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Grid Information Service (Meta-Directory Service 2)

Globus Toolkit™ Developer Tutorial

The Globus Project™

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http://www.globus.org/

Section Overview

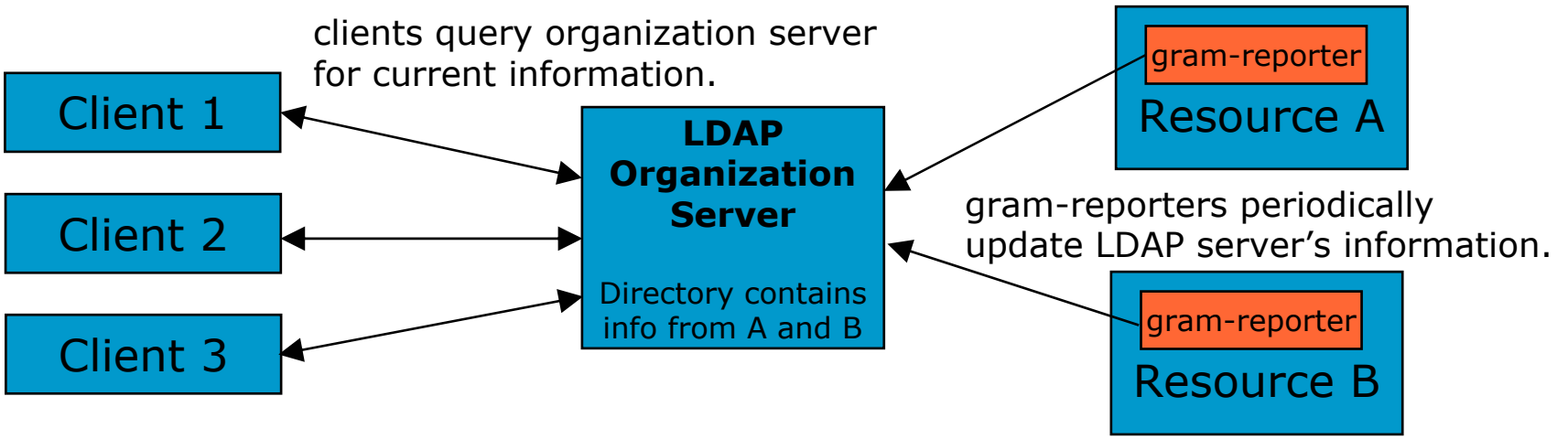
- MDS review
- Information model
- Client tools and APIs
- Configuring servers and adding service providers

Globus MDS Review

- Meta Directory Service (MDS)
  - Globus Toolkit implementation of a Grid Info Service
- System information is critical to operation of the grid and construction of applications
- A basis for configuration and adaptation in heterogeneous, dynamic environments
- Requirements and characteristics
  - Uniform, flexible access to information
  - Scalable, efficient access to dynamic data
  - Access to multiple information sources
  - Decentralized maintenance

