSYS=yourBDII~~
  - ~~LCG\_CATALOG\_TYPE=lcg/edg~~

```
[morgan@grid003 morgan]$ lcg-cr -v -d grid-se.ira.inaf.it --vo inaf \  
-l lfn:/grid/inaf/test.ira.bo file:$PWD/test.txt
```

Using grid catalog type: lfc

Using grid catalog : grid005.oat.ts.astro.it

Source URL: file:/home/morgan/test.txt

File size: 7

VO name: inaf

Destination specified: grid-se.ira.inaf.it

Destination URL for copy: gsiftp://grid-se.ira.inaf.it/fla6-09-01/file [...] -389771

# streams: 1

# set timeout to 0 seconds

Alias registered in Catalog: lfn:/grid/inaf/test.ira.bo

7 bytes 0.01 KB/sec avg 0.01 KB/sec inst

Transfer took 2080 ms

Destination URL registered in Catalog: sfn://grid-se.ira.inaf.it/fl [...] dc89771

guid:60517c5e-a918-48a4-baca-c2569a3a69c8

```
[morgan@grid003 morgan]$ lcg-cr -v -d grid-se.ira.inaf.it --vo inaf \  
-l lfn:/grid/inaf/test.ira.bo file:$PWD/test.txt
```

Using grid catalog type: lfc

Using grid catalog : grid005.oat.ts.astro.it

Source URL: file:/home/morgan/test.txt

File size: 7

VO name: inaf

Destination specified: grid-se.ira.inaf.it

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    7 bytes    0.01 KB/sec avg    0.01 KB/sec inst

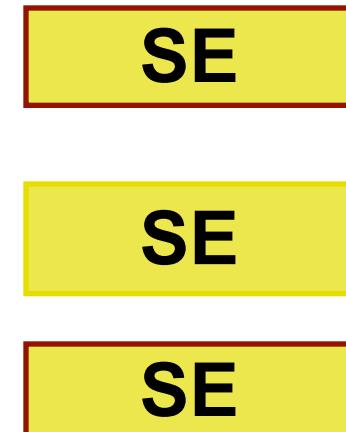
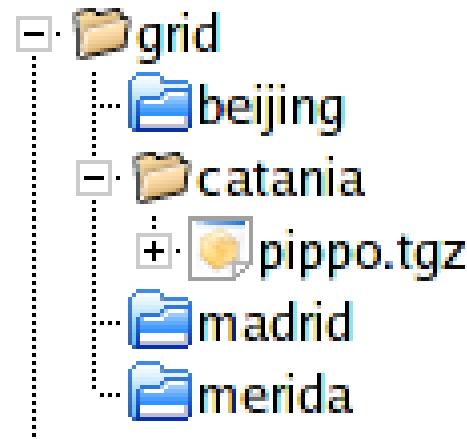
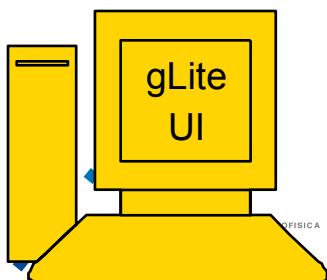
Transfer took 2080 ms

Destination URL registered in Catalog: sfn://grid-se.ira.inaf.it/fl [...] dc89771

