GLUE Schema v1.2 Mapping to Old Classad Format
DRAFT

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Abstract

The old classad repesentation of resource characteristics can be used in out-of-the-box resource selection technologies, such as the Condor Match Making Service. This document proposes a mapping between the GLUE schema v1.2 and old classad format.

1 Introduction

The GLUE schema [1] provides a model to describe grid resources and their relationship. Previous works [2] [3] present a mapping between the GLUE schema and different popular data formats, such as LDIF and XML. This document presents a mapping between the GLUE schema and the old classad format. Such representation can be immediately used by out-of-the-box software, such as the Condor Match Making Service, to implement resource selection.

2 Limitations

The main motivation for the mapping of the GLUE schema to old classad format is providing a resource description that can be easily used in resource selection and discovery services. We do not focus on the mapping to address the needs of monitoring services. For these reasons, some entities of the GLUE schema, such as "Job" of "Computing Element", are explicitly excluded from the mapping.

In addition, this document does not provide a mapping for the Storage Resources description of the GLUE schema. This mapping addresses the translation to old classad format for the computing resources only.

3 Mapping Rules

This section presents a set of rules to translate the GLUE schema into old classad format. The section describes a set of basic rules and a set of extended rules.

As of March 2006, the basic rules have been implemented as the "old_classad" dialect of the CEMon service from gLite. The mapping uses as input the GLUE representation of the resources in LDIF format from the Generic Information Providers. These rules apply to the GLUE schema v1.1 and v1.2.

The extended rules are an extension/modification to the basic rules and focus on the "VOView" and "Location" entities in the GLUE schema v1.2. This extended mapping has not been implemented as of March 2006.

3.1 Basic Rules

- Attribute names are built using the same rules as for the LDIF mapping [2] and are not described here.

- The mapping is built by considering all the possible combinations of inter-related ComputingElement, Cluster, and Subcluster entities. In other words, each combination contains a single ComputingElement, Cluster, and Subcluster entity. Attributes in each combination are then mapped to a single old classad. In general, the full representation of the GLUE schema for a site in old classad format consists of a set of old classads.

- Attributes of the CE, Cluster, and Subcluster entities that, according to the schema, do not appear with more than one value (e.g. GlueCEInfoHostName, GlueCEInfoTotalCPUs) are translated in old classad format as AttributeName = Value

- Attributes that can appear with more than one value (indicated in the UML representation of the GLUE schema with an asterisc [*] next to the attribute type), must be trated differently. In an old classad, in fact, attributes must be unique i.e. appear only once in the classad. Every GLUE attribute that can be present multiple times with different values (e.g. GlueHostApplicationSoftwareRunTimeEnvironment) appears in the old classad mapping only once. The multiple values are represented as a single comma-separated string of the original values. For the purpose of resource selection using the Condor Match Making service, the values can be individually used in expressions using custom (call-out) functions. For example, to select a classad that contains a certain value in one of these attributes, the Match Making Service could provide the users a syntax like

```
MultiValueAttribute ==
     matchString("myValue",MultiValueAttributeValues)
```

- Every classad has the following three attributes added after the mapping is complete: “MyType”, “TargetType”, and “Name”. These attributes are present because the main client of the classad representation of resources is the OSG Resource Selector Service (ReSS), which

is based on the Condor Match Making Service. These attribute are used internally by Condor for Match Making and have the following constant values:

MyType = "Machine"

TargetType = "Job"

Name = <GlueCeName>.<GlueClusterName>.<GlueSubclusterName>

where the notation <GlueCeName> indicates the value of the GlueCeName attribute and similarly for the other attributes.

- In some General Information Provider implementations (GIP), the ContactString Info attribute of the ComputingElement entity is not necessarily a GRAM URL and may have the form <GRAM-URL>-<VO-Name>. This form cannot be used directly as a contact string by most grid clients. In LCG, the Resource Broker processes this value so that it can be used by the standard grid clients. In the mapping to old classad, instead, the value is published in the form <GRAM-URL>, irrespectively of the GIP implementation, by comparing the value of ContactString with the values in the GlueCEAccessControlBaseRule (i.e. the VO names). This is important in order to use the Condor Match Making Service out-of-the-box for Resource Selection.

- The "Job" and "VOView" entities of "Computing Element" AND the "Location" entity of "SubCluster" are not considered for the mapping to old classad in the basic mapping rules. "VOView" and "Location" are used in the extended mapping rules.

