Enabling Grids for E-science in Europe

Data Management in Grid Enviroment

Data Management in Grids

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- ***Safe and reliable file transfer between grid nodes***
- ***Gathering and maintenance of information about data sources in the grid***
- ***Data access optimization***
- ***Providing of metadata services***
- ***Data sets consistency maintenance***

Data Mangement in contex of other grid services

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- *Virtual organization support*
- *Security (authorization, authentification)*
- *Storage systems*
- *Grid monitoring services*

GridFTP
Safe and reliable file transfer

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Based on FTP:

- ➢ *Widely implemented and well-understood standard protocol*
- ➢ *Well-defined architecture for protocol extensions*
- ➢ *Numerous extensions where already added*
- ➢ *Transfers between client and server support*
- ➢ *Third party transfers between two servers support*

GridFTP
Safe and reliable file transfer

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GridFTP - extension of FTP:

- ➢ Grid Security Infrastructure (GSI) and Kerberos support
- ➢ Third-party control of data transfer
- ➢ Parallel data transfer
- ➢ Partial file transfer
- ➢ Stripped data transport
- ➢ Support for reliable data transfer

Replication of Data Sets

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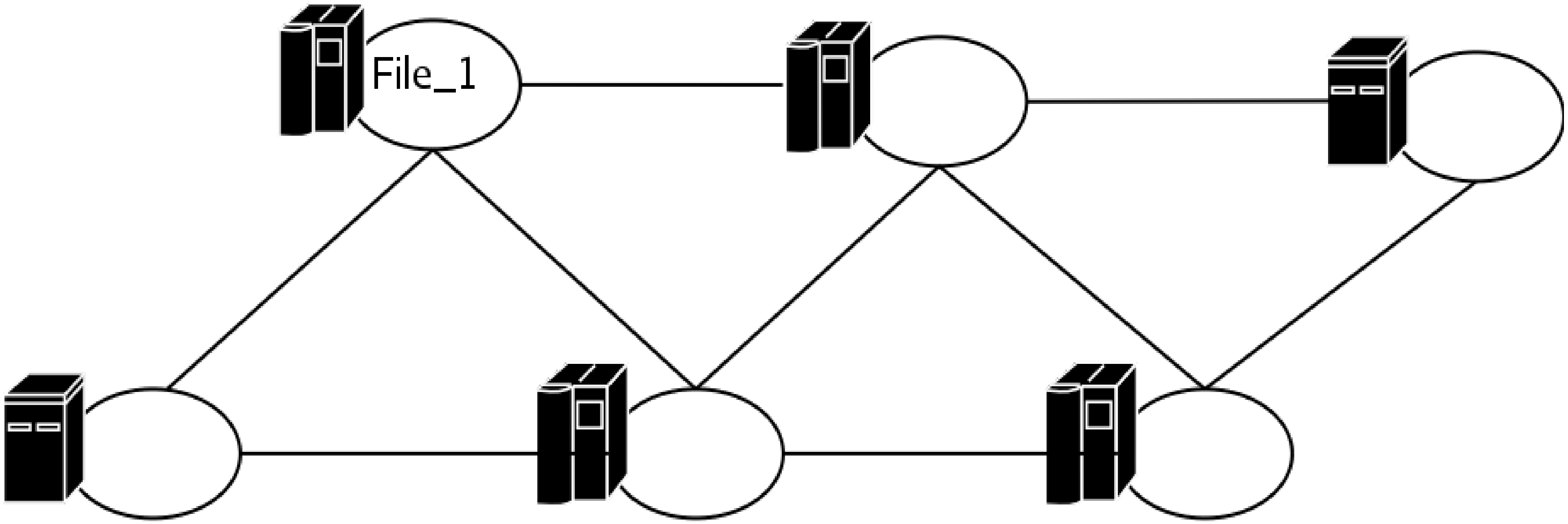
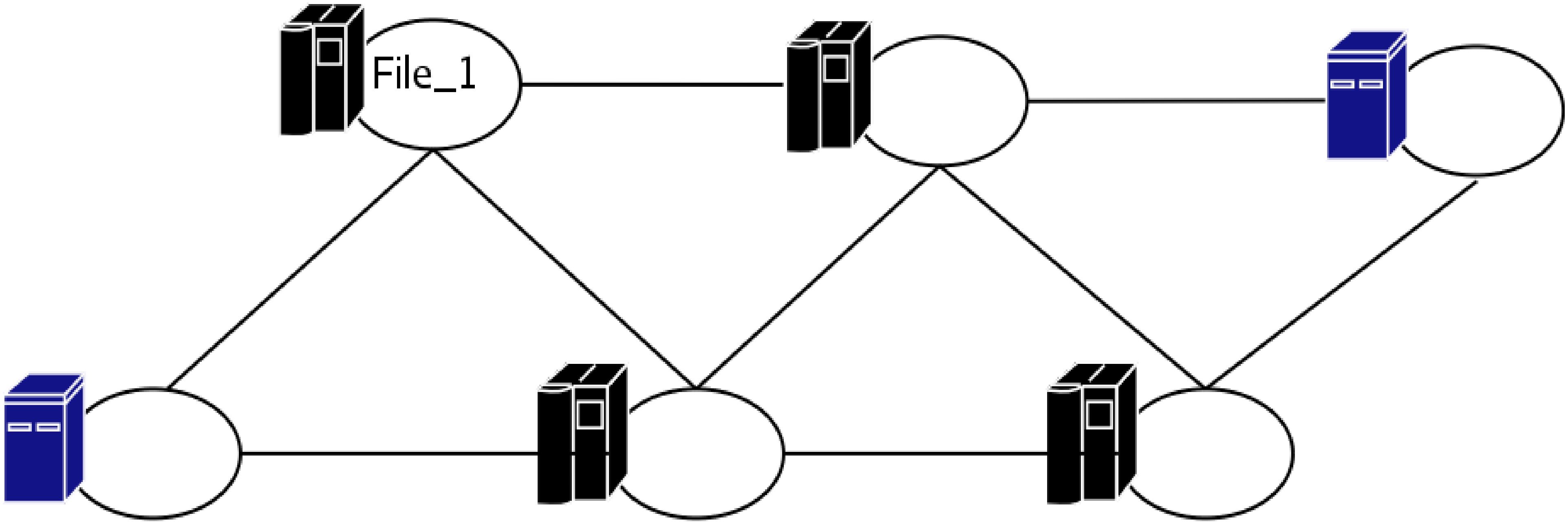
Replication of Data Sets - key concept to increase data availability