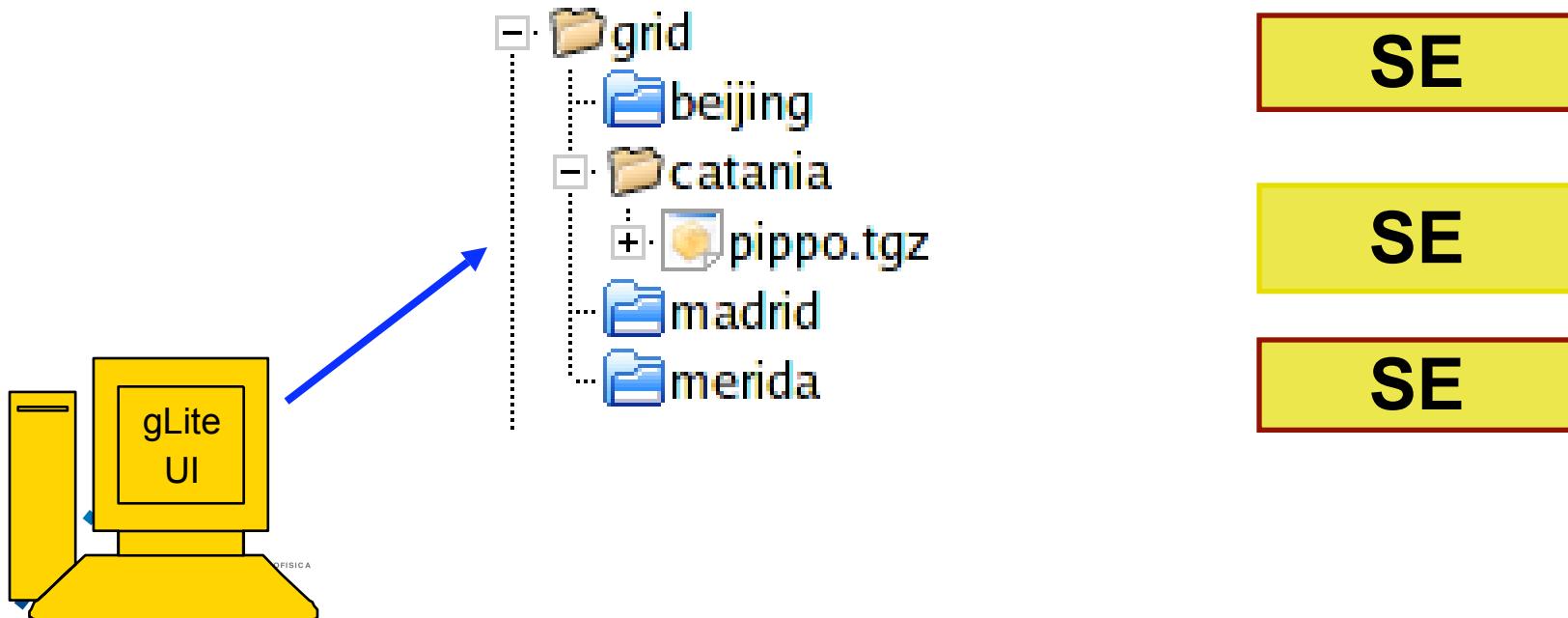
guid:60517c5e-a918-48a4-baca-c2569a3a69c8

```
[morgan@grid003 morgan]$ lcg-la guid:60517c5e-a918-48a4-baca-c2569a3a69c8
lfn:/grid/inaf/test.ira.bo
[morgan@grid003 morgan]$
[morgan@grid003 morgan]$ lcg-lg lfn:/grid/inaf/test.ira.bo
guid:60517c5e-a918-48a4-baca-c2569a3a69c8
[morgan@grid003 morgan]$
[morgan@grid003 morgan]$ lcg-rep -d grid002.oat.ts.astro.it lfn:/grid/inaf/test.ira.bo
[morgan@grid003 morgan]$
[morgan@grid003 morgan]$ lcg-lr lfn:/grid/inaf/test.ira.bo
sfn://grid-se.ira.inaf.it/flatfiles/SE00/inaf/gene19-3c70bdc89771
sfn://grid002.oat.ts.astro.it/flatfiles/SE06c-9944-b4e1e7081923
[morgan@grid003 morgan]$
[morgan@grid003 morgan]$ lcg-del -a guid:60517c5e-a918-48a4-baca-c2569a3a69c8
[morgan@grid003 morgan]$ lcg-del -a guid:60517c5e-a918-48a4-baca-c2569a3a69c8
[morgan@grid003 morgan]$ lcg-lr lfn:/grid/inaf/test.ira.bo --vo inaf
lcg_lr: No such file or directory
```

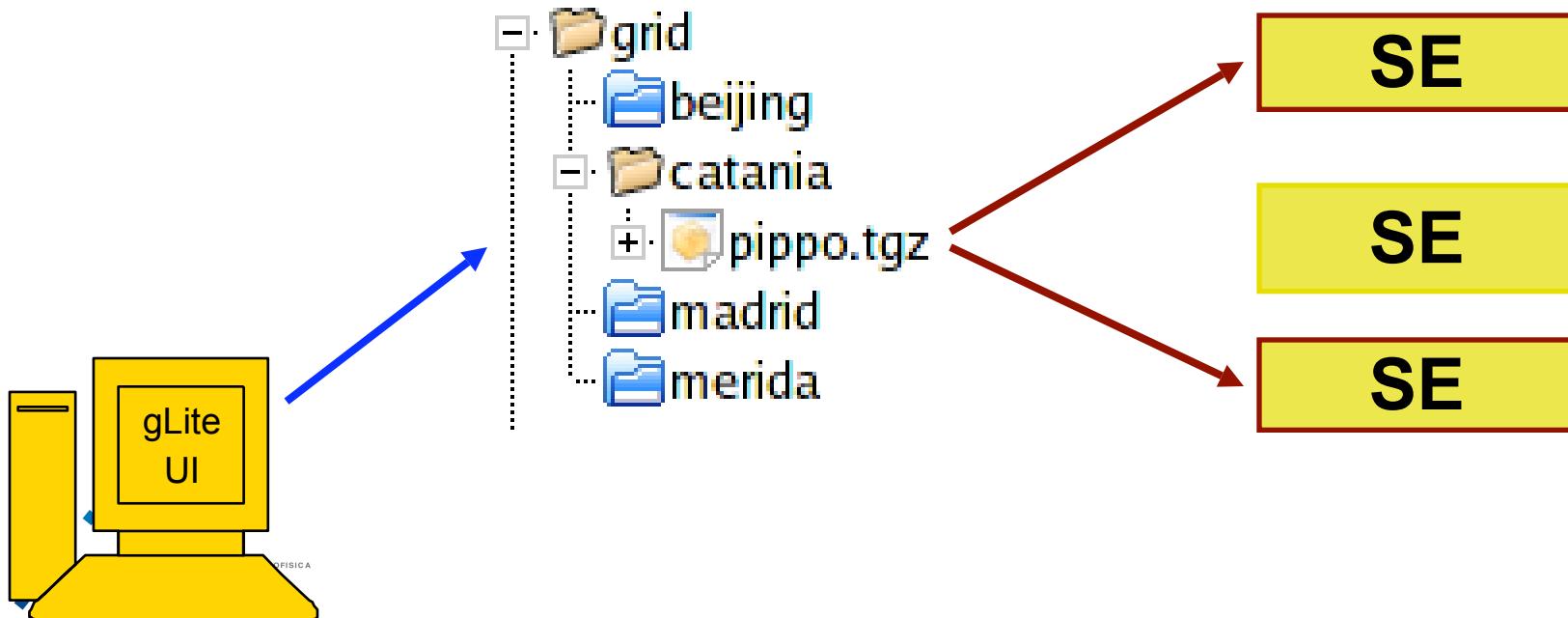
- From a distributed storage system to a gridfilesystem