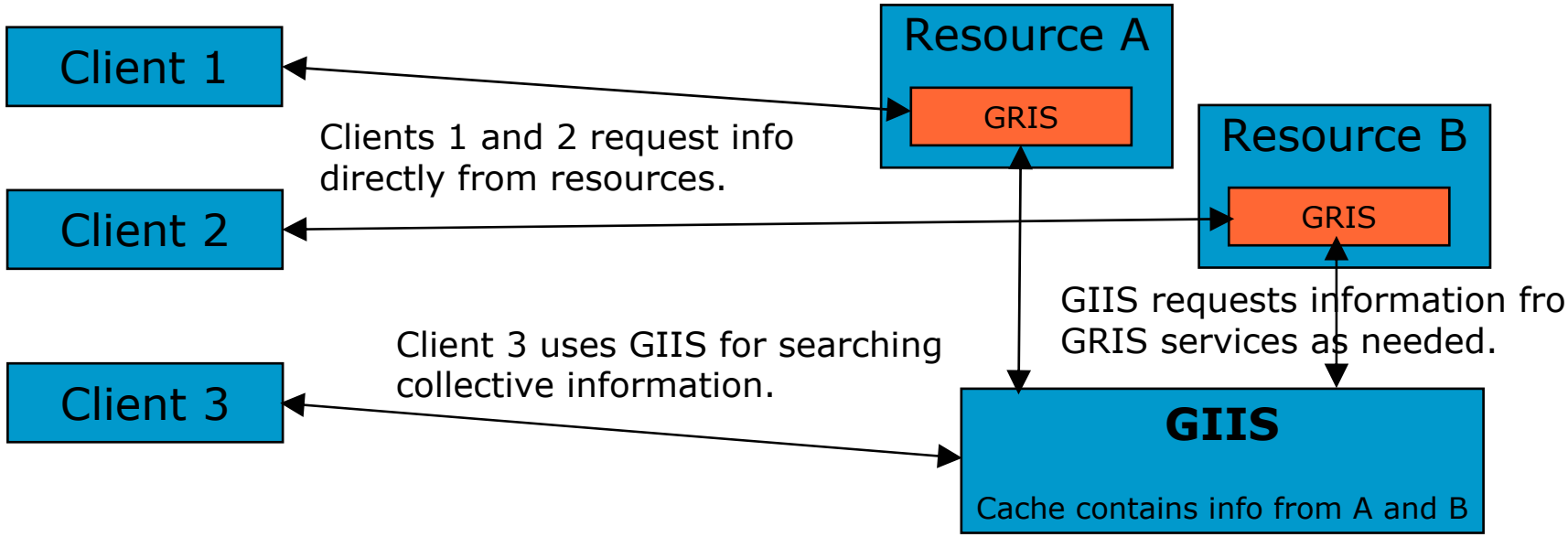
"Classic" MDS Architecture (MDS-1)

- Resources push information into a central organization server via regular updates (globus-gram-reporter), where it can be retrieved by clients.
- Regular updates don't scale as the number of resources grow rapidly. Commercial LDAP servers are optimized for "read" requests, and can't handle frequent "write" requests.
- If organization server is unavailable, no information is available.

