

# GLUE2 in the the EMI-ES job management interface and in the ARCLIB compute library



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Towards an integrated information system  
3rd workshop

- The EMI-ES information model
  - The Resource document
  - The Activity document
  - An LDAP overlook
- The arclib client library
  - A modular plugin system
  - Retrievers and GLUE2
  - Sample code

- Five port-types:
  - **ActivityCreation**
  - **ActivityManagement**
  - Delegation
  - **ActivityInfo**
  - **ResourceInfo**

# EMI-ES Information Model



- Five port-types:

- **ActivityCreation**

Only URLs to  
Access ResourceInfo  
and ActivityManagement

- **ActivityManagement**

Single Activity  
information

- Delegation

- **ActivityInfo**

Information  
port types

- **ResourceInfo**

Need both for full info!

- Five port-types:

- **ActivityCreation**

Only a URL to  
Access ResourceInfo

- **ActivityManagement**

Single Activity  
information

- Delegation

- **ActivityInfo**

Information  
port types

- **ResourceInfo**

Need both for full info!

- WS based
- Uses the GLUE2 jargon whenever possible
- Each **PortType** represented as a GLUE2 **Endpoint**
- **ResourceInfo** → **Resource Document**:  
Based on GLUE2 XML schema
- **ActivityInfo** → **Activity Document**:  
A GLUE2-like document

# Resource Document Structure



```
<GetResourceInfoResponse>
  <Services>
    <ComputingService>
      ID, Type, HealthState, Capability, QualityLevel
      CreationTime, Validity, Name, OtherInfo, StatusInfo, Complexity, TotalJobs, RunningJobs, WaitingJobs, StagingJobs, SuspendedJobs,
      PreLRMSWaitingJobs, Associations
      <ComputingEndpoint>
        InterfaceName = org.ogf.glue.emies.activitycreation
        Capability, URL, ID, ImplementationName, ImplementationVersion, QualityLevel, HealthState,
        ServingState, Staging, JobDescription
        CreationTime, Validity, Name, OtherInfo, Technology, InterfaceVersion, InterfaceExtension, WSDL, SupportedProfile, Semantics,
        Implementor, HealthStateInfo, StartTime, IssuerCA, TrustedCA, DowntimeAnnounce, DowntimeStart, DowntimeEnd, DowntimeInfo,
        TotalJobs, RunningJobs, WaitingJobs, StagingJobs, SuspendedJobs, PreLRMSWaitingJobs, Associations
      </AccessPolicy> </AccessPolicy>
    </ComputingEndpoint>
    <ComputingEndpoint>
      InterfaceName = org.ogf.glue.emies.activitymanagement , Capability, ...
    </ComputingEndpoint>
    <ComputingEndpoint>
      InterfaceName = org.ogf.glue.emies.activityinfo , Capability, ...
    </ComputingEndpoint>
    <Endpoint>
      InterfaceName = org.ogf.glue.emies.resourceinfo , Capability, ...
    </Endpoint>
    <Endpoint>
      InterfaceName = org.ogf.glue.emies.activityinfo , Capability, ...
    </Endpoint>
    <ComputingManager> </ComputingManager>
    <ComputingShare> </ComputingShare>
    <Location> </Location>
    <Contacts> </Contacts>
    <!-- non EMI-ES endpoints -->
    <ComputingEndpoint>
      InterfaceName = org.nordugrid.gridftpjob , Capability, ...
    </ComputingEndpoint>
    <Endpoint>
      InterfaceName = org.nordugrid.ldapng , Capability, ...
    </Endpoint>
  </ComputingService>
</Services>
</GetResourceInfoResponse>
```

