



# Data Management



The European DataGrid Project Team

<http://www.eu-datagrid.org>

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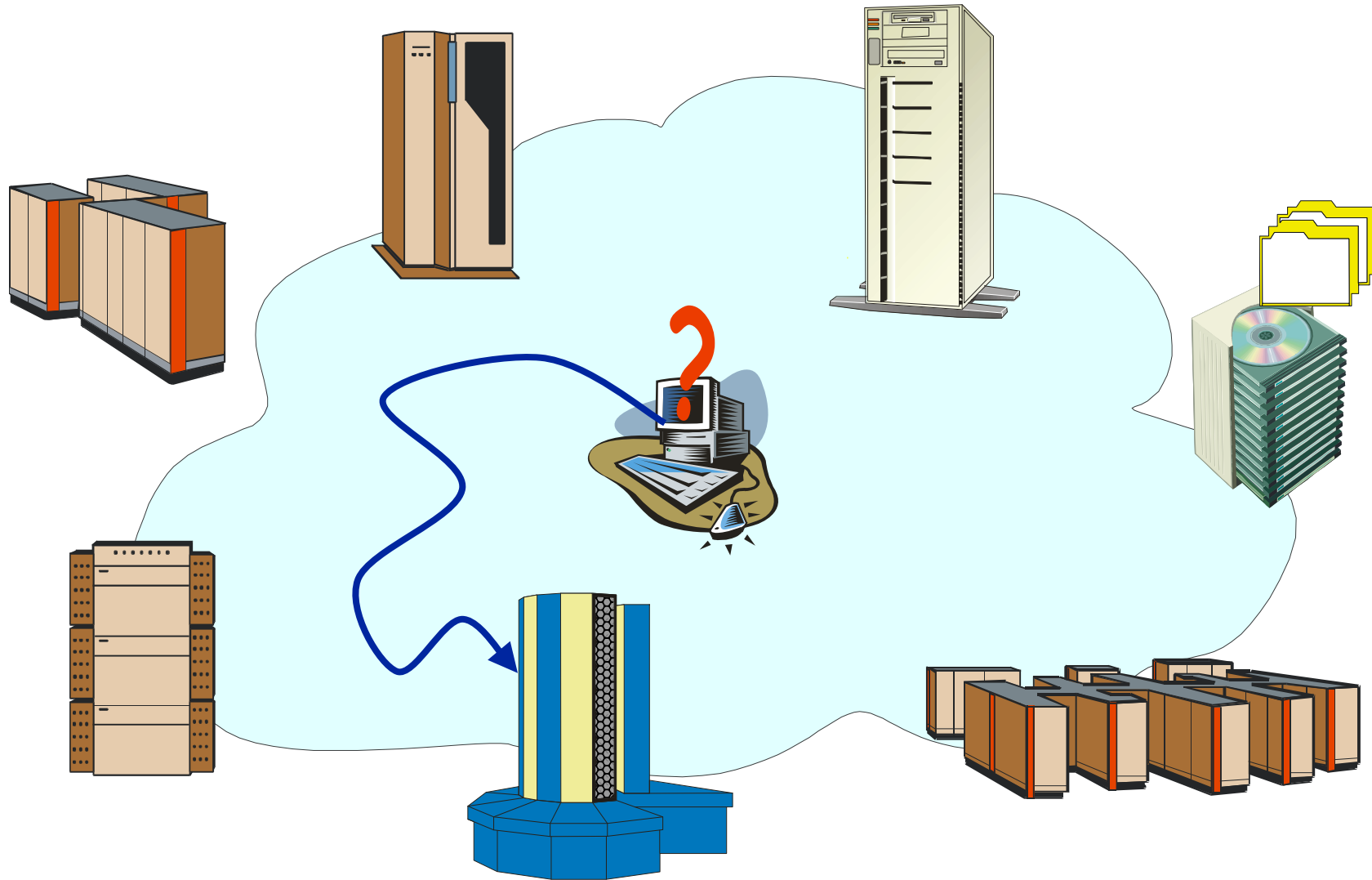


# Overview

- Data Management Issues
  
- Main Components
  - EDG Replica Catalog
  - EDG Replica Manager
  - GDMP

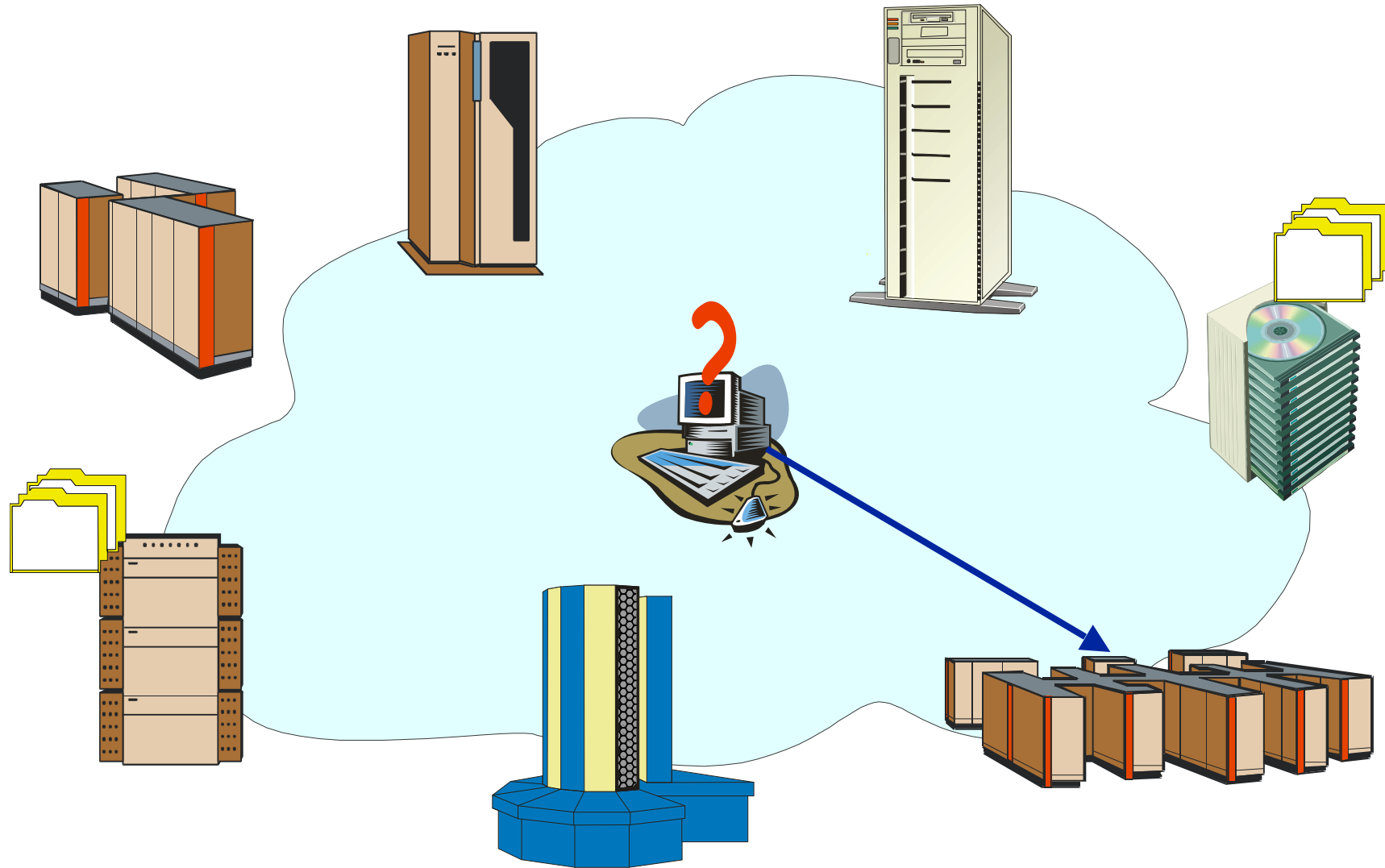


# Data Management Issues





# 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):
  - Physical File Name (PFN): host + full path & and file name
  - Logical File Name (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 full path 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
- Keeps RC consistent with stored data.