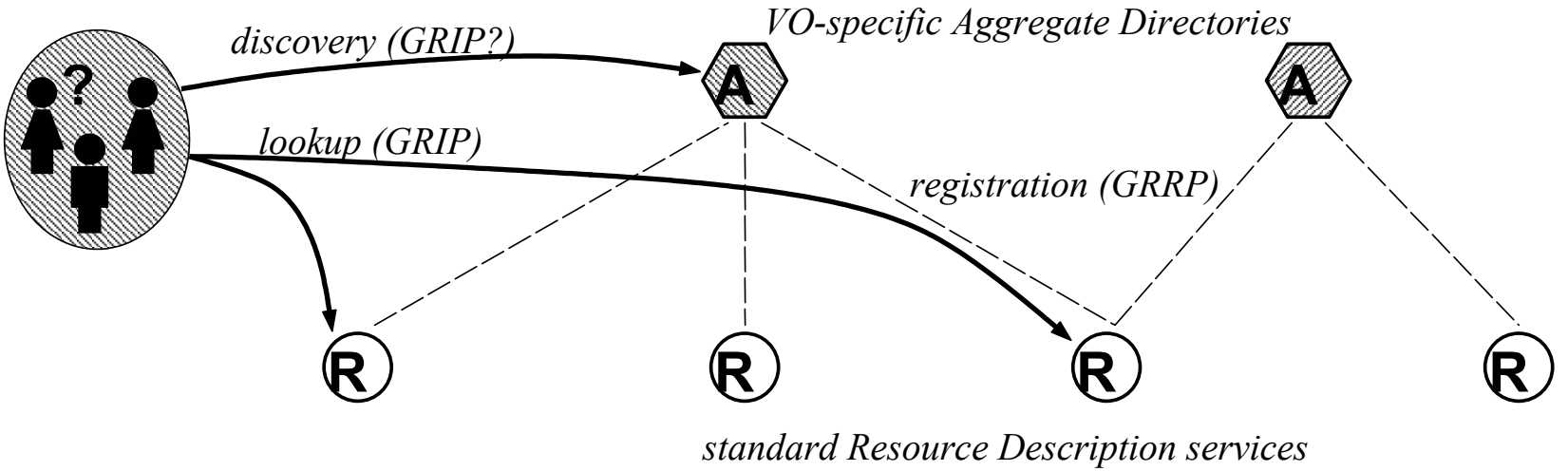


"Standard" MDS Architecture (MDS-2)

- Resources run a standard information service (GRIS) which speaks LDAP and provides information about the resource (no searching).
- GIIS provides a "caching" service much like a web search engine. Resources register with GIIS and GIIS pulls information from them when requested by a client and the cache as expired.
- GIIS provides the collective-level indexing/searching function.

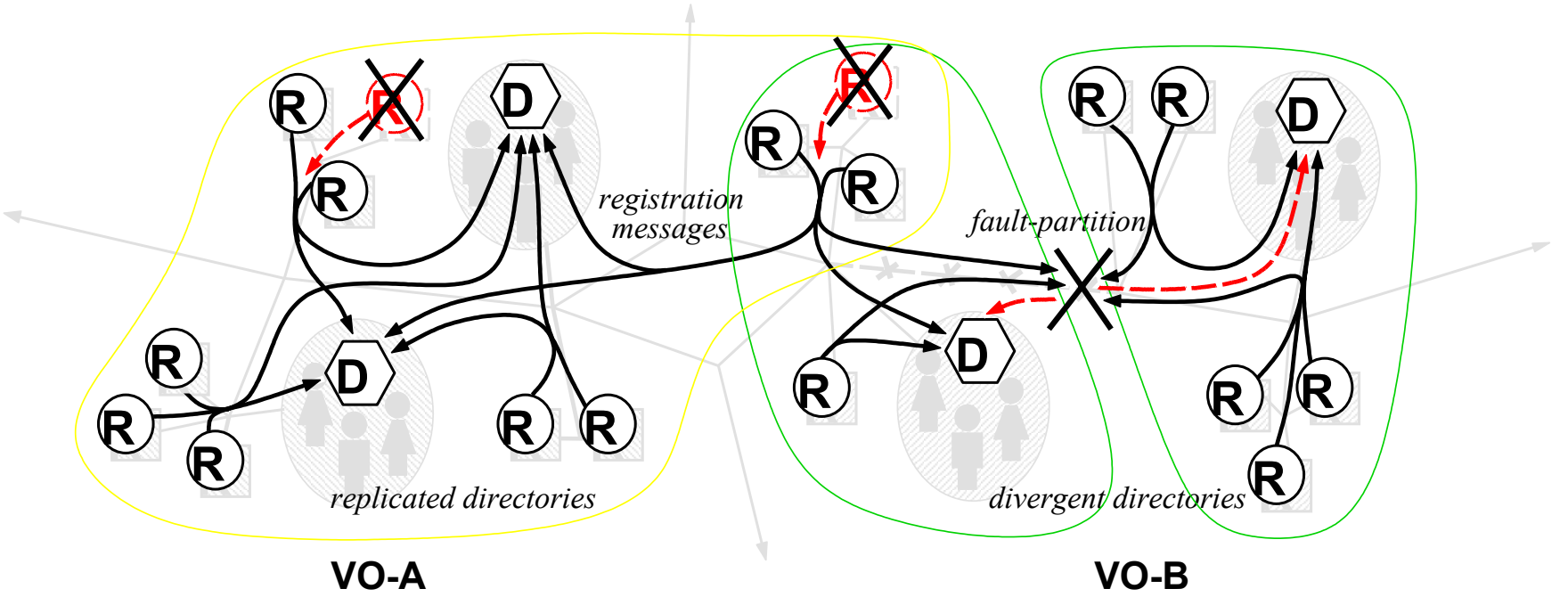


MDS-2 Service Architecture



- Dynamic Registration via Reg. Protocol (GRRP)
- Resource Inquiry via Info. Protocol (GRIP)
  - Co-located with resource on network
- Resource Discovery (via GRIP or other)
  - Using GRIP allows resource/directory hierarchy