# Resource Document Structure



EUROPEAN MIDDLEWARE INITIATIVE

```
<GetResourceInfoResponse>
  <Services>
    <ComputingService>
      ID, Type, HealthState, Capability, QualityLevel
      CreationTime, Validity, Name, OtherInfo, StatusInfo, Complexity, TotalJobs, RunningJobs, WaitingJobs, StagingJobs, SuspendedJobs,
      PreLRMSWaitingJobs, Associations
      <ComputingEndpoint>
        InterfaceName = org.ogf.glue.emies.activitycreation
        Capability, URL, ID, ImplementationName, ImplementationVersion, QualityLevel, HealthState,
        ServingState, Staging, JobDescription
        CreationTime, Validity, Name, OtherInfo, Technology, InterfaceVersion, InterfaceExtension, WSDL, SupportedProfile, Semantics,
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        TotalJobs, RunningJobs, WaitingJobs, StagingJobs, SuspendedJobs, PreLRMSWaitingJobs, Associations
      </AccessPolicy></AccessPolicy>
    </ComputingEndpoint>
    <ComputingEndpoint>
      InterfaceName = org.ogf.glue.emies.activitymanagement , Capability, ...
    </ComputingEndpoint>
    <ComputingEndpoint>
      InterfaceName = org.ogf.glue.emies.activityinfo , Capability, ...
    </ComputingEndpoint>
    <Endpoint>
      InterfaceName = org.ogf.glue.emies.resourceinfo , Capability, ...
    </Endpoint>
    <Endpoint>
      InterfaceName = org.ogf.glue.emies.activityinfo , Capability, ...
    </Endpoint>
    <ComputingManager></ComputingManager>
    <ComputingShare></ComputingShare>
    <Location></Location>
    <Contacts></Contacts>
    <!-- non EMI-ES endpoints -->
    <ComputingEndpoint>
      InterfaceName = org.nordugrid.gridftpjob , Capability, ...
    </ComputingEndpoint>
    <Endpoint>
      InterfaceName = org.nordugrid.idapng ,Capability, ...
    </Endpoint>
  </ComputingService>
</Services>
</GetResourceInfoResponse>
```

Might change  
wrt  
official GLUE2  
XML schema



# Activity Document Structure



**<ActivityInfoDocument>**

**<!-- Mandatory -->**

**ID**

**State**

**IDFromEndpoint**

**Owner**

**<!-- Optional -->**

CreationTime, Validity, LocalIDFromManager JobDescription, RestartState, ExitCode, ComputingManagerExitCode, Error, WaitingPosition, UserDomain, LocalOwner, RequestedTotalWallTime, RequestedTotalCPUTime, RequestedSlots, RequestedApplicationEnvironment, Sdtin, Stdout, StdErr, LogDir, ExecutionNode, Queue, UsedTotalWallTime, UsedTotalCPUTime, UsedMainMemory, SubmissionTime, ComputingManagerSubmissionTime StartTime, ComputingManagerEndTime, EndTime, WorkingAreaEraseTime, ProxyExpirationTime, SubmissionHost, SubmissionClient, OtherMessages

**<!-- EMIES specific -->**

**StageInDirectory**

**StageOutDirectory**

**SessionDirectory**

**ComputingActivityHistory**

**</ActivityInfoDocument>**

# Activity Document Structure



`<ActivityInfoDocument>`

`<!-- Mandatory -->`

**ID**

**State**

**IDFromEndpoint**

**Owner**

`<!-- Optional -->`

CreationTime, Validity, LocalIDFromManager JobDescription, RestartState, ExitCode, ComputingManagerExitCode, Error, WaitingPosition, UserDomain, LocalOwner, RequestedTotalWallTime, RequestedTotalCPUTime, RequestedSlots, RequestedApplicationEnvironment, Sdtin, Stdout, StdErr, LogDir, ExecutionNode, Queue, UsedTotalWallTime, UsedTotalCPUTime, UsedMainMemory, SubmissionTime, ComputingManagerSubmissionTime StartTime, ComputingManagerEndTime, EndTime, WorkingAreaEraseTime, ProxyExpirationTime, SubmissionHost, SubmissionClient, OtherMessages

`<!-- EMIES specific -->`

**StageInDirectory**

**StageOutDirectory**

**SessionDirectory**

**ComputingActivityHistory**

`</ActivityInfoDocument>`

Adoption of David Meredith's flat GLUE2 XML schema might make this document a GLUE2 document.