# 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



# The Replica Manager APIs

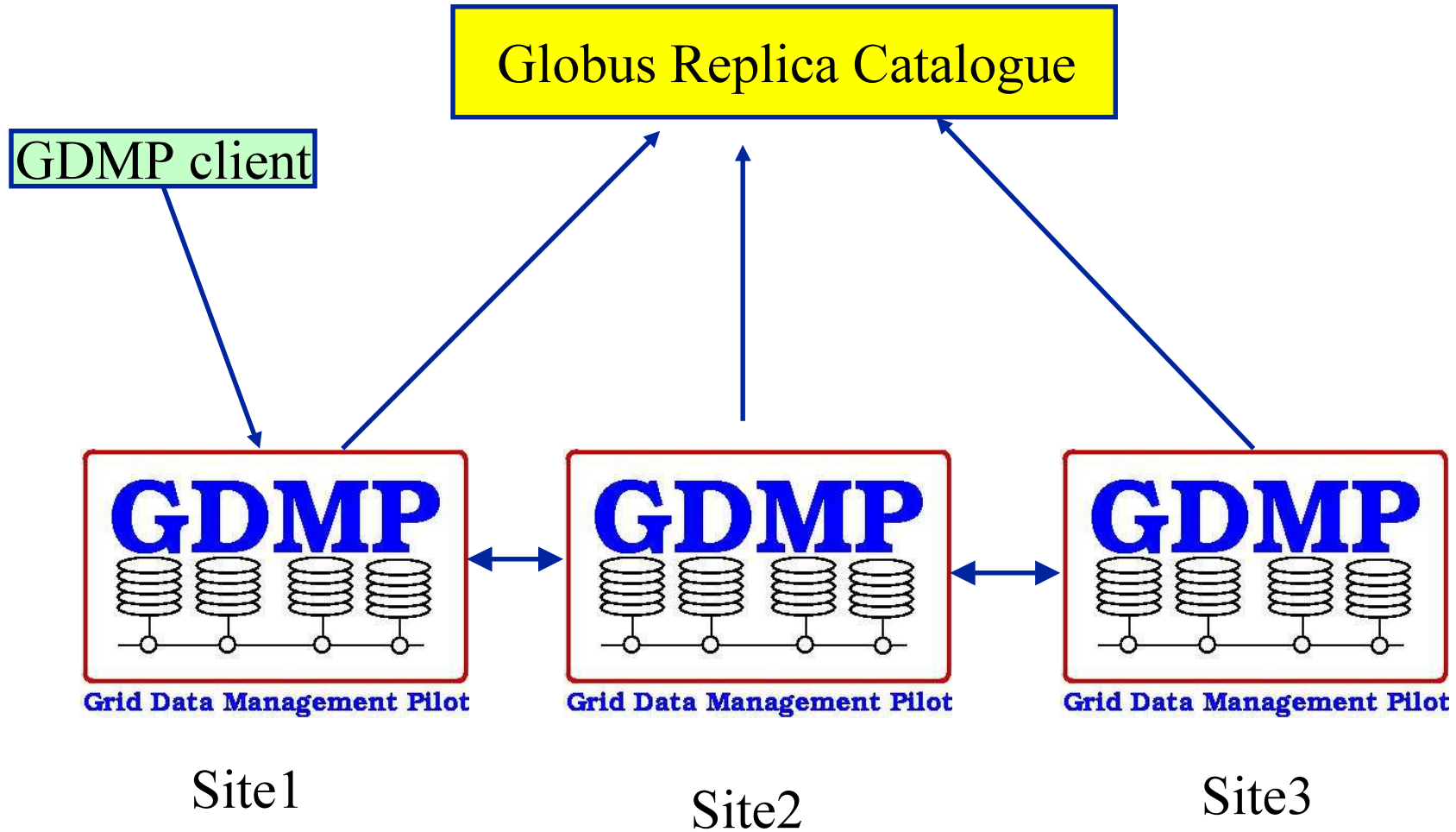
- *copyAndRegisterFile(LogicalFileName lfn,*  
*FileName source,*  
*FileName destination,*  
*String protocol)*
  - third-party transfer but :
    - files can only be registered in Replica Catalogue if **destination** PFN contains a valid **SE** (i.e. needs to be registered in the RC)!
- *replicateFile(LogicalFileName lfn,*  
*FileName source,*  
*FileName destination,*  
*String protocol)*
- *deleteFile(LogicalFileName lfn,*  
*FileName source)*