Distributed Services



- Service scales with Grid growth
- Loose consistency model tolerates failures
- Interoperability by GRIP/GRRP protocols

Soft-state Registration

- Periodic notification
  - "Service/resource is available"
  - Expected-frequency metadata
- Automatic directory construction
  - Add new resources to directory
  - Invite resources to join new directory
- Self-cleaning
  - Reduce occurrence of "dead" references

MDS-2 Implementation

- Grid Information Service (GRIS)
  - Provides resource description
  - Modular content gateway
- Grid Index Information Service (GIIS)
  - Provides aggregate directory
  - Hierarchical groups of resources
- Lightweight Dir. Access Protocol (LDAP)
  - Standard with many client implementations
  - Used for GRIP (and GRRP currently)

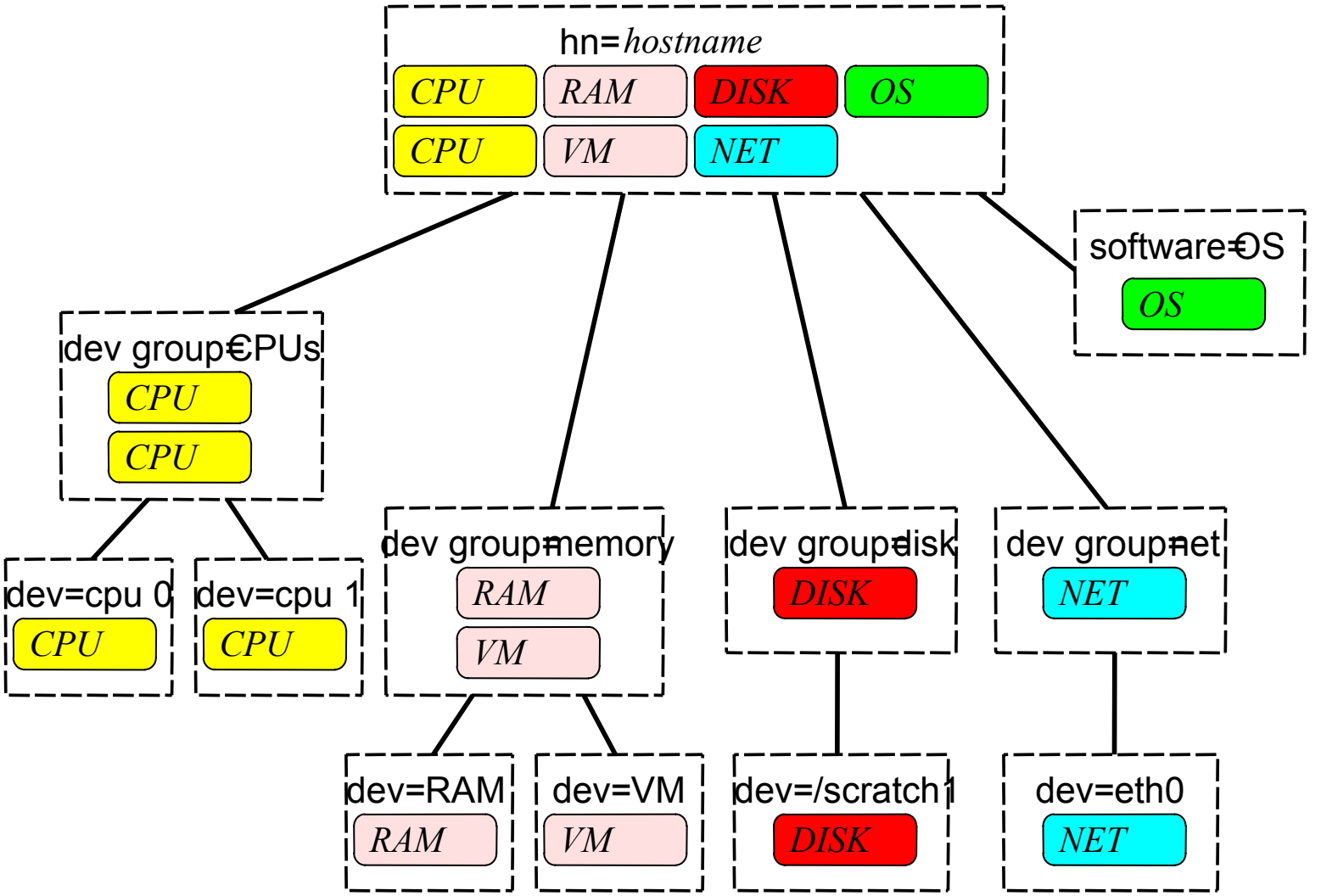
New MDS-2.1 Features

- Security Mechanisms
  - GSI mutual-authentication
  - Fine-grained access control by GSI name
- Performance Enhancements
  - Better query speeds
  - Less stale information
- New Information Model (schema)
  - Better representation of computers
  - Cleaner namespace management

MDS 2.1 Information Model

- Structural information
  - Resource hierarchy maps to objects
  - Named positions in LDAP DIT
- Merged information
  - Some parents "join" child data
  - Simplifies common query patterns
- Auxiliary information
  - Uniform representation of leaf/parent data
  - Uses LDAP auxiliary objectclasses

GRIS Host Objects



GRIS Object Hierarchy

- Mds-Host-name=*hostname*
  - Mds-Software-Deployment=operating system
  - Mds-Device-Group-name=processors
    - Mds-Device-name=cpu 0