- The following rules are followed to quote string values in old classad

```
Classad Keywords
  Special keyword are not quoted.
  Special keywords: undefined, true, t, false, f, error
  Note: int, float, and the like are not keywords in the
  ClassAd language and have no special meaning

Variables
  If an attribute refers to another attribute, the atttribute
  name is a variable, and is not quoted.
```

```
  For instance, if you have:
  X = 3
  Y = X
  then if you evaluate Y, you get 3. In this case, no quote
  marks are used.
  Variables can be combined into expressions, like:
  Y = X + 3
  Y = X > 3

Numbers
  Numbers are not quoted, unless you don't want them to be
  interpreted as numbers. There are floating point numbers
  and integers. If the C function strtod() recognizes it as
  a floating point number, then it is, otherwise it isn't.

Strings
  The only other element that you can have is a string,
  and it must be quoted.
  X = "blah"
  Y = X
  Z = "foo"
  A backslash (\) can also be used for quoting the following
  strings:
  \  (\<blank>)
  \"
  \n
  \r
```

3.2 Basic Rules Example

Firgure 6 and 7 show an example of a set of two old classads. The set is derived applying the "basic rules" (section 3.1) to the LDIF representation of the example GLUE schema in figures 1 2, 3, 4, and 5.

Note that the LDIF example is derived from a real configuration of resources and does not include the GLUE attributes "GlueClusterTmpDir", "GlueClusterWNTmpDir", "GlueHostArchitecturePlatformType", "GlueHostProcessorVersion", "GlueHostProcessorInstructionSet", "GlueHostProcessorOtherDescription", and "GlueCEInfoGRAMVersion". These attributes are included

for completeness in the old classad set example.

3.3 Extended Rules

The extended rules provide a mapping to old classad for the GLUE schema entities "VOView" and "Location". The extended rules have to be used in addition to the basic rules of section 3.1. The extended rules are the following

- The mapping is built by considering all the possible combinations of inter-related ComputingElement, Cluster, Subcluster, and VOView entities. In other words, each combination contains a single ComputingElement, Cluster, Subcluster, and VOView entity. Attributes in each combination are then mapped to a single old classad. VOView attributes that have the same names as the ones for CE overwrite the CE values (e.g. GlueCEStateFreeJobSlots from the linked VOView, if present, overwrites GlueCEStateFreeJobSlots from CE). This makes it easier for users to express requirements on resource characteristics that affect the VO/group/role. In fact, the requirement expression does not change depending on whether VOView is present or not.

- The location entity appears in old classad as a multivalue attribute. The mapping is built as follows. For a given subcluster entity, we consider all its related Location entities. For a given attribute in the Location entity, we build the list of values in all the related Location entities as a comma-separated string of values. The order of the values must be the same across different attibutes i.e. values from the same entity have the same position on the list. This way, pairs of values from two different Location attributes can be selected using custom (call-out) functions in the Condor Match Making Service. In summary, in old classad format, for every subcluster, every attribute in the Location entity appears once with the list of values expressed as a list.

- The attribute Path from the Location entity is not advertised, as it is deemed to be of marginal importance in the resource selection process.

3.4 Extended Rules Example

Firgure 8, 9, 10, and 11 show an example of a set of two old classads (each classad is split in two figures to fit on the page). The set is derived applying

the “extended rules” (section 3.3) to the LDIF representation of the example GLUE schema in figures 1 2, 3, 4, and 5.

The classad are identical to the ones generated with the basic rules, with the addition of Location attributes. VOView attributes have overwritten CE attributes in the case of the cdf VO. The GlueLocationPath attribute of the Location entity is not included in the mapping.

References

[1] http://infnforge.cnaf.infn.it/glueinfomodel/

[2] http://infnforge.cnaf.infn.it/glueinfomodel/index.php/Mapping/LDAP

[3] http://infnforge.cnaf.infn.it/glueinfomodel/index.php/Mapping/XMLSchema

```
# Computing Element Entity (1)
dn: GlueCEUniqueID=rsgrid3.its.uiowa.edu:2119/jobmanager-condor-cdf,mds-vo-name=local,o=grid
objectClass: GlueCETop
objectClass: GlueCE
objectClass: GlueSchemaVersion
objectClass: GlueCEAccessControlBase
objectClass: GlueCEInfo
objectClass: GlueCEPolicy
objectClass: GlueCEState
objectClass: GlueInformationService
objectClass: GlueKey
GlueCEHostingCluster: rsgrid3.its.uiowa.edu
GlueCEName: cdf
GlueCEUniqueID: rsgrid3.its.uiowa.edu:2119/jobmanager-condor-cdf
GlueCEInfoGatekeeperPort: 2119
GlueCEInfoHostName: rsgrid3.its.uiowa.edu
GlueCEInfoLRMSType: condor
GlueCEInfoLRMSVersion: 6.7.13
GlueCEInfoTotalCPUs: 1
GlueCEInfoJobManager: condor
GlueCEInfoContactString: rsgrid3.its.uiowa.edu:2119/jobmanager-condor
GlueCEInfoApplicationDir: /export/grid/app
GlueCEInfoDataDir: /export/grid/data
GlueCEInfoDefaultSE: rsgrid3.its.uiowa.edu
GlueCEStateEstimatedResponseTime: 0
GlueCEStateFreeCPUs: 0
GlueCEStateRunningJobs: 0
GlueCEStateStatus: Production
GlueCEStateTotalJobs: 0
GlueCEStateWaitingJobs: 0
GlueCEStateWorstResponseTime: 0
GlueCEStateFreeJobSlots: 1
GlueCEPolicyMaxCPUTime: 0
GlueCEPolicyMaxRunningJobs: 0
GlueCEPolicyMaxTotalJobs: 0
GlueCEPolicyMaxWallClockTime: 0
GlueCEPolicyPriority: 0
GlueCEPolicyAssignedJobSlots: 1
GlueCEAccessControlBaseRule: VO:cdf
GlueForeignKey: GlueClusterUniqueID=rsgrid3.its.uiowa.edu
GlueInformationServiceURL: ldap://rsgrid3.its.uiowa.edu:2135/mds-vo-name=local,o=grid
GlueSchemaVersionMajor: 1
GlueSchemaVersionMinor: 2
```

