Data Management

The European DataGrid Project Team

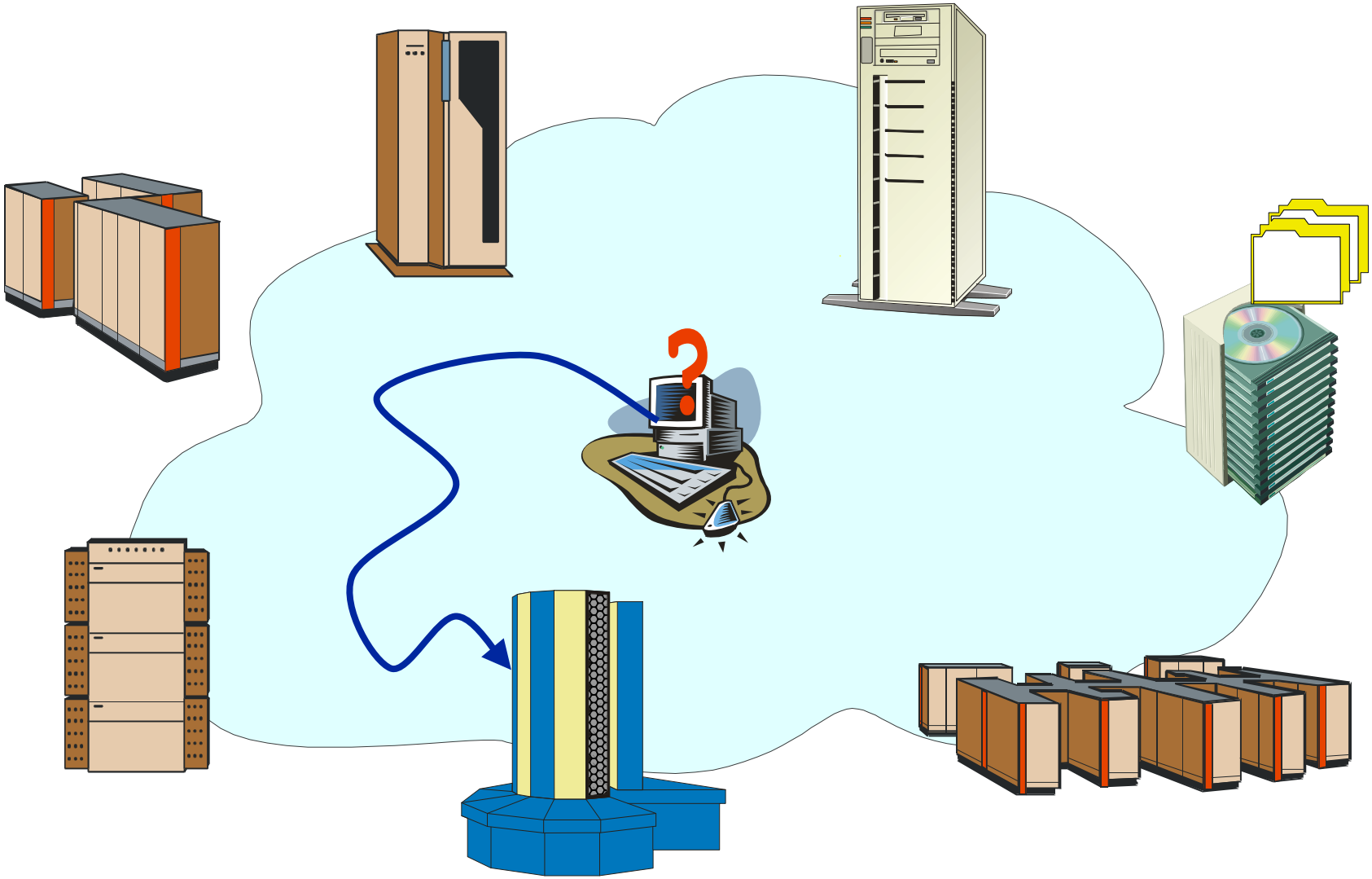
http://www.eu-datagrid.org

Overview

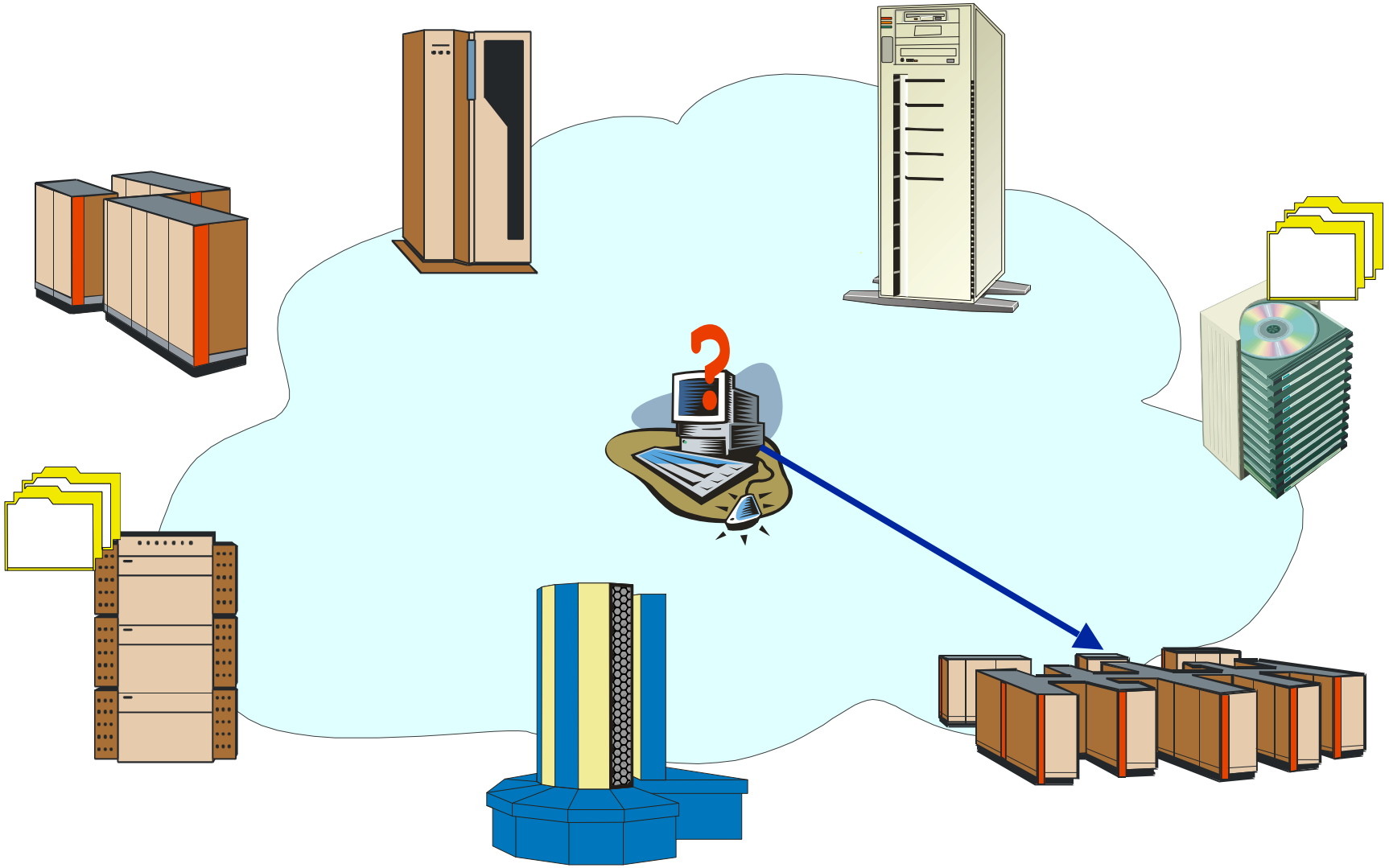
- Data Management Issues

- Main Components
  - EDG Replica Catalog
  - EDG Replica Manager
  - GDMP

Data Management Issues



Data Management Issues



Data Management Tools

- Tools for
  - Locating data
  - Copying data
  - Managing and replicating data
  - Meta Data management
- On EDG Testbed you have
  - EDG Replica catalog
  - globus-url-copy (GridFTP)
  - EDG Replica Manager
  - Grid Data Mirroring Package (GDMP)
  - Spitfire

EDG Replica Catalog

- Based upon the Globus LDAP Replica Catalog
- Stores LFN/PFN mappings and additional information (e.g. filesize):
  - PhysicalFileName (PFN): host + fullpath & and file name
  - LogicalFileName (LFN): logical name that may be resolved to PFNs
  - LFN : PFN = 1 : n
- Only files on storage elements may be registered
- Each VO has a specific *storage dir* on an SE
- Example PFN :
  `lxshare0222.cern.ch/flatfiles/SE1/iteam/file1.dat`
  host | storage dir
- LFN must be fullpath of file starting from storage dir
  LFN of above PFN : `file1.dat`