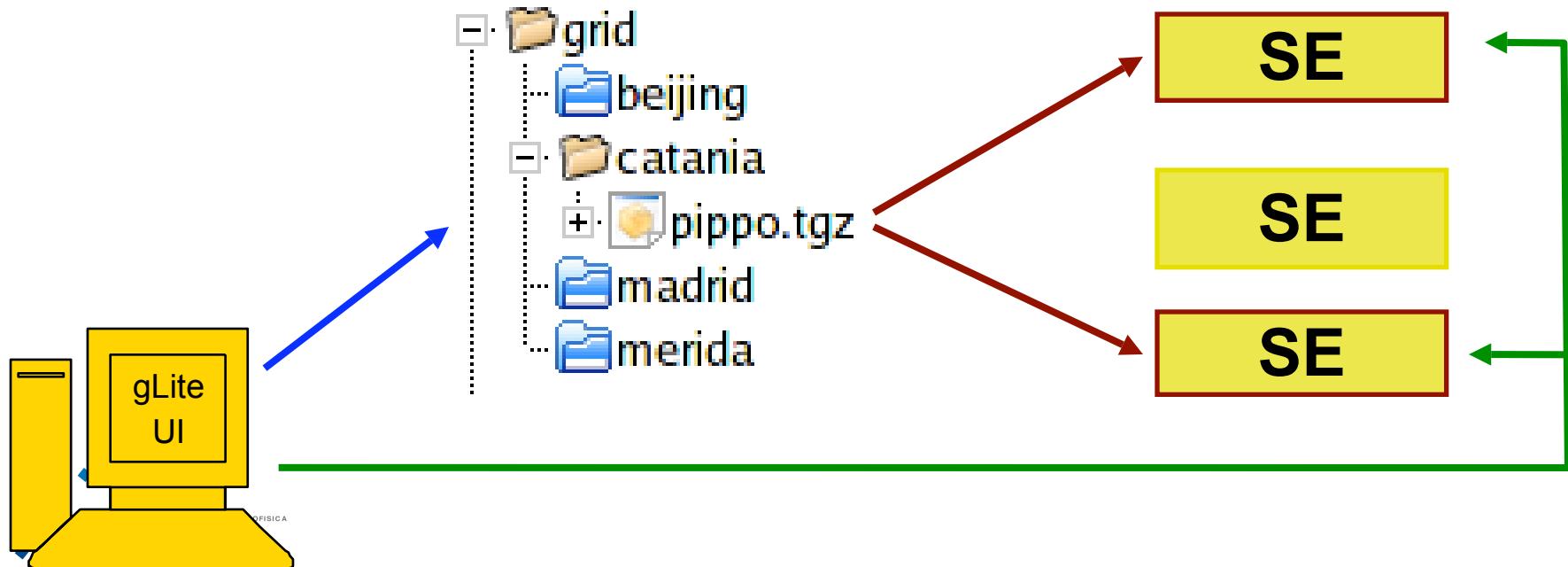
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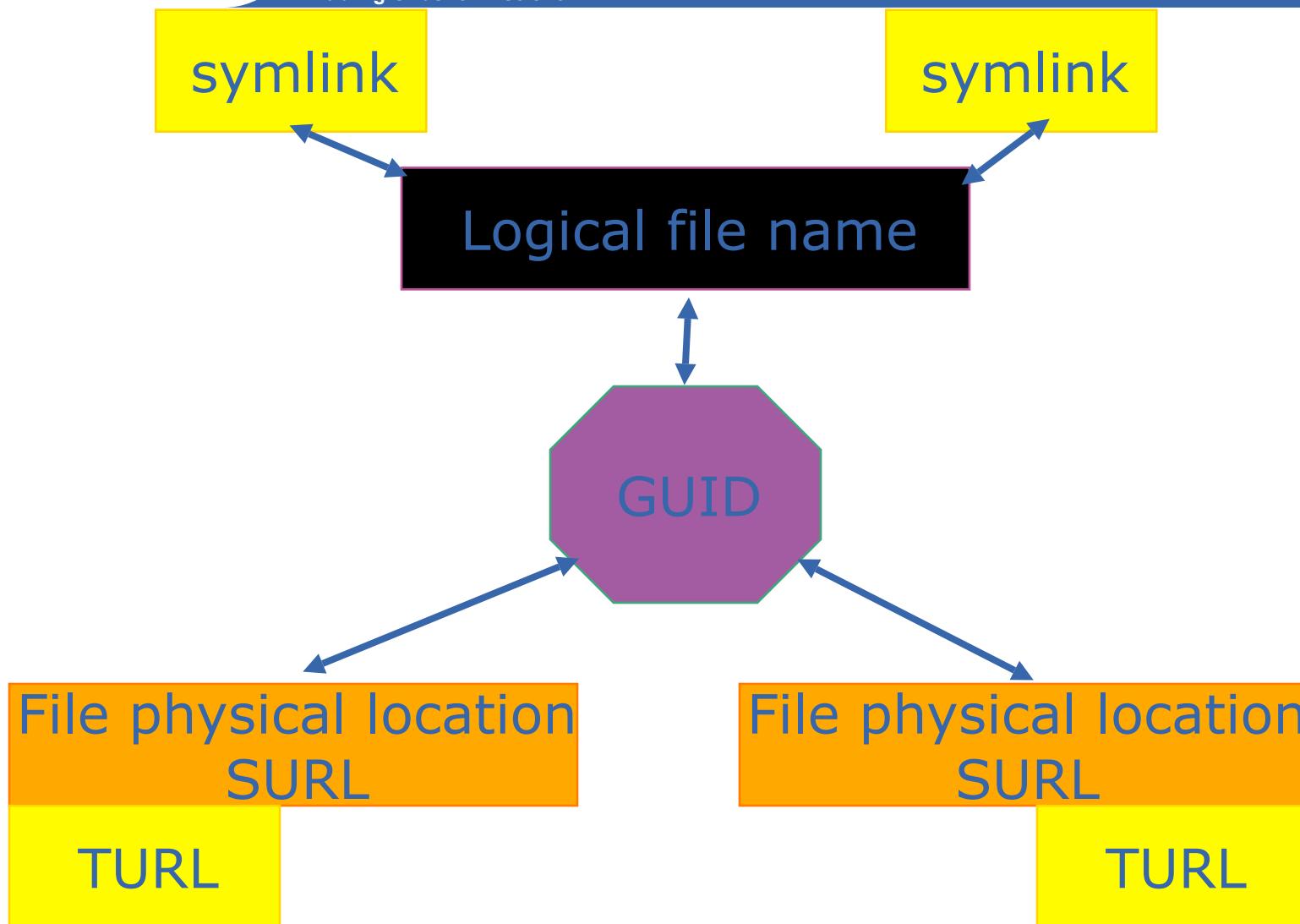