Figure 1: An LDIF respresentation of a Computing Element entity of the GLUE schema v1.2

```
# Computing Element Entity (2)
dn: GlueCEUniqueID=rsgrid3.its.uiowa.edu:2119/jobmanager-condor-fermilab,mds-vo-name=local,o=grid
objectClass: GlueCETop
objectClass: GlueCE
objectClass: GlueSchemaVersion
objectClass: GlueCEAccessControlBase
objectClass: GlueCEInfo
objectClass: GlueCEPolicy
objectClass: GlueCEState
objectClass: GlueInformationService
objectClass: GlueKey
GlueCEHostingCluster: rsgrid3.its.uiowa.edu
GlueCEName: fermilab
GlueCEUniqueID: rsgrid3.its.uiowa.edu:2119/jobmanager-condor-fermilab
GlueCEInfoGatekeeperPort: 2119
GlueCEInfoHostName: rsgrid3.its.uiowa.edu
GlueCEInfoLRMSType: condor
GlueCEInfoLRMSVersion: 6.7.13
GlueCEInfoTotalCPUs: 1
GlueCEInfoJobManager: condor
GlueCEInfoContactString: rsgrid3.its.uiowa.edu:2119/jobmanager
GlueCEInfoApplicationDir: /export/grid/app
GlueCEInfoDataDir: /export/grid/data
GlueCEInfoDefaultSE: rsgrid3.its.uiowa.edu
GlueCEStateEstimatedResponseTime: 0
GlueCEStateFreeCPUs: 0
GlueCEStateRunningJobs: 0
GlueCEStateStatus: Production
GlueCEStateTotalJobs: 0
GlueCEStateWaitingJobs: 0
GlueCEStateWorstResponseTime: 0
GlueCEStateFreeJobSlots: 1
GlueCEPolicyMaxCPUTime: 0
GlueCEPolicyMaxRunningJobs: 0
GlueCEPolicyMaxTotalJobs: 0
GlueCEPolicyMaxWallClockTime: 0
GlueCEPolicyPriority: 0
GlueCEPolicyAssignedJobSlots: 1
GlueCEAccessControlBaseRule: VO:fermilab
GlueForeignKey: GlueClusterUniqueID=rsgrid3.its.uiowa.edu
GlueInformationServiceURL: ldap://rsgrid3.its.uiowa.edu:2135/mds-vo-name=local,o=grid
GlueSchemaVersionMajor: 1
GlueSchemaVersionMinor: 2
```