Replication of Data Sets

***Replication of Data Sets* - key concept to increase data availability**



Replication of Data Sets

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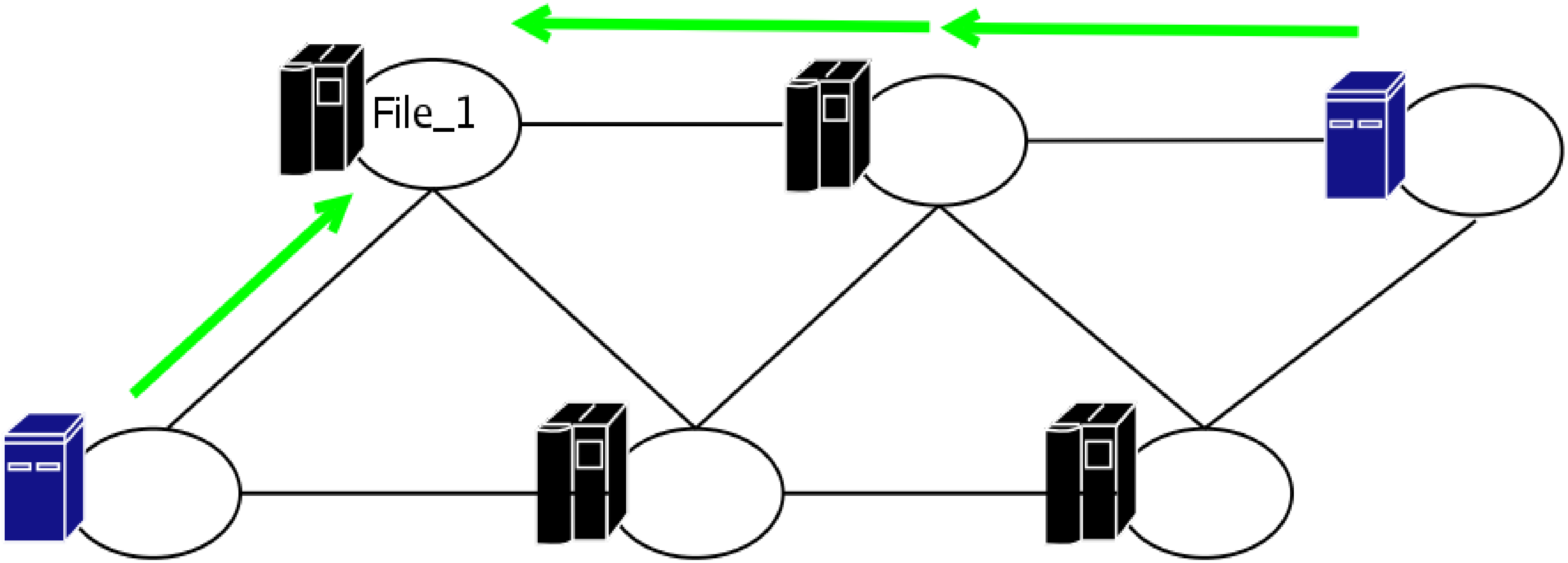
Replication of Data Sets - key concept to increase data availability