- Keeps track of the location of copies (replicas) of Grid files
- LFC has:
  - Symbolic links to it (additional LFNs)
  - Unique Identifier (GUID)
  - System metadata
  - Information on replicas
  - One field of user metadata

- **Integrated GSI Authentication + Authorization**
- **Access Control Lists (Unix Permissions and POSIX ACLs)**
- **Checksums**
- **Integration with VOMS (VirtualID and VirtualGID)**
- **CLI + API**

- LCG\_GFAL\_INFOSYS=BDII
- LFC\_HOME=your home in the catalogue
- LCG\_GFAL\_VO = your vo
- LFC\_HOST = your lfc host
- **LFC == filesystem (you may have more than one changing LFC\_HOST)**

lfc-chmod	Change access mode of the LFC file/directory
lfc-chown	Change owner and group of the LFC file-directory
lfc-delcomment	Delete the comment associated with the file/directory
lfc-getacl	Get file/directory access control lists
lfc-ln	Make a symbolic link to a file/directory
lfc-ls	List file/directory entries in a directory
lfc-mkdir	Create a directory
lfc-rename	Rename a file/directory
lfc-rm	Remove a file/directory
lfc-setacl	Set file/directory access control lists
lfc-setcomment	Add/replace a comment



***lfc-ls*** [-cdiLIRTu] [--class] [--comment] [--deleted] [--display\_side]  
[--ds] path...

- Remember that LFC has a directory tree structure
  - /grid/<VO\_name>/<you create it>

```
[morgan@grid001 SIMPLE]$ lfc-ls /grid/planck/  
PIPPO  
galrise  
generated  
Simulations  
[morgan@grid001 SIMPLE]$ LFC_HOME=/grid/planck
```

```
[morgan@grid001 SIMPLE]$ lfc-ls -R
/grid/planck
PIPPO
galrise
generated
Simulations
\grid/planck/PIPPO
TEST
....
[morgan@grid001 SIMPLE]$ lfc-mkdir /grid/planck/newdata
[morgan@grid001 SIMPLE]$ lfc-ls -l /grid/planck/newdata
[morgan@grid001 SIMPLE]$ lfc-rm -r /grid/planck/newdata
```