Figure 2: An LDIF respresentation of a Computing Element entity of the GLUE schema v1.2

```
# Cluster Entity
dn: GlueClusterUniqueID=rsgrid3.its.uiowa.edu,mds-vo-name=local,o=grid
objectClass: GlueClusterTop
objectClass: GlueCluster
objectClass: GlueSchemaVersion
objectClass: GlueInformationService
objectClass: GlueKey
GlueClusterName: rsgrid3.its.uiowa.edu
GlueClusterService: rsgrid3.its.uiowa.edu
GlueClusterUniqueID: rsgrid3.its.uiowa.edu
GlueForeignKey: GlueCEUniqueID=rsgrid3.its.uiowa.edu:2119/jobmanager-condor-cdf
GlueForeignKey: GlueCEUniqueID=rsgrid3.its.uiowa.edu:2119/jobmanager-condor-fermilab
GlueForeignKey: GlueSiteUniqueID=rsgrid3.its.uiowa.edu
GlueInformationServiceURL: ldap://rsgrid3.its.uiowa.edu:2135/mds-vo-name=local,o=grid
GlueSchemaVersionMajor: 1
GlueSchemaVersionMinor: 2

# SubCluster Entity
dn: GlueSubClusterUniqueID=rsgrid3.its.uiowa.edu, GlueClusterUniqueID=rsgrid3.its.uiowa.edu,
    mds-vo-name=local,o=grid
objectClass: GlueClusterTop
objectClass: GlueSubCluster
objectClass: GlueSchemaVersion
objectClass: GlueHostApplicationSoftware
objectClass: GlueHostArchitecture
objectClass: GlueHostBenchmark
objectClass: GlueHostMainMemory
objectClass: GlueHostNetworkAdapter
objectClass: GlueHostOperatingSystem
objectClass: GlueHostProcessor
objectClass: GlueInformationService
objectClass: GlueKey
GlueChunkKey: GlueClusterUniqueID=rsgrid3.its.uiowa.edu
GlueHostApplicationSoftwareRunTimeEnvironment: OSG-0.3.6
GlueHostApplicationSoftwareRunTimeEnvironment: ATLAS_LOC_903
GlueHostApplicationSoftwareRunTimeEnvironment: LCG-2_6_0
GlueHostArchitectureSMPSize: 2
GlueHostBenchmarkSF00: 380
GlueHostBenchmarkSI00: 400
GlueHostMainMemoryRAMSize: 512
GlueHostMainMemoryVirtualSize: 1024
GlueHostNetworkAdapterInboundIP: FALSE
GlueHostNetworkAdapterOutboundIP: TRUE
GlueHostOperatingSystemName: linux-rocks-3.3
GlueHostOperatingSystemRelease: Rocks Linux
GlueHostOperatingSystemVersion: 3.3
GlueHostProcessorClockSpeed: 1000
GlueHostProcessorModel: Pentium III (Coppermine)
GlueHostProcessorVendor: GenuineIntel
GlueSubClusterName: rsgrid3.its.uiowa.edu
GlueSubClusterUniqueID: rsgrid3.its.uiowa.edu
GlueSubClusterPhysicalCPUs: 1
GlueSubClusterLogicalCPUs: 2
GlueSubClusterTmpDir: /export/grid/data
GlueSubClusterWNTmpDir: /tmp
GlueInformationServiceURL: ldap://rsgrid3.its.uiowa.edu:2135/mds-vo-name=local,o=grid
GlueSchemaVersionMajor: 1
GlueSchemaVersionMinor: 2
```

Figure 3: An LDIF respresentation of a Cluster and SubCluster entities of the GLUE schema v1.2

```
# VOView Entity: Ignored in the mapping with the basic rules
dn: GlueVOViewLocalID=cdf,GlueCEUniqueID=rsgrid3.its.uiowa.edu:2119/
    jobmanager-condor-cdf,mds-vo-name=local,o=grid
objectClass: GlueCETop
objectClass: GlueVOView
objectClass: GlueCEInfo
objectClass: GlueCEState
objectClass: GlueCEAccessControlBase
objectClass: GlueCEPolicy
objectClass: GlueKey
objectClass: GlueSchemaVersion
GlueVOViewLocalID: cdf
GlueCEAccessControlBaseRule: VO:cdf
GlueCEStateRunningJobs: 0
GlueCEStateWaitingJobs: 0
GlueCEStateTotalJobs: 0
GlueCEStateFreeJobSlots: 1
GlueCEStateEstimatedResponseTime: 0
GlueCEStateWorstResponseTime: 0
GlueCEInfoDefaultSE: rsgrid3.its.uiowa.edu
GlueCEInfoApplicationDir: /export/grid/app
GlueCEInfoDataDir: /export/grid/data
GlueChunkKey: GlueCEUniqueID=rsgrid3.its.uiowa.edu:2119/jobmanager-condor-cdf
GlueSchemaVersionMajor: 1
GlueSchemaVersionMinor: 2

# Site Entity: Ignored in the mapping
dn: GlueSiteUniqueID=rsgrid3.its.uiowa.edu,mds-vo-name=local,o=grid
objectClass: GlueTop
objectClass: GlueSite
objectClass: GlueKey
objectClass: GlueSchemaVersion
GlueSiteUniqueID: rsgrid3.its.uiowa.edu
GlueSiteName: UIOWA-ITB
GlueSiteDescription: OSG Site
GlueSiteUserSupportContact: mailto: shaowen-wang@uiowa.edu
GlueSiteSysAdminContact: mailto: shaowen-wang@uiowa.edu
GlueSiteSecurityContact: mailto: shaowen-wang@uiowa.edu
GlueSiteLocation: Iowa City , US
GlueSiteLatitude: 41.67
GlueSiteLongitude: -91.55
GlueSiteWeb: http://rsgrid3.its.uiowa.edu
GlueForeignKey: GlueSiteUniqueID=rsgrid3.its.uiowa.edu
GlueSchemaVersionMajor: 1
GlueSchemaVersionMinor: 2
```