EDG Replica Catalog

- API and command line tools
  - addLogicalFileName
  - getLogicalFileName
  - deleteLogicalFileName
  - getPhysicalFileName
  - addPhysicalFileName
  - deletePhysicalFileName
  - addLogicalFileAttribute
  - getLogicalFileAttribute
  - deleteLogicalFileAttribute

http://cmsdoc.cern.ch/cms/grid/userguide/gdmp-3-0/node85.html

globus-url-copy

- Low level tool for secure copying

```
globus-url-copy <protocol>://<source file> \
                <protocol>://<destination file>
```

- Main Protocols:
  - gsiftp – for secure transfer, only available on SE and CE
  - file – for accessing files stored on the local file system on e.g. UI, WN

```
globus-url-copy file://`pwd`/file1.dat \
                gsiftp://lxshare0222.cern.ch/ \
                flatfiles/SE1/EDGTutorial/file1.dat
```

The EDG Replica Manager

- Extends the Globus replica manager
- Only client side tool
- Allows replication (copy) and registering of files in RC
  - works with LDAP based RC and RLS (see future directions)
- Keeps RC consistent with stored data.
- Uses GDMP's staging interface to stage to MSS

The Replica Manager APIs

- *(un)registerEntry(LogicalFileName lfn,*

  FileName source)

  - Replica Catalogue operations only – no file transfer
- *copyFile(FileName source,*

  FileName destination,

  String protocol)

  - allows for third-party transfer
  - transfer between:
    - two StorageElements or
    - ComputingElement and Storage Element
    - Space management policies under development
  - all tools support **parallel streams** for file transfers

The Replica Manager APIs

- *copyAndRegisterFile(LogicalFileName lfn,*

  FileName source,

  FileName destination,

  String protocol)

  - third-party transfer but :

    files can only be registered in Replica Catalogue if destination PFN contains a valid SE (i.e. needs to be registered in the RC)!

- *replicateFile(LogicalFileName lfn,*

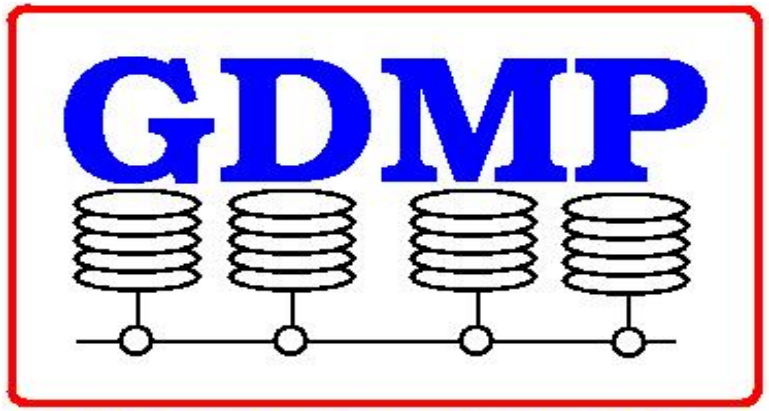
  FileName source,

  FileName destination,

  String protocol)

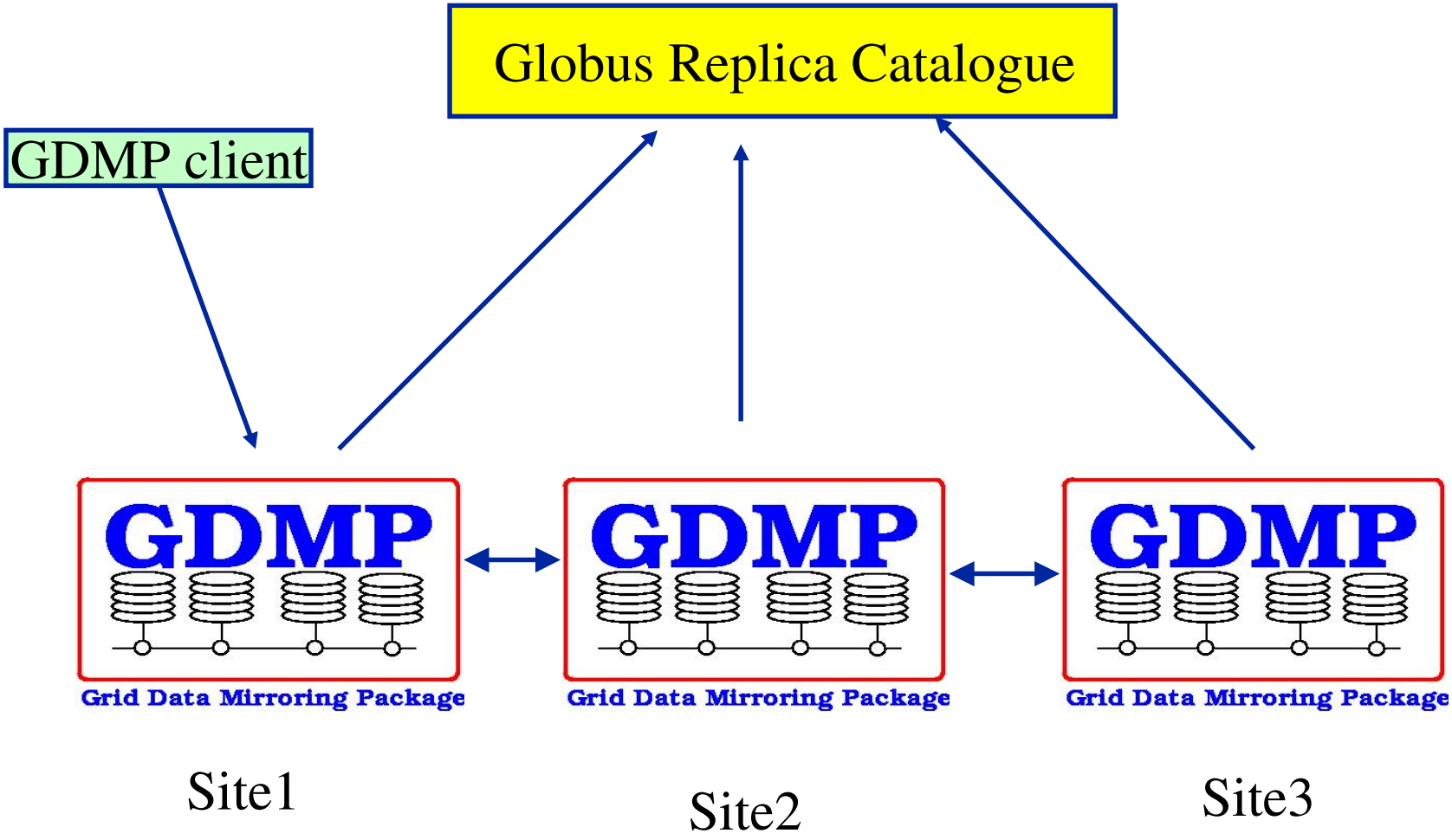
- *deleteFile(LogicalFileName lfn,*

  FileName source)



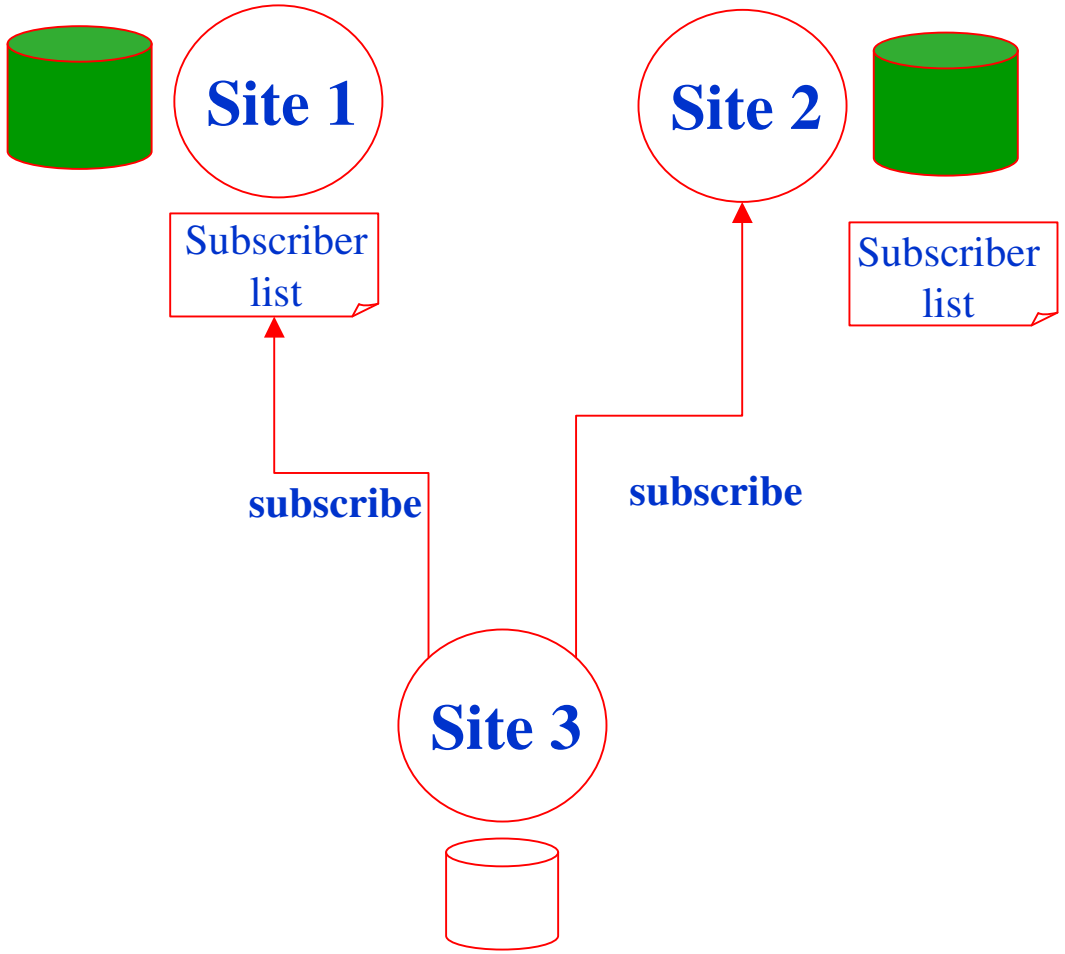
- originally based on CMS requirements for replicating Objectivity files for High Level Trigger studies
- **production** prototype project for evaluating Grid technologies (especially Globus)
- experience will directly be used in DataGrid
  - input also for PPDG and GriPhyN
- http://cern.ch/GDMP

