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GLUE v. 2.0 – Reference Realisation to LDAP Schema

Status of This Document

This document provides information to the Grid community regarding the LDAP Schema realisation of the GLUE information model (v.2.0). Distribution is unlimited. This implementation is derived from the proposed recommendation GFD.147 "GLUE Specification v. 2.0".

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Abstract
The GLUE specification is an information model for Grid entities described in natural language enriched with a graphical representation using UML Class Diagrams. This document presents a realisation of this information model as an LDAP Schema, and includes explanations of the major design decisions made during the rendering process.

Contents

1. Introduction

The GLUE 2.0 information model defined in [glue-2] is an abstract information model of Grid entities. For technology providers to adopt it, it has to be realized into a concrete data model. This document describes the normative realisation of the GLUE 2.0 abstract information model in terms of an LDAP Schema. The approach followed to map the entities and relationships in the abstract information model to the LDAP data model is also described.

2. Notational Conventions

The key words 'MUST," "MUST NOT," "REQUIRED," "SHALL," "SHALL NOT," "SHOULD," "SHOULD NOT," "RECOMMENDED," "MAY," and "OPTIONAL" are to be interpreted as described in RFC 2119 (see http://www.ietf.org/rfc/rfc2119.txt).

This document adopts the following terminology:

"Entities" and "Classes" as defined in the abstract model of GFD.147 are referred with the terms "entity" or "entities"; "attributes" as defined in GFD.147 are called "attribute" or "attributes". Entity and attribute names as defined in GFD.147 are shown in *italic.* For example, the entity with name "Service" is represented as *Service*.

Note that the term "entity" with no typesetting is used in this document for any generic entity or class defined in GFD147, and MUST NOT be confused with the term "*Entity*" with italic typesetting, that identifies the specific entity in GFD whose name is "Entity".

All the terminology relative to LDAP is taken from definitions in RFC 4510 (see http://tools.ietf.org/html/rfc4150); object classes and attributes in the concrete LDAP schema will have typesetting **bold**. For example, **GLUE2Entity** is an LDAP object class and **GLUE2EntityID** is a LDAP attribute.

3. LDAP Schema Realisation

3.1 Approach

There are many possible approaches to realise the GLUE 2.0 abstract information model as an LDAP Schema. The approach followed here is informed by practical experience with the LDAP implementation of the GLUE 1 schema [glue-1], and by general considerations relating to the efficiency and simplicity of likely queries. Conversely, the GLUE 2 schema itself was designed with the expectation that LDAP would be one of the main implementation technologies, and hence there is in many cases a natural way to translate the schema concepts into LDAP.

The GLUE LDAP implementation needs to map each entity in the GLUE information model to a specific LDAP entry defined in terms of object classes. We have chosen the most straightforward mapping in which there is a one-to-one correspondence between LDAP object classes and GLUE entities, with inheritance in the abstract schema represented explicitly by object class inheritance in LDAP.

In the following sections we discuss the detailed design decisions that have been made while implementing the GLUE model into LDAP.

3.2 Prefix conventions

LDAP allows the same descriptor to refer to different object identifiers in certain cases and the LDAP server supports multiple registrations of the same descriptor (each indicating a different kind of schema element and different object identifier). However, multiple registrations of the same descriptor are to be avoided if possible [rfc4520].

In practical experience with version 1 of the GLUE schema it has generally been the case that the schema does not need to coexist with other schemas, but it nevertheless seems useful to allow

for this as a possibility. As object classes and attributes might have the same names in different schemas (there is only a global namespace), in order to make schemas compatible and able to coexist with other schemas in the same LDAP server we have decided that all object class and attribute names should be prefixed with a concrete string.

Given that GLUE 2.0 represents a major version change which may be required to cohabit with older versions for some time, **GLUE2** is used as a clean short prefix for all schema elements in the model – this compares with the prefix of **Glue** used for the version 1.x schemas.

3.3   Object class and attribute naming conventions

The name of each LDAP object class is simply the name of the model entity prefixed as described above, e.g. the object class representing the *Service* entity is called **GLUE2Service**. Each attribute of an entity in the abstract model is rendered as an LDAP attribute with a name composed from the names of the entity and the attribute, for example **GLUE2ServiceType** corresponds to the *Type* attribute of the *Service* entity. This gives a clear separation of attributes per object class, making it less prone to mistakes if changes are made and in the construction of queries.

3.4   Object class types and inheritance

The LDAP schema objects in the rendering are defined by following the most straightforward mapping in which there is a one-to-one correspondence between the model entities and the LDAP object classes. Every entity is represented by an LDAP object class whose set of mapped attributes is constituted only of those attributes explicitly defined in the model as belonging to that entity, and that are NOT inherited from other entities.