Figure 4: An LDIF respresentation of a VOView and Site entities of the GLUE schema v1.2. Site is ignored by all mappings because it is not useful for resource selection, while a mapipng for VOView is not provided by the basic rules but is provided by the extended rules.

```
# Location Entity: Ignored in the mapping with the basic rules
# OSG_SITE_READ, rsgrid3.its.uiowa.edu, rsgrid3.its.uiowa.edu, local, grid
dn: GlueLocationLocalID=OSG_SITE_READ,
    GlueSubClusterUniqueID=rsgrid3.its.uiowa.edu,
    GlueClusterUniqueID=rsgrid3.its.uiowa.edu,mds-vo-name=local,o=grid
objectClass: GlueClusterTop
objectClass: GlueLocation
objectClass: GlueKey
objectClass: GlueSchemaVersion
GlueLocationLocalID: OSG_SITE_READ
GlueLocationName: OSG_SITE_READ
GlueLocationPath: /export/grid/data
GlueChunkKey: GlueClusterUniqueID=rsgrid3.its.uiowa.edu
GlueSchemaVersionMajor: 1
GlueSchemaVersionMinor: 2

# OSG_SITE_WRITE, rsgrid3.its.uiowa.edu, rsgrid3.its.uiowa.edu, local, grid
dn: GlueLocationLocalID=OSG_SITE_WRITE,
    GlueSubClusterUniqueID=rsgrid3.its.uiowa.edu,
    GlueClusterUniqueID=rsgrid3.its.uiowa.edu,mds-vo-name=local,o=grid
objectClass: GlueClusterTop
objectClass: GlueLocation
objectClass: GlueKey
objectClass: GlueSchemaVersion
GlueLocationLocalID: OSG_SITE_WRITE
GlueLocationName: OSG_SITE_WRITE
GlueLocationPath: /export/grid/data
GlueChunkKey: GlueClusterUniqueID=rsgrid3.its.uiowa.edu
GlueSchemaVersionMajor: 1
GlueSchemaVersionMinor: 2
```

Figure 5: An LDIF respresentation of Location entities of the GLUE schema v1.2. The basic rules do not provide a mapping to old classad for these entitites, but the extended rules do (see Fig.9).

```
### Computing Element Entity (1)
GlueCEHostingCluster = "rsgrid3.its.uiowa.edu"
GlueCEName = "cdf"
GlueCEUniqueID = "rsgrid3.its.uiowa.edu:2119/jobmanager-condor-cdf"
GlueCEInfoGatekeeperPort = 2119
GlueCEInfoHostName = "rsgrid3.its.uiowa.edu"
GlueCEInfoLRMSType = "condor"
GlueCEInfoLRMSVersion = "6.7.13"
GlueCEInfoTotalCPUs = 1
GlueCEInfoJobManager = "condor"
GlueCEInfoContactString = "rsgrid3.its.uiowa.edu:2119/jobmanager-condor"
GlueCEInfoApplicationDir = "/export/grid/app"
GlueCEInfoDataDir = "/export/grid/data"
GlueCEInfoDefaultSE = "rsgrid3.its.uiowa.edu"
GlueCEInfoGRAMVersion = "1.7"
GlueCEStateEstimatedResponseTime = 0
GlueCEStateFreeCPUs = 0
GlueCEStateRunningJobs = 0
GlueCEStateStatus = "Production"
GlueCEStateTotalJobs = 0
GlueCEStateWaitingJobs = 0
GlueCEStateWorstResponseTime = 0
GlueCEStateFreeJobSlots = 1
GlueCEPolicyMaxCPUTime = 0
GlueCEPolicyMaxRunningJobs = 0
GlueCEPolicyMaxTotalJobs = 0
GlueCEPolicyMaxWallClockTime = 0
GlueCEPolicyPriority = 0
GlueCEPolicyAssignedJobSlots = 1
GlueCEAccessControlBaseRule = "VO:cdf"
GlueInformationServiceURL = "ldap://rsgrid3.its.uiowa.edu:2135/mds-vo-name=local,o=grid"
GlueSchemaVersionMajor: 1
GlueSchemaVersionMinor: 2
### Cluster Entity
GlueClusterName = "rsgrid3.its.uiowa.edu"
GlueClusterService = "rsgrid3.its.uiowa.edu"
GlueClusterUniqueID = "rsgrid3.its.uiowa.edu"
GlueClusterTmpDir = "/tmp"
GlueClusterWNTmpDir = "/scratch"
### SubCluster Entity
GlueHostApplicationSoftwareRunTimeEnvironment = "OSG-0.3.6,ATLAS_LOC_903,LCG-2_6_0"
GlueHostArchitectureSMPSize = 2
GlueHostArchitecturePlatformType = "undefined"
GlueHostBenchmarkSF00 = 380
GlueHostBenchmarkSI00 = 400
GlueHostMainMemoryRAMSize = 512
GlueHostMainMemoryVirtualSize = 1024
GlueHostNetworkAdapterInboundIP = FALSE
GlueHostNetworkAdapterOutboundIP = TRUE
GlueHostOperatingSystemName = "linux-rocks-3.3"
GlueHostOperatingSystemRelease = "Rocks Linux"
GlueHostOperatingSystemVersion = 3.3
GlueHostProcessorClockSpeed = 1000
GlueHostProcessorModel = "Pentium III (Coppermine)"
GlueHostProcessorVendor = "GenuineIntel"
GlueHostProcessorVersion = "undefined"
GlueHostProcessorInstructionSet = "i686"
GlueHostProcessorOtherDescription = "i686"
GlueSubClusterName = "rsgrid3.its.uiowa.edu"
GlueSubClusterUniqueID = "rsgrid3.its.uiowa.edu"
GlueSubClusterPhysicalCPUs = 1
GlueSubClusterLogicalCPUs = 2
GlueSubClusterTmpDir = "/export/grid/data"
GlueSubClusterWNTmpDir = "/tmp"
```