Overview of Components



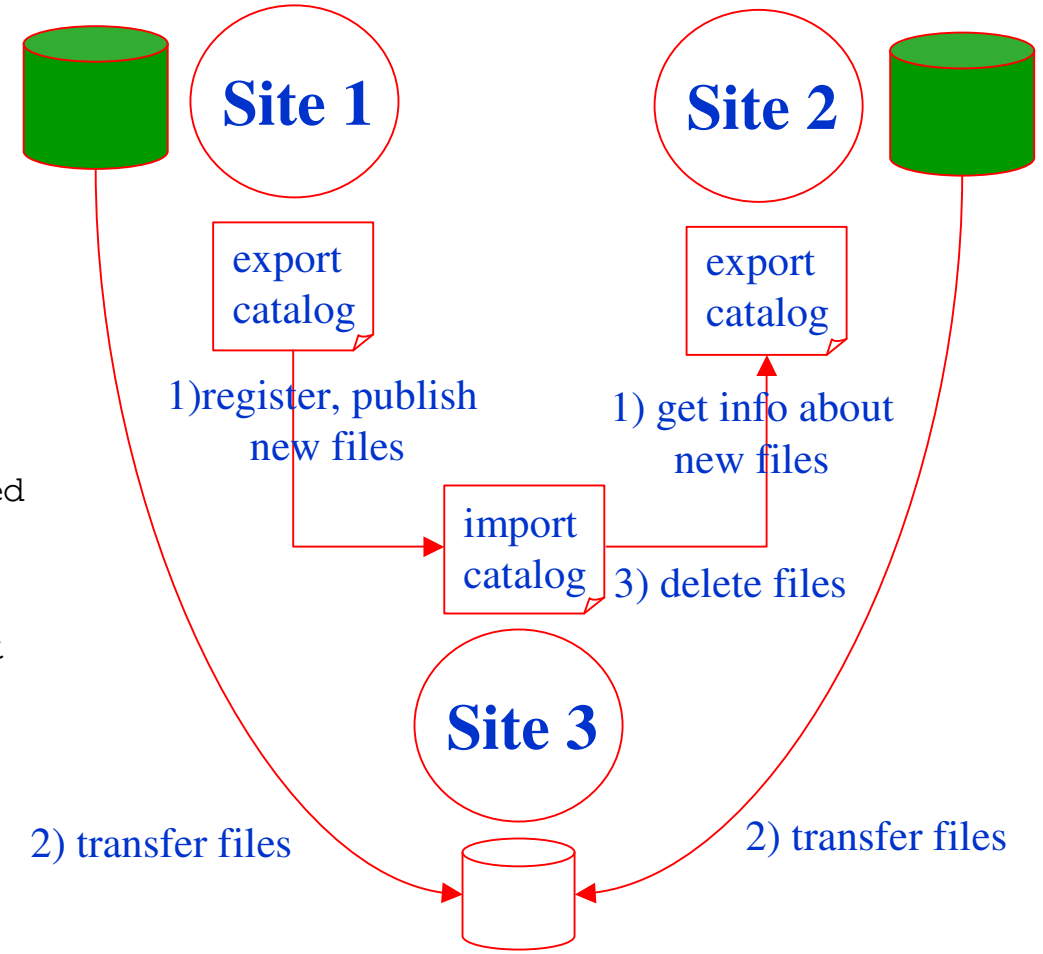
Subscription Model

- All the sites that subscribe to a particular site get notified whenever there is an update in its catalog.



Export / Import Catalogue

- Export Catalog
  - information about the new files produced.
  - is published
- Import Catalog
  - information about the files which have been published by other sites but not yet transferred locally
  - As soon as the file is transferred locally, it is removed from the import catalogue.
- Possible to pull the information about new files into your import catalogue.



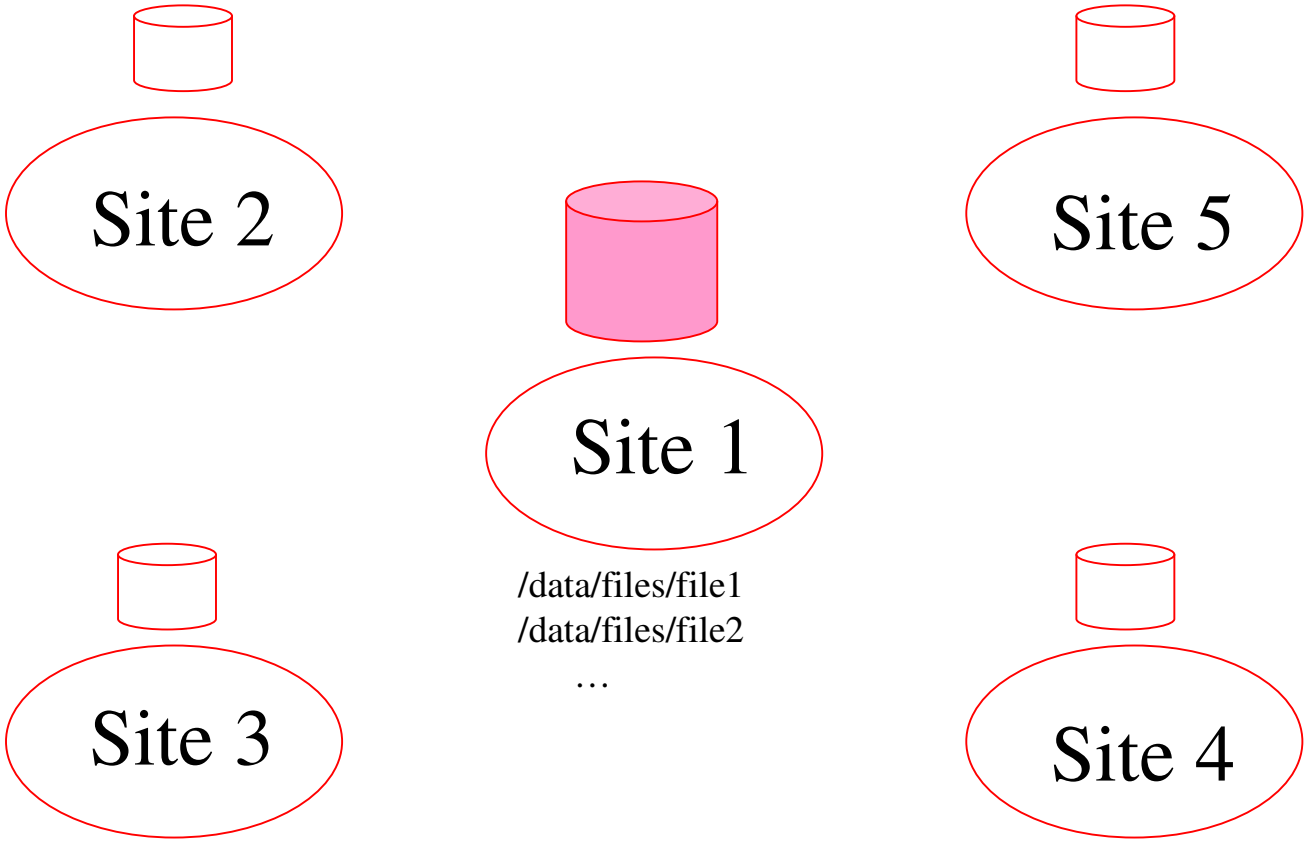
Usage

- **gdmp_ping**
  - Ping a GDMP server and get its status
- **gdmp_host_subscribe**
  - first thing to be done by a site
- **gdmp_register_local_file**
  - Registers a file in local file catalogue but NOT in Replica Catalogue (RC)
- **gdmp_publish_catalogue**
  - send information of newly created files to subscribed hosts (*no* real data transfer) – update RC
- **gdmp_replicate_get – gdmp_replicate_put**
  - get/put all the files from the import catalogue – update RC
- **gdmp_remove_local_file**
  - Delete a local file and update RC
- **gdmp_get_catalogue**
  - Get remote catalogue contents – for error recovery