- 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>

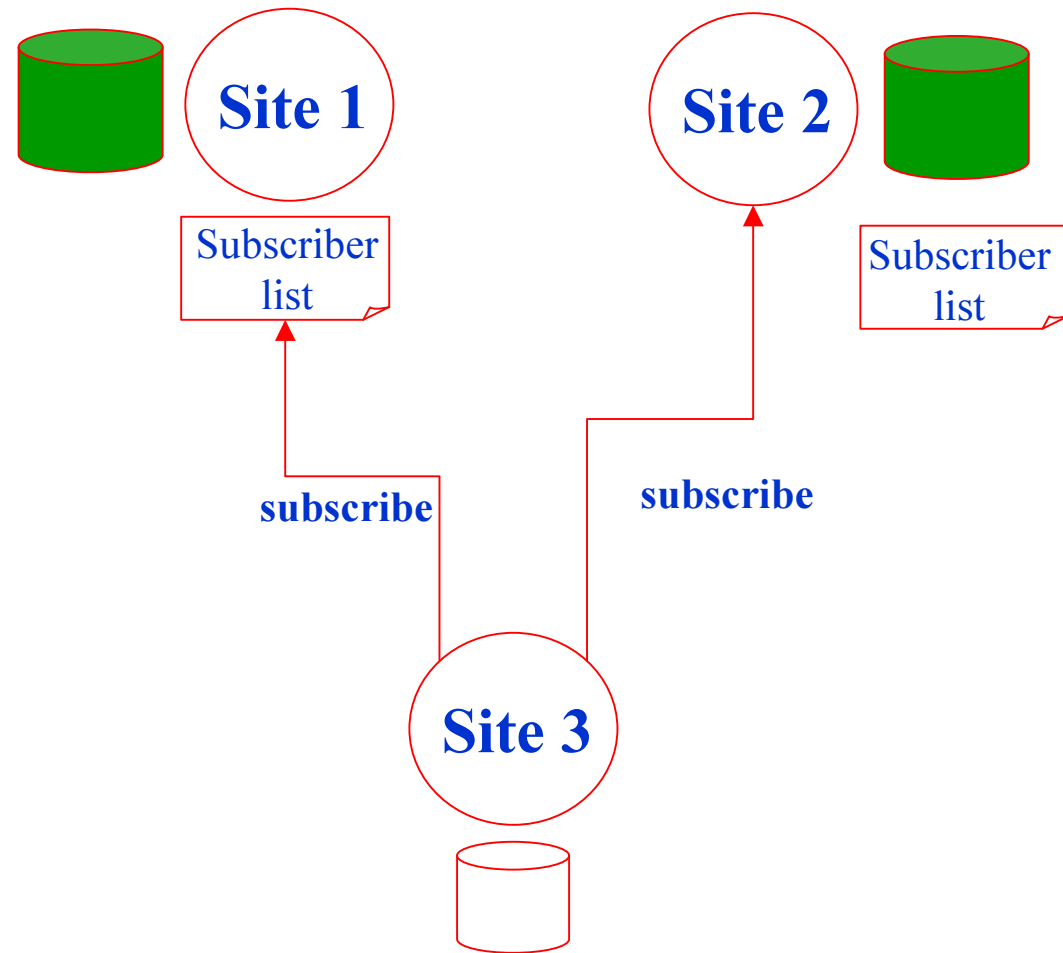


# Overview of Components



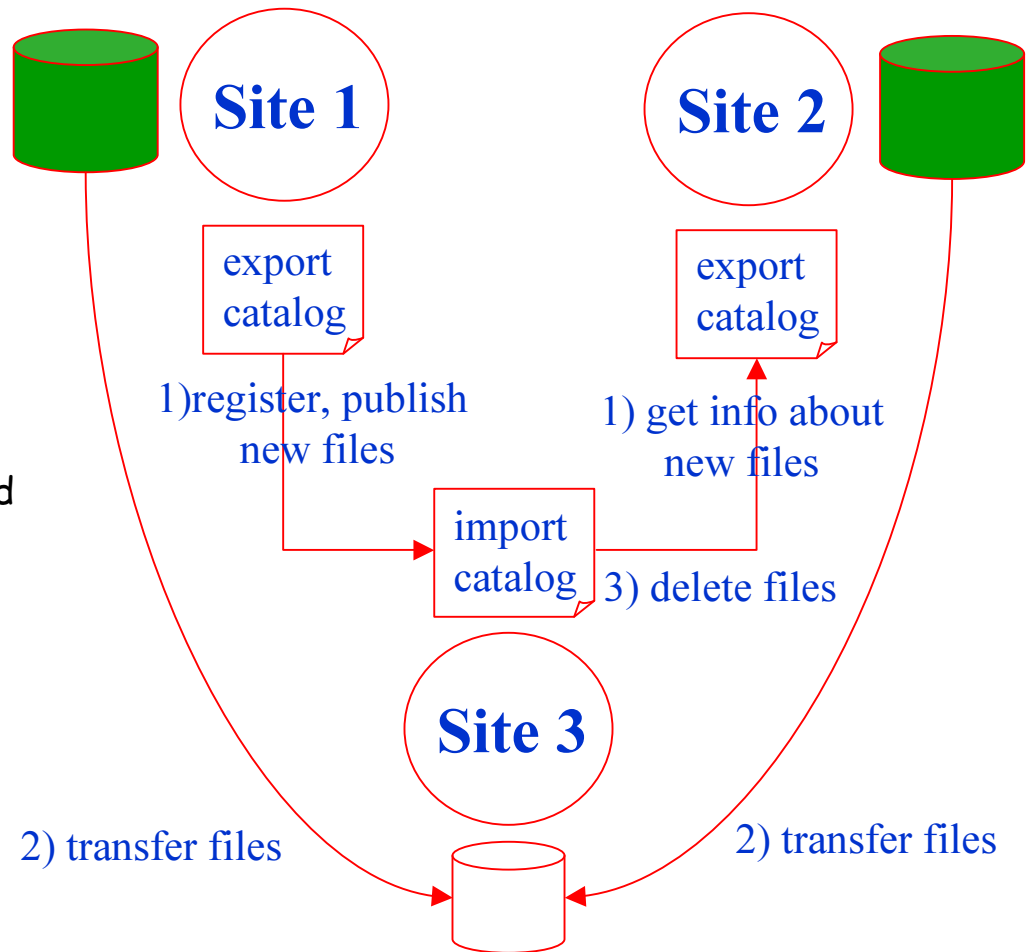
# Subscription Model

- 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