Figure 6: The first of two old classads respresenting the GLUE Schema presented before in LDIF format. This classad was generated using the "basic rules" for the mapping. The 3 pound signs (###) are used as comments only and are not part of the classad.

```
### Computing Element Entity (2)
GlueCEHostingCluster = "rsgrid3.its.uiowa.edu"
GlueCEName = "fermilab"
GlueCEUniqueID = "rsgrid3.its.uiowa.edu:2119/jobmanager-condor-fermilab"
GlueCEInfoGatekeeperPort = 2119
GlueCEInfoHostName = "rsgrid3.its.uiowa.edu"
GlueCEInfoLRMSType = "condor"
GlueCEInfoLRMSVersion = "6.7.13"
GlueCEInfoTotalCPUs = 1
GlueCEInfoJobManager = "condor"
GlueCEInfoContactString = "rsgrid3.its.uiowa.edu:2119/jobmanager-condor"
GlueCEInfoApplicationDir = "/export/grid/app"
GlueCEInfoDataDir = "/export/grid/data"
GlueCEInfoDefaultSE = "rsgrid3.its.uiowa.edu"
GlueCEInfoGRAMVersion = "1.7"
GlueCEStateEstimatedResponseTime = 0
GlueCEStateFreeCPUs = 0
GlueCEStateRunningJobs = 0
GlueCEStateStatus = "Production"
GlueCEStateTotalJobs = 0
GlueCEStateWaitingJobs = 0
GlueCEStateWorstResponseTime = 0
GlueCEStateFreeJobSlots = 1
GlueCEPolicyMaxCPUTime = 0
GlueCEPolicyMaxRunningJobs = 0
GlueCEPolicyMaxTotalJobs = 0
GlueCEPolicyMaxWallClockTime = 0
GlueCEPolicyPriority = 0
GlueCEPolicyAssignedJobSlots = 1
GlueCEAccessControlBaseRule = "VO:fermilab"
GlueInformationServiceURL = "ldap://rsgrid3.its.uiowa.edu:2135/mds-vo-name=local,o=grid"
GlueSchemaVersionMajor = 1
GlueSchemaVersionMinor = 2
### Cluster Entity
GlueClusterName = "rsgrid3.its.uiowa.edu"
GlueClusterService = "rsgrid3.its.uiowa.edu"
GlueClusterUniqueID = "rsgrid3.its.uiowa.edu"
GlueClusterTmpDir = "/tmp"
GlueClusterWNTmpDir = "/scratch"
### SubCluster Entity
GlueHostApplicationSoftwareRunTimeEnvironment = "OSG-0.3.6,ATLAS_LOC_903,LCG-2_6_0"
GlueHostArchitectureSMPSize = 2
GlueHostArchitecturePlatformType = "undefined"
GlueHostBenchmarkSF00 = 380
GlueHostBenchmarkSI00 = 400
GlueHostMainMemoryRAMSize = 512
GlueHostMainMemoryVirtualSize = 1024
GlueHostNetworkAdapterInboundIP = FALSE
GlueHostNetworkAdapterOutboundIP = TRUE
GlueHostOperatingSystemName = "linux-rocks-3.3"
GlueHostOperatingSystemRelease = "Rocks Linux"
GlueHostOperatingSystemVersion = 3.3
GlueHostProcessorClockSpeed = 1000
GlueHostProcessorModel = "Pentium III (Coppermine)"
GlueHostProcessorVendor = "GenuineIntel"
GlueHostProcessorVersion = "undefined"
GlueHostProcessorInstructionSet = "i686"
GlueHostProcessorOtherDescription = "i686"
GlueSubClusterName = "rsgrid3.its.uiowa.edu"
GlueSubClusterUniqueID = "rsgrid3.its.uiowa.edu"
GlueSubClusterPhysicalCPUs = 1
GlueSubClusterLogicalCPUs = 2
GlueSubClusterTmpDir = "/export/grid/data"
GlueSubClusterWNTmpDir = "/tmp"
```