# ARC EMIES LDAP rendering

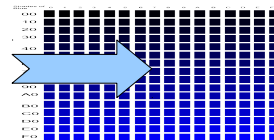
Entries

- +- aasyfe-grid.fg.csc.f
- +- bdi.grif.r-2170
- +- bdi-site.ca.inf.n.t
- +- celano-grid.lu.f.t
- +- cream01.kg.cscs.ch
- +- cream-39.pd.inf.n.t
- +- cream-38.pd.inf.n.t
- +- cream-52.pd.inf.n.t
- +- edg-prod.nbi.dk
- +- gridtest.hep.lu.se
- o=glue
- GLUE2DomainID=urn:ogf:AdminDomain:UNDEFINEDVALUE
- GLUE2GroupID=resource
  - GLUE2ServiceID=urn:ogf:ComputingService:gridtest.hep.lu.se:arex
  - GLUE2ContactID=urn:ogf:Contact:gridtest.hep.lu.se:ComputingService:arex:cn=0
  - GLUE2EndpointID=urn:ogf:ComputingEndpoint:gridtest.hep.lu.se:emies:https://gridtest.hep.lu.se:50000/arex:ac
  - GLUE2GroupID=ComputingActivities
    - GLUE2PolicyID=urn:ogf:AccessPolicy:gridtest.hep.lu.se:basic
    - GLUE2EndpointID=urn:ogf:ComputingEndpoint:gridtest.hep.lu.se:emies:https://gridtest.hep.lu.se:50000/arex:ai
    - GLUE2GroupID=ComputingActivities
      - GLUE2PolicyID=urn:ogf:AccessPolicy:gridtest.hep.lu.se:basic
      - GLUE2EndpointID=urn:ogf:ComputingEndpoint:gridtest.hep.lu.se:emies:https://gridtest.hep.lu.se:50000/arex:am
      - GLUE2GroupID=ComputingActivities
        - GLUE2PolicyID=urn:ogf:AccessPolicy:gridtest.hep.lu.se:basic
        - GLUE2EndpointID=urn:ogf:ComputingEndpoint:gridtest.hep.lu.se:50000/arex:d
        - GLUE2PolicyID=urn:ogf:AccessPolicy:gridtest.hep.lu.se:basic
        - GLUE2EndpointID=urn:ogf:ComputingEndpoint:gridtest.hep.lu.se:emies:https://gridtest.hep.lu.se:50000/arex:n
        - GLUE2PolicyID=urn:ogf:AccessPolicy:gridtest.hep.lu.se:basic
        - GLUE2EndpointID=urn:ogf:ComputingEndpoint:gridtest.hep.lu.se:gridfobj:gnfj:gridtest.hep.lu.se:20113jps
        - GLUE2EndpointID=urn:ogf:ComputingEndpoint:gridtest.hep.lu.se:xbes:https://gridtest.hep.lu.se:50000/arex
        - GLUE2EndpointID=urn:ogf:Endpoint:gridtest.hep.lu.se:ldapglue1.2135
        - GLUE2EndpointID=urn:ogf:Endpoint:gridtest.hep.lu.se:ldapglue2.2135
        - GLUE2EndpointID=urn:ogf:Endpoint:gridtest.hep.lu.se:ldapj.2135
        - GLUE2EndpointID=urn:ogf:Endpoint:gridtest.hep.lu.se:wsl:fglue2:https://gridtest.hep.lu.se:50000/arex
        - GLUE2LocationID=urn:ogf:Location:gridtest.hep.lu.se:ComputingService:arex
        - GLUE2ManagerID=urn:ogf:ComputingManager:gridtest.hep.lu.se:jps
        - GLUE2ShareID=urn:ogf:ComputingShare:gridtest.hep.lu.se:long