***lfc-In -s file linkname***

***lfc-In -s directory linkname***

Create a link to the specified *file* or *directory* with *linkname*

```
$ lfc-ls -R
$ lfc-ln -s /grid/inaf/gossip/models_san_lr.fits.gz /grid/inaf/gossip/modelnew.gz
$ lfc-ls -l grid/inaf/gossip/
grid/inaf/gossip/: invalid path
$ lfc-ls -l /grid/inaf/gossip/
lrwxrwxrwx 1 122    108      0 Sep 01 18:04 modelnew.gz -> models_san_lr.fits.gz
-rw-rw-r-- 1 122    108      85472141 Apr 06 16:48 models_san_lr.fits.gz
$
$ lcg-lg lfn:/grid/inaf/gossip/models_san_lr.fits.gz
guid:24fd1aa3-adf4-4646-81de-a202bdd20cab
$ lcg-la guid:24fd1aa3-adf4-4646-81de-a202bdd20cab
lfn:/grid/inaf/gossip/models_san_lr.fits.gz
lfn:/grid/inaf/gossip/modelnew.gz
```

***lfc-In -s file linkname***

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```
$ lfc-ls -R
$ lfc-ln -s /grid/inaf/gossip/models_san_lr.fits.gz /grid/inaf/gossip/modelnew.gz
$ lfc-ls -l grid/inaf/gossip/
grid/inaf/gossip/: inva
$ lfc-ls -l /grid/inaf/gos
lrwxrwxrwx 1 122          LCF <=> LCG-REP      -> models_san_lr.fits.gz
-rw-rw-r-- 1 122          lfn:/grid/inaf/gos
$ lcg-lg lfn:/grid/inaf/gossip/models_san_lr.fits.gz
guid:24fd1aa3-adf4-4646-81de-a202bdd20cab
$ lcg-la guid:24fd1aa3-adf4-4646-81de-a202bdd20cab
lfn:/grid/inaf/gossip/models_san_lr.fits.gz
lfn:/grid/inaf/gossip/modelnew.gz
```

lfc_access	lfc_deleteclass	lfc_listreplica	lfc_setacl
lfc_aborttrans	lfc_delreplica	lfc_lstat	lfc_setatime
lfc_addrreplica	lfc_endtrans	lfc_mkdir	lfc_setcomment
lfc_apiinit	lfc_enterclass	lfc_modifyclass	lfc_seterrbuf
lfc_chclass	lfc_errmsg	lfc_opendir	lfc_setfilesize
lfc_chdir	lfc_getacl	lfc_queryclass	lfc_starttrans
lfc_chmod	lfc_getcomment	lfc_readdir	lfc_stat
lfc_chown	lfc_getcwd	lfc_readlink	lfc_symlink
lfc_closedir	lfc_getpath	lfc_rename	lfc_umask
lfc_creat	lfc_lchown	lfc_rewind	lfc_undelete
lfc_delcomment	lfc_listclass	lfc_rmdir	lfc_unlink
lfc_delete	lfc_listlinks	lfc_selectsrvr	lfc_utime
			send2lfc

- **Allow applications to easily access and store files across the grid**
  - FILE I/O API
  - Catalogue API
  - Storage API

```
int gfal_access (const char *path, int amode);  
int gfal_chmod (const char *path, mode_t mode);  
int gfal_close (int fd);  
int gfal_creat (const char *filename, mode_t mode);  
off_t gfal_lseek (int fd, off_t offset, int whence);  
int gfal_open (const char * filename, int flags, mode_t mode);  
ssize_t gfal_read (int fd, void *buf, size_t size);  
int gfal_rename (const char *old_name, const char *new_name);  
ssize_t gfal_setfilchg (int, const void *, size_t);  
int gfal_stat (const char *filename, struct stat *statbuf);  
int gfal_unlink (const char *filename);  
ssize_t gfal_write (int fd, const void *buf, size_t size);  
..
```

```
int gfal_closedir (DIR *dirp);  
  
int gfal_mkdir (const char *dirname, mode_t mode);  
  
DIR *gfal_opendir (const char *dirname);  
  
struct dirent *gfal_readdir (DIR *dirp);  
  