Replication of Data Sets

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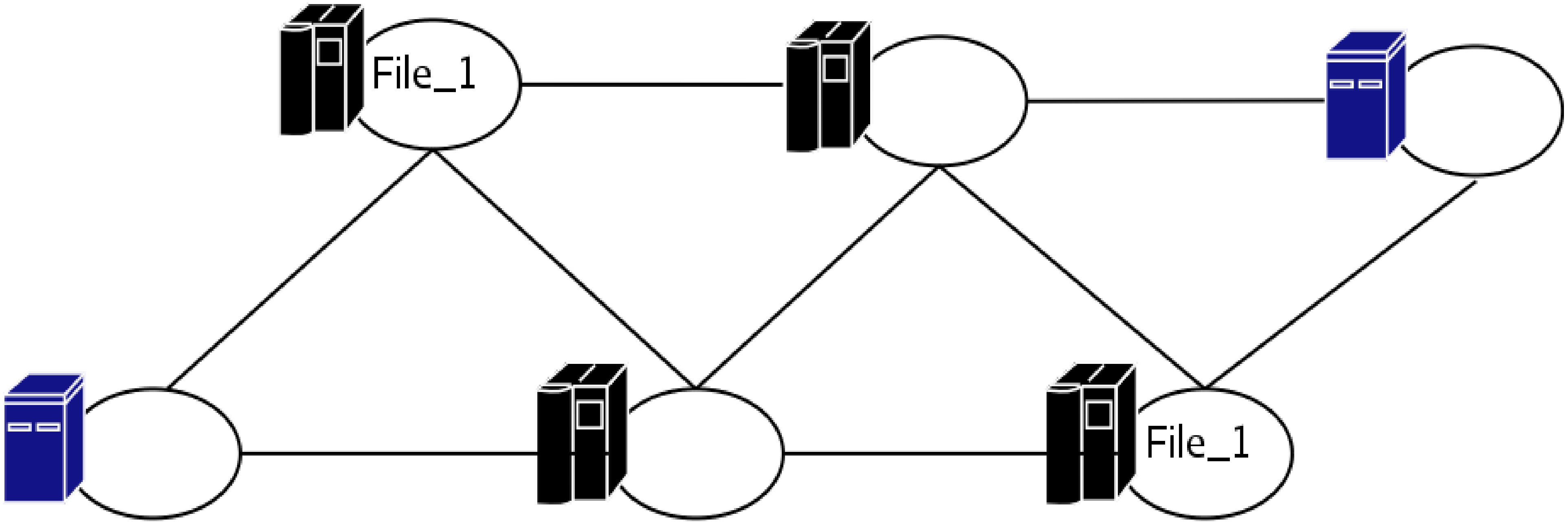