Using GDMP

Register all files in a directory at site 1

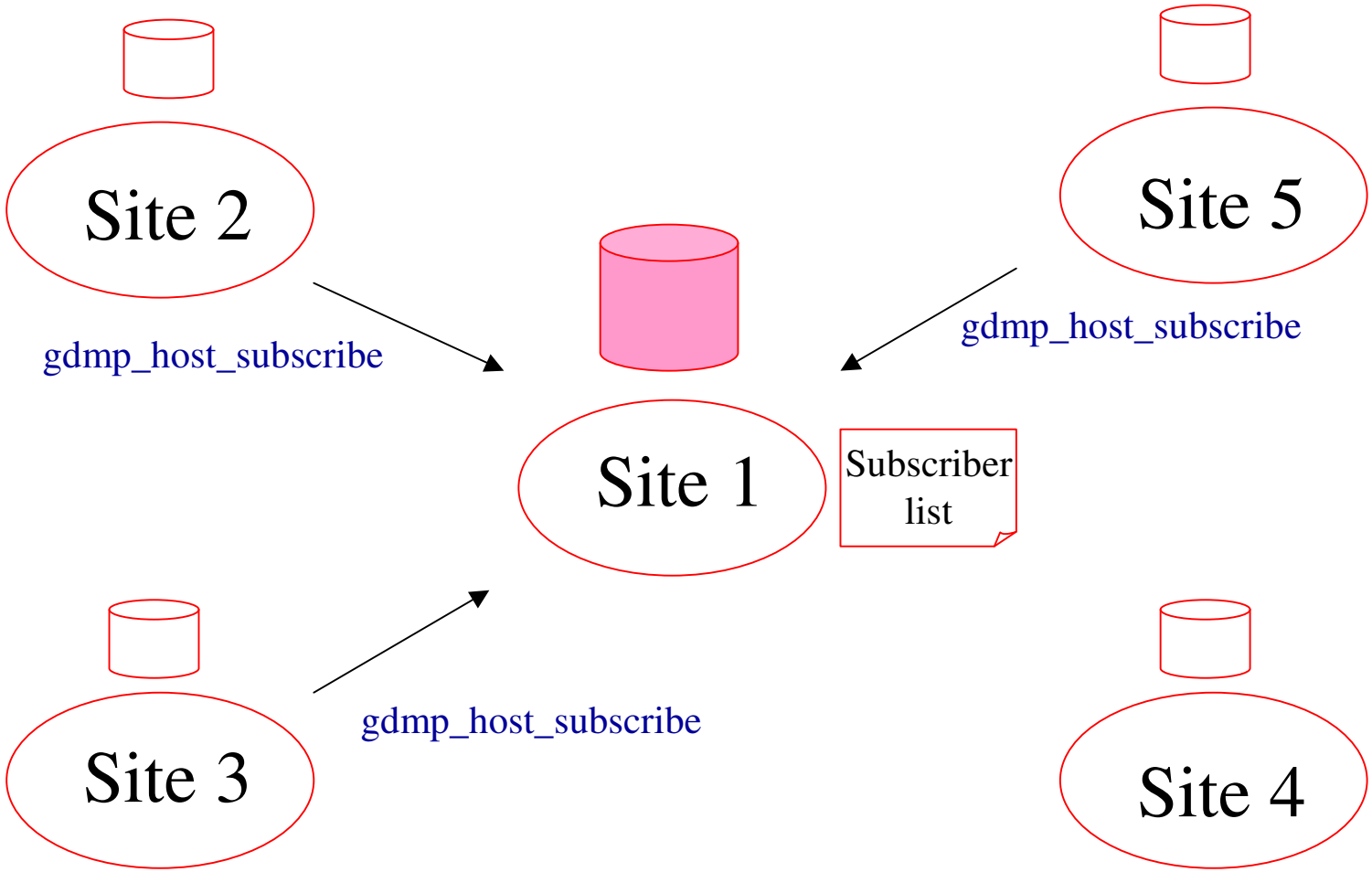
- gdmp_register_local_file -d /data/files