The abstract model uses inheritance to derive some entities from others. LDAP is not object-oriented in the usual sense, but it allows inheritance to be represented explicitly by composing object classes [rfc4512] into LDAP entries. However, it would also be possible to define standalone object classes including all inherited attributes directly. We have chosen to use explicit inheritance, both as the most natural representation of the schema and because it simplifies some queries. For example, it enables a generic query to be made for the *URL* attribute of every *Endpoint* without any special treatment for *Computing Endpoint*s, *Storage Endpoint*s or any other specialised entity which may be defined in the future. The main disadvantage of this approach is more complexity in the naming of attributes within an LDAP entry, for example a **GLUE2ComputingEndpoint** entry can include attributes called **GLUE2ComputingEndpoint-RunningJobs**, **GLUE2EndpointURL** and **GLUE2EntityName**, but in practice this seems unlikely to cause significant problems.

A separate case could be made for the *Entity* entity, since it is unlikely that queries for the attributes of all LDAP entries will be common. In general, we conclude that consistency both with the abstract model and the general principles for the LDAP schema nevertheless make an explicit **GLUE2Entity** object class the best solution.

We have however made an exception for the *ID* attribute. All LDAP entries have an attribute that is used to construct its Distinguished Name (DN), and for the GLUE2 schema the natural attribute to use is clearly the *ID*. If we simply followed the rules described above the name of the *ID* attribute for every object would be **GLUE2EntityID**, and the DN of every object would be of the form "`GLUE2EntityID=x,GLUE2EntityID=y,GLUE2EntityID=z`". We consider that this would be unduly opaque, and therefore introduce an additional rule that the *ID* attribute is defined in the object classes representing the classes derived immediately from *Entity*, and the naming then follows the standard rules. So for example the *ID* attribute for all of the **GLUE2Service**, **GLUE2ComputingService** and **GLUE2StorageService** objects is called **GLUE2ServiceID**.

One final point is that the schema document defines *Policy*, *Domain*, *Share*, *Manager* and *Resource* as being abstract classes which MUST NOT be instantiated, but should only be used to derive specialised entities. However, this rule is based on the fact that these objects in themselves contain no useful information, rather than that there is any structural flaw caused by

instantiating them. Modifying an LDAP schema is a complex and time-consuming operation, so it may be useful at some point to prototype a new class derived from, for example, *Share* using a concrete **GLUE2Share** object class together with **GLUE2Extension** objects to carry the putative new attributes, and only define a new specialised object class once the definition of the new entity is stable. We have therefore decided to make these object classes concrete and instantiable. However, it should be emphasised that such objects MUST NOT be regarded as strictly compliant with the schema, that schema validation tools SHOULD reject such objects, and that tools to translate the LDAP schema to another representation MAY reject or ignore them.

To summarise, the following rules were employed:

- The **GLUE2Entity** object class in LDAP should carry all attributes defined in *Entity* except *ID*.

- All entities immediately deriving from *Entity* will have their own *ID* attribute named after the entity name. For example, the object class **GLUE2Location** will have the attribute **GLUE2LocationID**.

- All classes deriving from *Entity* in GLUE2 will also inherit from the **GLUE2Entity** object class in LDAP.

- The **GLUE2Entity** object class will be of type "Abstract".

- All classes except *Entity* are STRUCTURAL.

3.4.1 Composition of LDAP object classes into entries
An LDAP entry is formed out of a collection of LDAP object classes. Please note that since **GLUE2Entity** is abstract, no **GLUE2EntityID** is defined for it (see discussion above), hence there is no need to include such object class. Inheritance in the schema allows to instantiate its attributes into any GLUE2 LDAP object class.

Each entry which is a realization of an entity in GFD.147 MUST include:

- An object class that has a defined **GLUE2<entityname>ID** attribute, e.g. the object class **GLUE2Service** has attribute **GLUE2ServiceID** attribute.

- Any additional object class added MUST be consistent with respect to inheritance as defined in GFD.147. For example, a **GLUE2ComputingEndpoint** entry MUST have **GLUE2Endpoint** object class as well, but SHOULD NOT have a **GLUE2StorageEndopoint** object class, as it would break the model.

- Attributes can belong to any of the included object classes, plus those of the abstract object class GLUE2Entity

- Attributes included in the RDN MUST be of the form GLUE2<entityname>ID, that is, ONLY GLUE2 ID or Local IDs as defined in GFD.147 MUST appear in the RDN, with the exception of the special **o=glue** suffix.