- o=grid
- o=infosys
- + hercules.mib.inf.n.t SITE
- + jost.arne.si
- + kg.lsk.cern.ch
- + ldap://cluster1.csk.kg.ac.rs:2170
- + ldap://targata-grid.oulu.fi:2135
- + lruca-bdi.cs.inf.n.t SITE
- + lscf.nbi.dk
- + ockbor.uzh.ch
- + pgr02.grid.upjs.sk
- + pgr01.grid.upjs.sk
- + pif270
- + piff.hep.lu.se
- + pkoit.si.si:2135:mvs-vo-name=resource.o=grid
- + prod-bdi.cern.ch SITE
- + rc1.grid.upjs.sk
- + sbdi01.kg.cscs.ch
- + stedi.umd.sara.nl

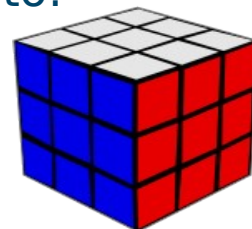
Distinguished Name:	GLUE2EndpointID=urn:ogf:ComputingEndpoint:gridtest.hep.lu.se:50000/arex:GLUE2ServiceID=urn:ogf:ce:gridtest.hep.lu.se:arex,GLUE2GroupID=resource,o=glue
Object Classes	GLUE2Endpoint
GLUE2ComputingEndpoint	
Attributes	urn:ogf:ComputingService:gridtest.hep.lu.se:arex
foreignKey	information:discovery:resource
GLUE2EndpointCapability	information:query:xpath1
GLUE2EndpointHealthState	ok
GLUE2EndpointID	urn:ogf:ComputingEndpoint:gridtest.hep.lu.se:emies:https://gridtest.hep.lu.se:50000/arex:ri
GLUE2EndpointImplementationName	ARC_CE
GLUE2EndpointImplementationVersion	2.0.0
GLUE2EndpointImplementor	Nordugrid
GLUE2EndpointInterfaceName	org.ogf.glue.emies.resourceinfo
GLUE2EndpointInterfaceVersion	1.14
GLUE2EndpointIssuerCA	/DC=eui/DC=KnowARC/CN=LUEM1-1345129960.68
GLUE2EndpointQualityLevel	development
GLUE2EndpointServiceForeignKey	urn:ogf:ComputingService:gridtest.hep.lu.se:arex
GLUE2EndpointServingState	production
GLUE2EndpointTechnology	webservice
GLUE2EndpointTrustedCA	/C=ARMJ=AmeSfGj/CN=ArmeSfG CA
/C=ARJ=e-Ciencia/OU=LUNPL/L=CeSPl/CN=PKIGrid	
/C=ATJ=Austriangrid/OU=Certification Authority/CN=Certificate Issuer	
/C=AUJ=APACGrid/OU=CACN=APACGrid/emailAddress=camanager@vparc.org	
/C=BEJ=BEGRID/OU=BELNET/CN=BEGrid CA	
/C=BMJ=Quovadis Limited/OU=Issuing Certification Authority/CN=Quovadis Grid IC A	
/C=BMJ=Quovadis Limited/OU=Root Certification Authority/CN=Quovadis Root Certification Authority	
/C=BRJ=ANSPJ/OU=ANSPGrid/CACN=ANSPGrid CA	
/C=BRJ=ICPEDUJ=UFF BrGrid/CACN=UFF Brazilian Grid Certification Authority	
/C=CAJ=GridCN=Grid Canada Certificate Authority	
/C=CHJ=SWITCH/CN=SWITCHSics CA	
/C=CHJ=Switch - Teleformatikdienste fuer Lehre und Forschung/CN=SWITCHGRID Root CA	
/C=CLJ=REUNACA/CN=REUNA Certification Authority	
/C=CNJ=HEP/CN=gridca-cy/emailAddress=gridca@hep.ac.cn	
/C=COJ=Unianes CAJ=UNIANDES/OU=DTI/CN=Unianes CA	
/C=CyJ=CyGrid/OU=HIP/CLUCN=CyGrid CA	
/C=DEJ=DFN-Verein/OU=DFN-PKICN=DFN SLCS-CA	
/C=DEJ=DFN-Verein/OU=DFN-PKICN=DFN-Verein PCA Grid - G01	
/C=DEJ=GermanGrid/CN=GridKa-CA	
/C=FRJ=CNRS/CN=CNRS2	