Data produced at site 1 to be replicated to other sites

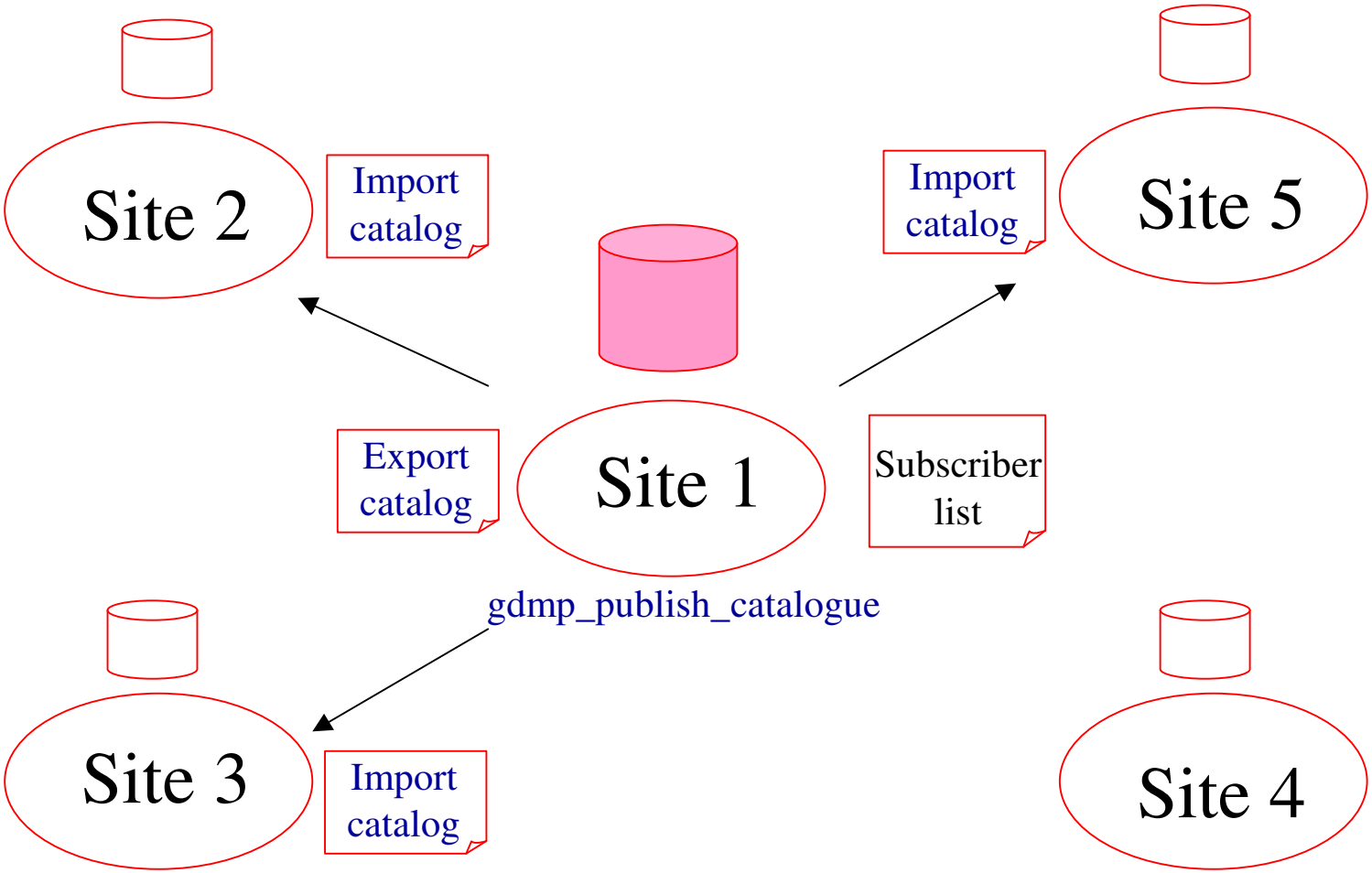
Using GDMP 2

- Start with subscription
  - gdmp_host_subscribe -r <HOST> -p <PORT>



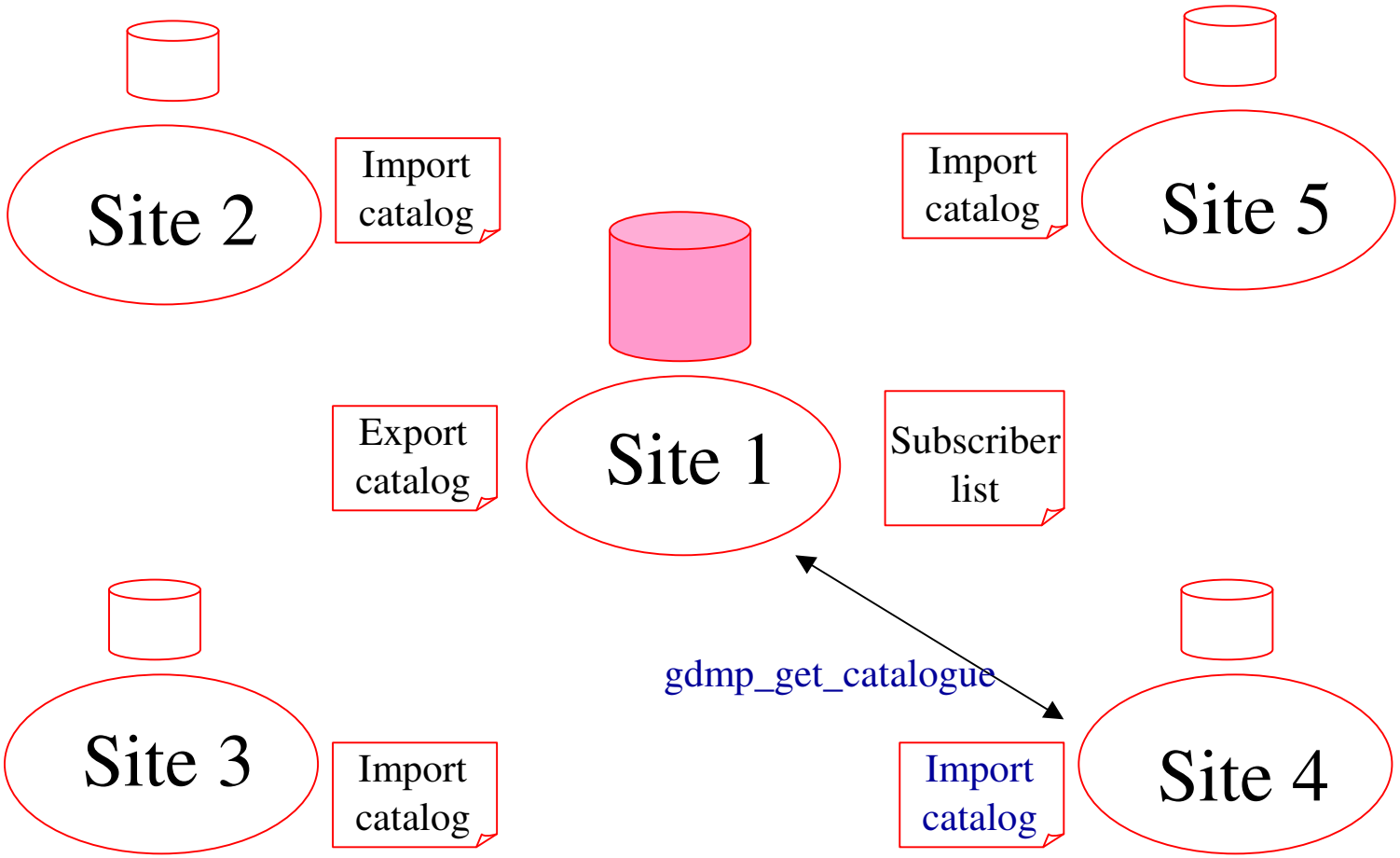
Using GDMP 3

- Publish new files... can combine with filtering
  - gdmp_publish_catalogue (might use filter option)



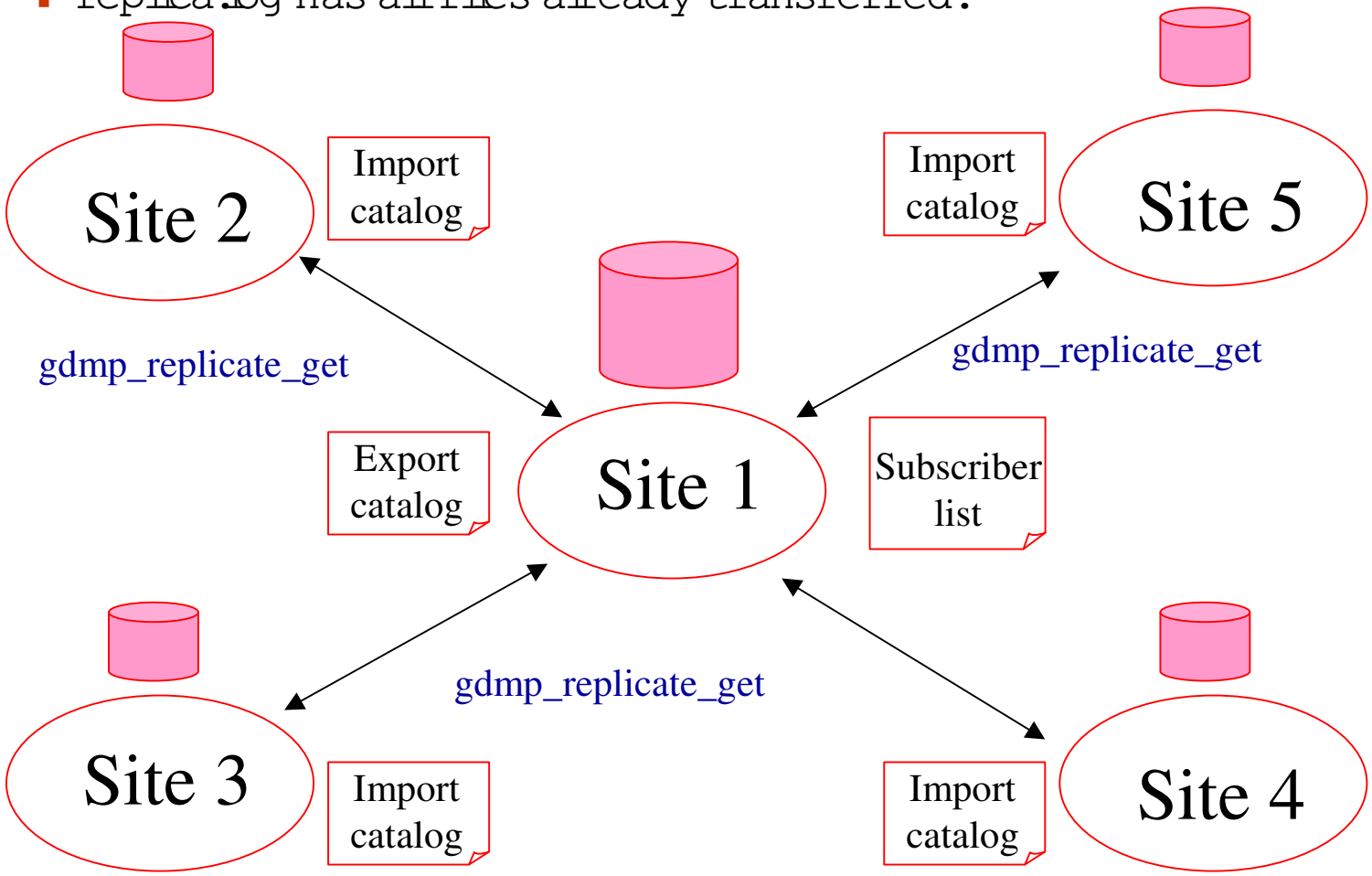
Using GDMP 4

- Poll for change in catalog (pull model)... can combine with filtering... also used for error recovery.
  - gdmp_get_catalogue -host <HOST>



Using GDMP 5

- Transfer files... can use the progress meter
  - gdmp_replicate_get
  - get_progress_meter... produces a progress.log.
  - replica.log has all files already transferred.