Replication of Data Sets

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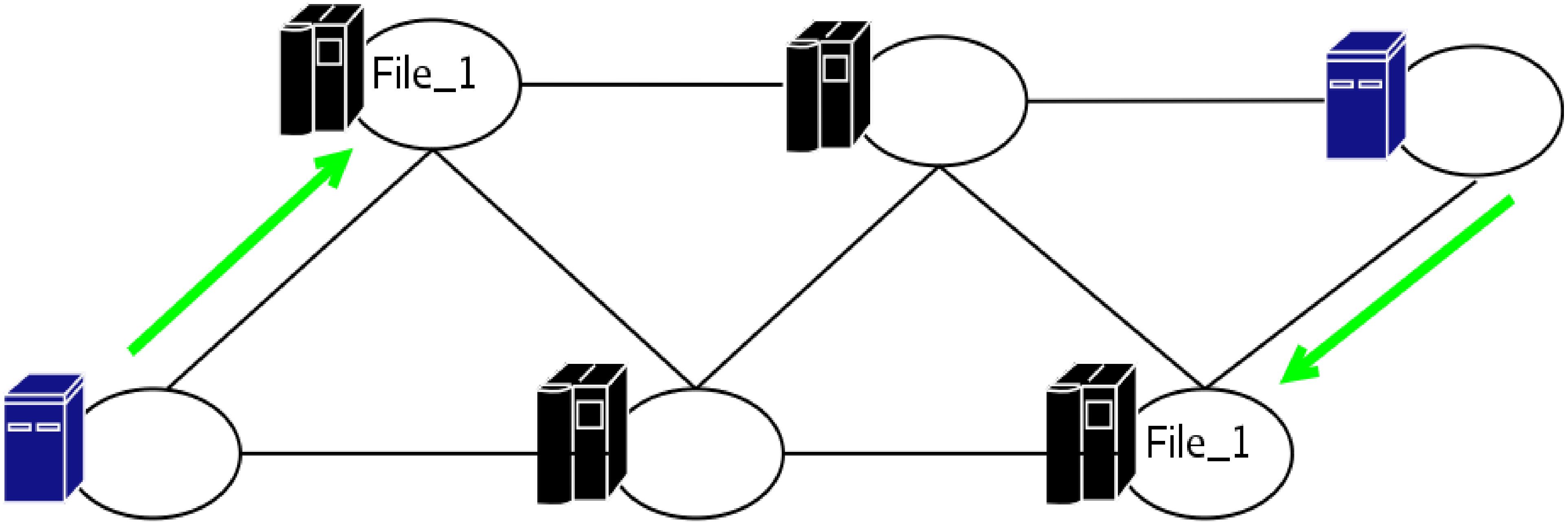
Replication of Data Sets - key concept to increase data availability



Replica Location Service

- ***Provide information about replicas location***
- ***Replicas are identified by LFN and PFN***

- ***LFN - Logical File Name***
  - ***global unique file identifier***
- ***PFN – Physical File Name***
  - ***replica name on concrete Storage Element***

Replica Location Service

Replica Location Catalog

- Service run at each grid node
- Stores information about files stored at the grid node
- Provides mapping between LFN and PFN
- Propagate information to Replica Location Index
- Soft state update mechanism

Information Propagation:

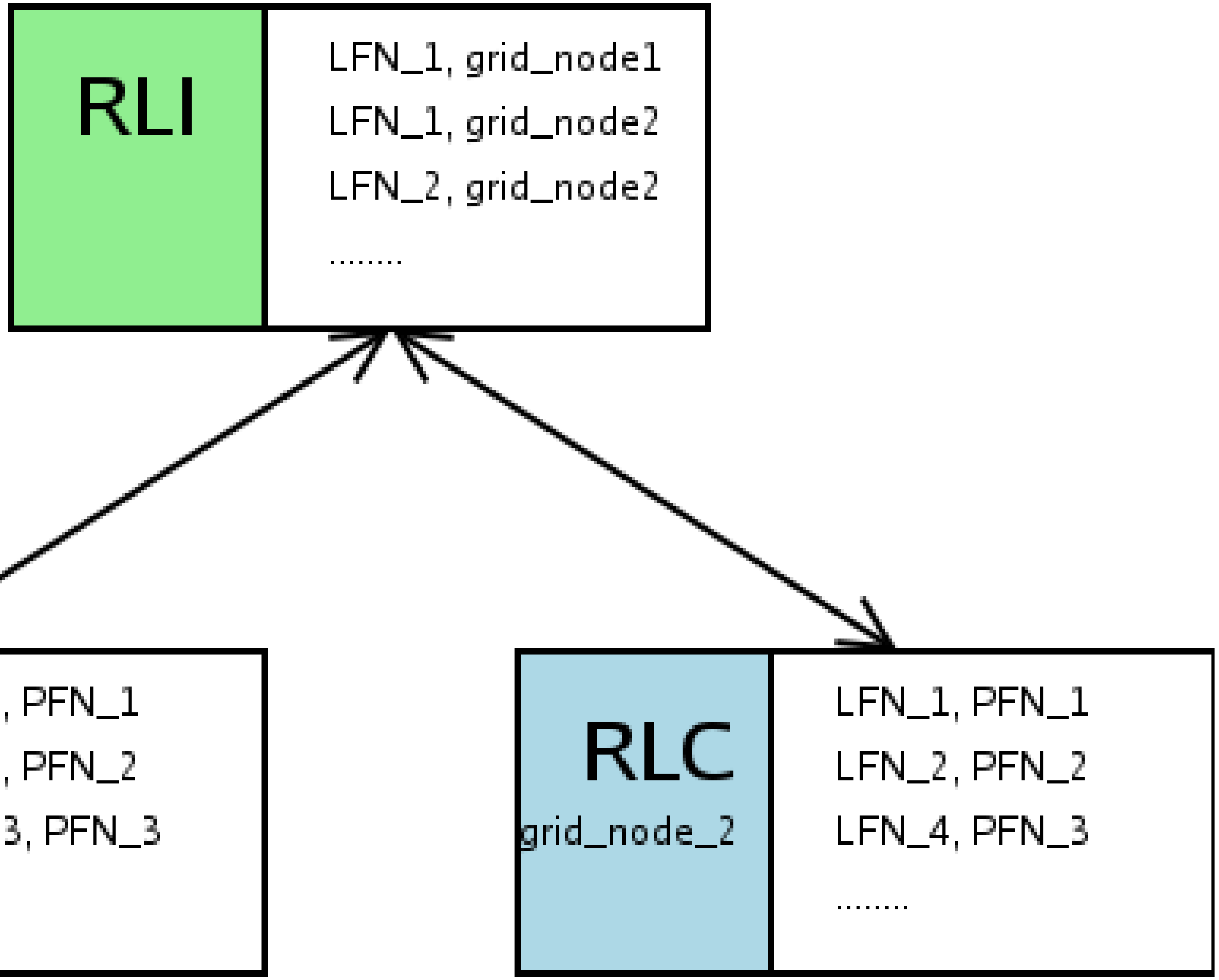
- Full
- Compressed (Bloom filters)

Replica Location Service

Replica Location Index

- ***Central grid service***
- ***Gathers information from grid RLCs***
- ***Provides mapping between LFN and a set of grid nodes containing given file***

Replica Location Service



RLI

LFN_1, grid_node1
LFN_1, grid_node2
LFN_2, grid_node2
....

RLC

grid_node_1

LFN_1, PFN_1
LFN_8, PFN_2
LFN_13, PFN_3
....

RLC

grid_node_2

LFN_1, PFN_1
LFN_2, PFN_2
LFN_4, PFN_3
....

Replica Location Service

Replica Manger Service

Integrates GritFTP and catalog services

RLS Implementations

EU Data Grid

-only full information transfer between RLCs and RLI

Globus Toolkit

- compressed information transfer to RLI

- bloom filters

Replica Access Optimization

Short-term optimization

- ***select best file replica for given grid node an LFN***
- ***selection based on current network status & replica location***
- ***implemented in EU Data Grid project***

Long-term optimization

- ***automated file replication and deletion***
- ***prediction of replica usefulness at a given site***
- ***only simulations were done***