- A client library for accessing grid resources.

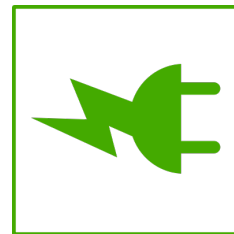


- Provides a simple but powerful API to:

- **discover services**
- create and manage jobs
- handle data transfers
- handle user credentials



- Features a modular architecture: it uses **plugins** to be able to talk to different services.



- **ServiceEndpointRetriever**  
class to query **registry services**, and **receive endpoints** of computing elements, storage elements or even other registries.  
(queries information system **index-levels**)
- **TargetInformationRetriever**  
class to get the information about a **computing element from the computing element itself**, about the state of the service, queues, runtime environments, etc.  
This information is used to do **matchmaking** of job descriptions and resources.  
(queries information system **local-levels**)

Current plugins for querying:

- EGIIS (Nordugrid Index)
- EMIR (EMI Registry)

Planned:

- top-level BDII

Currently it has plugins to query:

- LDAP with NorduGrid schema
- LDAP with GLUE1.x schema
- **LDAP** with a rendering of **GLUE2**
- **WSRF** with an **XML** rendering of **GLUE2**
- **EMIES ResourceInfo** with an **XML** rendering of **GLUE2**

# A sample chunk of code



```
// Create a UserConfig object, and setting the credentials
```

```
UserConfig uc;  
uc.ProxyPath("/path/to/proxy");  
uc.CACertificatesDirectory("");
```

```
// Create some endpoint objects from known computing elements
```

```
std::list<Endpoint> endpoints;  
endpoints.push_back(Endpoint("hostname.of.endpoint", Endpoint::COMPUTINGINFO));  
endpoints.push_back(Endpoint("hostname.of.other.endpoint", Endpoint::COMPUTINGINFO));  
endpoints.push_back(Endpoint("hostname.of.third.endpoint", Endpoint::COMPUTINGINFO));
```

```
// Parse the job description(s) from a file
```

```
std::list<Arc::JobDescription> jobdescriptions;  
JobDescription::ParseFromFile("filename.jsdl", jobdescriptions);
```

```
// Query the information about the endpoints, do matchmaking of the job descriptions and  
submit the jobs
```

```
Arc::SubmissionStatus status = s.BrokeredSubmit(endpoints, jobdescriptions);
```



# The workflow



- 1) **BrokeredSubmit** runs all Retrievers on a set of known Endpoints;
- 2) Each Endpoint URL is passed to all kind of enabled retriever **plugin**
- 3) Every Target and Service retriever, **in parallel**, tries to contact each Endpoint and tries to communicate; only returns data if communication is successful
- 4) Currently, the data used is that returned by the **first retriever to finish**. More elaborate techniques can be added.

- EMI-ES enforces the use of GLUE2
  - ResourceInfo GLUE2 document
  - ActivityInfo GLUE2-like document
  - Documents might change depending on the GLUE2 group decisions
- arclib is a versatile plugin-based library
  - Enables interaction with the current registries and direct interaction with CEs
  - May be used as the foundation for new clients and gateways

# THANKS!

INSERT COIN TO PLAY GRID!

CREDIT 0