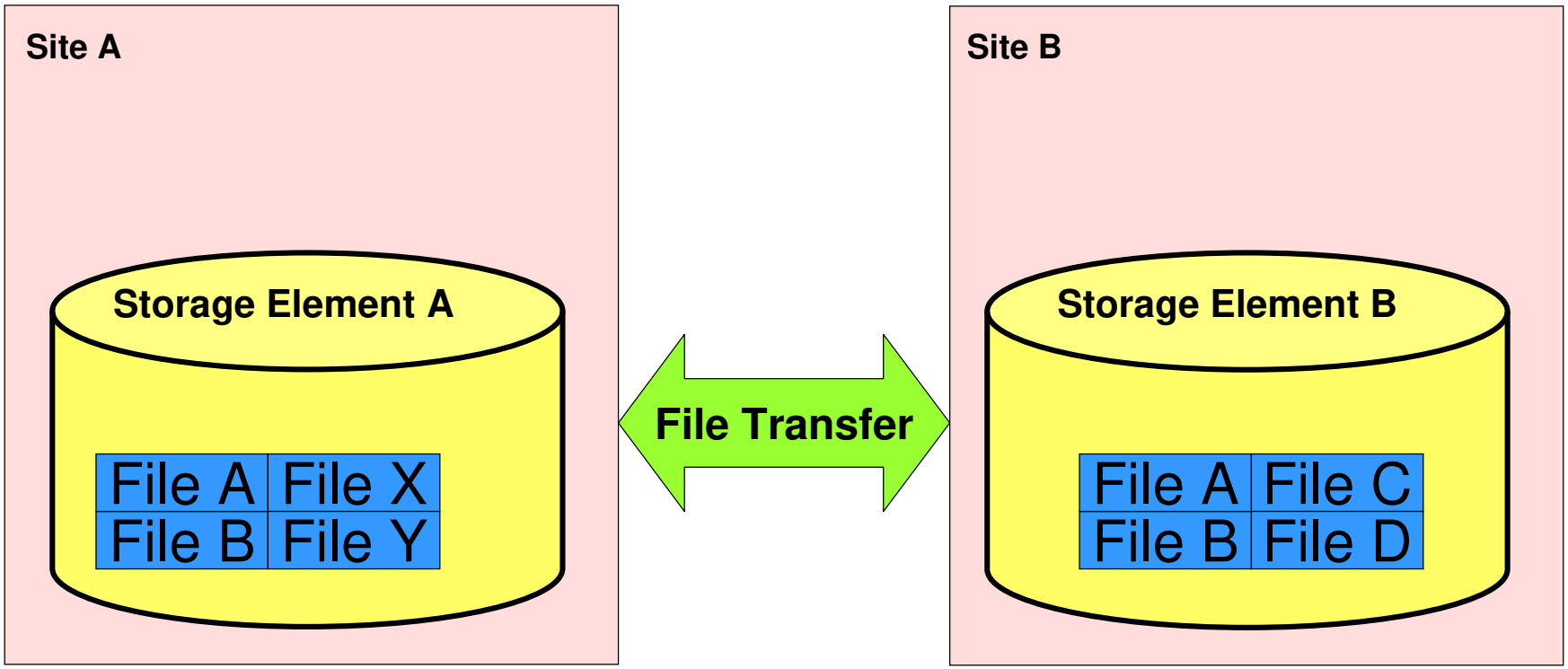
GDMP vs. EDG Replica Manager

- GDMP
  - Replicates sets of files
  - Replication between SEs only
  - Mass storage interface
  - File size as logical attribute
  - Subscription model
  - Event notification
  - CRC file size check
  - Support for Objectivity
- Replica Manager
  - Replicates single files
  - Replication between SEs, UI or CE to SE.
  - Uses GDMP's Mass Storage interface at the SE

client-server

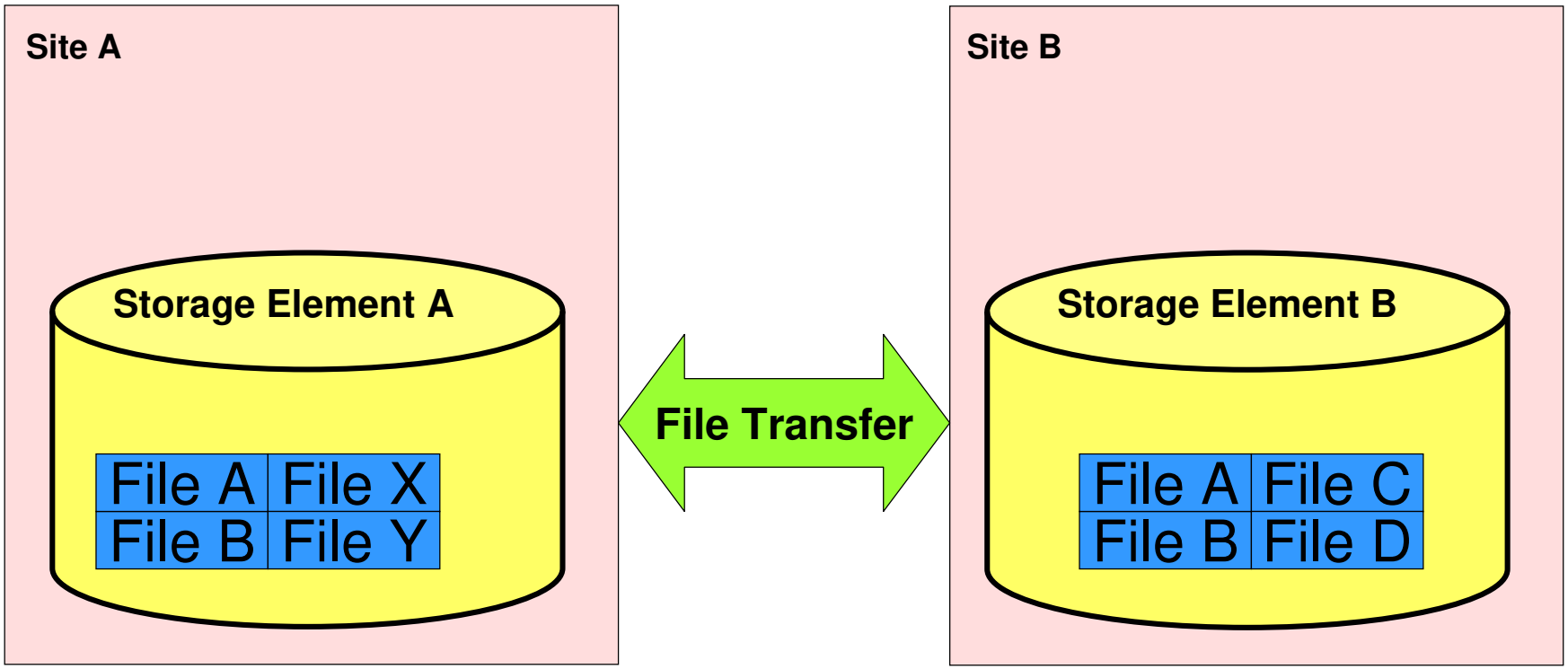
client side only

File Management Summary



File Management Summary

Replica Catalog:
Map Logical to Site files



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Replica Catalog:
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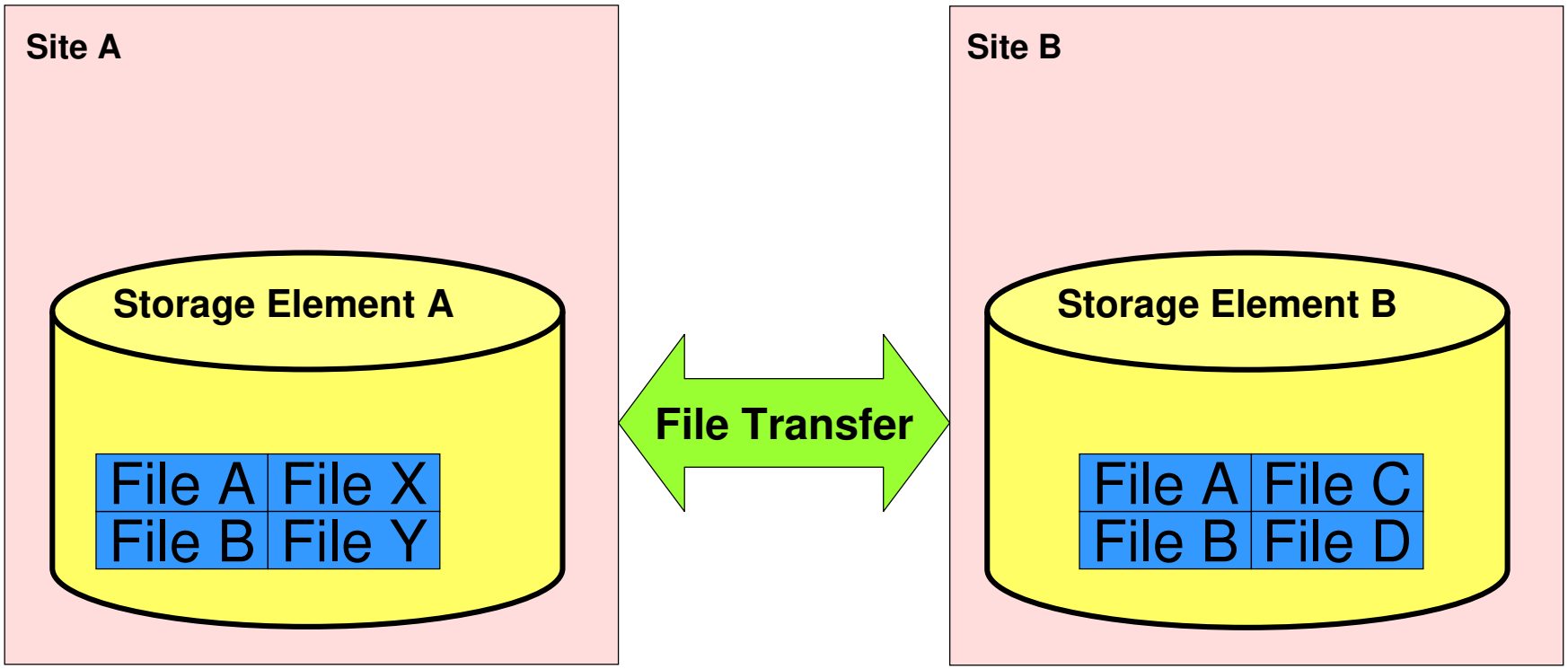
Replica Selection:
Get 'best' file