Figure 7: The second of two old classads respresenting the GLUE Schema presented before in LDIF format. This classad was generated using the "basic rules" for the mapping. The 3 pound signs (###) are used as comments only and are not part of the classad.

```
### Computing Element Entity (1)
GlueCEHostingCluster = "rsgrid3.its.uiowa.edu"
GlueCEName = "cdf"
GlueCEUniqueID = "rsgrid3.its.uiowa.edu:2119/jobmanager-condor-cdf"
GlueCEInfoGatekeeperPort = 2119
GlueCEInfoHostName = "rsgrid3.its.uiowa.edu"
GlueCEInfoLRMSType = "condor"
GlueCEInfoLRMSVersion = "6.7.13"
GlueCEInfoTotalCPUs = 1
GlueCEInfoJobManager = "condor"
GlueCEInfoContactString = "rsgrid3.its.uiowa.edu:2119/jobmanager-condor"
GlueCEInfoGRAMVersion = "1.7"
GlueCEStateFreeCPUs = 0
GlueCEStateStatus = "Production"
GlueCEPolicyMaxCPUTime = 0
GlueCEPolicyMaxRunningJobs = 0
GlueCEPolicyMaxTotalJobs = 0
GlueCEPolicyMaxWallClockTime = 0
GlueCEPolicyPriority = 0
GlueCEPolicyAssignedJobSlots = 1
GlueInformationServiceURL = "ldap://rsgrid3.its.uiowa.edu:2135/mds-vo-name=local,o=grid"
GlueSchemaVersionMajor: 1
GlueSchemaVersionMinor: 2
### Attributes overwritten by VOView Entity
GlueVOViewLocalID: cdf
GlueCEAccessControlBaseRule = "VO:cdf"
GlueCEStateRunningJobs = 0
GlueCEStateWaitingJobs = 0
GlueCEStateTotalJobs = 0
GlueCEStateFreeJobSlots = 1
GlueCEStateEstimatedResponseTime = 0
GlueCEStateWorstResponseTime = 0
GlueCEInfoDefaultSE = "rsgrid3.its.uiowa.edu"
GlueCEInfoApplicationDir = "/export/grid/app"
GlueCEInfoDataDir = "/export/grid/data"
```

Figure 8: The first half of the first of two old classads respresenting the GLUE Schema presented before in LDIF format. This classad was generated using the "extended rules" for the mapping. The 3 pound signs (###) are used as comments only and are not part of the classad.

```
### Cluster Entity
GlueClusterName = "rsgrid3.its.uiowa.edu"
GlueClusterService = "rsgrid3.its.uiowa.edu"
GlueClusterUniqueID = "rsgrid3.its.uiowa.edu"
GlueClusterTmpDir = "/tmp"
GlueClusterWNTmpDir = "/scratch"
### SubCluster Entity
GlueHostApplicationSoftwareRunTimeEnvironment = "OSG-0.3.6,ATLAS_LOC_903,LCG-2_6_0"
GlueHostArchitectureSMPSize = 2
GlueHostArchitecturePlatformType = "undefined"
GlueHostBenchmarkSF00 = 380
GlueHostBenchmarkSI00 = 400
GlueHostMainMemoryRAMSize = 512
GlueHostMainMemoryVirtualSize = 1024
GlueHostNetworkAdapterInboundIP = FALSE
GlueHostNetworkAdapterOutboundIP = TRUE
GlueHostOperatingSystemName = "linux-rocks-3.3"
GlueHostOperatingSystemRelease = "Rocks Linux"
GlueHostOperatingSystemVersion = 3.3
GlueHostProcessorClockSpeed = 1000
GlueHostProcessorModel = "Pentium III (Coppermine)"
GlueHostProcessorVendor = "GenuineIntel"
GlueHostProcessorVersion = "undefined"
GlueHostProcessorInstructionSet = "i686"
GlueHostProcessorOtherDescription = "i686"
GlueSubClusterName = "rsgrid3.its.uiowa.edu"
GlueSubClusterUniqueID = "rsgrid3.its.uiowa.edu"
GlueSubClusterPhysicalCPUs = 1
GlueSubClusterLogicalCPUs = 2
GlueSubClusterTmpDir = "/export/grid/data"
GlueSubClusterWNTmpDir = "/tmp"
### Location Entity
GlueLocationLocalID = "OSG_SITE_READ,OSG_SITE_WRITE"
GlueLocationName = "OSG_SITE_READ,OSG_SITE_WRITE"
```