int gfal_rmdir (const char *dirname);
```

```
int create_alias (const char *guid, const char *lfn, long long size)
int guid_exists (const char *guid)
char *guidforpfn (const char *surl)
char *guidfromlfn (const char *lfn)
char **lfnforguid (const char *guid)
int register_alias (const char *guid, const char *lfn)
int register_pfn (const char *guid, const char *surl)
int setfilesize (const char *surl, long long size)
char *surlfromguid (const char *guid)
char **surlsfromguid (const char *guid)
int unregister_alias (const char *guid, const char *lfn)
int unregister_pfn (const char *guid, const char *surl)
```

int **Deletesurl** (const char \***surl**)

int **Getfilemd** (const char \***surl**, struct stat64 \***statbuf**)

int **Set\_xfer\_done** (const char \***surl**, int **reqid**, int **fileid**, char \***token**, int **oflag**)

int **Set\_xfer\_running** (const char \***surl**, int **reqid**, int **fileid**, char \***token**)

char \***Turlfromsurl** (const char \***surl**, char \*\***protocols**, int **oflag**, int \***reqid**, int \***fileid**, char \*\***token**)

int **SRM\_get** (int **nbfiles**, char \*\***surls**, int **nbprotocols**, char \*\***protocols**, int \***reqid**, char \*\***token**, struct srm\_filestatus \*\***filestatuses**)

int **SRM\_getstatus** (int **nbfiles**, char \*\***surls**, int **reqid**, char \***token**, struct srm\_filestatus \*\***filestatuses**)

- **gLITE documentation homepage**
  - <http://glite.web.cern.ch/glite/documentation/default.asp>
- **DM subsystem documentation**
  - <http://egee-jra1-dm.web.cern.ch/egee-jra1-dm/doc.htm>
- **LFC and DPM documentation**
  - <https://uimon.cern.ch/twiki/bin/view/LCG/DataManagementDocumentation>
- **FTS user guide**
  - <https://edms.cern.ch/file/591792/1/EGEE-TECH-591792-Transfer-CLI-v1.0.pdf>



- **Metadata is data about data**
- **On the Grid: information about files**
  - Describe files
  - Locate files based on their contents
- **But also simplified DB access on the Grid**

- **ARDA Metadata Grid Application**
- **Official Metadata Service for EGEE**
- **Useful for different applications:**
  - HEP
  - Biomed
  - UNOSAT
  - etc

- Metadata - List of attributes associated with entries
- Attribute – key/value pair with type information
  - Type – The type (int, float, string,...)
  - Name/Key – The name of the attribute
  - Value - Value of an entry's attribute
- Schema – A set of attributes
- Collection – A set of entries associated with a schema
- Think of schemas as tables, attributes as columns, entries as rows

- **Metadata organized in directory structure**
- **CLI:**
  - `mdclient`: interactive connection with server
  - `mdcli` batch mode
  - `$HOME/.mdclient.conf`

**>> createdir <path> [options]**

Make a new folder. It can inherit the schema associated to the upper level folder

**>> rm pattern**

Remove items corresponding to the given pattern

**>> link <file>**

Make a link to another file or to a external URL

**>> dir <directory>**

List the content of a directory

**>> listentries <directory>**

List the items (not the collections) of a directory

**>> stat <filepattern>**

Show the statistic information about a directory

**>> chown <file> <owner>**

Change the ownership of a file or a directory

**>> chmod <file> <rights>**

Change the access rights to a file or a directory

**>> rmdir <directory>**

Remove a directory

**>> dump <directory>**

Make a recursive dump starting from a given directory, (the default is: '/')

- **Browse the contents of a directory**

- `dir [path]`

Returns the name of all subdirectories and files in the given `path` or in the current directory if not specified

- **Print the current working directory**

- `pwd`

- **Change the current working directory**

- `cd directory`

- **Directory creation**

- `mkdir /parentdir/dir`

Creates the directory `dir` if it does not yet exist but `parentdir` already does

- **Directory removal**

- `rmdir path`

Removes the directory given by path

- **Schema population**

- **addattr dir attr type**

Adds a new attribute to the schema of a directory. Type is the name of an SQL datatype which will be translated (if necessary) into a data type understood by the back end DB.

Examples of valid datatypes are `int`, `float`, `varchar(n)`,  
`timestamp`, `text`, `numeric(p,s)`

Examples:

```
addattr /gilda/merida/tcaland MovieTitle varchar(100)
addattr /gilda/merida/tcaland Runtime int
addattr /gilda/merida/tcaland PlotOutline text
```

- **Attribute listing**

- **listattr path**

Returns a list of all attributes of the given file/directory

- **Attribute Removal**

- **removeattr dir attribute**

Removes an attribute from a directory if it is not used by any entry in the directory

- **Entry creation**

- `addentry entry (attribute value) +`

Add a new entry and initializes some attributes

Example: `addentry /gilda/rio/tcaland/madagascar.mov  
MovieTitle Madagascar`

- **Setting attribute values**

- `setattr entry (attribute value) +`

Sets one or more attributes of an entry to given values

Example: `setattr /gilda/.../madagascar.mov Runtime 86`

- **Getting attribute values**

- `getattr pattern (attribute) +`

Returns the entries and all the attributes for every file matching pattern

Example: `getattr /gilda/.../tcaland/*.mov Title`

- **Entry deletion**

- `rm pattern`

Removes all entries matching pattern

Example: `rm /gilda/.../m*.mov`

- **gLibrary**
  - SE used to archive data
  - AMGA used to organize data stored in the SE
- **File are:**
  - PPT presentations
  - Audio Files
  - Movies...

- **gLibrary is built using the following AMGA collections:**
  - /gLibrary contains generic metadata for each entry
  - /gLAudio, /gLImage, /gLVideo, /gLPPT, /EGEEPPT, /gLDoc, ... are examples of collections of “additional features” (shown later)
  - /gLTypes
    - keeps the associations between document types and the names of the collection that contains the “additional features”
    - is used by gLibrary to find out where it has to look when new document types are added into the system (extensibility)
  - /gLKeys is used to store Decryption Keys

Collection	/gLibrary			
Entry Names	Attributes			
	FileName	PathName	Type	Submitter
4ffafffc8-26e7-4826-b460-3d5bf08081a4	DedicatoAte.mp3	/grid/gilda/calanducci	Audio	Tony Calanducci
00454dca-a269-4b93-8a45-c4012af05600	ardizzonelarocca_is_231005.ppt.gpg	/grid/gilda/calanducci/EGEE	EGEED OC	Tony Calanducci

/gLibrary (continuum)

Attributes				
SubmissionDate	Encryption	Description	Keywords	CreationDate
2006-01-05 00:00:00	false	Canzone delle Vibrazioni	Vibrazioni	2004-02-05 00:00:00

Collection	/gLTypes
Entry names	Attributes
	Path ( <i>refers to a collection</i> )
Audio	/gLAudio
Image	/gLImage
Video	/gLVideo
Documents	/gLDOC
PowerPoint	/gLPPT
EGEEDOC	/EGEEPPT

# Example of gl library collections

Collection	/gLTypes
Entry names	Attributes Path <i>(refers to a collection)</i>
Audio	/gLAudio
Image	/gLImage
Video	/gLVideo
Documents	/gLDOC
PowerPoint	/gLPPPT
EGEEDOC	/EGEEPPT

Collection	/gLKeys
Entry names	Attributes Passphrase
	00454dca-a269-4b93-8a45-c4012af05600 ardizzo

Collection	/gLTypes	Collection	/gLKeys					
Entry names	Attributes	Entry names	Attributes					
	Path <i>(refers to a collection)</i>		Passphrase					
Audio	/gLAudio	00454dca-a269-4b93-8a45-c4012af05600	ardizzo					
Image	/gLImage							
Video	/gLVideo							
Documents	/gLDOC							
PowerPoint	/gLPPPT							
EGEEDOC	/EGEEPPPT							
Collection	Attributes							
Entry names	Title	Runtime	Author	Type	Date	Event	Speaker	Topic
00454dca-a269-4b93-8a45-c4012af05600	Information Systems	00:30:00	Valeria Ardizzone, Giuseppe La Rocca	Theoretical	2005-10-23	4 <sup>th</sup> EGEE Conference	Giuseppe La Rocca, Valeria Ardizzone	R-GMA, BDII

# Example of gl library collections

Collection	/gLTypes
Entry names	Attributes
	Path ( <i>refers to a collection</i> )
Audio	/gLAudio
Image	/gLImage
Video	/gLVideo
Documents	/gLDOC
PowerPoint	/gLPPPT
EGEEDOC	/EGEEPPPT

Collection	/gLKeys
Entry names	Attributes
	Passphrase
	00454dca-a269-4b93-8a45-c4012af05600
	ardizzo

Entry names	Attributes							
	Title	Runtime	Author	Type	Date	Event	Speaker	Topic
00454dca-a269-4b93-8a45-c4012af05600	Information Systems	00:30:00	Valeria Ardizzone, Giuseppe La Rocca	Theoretical	2005-10-23	4 <sup>th</sup> EGEE Conference	Giuseppe La Rocca, Valeria Ardizzone	R-GMA, BDII
Collection	/gLAudio							

Entry names	Attributes						
	SongTitle	Duration	Album	Genre	Singer	Format	
4ffafffc8-26e7-4826-b460-3d51f08081a4 EGEE-INFN-FC-RI-031688	Dedicato A Te	00:03:27	Dedicato A Te INAF - Astronomical Observatory	Pop	Le Vibrazioni of Trieste, Via Bazzoni 2, TRIESTE, Italy	MP3	

# Example of gl library collections

Collection	/gLTypes
Entry names	Attributes
	Path ( <i>refers to a collection</i> )
Audio	/gLAudio
Image	/gLImage
Video	/gLVideo
Documents	/gLDOC
PowerPoint	/gLPPPT
EGEEDOC	/EGEEPPPT

Collection	/gLKeys
Entry names	Attributes
	Passphrase
	00454dca-a269-4b93-8a45-c4012af05600
	ardizzo

“additional features”

Collection	Attributes							
Entry names	Title	Runtime	Author	Type	Date	Event	Speaker	Topic
00454dca-a269-4b93-8a45-c4012af05600	Information Systems	00:30:00	Valeria Ardizzone, Giuseppe La Rocca	Theoretical	2005-10-23	4 <sup>th</sup> EGEE Conference	Giuseppe La Rocca, Valeria Ardizzone	R-GMA, BDII
Collection	/gLAudio							
Entry names	Attributes							
INAF	SongTitle	Duration	Album	Genre	Singer	Format		
4ffafffc8-26e7-4826-b460-3d51f08081a4	Dedicato A Te	00:03:27	Dedicato A Te INAF - Astronomical Observatory	Pop	Le Vibrazioni of Trieste, Via Bazzoni 2, TRIESTE, Italy	MP3		



```
Query> selectattr /gLibrary:FILE /gLibrary:FileName /gLibrary:Description /  
EGEEPPT:Author /EGEEPPT:Title /EGEEPPT:Event '/gLibrary:FILE=/EGEEPPT:FILE and  
like(/gLibrary:Keywords, "%VOMS%") '
```

```
Query> selectattr /gLibrary:FILE /gLibrary:FileName /gLibrary:Description /  
EGEEPPT:Author /EGEEPPT:Title /EGEEPPT:Event '/gLibrary:FILE=/EGEEPPT:FILE and  
like(/gLibrary:Keywords, "%VOMS%")'  
>> 1f6e9ac6-5c86-4599-b03b-560e0e7ea38a
```