File Management Summary

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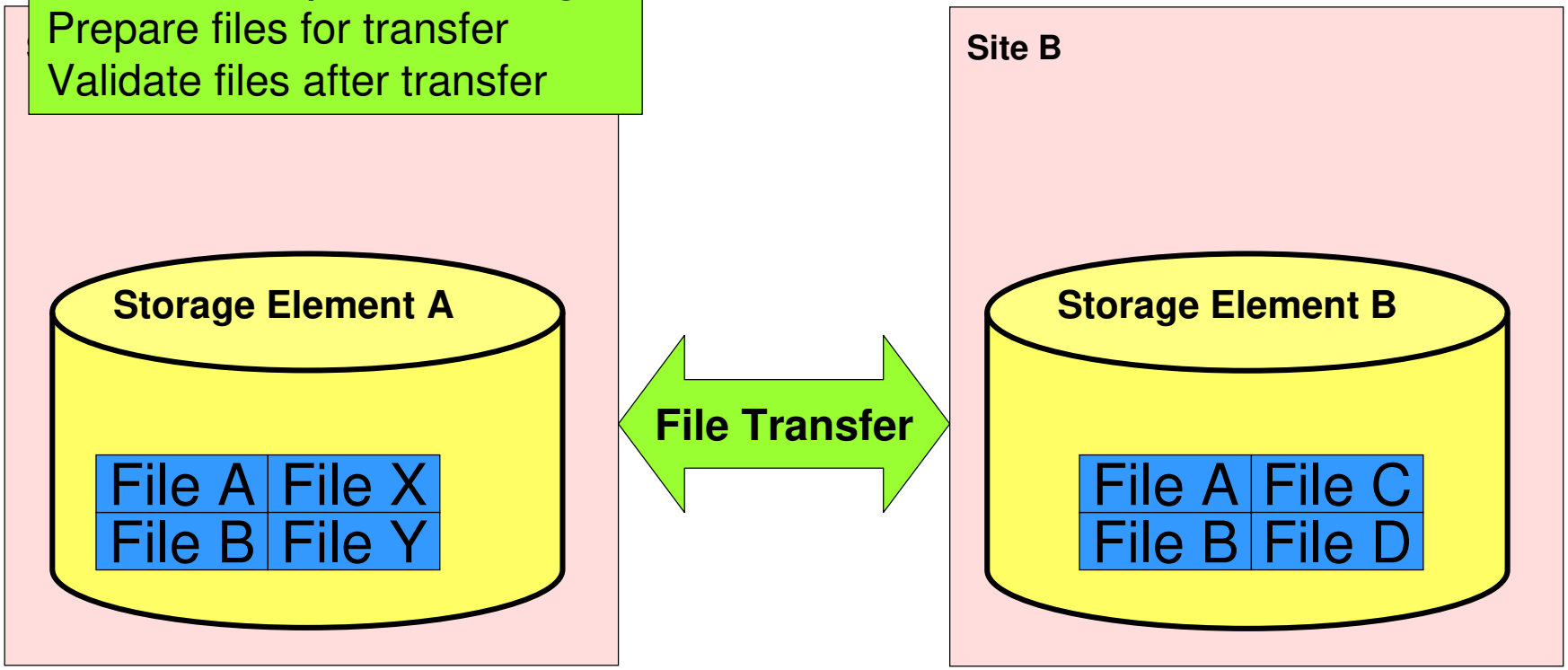
Pre- Post-processing:
Prepare files for transfer
Validate files after transfer



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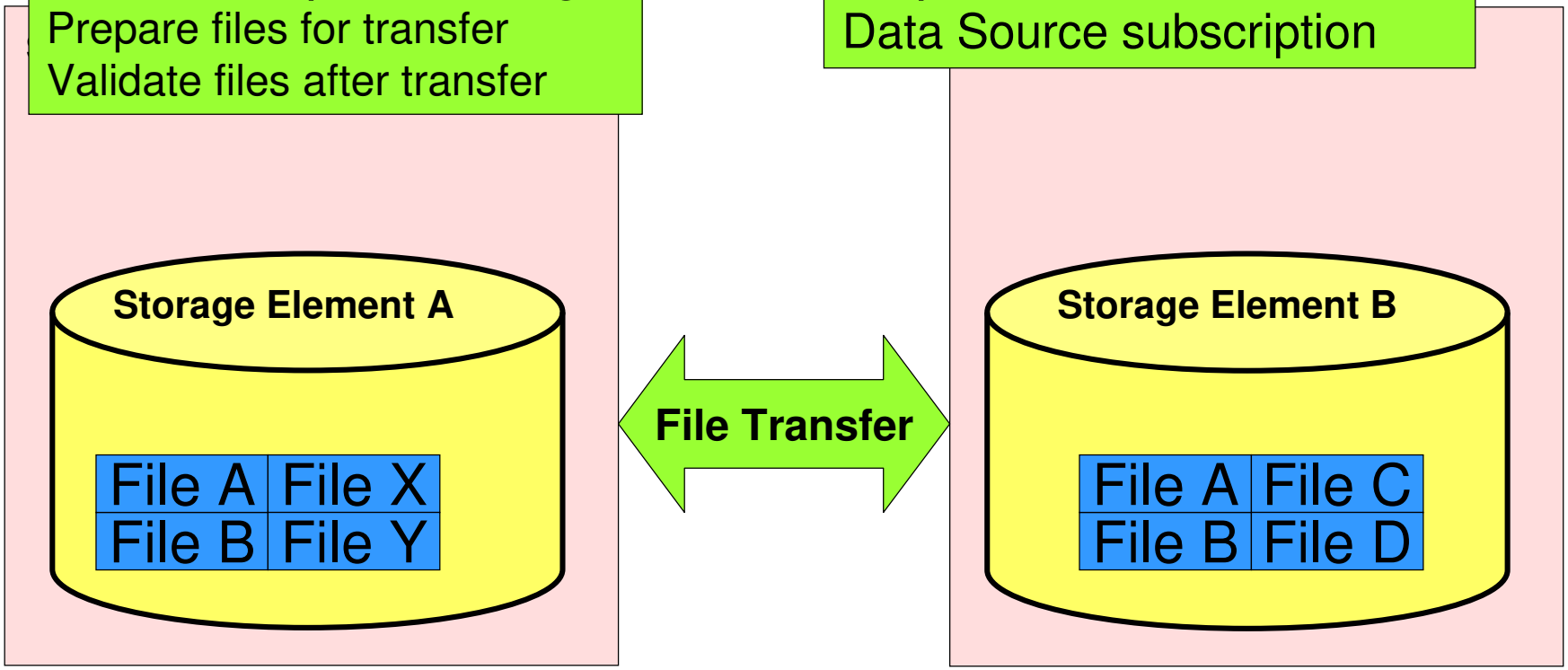
Replication Automation:
Data Source subscription



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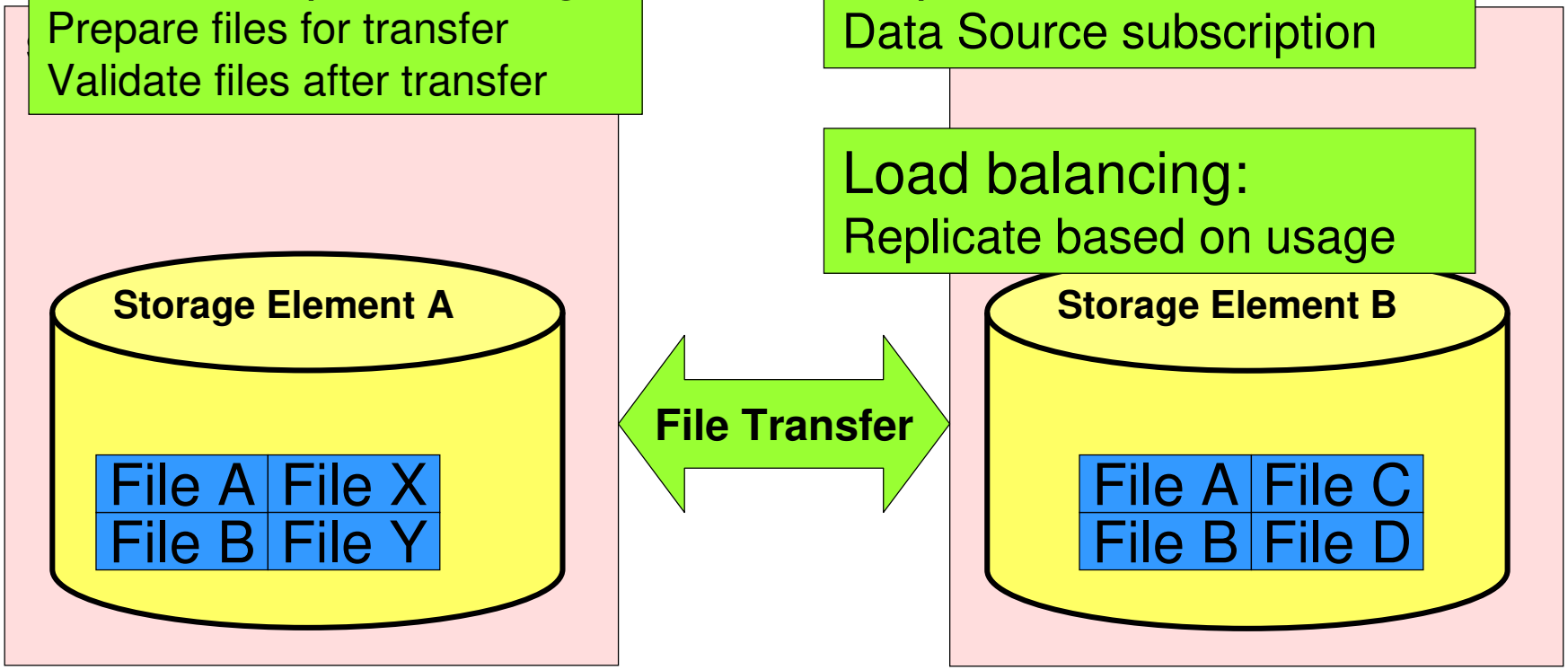
Load balancing:
Replicate based on usage