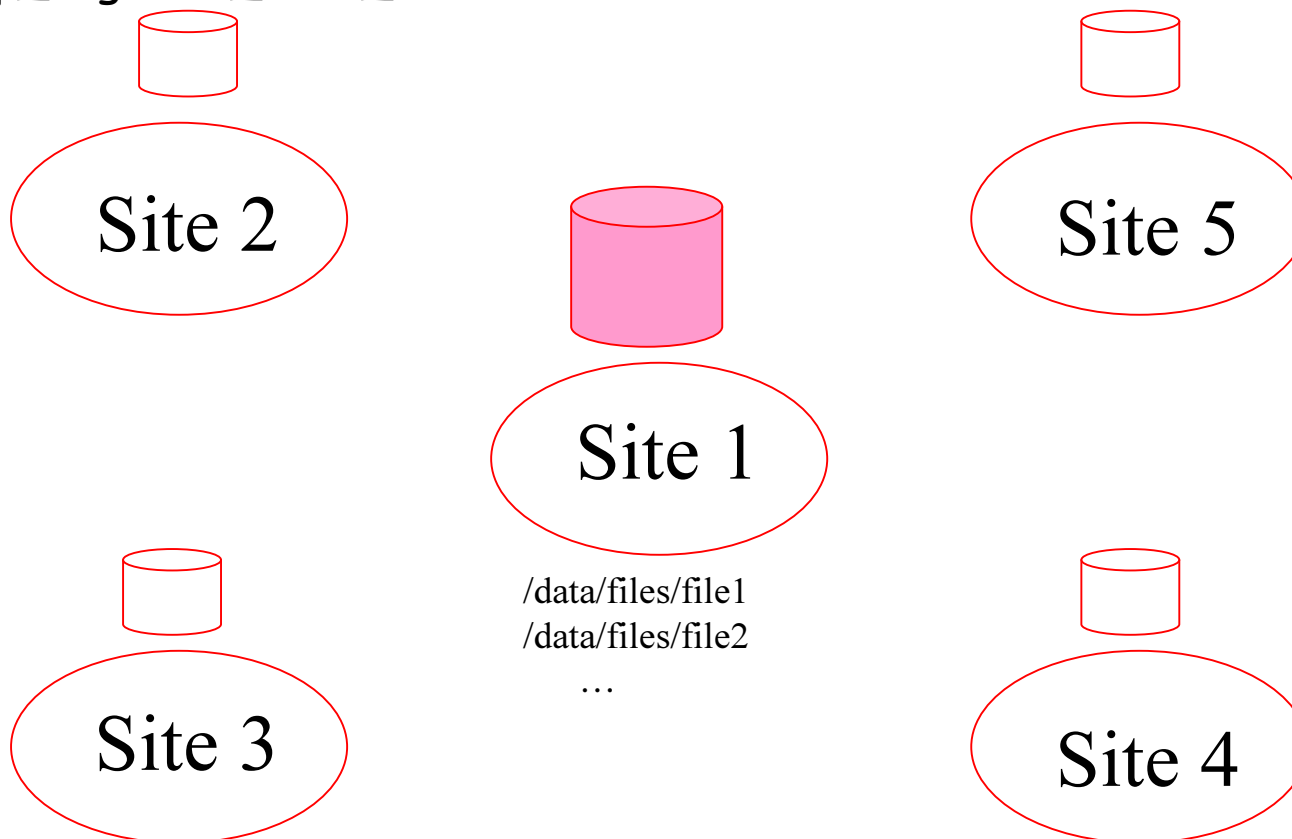




## Using GDMP

**Register all files in a directory at site 1**

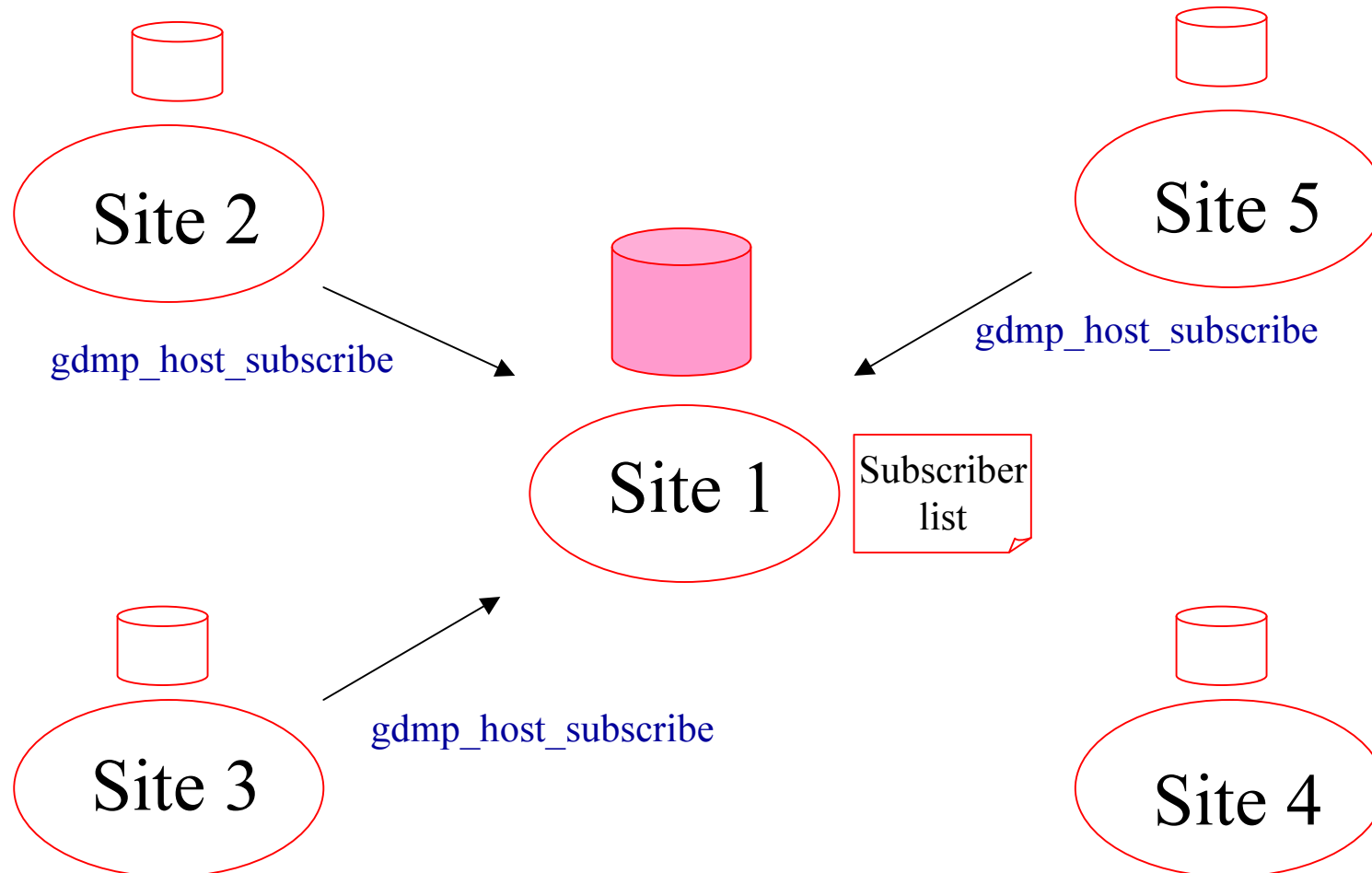
```
•gdmp_register_local_file -d /data/files
```