  - Mds-Device-Group-name=memory
    - Mds-Device-name=physical memory
    - Mds-Device-name=virtual memory
  - Mds-Device-Group-name=filesystems
    - Mds-Device-name=/scratch1
    - Mds-Device-name=/scratch2
  - Mds-Device-Group-name=networks
    - Mds-Device-name=eth0

GRIS Structural Class Hierarchy

Mds

Attr: Mds-validfrom (like createtime)

Attr: Mds-validto (accuracy metadata)

Attr: Mds-keepto (discard metadata)

MdsHost

MdsDevice

MdsDeviceGroup

MdsSoftwareDeployment

- Every MDS object: name, time metadata

GRIS Auxiliary Class Examples

MdsCpu

Attr: Mds-Cpu-vendor

Attr: Mds-Cpu-model

Attr: Mds-Cpu-speedMHz

- Once per CPU

MdsCpuCache

Attr: Mds-Cpu-Cache-L1kB

- Once per CPU

MdsCpuSmp

Attr: Mds-Cpu-Smp-size

- Once per SMP

MdsCpuTotal

Attr: Mds-Cpu-Total-count

- Once per MPP

GRIS Auxiliary Class Examples

MdsCpuFree (once per SMP)

Attr: Mds-Cpu-Free-1minX100

Attr: Mds-Cpu-Free-5minX100

Attr: Mds-Cpu-Free-15minX100

MdsCpuTotalFree (once per MPP)

Attr: Mds-Cpu-Total-Free-1minX100

Attr: Mds-Cpu -Total-Free-5minX100

Attr: Mds-Cpu -Total-Free-15minX100

Client Tools

- Globus Toolkit includes 2 command line client tools for querying MDS services
  - grid-info-search: General purpose client
    - > grid-info-search –h <host> -p <port> -b <base> \
      -T <timeout> [<filter>] [<attributes>]
    - > -x: Anonymous access
  - grid-info-host-search: Same as grid-info-search, but defaults to GRIS standard port
    - > E.g. grid-info-host-search –h localhost
- Both clients can search for specific system information and filter results.

Köszönöm a figyelmüket

További információ: www.lpds.sztaki.hu