Example of a GLUE2ComputingService entry:

```
dn: GLUE2ServiceID=<URI>,…,o=glue

objectClass GLUE2Service

ObjectClass GLUE2ComputingService

# from GLUE2Entity

GLUE2EntityName: Human readable Service Name

GLUE2EntityCreationTime: 2013-11-26T08:28:16Z

GLUE2EntityValidity: 120

# from GLUE2Service

GLUE2ServiceID: <URI>
```

```
        GLUE2ServiceType: org.ogf.glue.someservice

        GLUE2QualityLevel: testing

        GLUE2ServiceCapability: information.discovery.resource

        # From GLUE2ComputingService

        GLUE2ComputingServiceTotalJobs: 1

        GLUE2ComputingServiceRunningJobs: 1

        …
```

3.5   Data types

LDAP does not have an extensive range of data types, and there is little overlap with the types defined in the GLUE schema. For the implementation of the different data types, just two different types of the standard LDAP v3 attribute set referred to in [rfc4517] are used:

-   **DirectoryString**, with OID 1.3.6.1.4.1.1466.115.121.1.15

-   **Integer**, with OID 1.3.6.1.4.1.1466.115.121.1.27

"**Integer**" is used for types *UInt32* and *UInt64* of the original GLUE 2.0 Specification and "**DirectoryString**" is used for every other type.

DirectoryString type does NOT allow empty strings. This means that if an attribute has no value the corresponding LDAP attribute entry will NOT be published by any LDAP server. Information consumers and validation tools MUST take this into account.

This also means that data type integrity (for example in the case of enumerations) will largely not be checked in the LDAP implementation itself, but must be ensured by other means, for example external validation tools.

Due to the fact that this document has been in DRAFT status for long time, some of the existing implementations of the LDAP schema prior to the current revision of this document do not yet follow the above recommendations. In particular:

-   The Boolean object type (OID 1.3.6.1.4.1.1466.115.121.1.7) was used for all attributes with type *ExtendedBoolean_t* in GFD147

-   The string type IA5String (OID 1.3.6.1.4.1.1466.115.121.1.26) was used for all objects of different type from GFD.147 *UInt32, UInt64, and ExtendedBoolean_t*

The GLUE WG recommends updating all renderings and adopting version 2.0 of the schema as soon as this document is out. The attribute multiplicity in the model maps naturally to LDAP since it supports both optional and multi-valued attributes directly, and hence the constraints implied by the model (**MUST/MAY** and **SINGLE-VALUE**) are imposed directly in the LDAP attribute definitions.

Note that there are two principle changes from the LDAP representation used for GLUE 1. First, in the case of choosing **IA5String** (OID=1.3.6.1.4.1.1466.115.121.1.26) as the string type. However, this is basically 7-bit ASCII that does not allow text in various non-English languages to be represented, and moreover the presence of such strings may cause the entire object to be rejected by an LDAP server. We have therefore decided to use **DirectoryString** for GLUE 2, which is basically the UTF-8 encoding of Unicode that includes ASCII as a subset. Potentially it would be possible to use **IA5String** for the majority of attributes where the permitted values could be restricted and only use **DirectoryString** for attributes that represent free text, but in practice it seems simpler to use a uniform representation. We note that the schema document itself does not define the string type in any detail, which also implies that we should use the broadest possible type.

The second change concerns case sensitivity. The Glue 1 schema defines strings not to be case-sensitive (a matching rule of **caseIgnoreIA5Match**), and to some extent this makes queries simpler. However, many external tools are case-sensitive, and for the GLUE 2 schema we explicitly defined strings to be case-sensitive. We have therefore followed this in the LDAP schema by defining the matching rules to be **caseExact**. This also supports the change to **DirectoryString**, since case-matching rules are more complex for extended character sets. However, this will be the most visible change in behaviour relative to GLUE 1, and hence may require some education for users.

The existence of mandatory attributes also represents a partial change from GLUE 1 which had essentially all attributes as optional. This may require more care in the implementation of information providers, but also helps to ensure the quality of the published data.

3.6   Relationships

LDAP is not a relational database, but a directory. Thus, LDAP neither provides nor ensures relationships other than the parent-child relations implied by the hierarchical DN.

To implement relationships between objects in LDAP, for each relationship a new attribute must be defined. In the Glue 1 schema we defined two such attributes, **GlueChunkKey** pointing to parent objects in the DN hierarchy and **GlueForeignKey** pointing to objects outside the hierarchy. These attributes contain ID-value constraints of the form **GlueClusterUniqueID**=xyz.