**Data produced at site 1 to be replicated to other sites**

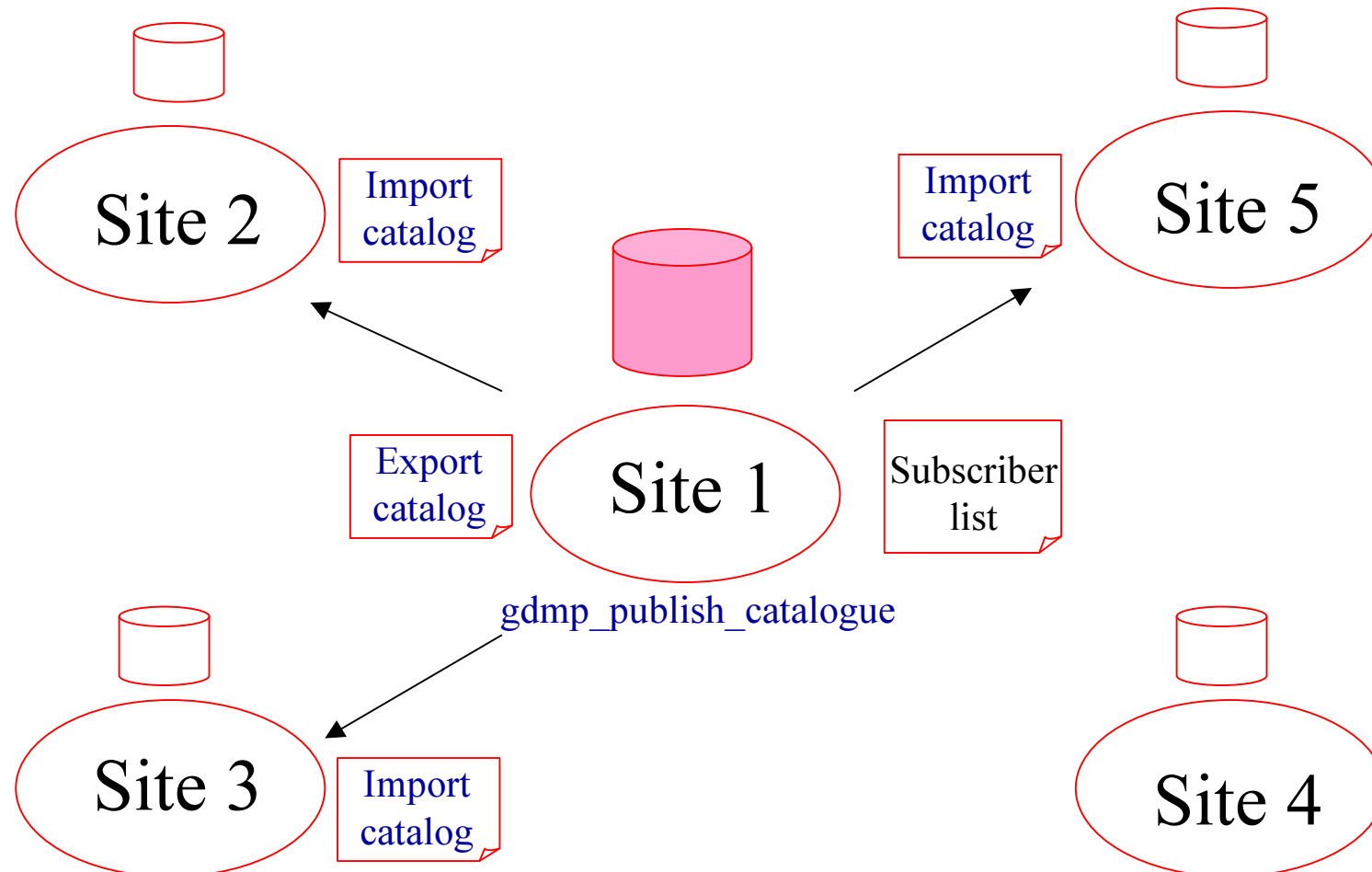
## Using GDMP 2

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



## Using GDMP 3

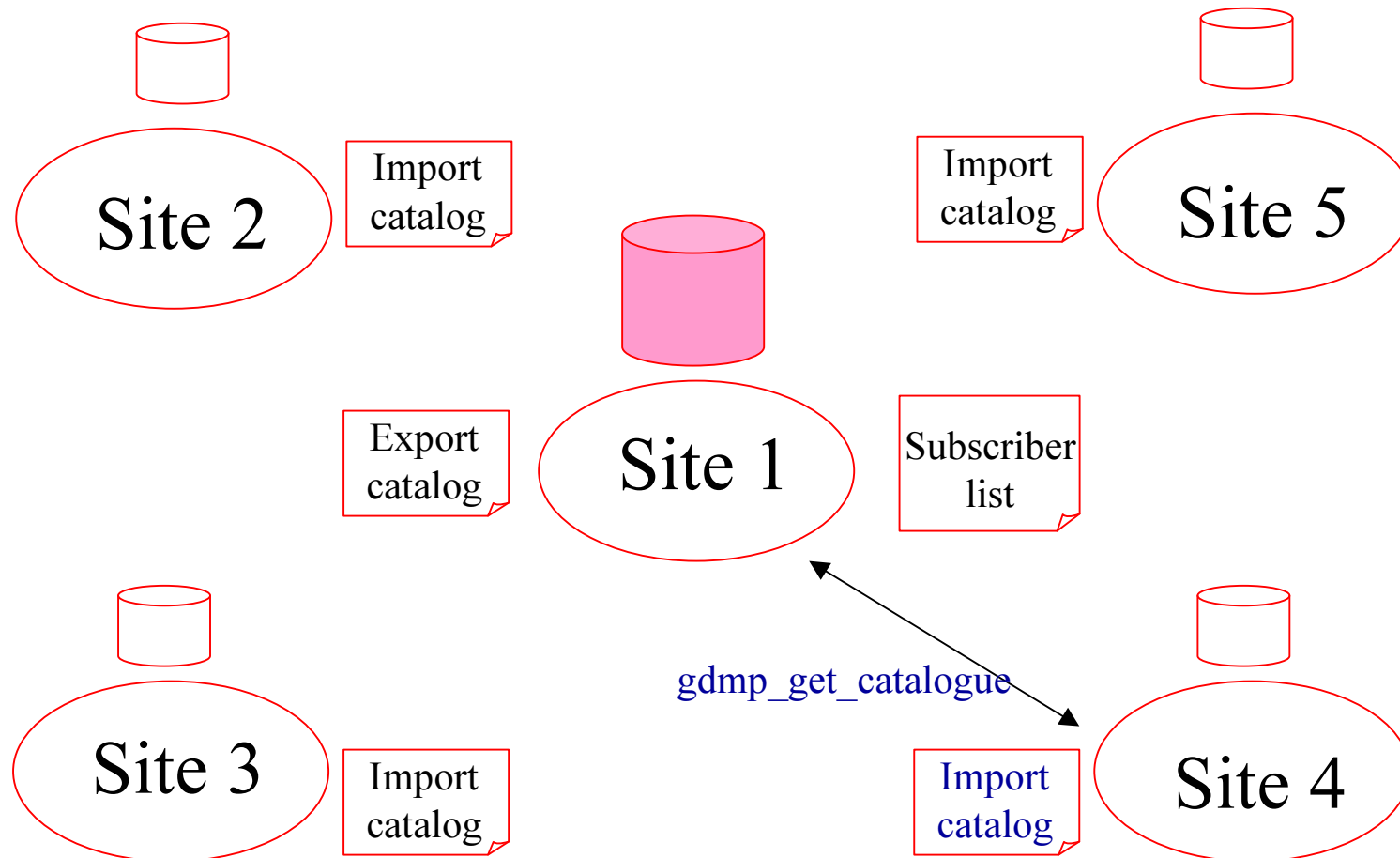
- Publish new files...can combine with filtering
  - `gdmp_publish_catalogue` (might use filter option)