Metadata Services

- ➢*descriptive information about data*
- ➢*lot of metadata types*

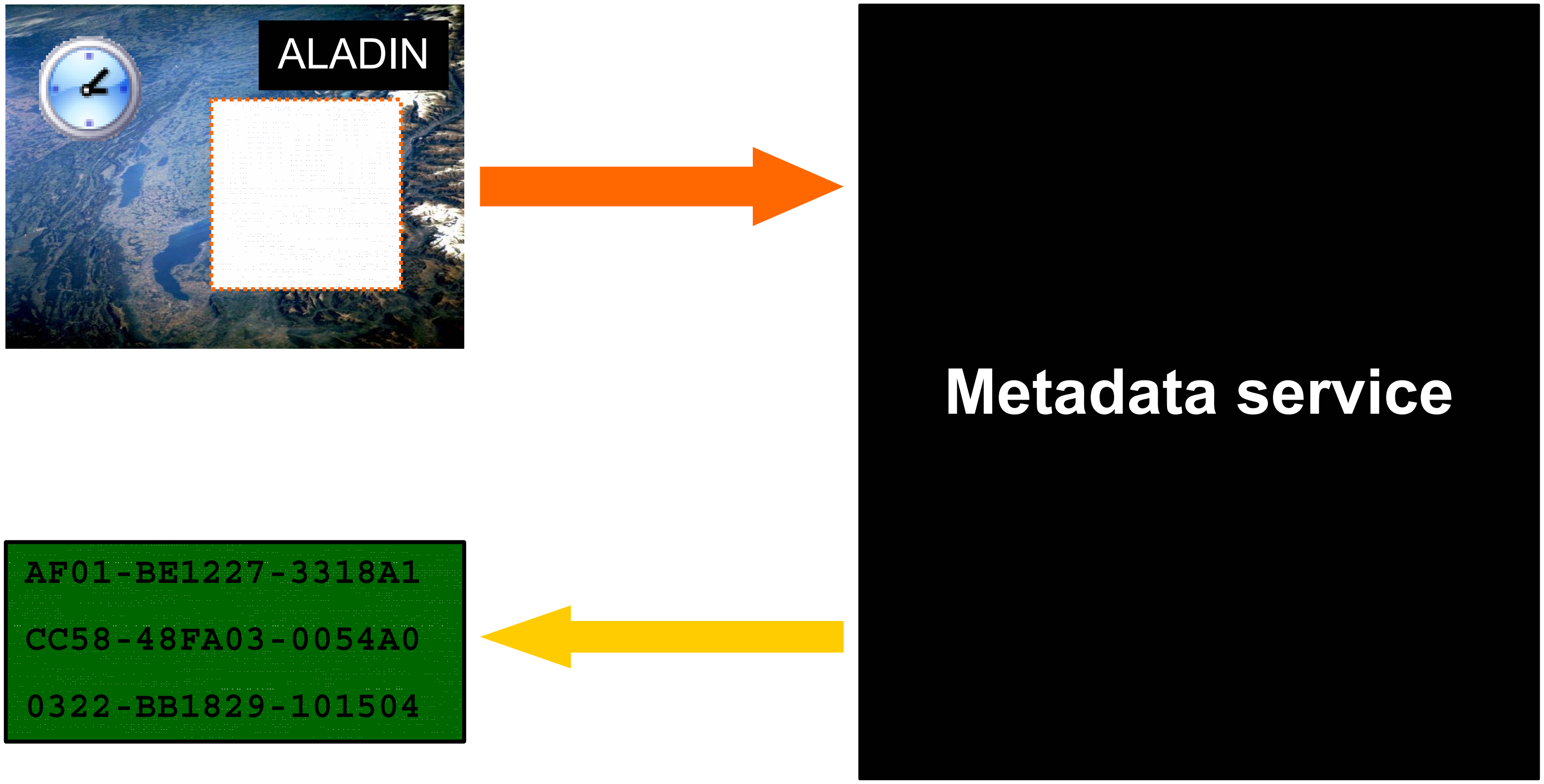
  general metadata (file type, file size, creation date)

  security metadata

  application specific metadata

- ➢*metadata description by ontologies*

Metadata Services



ALADIN

Metadata service

AF01-BE1227-3318A1

CC58-48FA03-0054A0

0322-BB1829-101504

Replica Consistency Services

- ***difficult task***
- ***standard transactional two-phase commit protocol is not suitable for grids***
- ***current state: no replica updates are allowed***
- ***data update only by file versioning***