Replica Manager:
'atomic' replication operation
single client interface
orchestrator

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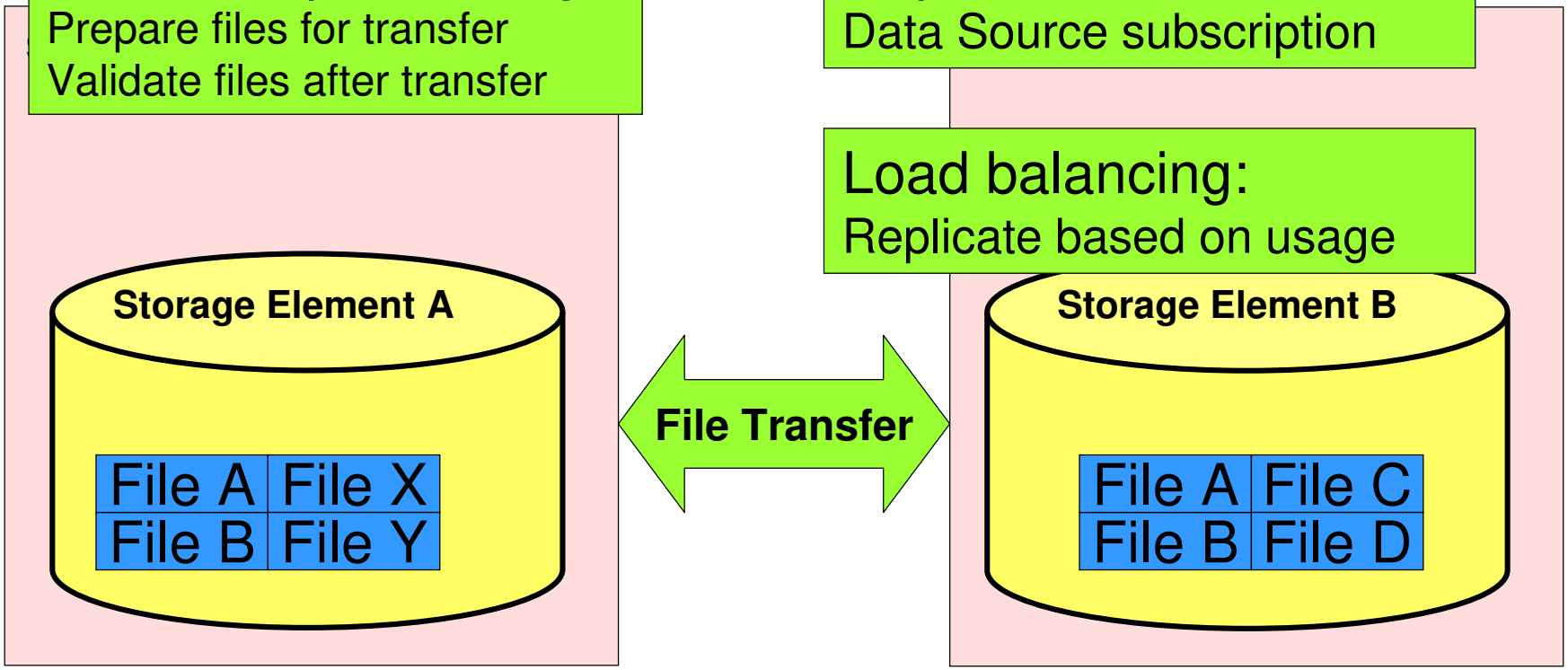

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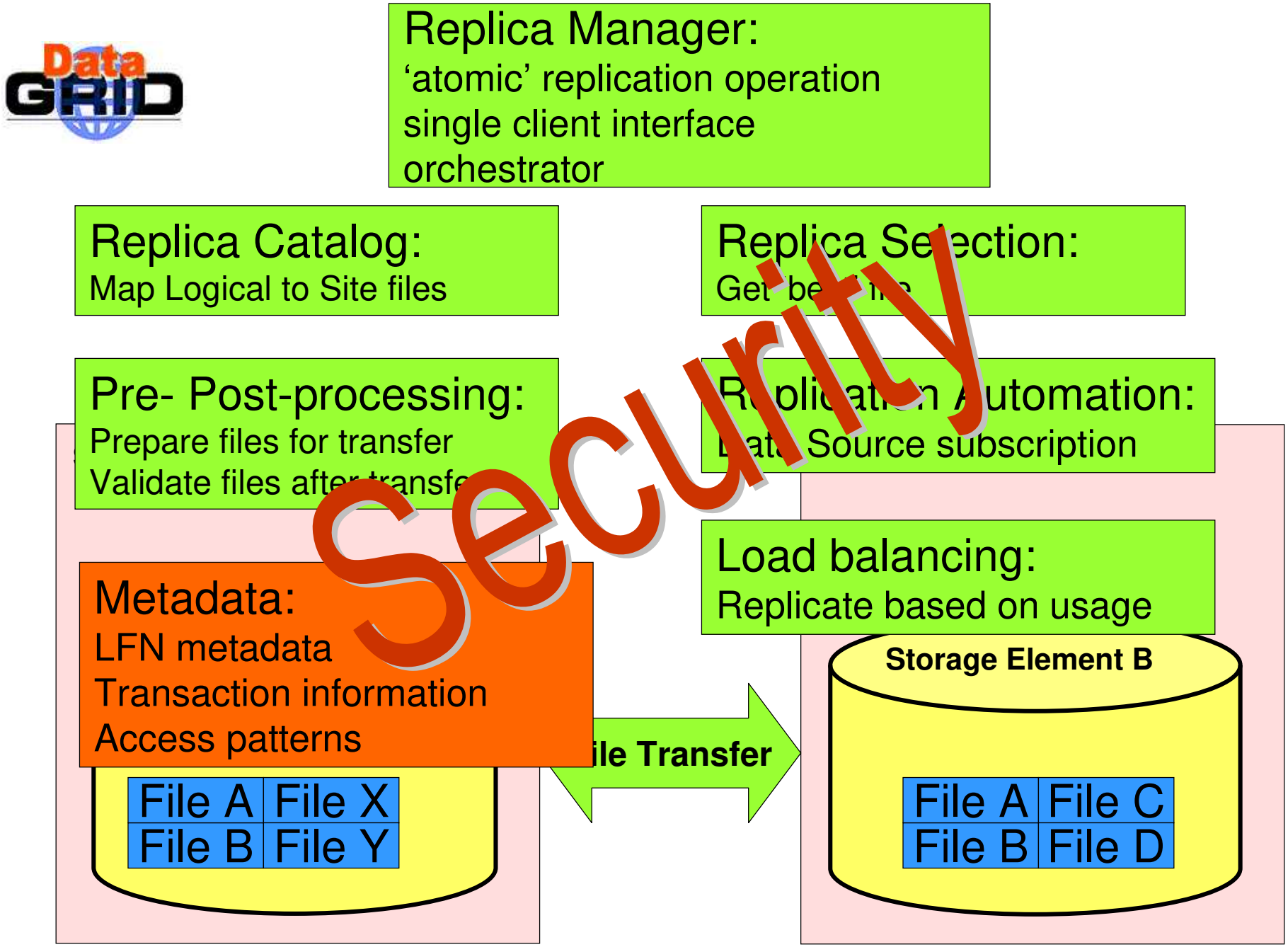
Metadata:
LFN metadata
Transaction information
Access patterns

File A | File X
File B | File Y

ile Transfer

Storage Element B

File A | File C
File B | File D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File D