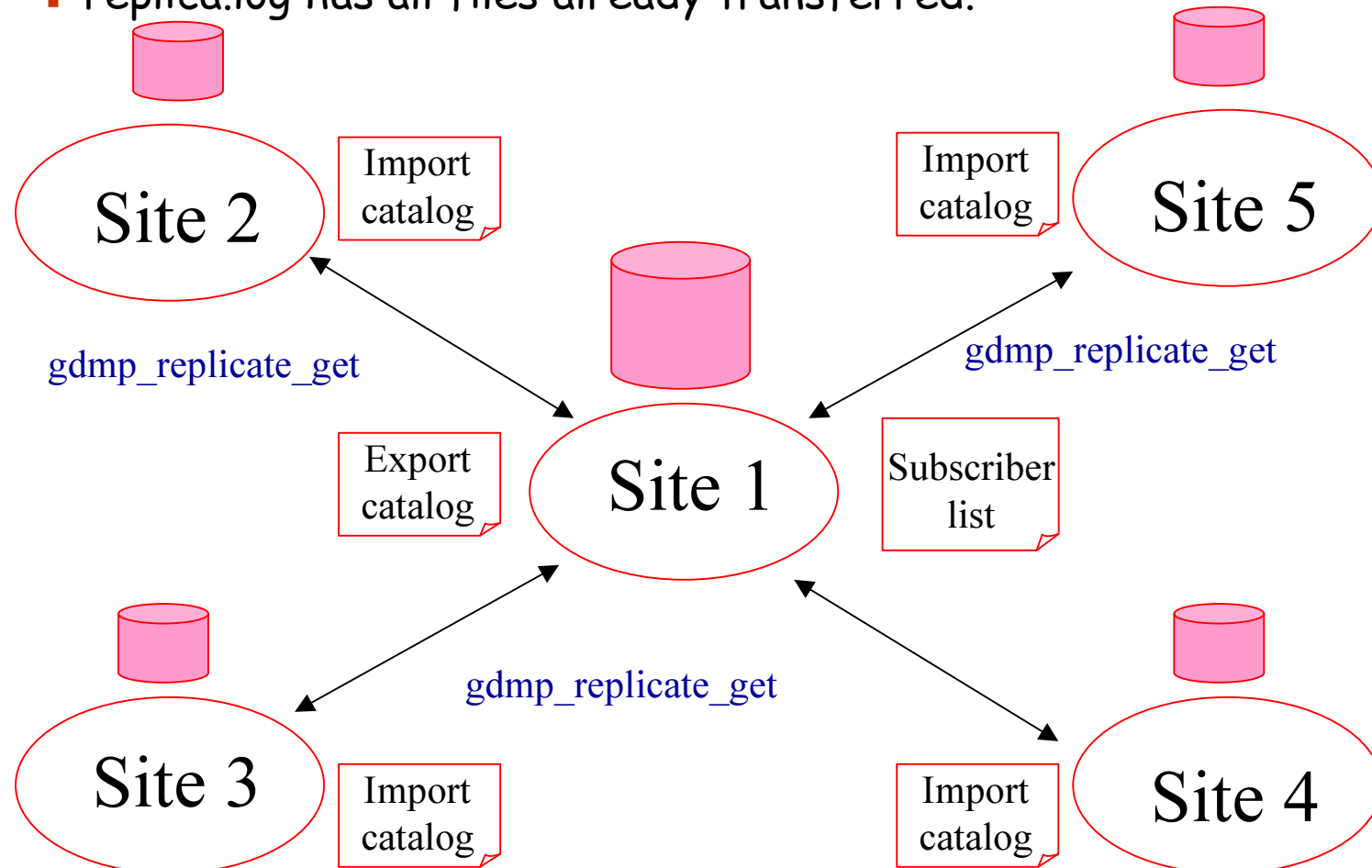
## Using GDMP 4

- 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

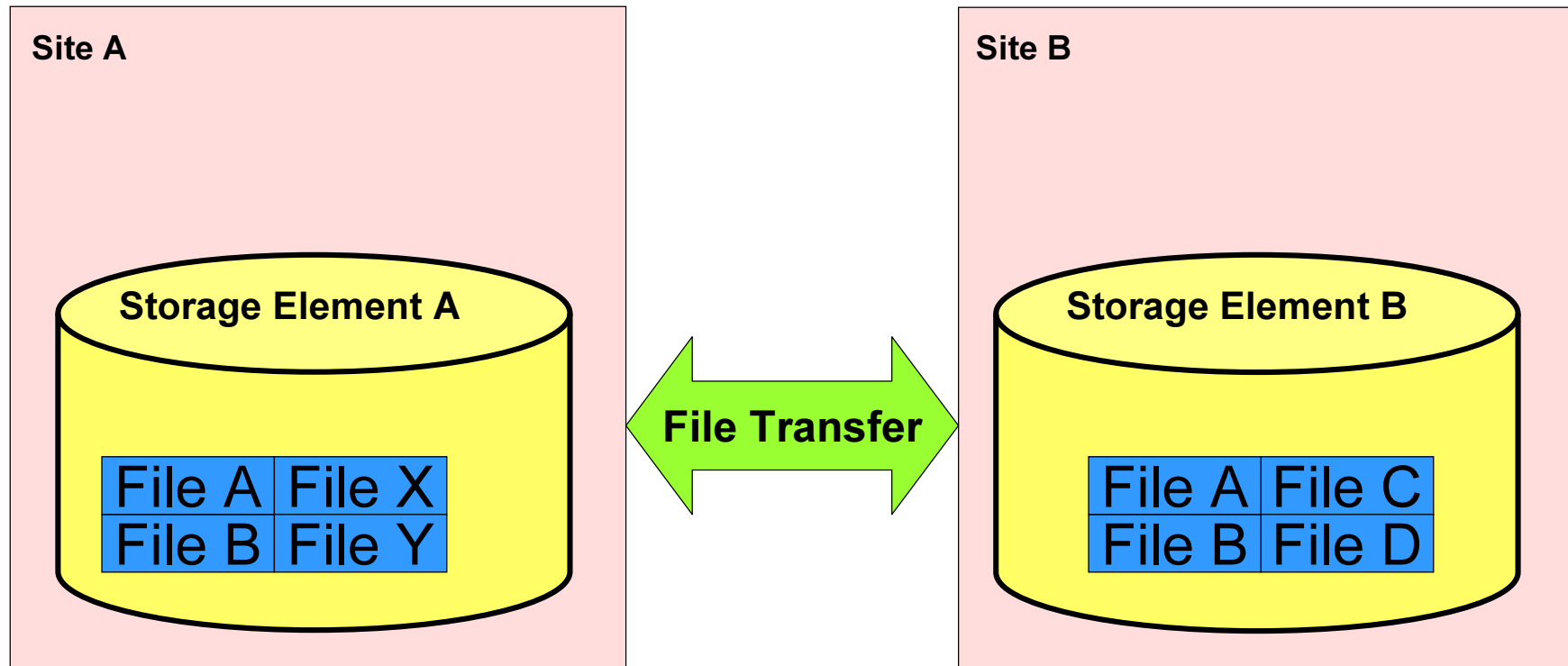
- Replicates sets of files
- Replication between SEs
- Mass storage interface
- File size as logical attribute
- Subscription model
- Event notification
- CRC file size check
- Support for Objectivity

## ➤ Replica Manager

- Replicates single files
- Replication between SEs, CEs to SE.