```
Query> selectattr /gLibrary:FILE /gLibrary:FileName /gLibrary:Description /  
EGEEPPT:Author /EGEEPPT:Title /EGEEPPT:Event '/gLibrary:FILE=/EGEEPPT:FILE and  
like(/gLibrary:Keywords, "%VOMS%")'  
>> 1f6e9ac6-5c86-4599-b03b-560e0e7ea38a  
>> VOMS_server_Installation.ppt.gpg
```

```
Query> selectattr /gLibrary:FILE /gLibrary:FileName /gLibrary:Description /  
EGEEPPT:Author /EGEEPPT:Title /EGEEPPT:Event '/gLibrary:FILE=/EGEEPPT:FILE and  
like(/gLibrary:Keywords, "%VOMS%")'  
>> 1f6e9ac6-5c86-4599-b03b-560e0e7ea38a  
>> VOMS_server_Installation.ppt.gpg  
>> VOMS Server installation tutorial done in Venezuela
```

```
Query> selectattr /gLibrary:FILE /gLibrary:FileName /gLibrary:Description /  
EGEEPPT:Author /EGEEPPT:Title /EGEEPPT:Event '/gLibrary:FILE=/EGEEPPT:FILE and  
like(/gLibrary:Keywords, "%VOMS%")'  
>> 1f6e9ac6-5c86-4599-b03b-560e0e7ea38a  
>> VOMS_server_Installation.ppt.gpg  
>> VOMS Server installation tutorial done in Venezuela  
>> ziggy, Giorgio
```

```
Query> selectattr /gLibrary:FILE /gLibrary:FileName /gLibrary:Description /  
EGEEPPT:Author /EGEEPPT:Title /EGEEPPT:Event '/gLibrary:FILE=/EGEEPPT:FILE and  
like(/gLibrary:Keywords, "%VOMS%")'  
>> 1f6e9ac6-5c86-4599-b03b-560e0e7ea38a  
>> VOMS_server_Installation.ppt.gpg  
>> VOMS Server installation tutorial done in Venezuela  
>> ziggy, Giorgio  
>> Installing a gLite VOMS Server
```

```
Query> selectattr /gLibrary:FILE /gLibrary:FileName /gLibrary:Description /  
EGEEPPT:Author /EGEEPPT:Title /EGEEPPT:Event '/gLibrary:FILE=/EGEEPPT:FILE and  
like(/gLibrary:Keywords, "%VOMS%")'  
>> 1f6e9ac6-5c86-4599-b03b-560e0e7ea38a  
>> VOMS_server_Installation.ppt.gpg  
>> VOMS Server installation tutorial done in Venezuela  
>> ziggy, Giorgio  
>> Installing a gLite VOMS Server  
>> First Latin American Workshop for Grid Administrators
```

```
Query> selectattr /gLibrary:FILE /gLibrary:FileName /gLibrary:Description /  
EGEEPPT:Author /EGEEPPT:Title /EGEEPPT:Event '/gLibrary:FILE=/EGEEPPT:FILE and  
like(/gLibrary:Keywords, "%VOMS%")'  
>> 1f6e9ac6-5c86-4599-b03b-560e0e7ea38a  
>> VOMS_server_Installation.ppt.gpg  
>> VOMS Server installation tutorial done in Venezuela  
>> ziggy, Giorgio  
>> Installing a gLite VOMS Server  
>> First Latin American Workshop for Grid Administrators
```

```
Query> selectattr /gLibrary:FileName SubmissionDate Submitter /  
gLAudio:SongTitle Singer Duration Genre '/gLibrary:FILE=/gLAudio:FILE  
and /gLAudio:Format="MP3"'  
>> DedicatoAte.mp3  
>> 2006-01-05 00:00:00  
>> Tony Calanducci  
>> Dedicato A Te  
>> Le Vibrazioni  
>> 00:03:27  
>> Pop
```



```
Query> dir /gLibrary
```

```
Query> dir /gLibrary
>> /gLibrary/00454dca-a269-4b93-8a45-c4012af05600
```

```
Query> dir /gLibrary
>> /gLibrary/00454dca-a269-4b93-8a45-c4012af05600
>> entry
```

```
Query> dir /gLibrary
>> /gLibrary/00454dca-a269-4b93-8a45-c4012af05600
>> entry
>> /gLibrary/abd52d35-1bee-4de9-b234-a9abd920307e
```

```
Query> dir /gLibrary
>> /gLibrary/00454dca-a269-4b93-8a45-c4012af05600
>> entry
>> /gLibrary/abd52d35-1bee-4de9-b234-a9abd920307e
>> entry
```

```
Query> dir /gLibrary
>> /gLibrary/00454dca-a269-4b93-8a45-c4012af05600
>> entry
>> /gLibrary/abd52d35-1bee-4de9-b234-a9abd920307e
>> entry
>> /gLibrary/1f6e9ac6-5c86-4599-b03b-560e0e7ea38a
```

```
Query> dir /gLibrary
>> /gLibrary/00454dca-a269-4b93-8a45-c4012af05600
>> entry
>> /gLibrary/abd52d35-1bee-4de9-b234-a9abd920307e
>> entry
>> /gLibrary/1f6e9ac6-5c86-4599-b03b-560e0e7ea38a
>> entry
```