Figure 9: The second half of the classad in figure 8

```
### Computing Element Entity (2)
GlueCEHostingCluster = "rsgrid3.its.uiowa.edu"
GlueCEName = "fermilab"
GlueCEUniqueID = "rsgrid3.its.uiowa.edu:2119/jobmanager-condor-fermilab"
GlueCEInfoGatekeeperPort = 2119
GlueCEInfoHostName = "rsgrid3.its.uiowa.edu"
GlueCEInfoLRMSType = "condor"
GlueCEInfoLRMSVersion = "6.7.13"
GlueCEInfoTotalCPUs = 1
GlueCEInfoJobManager = "condor"
GlueCEInfoContactString = "rsgrid3.its.uiowa.edu:2119/jobmanager-condor"
GlueCEInfoApplicationDir = "/export/grid/app"
GlueCEInfoDataDir = "/export/grid/data"
GlueCEInfoDefaultSE = "rsgrid3.its.uiowa.edu"
GlueCEInfoGRAMVersion = "1.7"
GlueCEStateEstimatedResponseTime = 0
GlueCEStateFreeCPUs = 0
GlueCEStateRunningJobs = 0
GlueCEStateStatus = "Production"
GlueCEStateTotalJobs = 0
GlueCEStateWaitingJobs = 0
GlueCEStateWorstResponseTime = 0
GlueCEStateFreeJobSlots = 1
GlueCEPolicyMaxCPUTime = 0
GlueCEPolicyMaxRunningJobs = 0
GlueCEPolicyMaxTotalJobs = 0
GlueCEPolicyMaxWallClockTime = 0
GlueCEPolicyPriority = 0
GlueCEPolicyAssignedJobSlots = 1
GlueCEAccessControlBaseRule = "VO:fermilab"
GlueInformationServiceURL = "ldap://rsgrid3.its.uiowa.edu:2135/mds-vo-name=local,o=grid"
GlueSchemaVersionMajor = 1
GlueSchemaVersionMinor = 2
### VOView Entity for VO:fermilab is not defined: nothing to overwrite.
```

Figure 10: The first half of the second of two old classads respresenting the GLUE Schema presented before in LDIF format. This classad was generated using the "extended rules" for the mapping. The 3 pound signs (###) are used as comments only and are not part of the classad.

```
### Cluster Entity
GlueClusterName = "rsgrid3.its.uiowa.edu"
GlueClusterService = "rsgrid3.its.uiowa.edu"
GlueClusterUniqueID = "rsgrid3.its.uiowa.edu"
GlueClusterTmpDir = "/tmp"
GlueClusterWNTmpDir = "/scratch"
### SubCluster Entity
GlueHostApplicationSoftwareRunTimeEnvironment = "OSG-0.3.6,ATLAS_LOC_903,LCG-2_6_0"
GlueHostArchitectureSMPSize = 2
GlueHostArchitecturePlatformType = "undefined"
GlueHostBenchmarkSF00 = 380
GlueHostBenchmarkSI00 = 400
GlueHostMainMemoryRAMSize = 512
GlueHostMainMemoryVirtualSize = 1024
GlueHostNetworkAdapterInboundIP = FALSE
GlueHostNetworkAdapterOutboundIP = TRUE
GlueHostOperatingSystemName = "linux-rocks-3.3"
GlueHostOperatingSystemRelease = "Rocks Linux"
GlueHostOperatingSystemVersion = 3.3
GlueHostProcessorClockSpeed = 1000
GlueHostProcessorModel = "Pentium III (Coppermine)"
GlueHostProcessorVendor = "GenuineIntel"
GlueHostProcessorVersion = "undefined"
GlueHostProcessorInstructionSet = "i686"
GlueHostProcessorOtherDescription = "i686"
GlueSubClusterName = "rsgrid3.its.uiowa.edu"
GlueSubClusterUniqueID = "rsgrid3.its.uiowa.edu"
GlueSubClusterPhysicalCPUs = 1
GlueSubClusterLogicalCPUs = 2
GlueSubClusterTmpDir = "/export/grid/data"
GlueSubClusterWNTmpDir = "/tmp"
### Location Entity
GlueLocationLocalID = "OSG_SITE_READ,OSG_SITE_WRITE"
GlueLocationName = "OSG_SITE_READ,OSG_SITE_WRITE"
```

Figure 11: The second half of the classad in figure 10