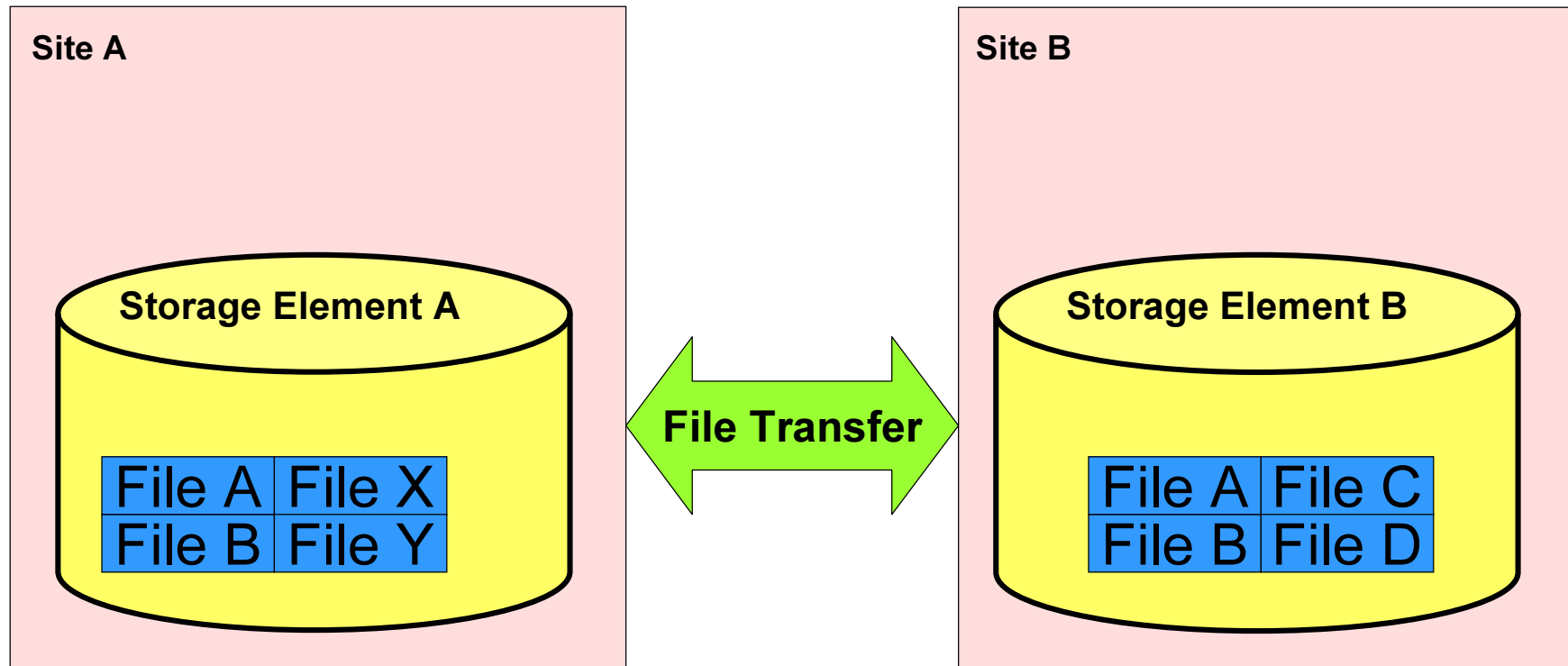
# File Management Summary





# File Management Summary

Replica Catalog:  
Map Logical to Site files



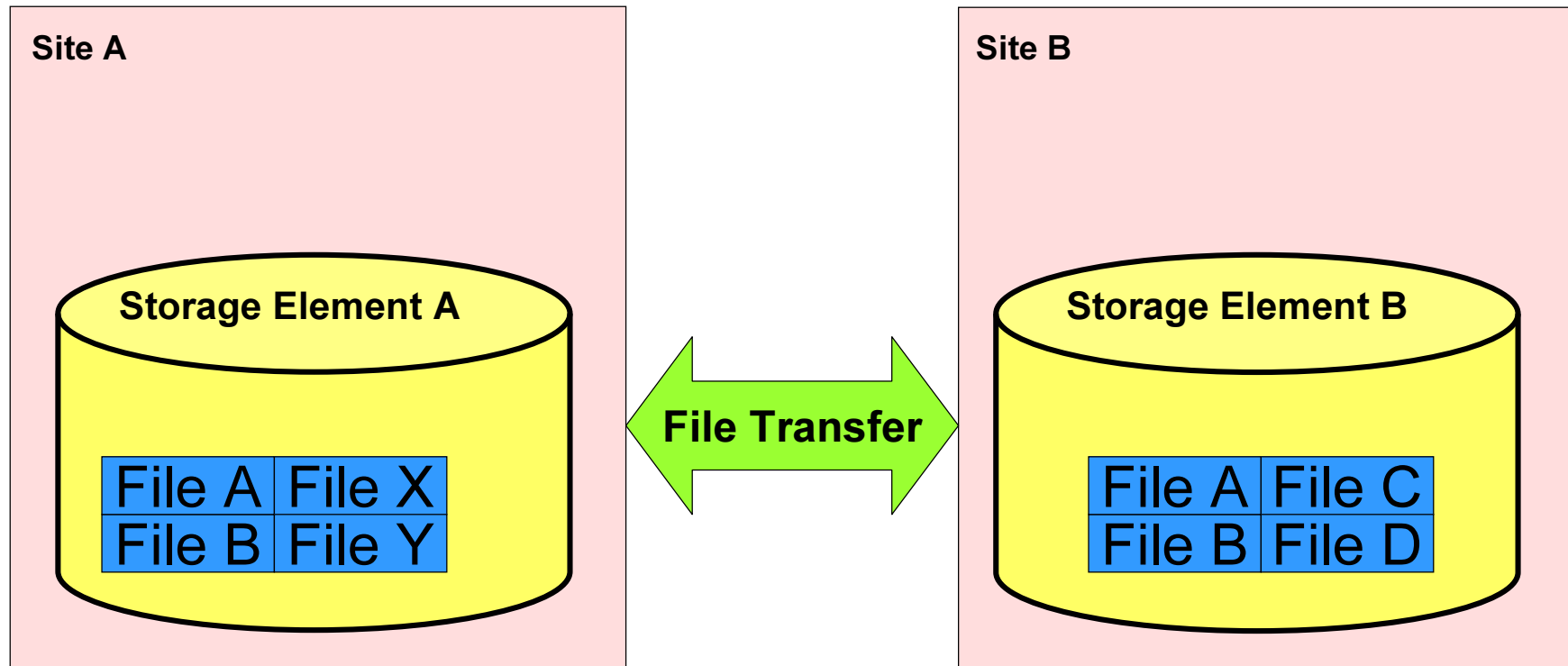




# File Management Summary

**Replica Catalog:**  
Map Logical to Site files

**Replica Selection:**  
Get 'best' file



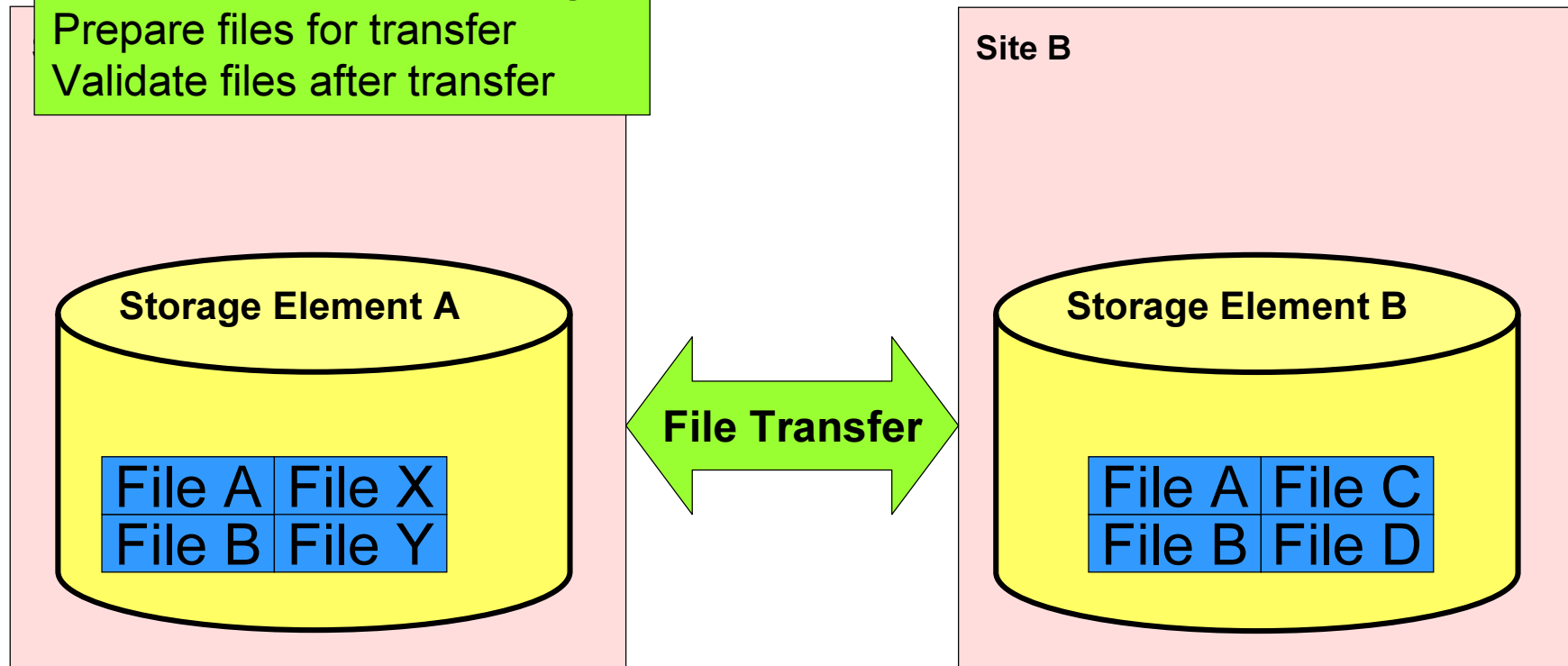


# File Management Summary

**Replica Catalog:**  
Map Logical to Site files

**Replica Selection:**  
Get 'best' file

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





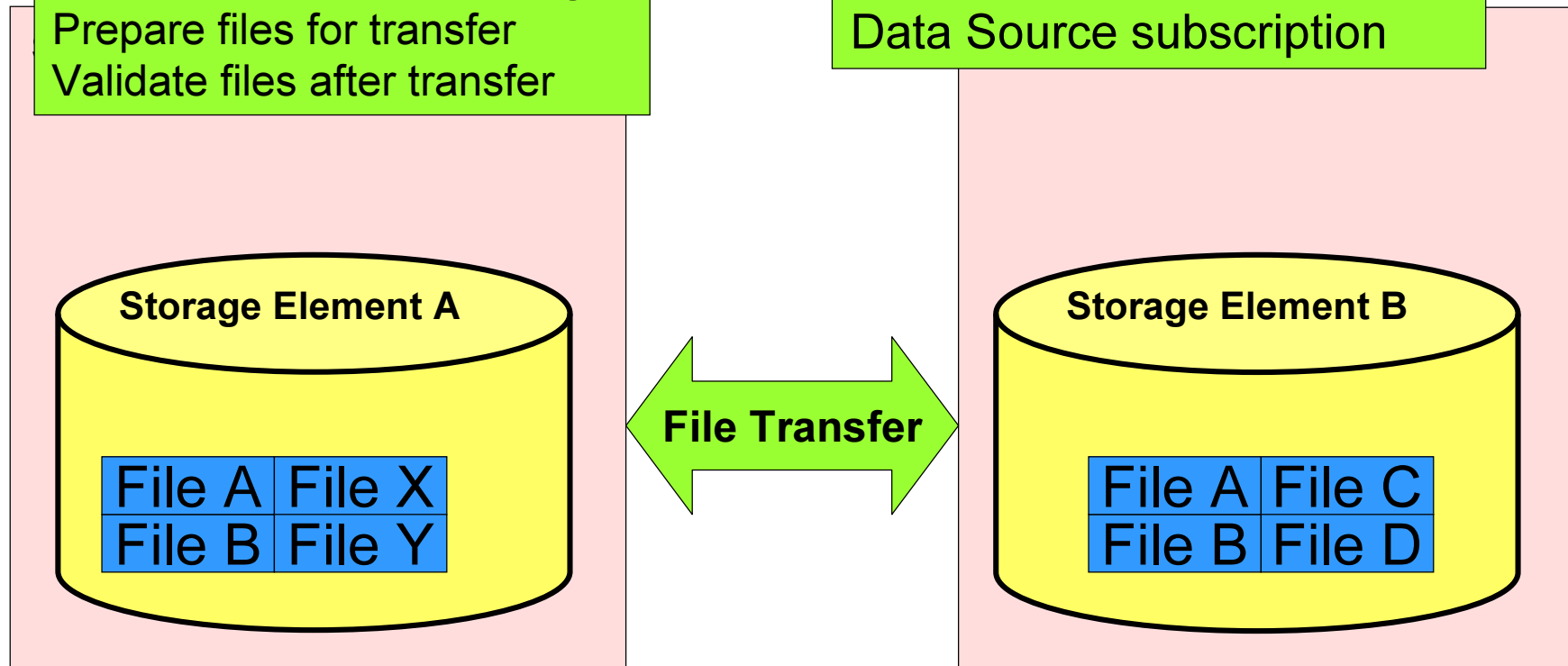
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Map Logical to Site files

**Replica Selection:**  
Get 'best' file

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

**Replication Automation:**  
Data Source subscription





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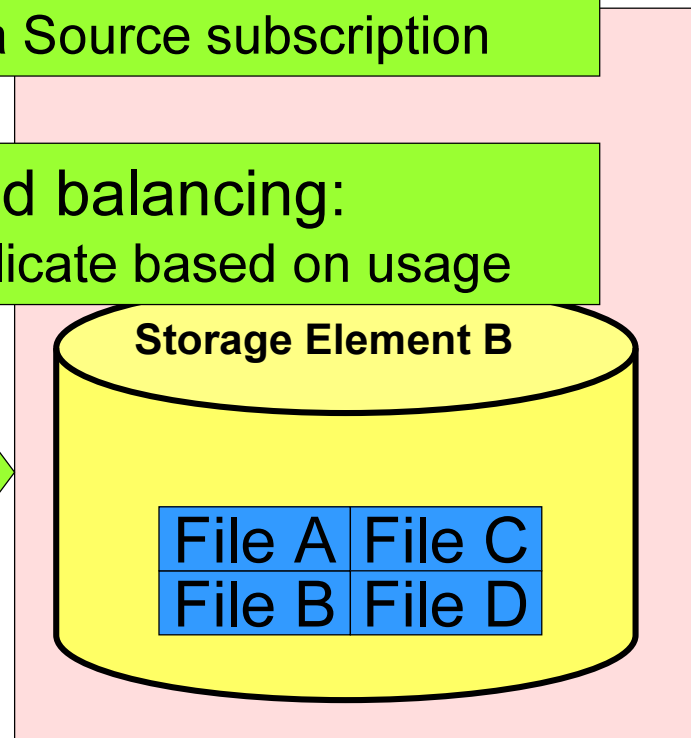
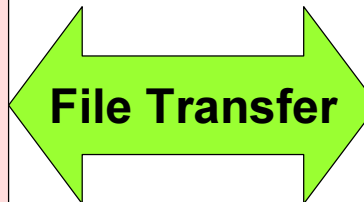
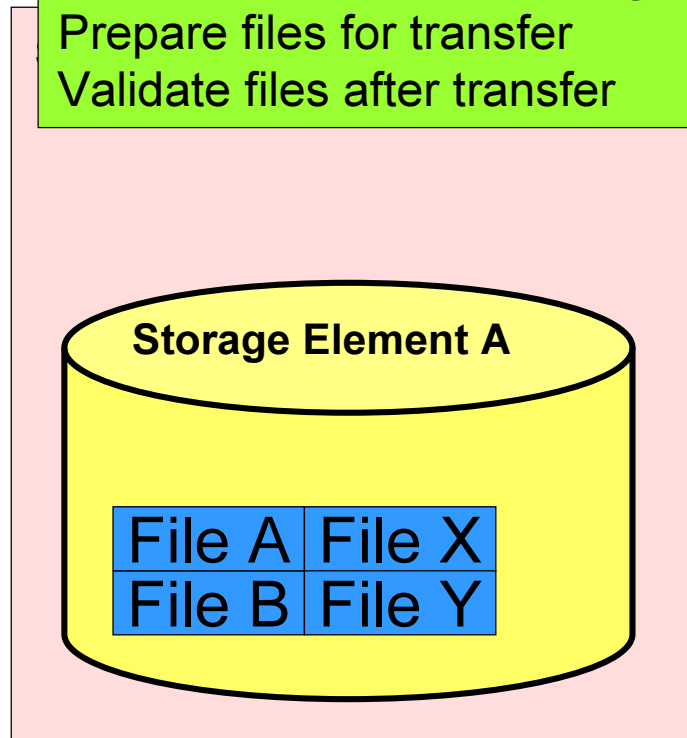
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**Replication Automation:**  
Data Source subscription

**Load balancing:**  
Replicate based on usage





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

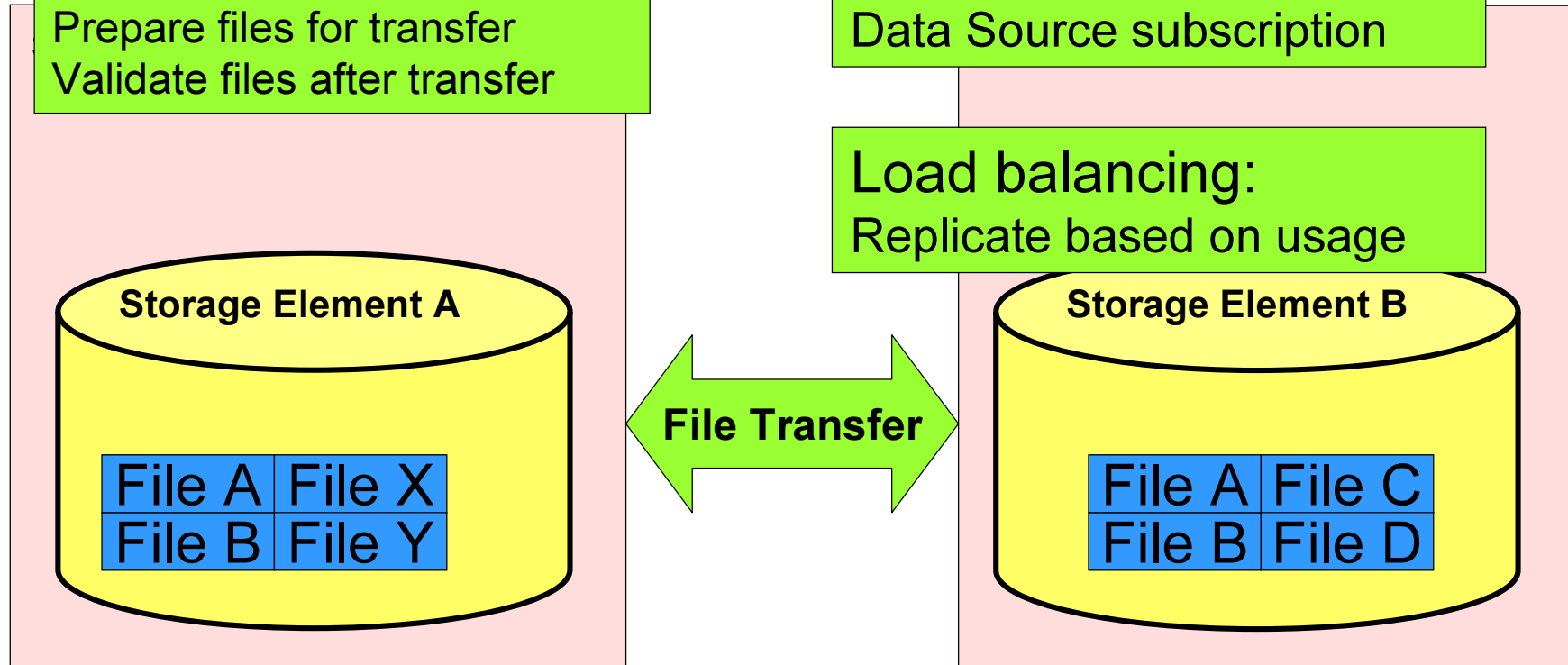
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Prepare files for transfer  
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**Replication Automation:**  
Data Source subscription

**Metadata:**  
LFN metadata  
Transaction information  
Access patterns

**Load balancing:**  
Replicate based on usage

File A	File X
File B	File Y

File Transfer

Storage Element B

File A	File C
File B	File D



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

**Replica Catalog:**  
Map Logical to Site files

**Replica Selection:**  
Get best replica

**Pre- Post-processing:**  
Prepare files for transfer  
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File Transfer

**Storage Element B**

File A	File C
File B	File D

**Security**