In GLUE2 we have two differences that imply a change in the way that relationships are represented. In Glue 1 the need for the **ChunkKey** is related to the fact that some objects have only a non-unique **LocalID**, and there is therefore a need to relate those objects explicitly to their parent in order for them to be identified. For example, a **GlueSA** object can only be identified relative to its parent **GlueSE** object. By contrast, in GLUE2 all entities (other than *Extension*) have a unique *ID* and hence can be identified uniquely, which removes the need for something similar to the **ChunkKey**.

Secondly, in Glue 1 the unique ID attributes are only unique within objects of the same type, so for example a **GlueClusterUniqueID** and a **GlueSubClusterUniqueID** may be identical. However, in GLUE2 we require *ID* attributes to be globally unique even across object types. It is therefore possible for the relationship value to simply be the *ID*.

In terms of the attribute names we felt that it would be clearer and more explicit for the name to specify the relation it represents, rather than using a generic name such as **GLUE2ForeignKey**. This also prevents the accidental publication of relationships not defined in the schema. The naming convention chosen is to have the prefix and object class name as for other attributes, followed by the name of the object class to which the reference points, and finally a suffix **ForeignKey**. (We also considered using **FK** as a more compact suffix, but decided that the longer string is likely to be easier to understand.) As an example, this means that a relation from **GLUE2Endpoint** to **GLUE2Service** is called **GLUE2EndpointServiceForeignKey**, and will have a value which is the corresponding **GLUE2ServiceID**. These attributes are inherited in the same way as any other attribute, so that for example a **GLUE2StorageEndpoint** will be related to a **GLUE2StorageService** via an attribute with the same name.

Relational attributes need to be defined in the LDAP schema corresponding to every relation defined in the abstract model, and with multiplicities as defined in the model document. Relations are bidirectional, but there is no general need to define an attribute for both ends of the relation since LDAP queries can be performed in either direction. That is, it is possible either to query for an object which has a particular **ID** in its **ForeignKey** attribute, or for an object with an **ID** which has been extracted from a **ForeignKey**. Depending on the circumstances there may be differences in efficiency or ease of use, for example queries which return multiple **ID**s are likely to be more complex, but in general we decided to define a **ForeignKey** only for one end of a relationship.

There were two main considerations taken into account in deciding which end of the relationship to use. In many cases there is a natural parent-child relation, for example *Service* is a parent of

Endpoint, and it is likely to be better for the relation to point from child to parent. This is both for likely ease of coding of information providers – create the parent and then loop over the children – and because the most likely query direction is to find the children of a given parent rather than vice versa.

The second consideration is multiplicity. For one-to-many relations it will normally be better to have one attribute per object than many, and even for many-to-many relations it will often be the case that one of the multiplicities is likely to be substantially more than the other. For example, the relation between *Share* and *Endpoint* is many-to-many, but in most cases there will be many more *Share*s than *Endpoint*s.

In general this mechanism is similar to the one used in relational databases with foreign keys, except for a few key points:

-    In a relational database, when implementing a one-to-many relationship, the foreign key attribute is included in the "many" object since a database cell can only have one value. In LDAP attributes can be multivalued, so this may depend on the needs for each object.

-    In a relational database, when implementing a many-to-many relationship, a new table is created that holds all relations due to the fact that a table cell cannot hold multivalued attributes. LDAP supports multivalued attributes directly so there is no need for any intermediate table.

-    Relational databases ensure relationship integrity, but LDAP does not.

We then considered each of the schema relations individually to decide which end should carry the foreign key attribute in the light of the considerations described above, and the result is shown in Table 1. In the vast majority of cases the decision was obvious. The only exception to the "one end" rule is for the two peer relations *Service-Service* and *Activity-Activity* where the keys need to be at both ends.

Relation 1	Mult 1	Mult 2	Relation 2	Object with key	Name
Entity	1	0..*	Extension	Extension	GLUE2ExtensionEntity ForeignKey
Location	0..1	0..*	Service	Location	GLUE2LocationService ForeignKey
Location	0..1	0..*	Domain	Location	GLUE2LocationDomain ForeignKey
Contact	0..*	0..*	Service	Contact	GLUE2ContactService ForeignKey
Contact	0..*	0..*	Domain	Contact	GLUE2ContactDomain ForeignKey
AdminDomain	1	0..*	Service	Service	GLUE2ServiceAdminDomain ForeignKey
AdminDomain	0..1	0..*	AdminDomain	AdminDomain (child)	GLUE2AdminDomain AdminDomain ForeignKey
UserDomain	1..*	0..*	Policy	Policy	GLUE2PolicyUserDomain ForeignKey
UserDomain	0..1	0..*	Activity	Activity	GLUE2ActivityUserDomain ForeignKey
UserDomain	0..1	0..*	UserDomain	UserDomain (child)	GLUE2UserDomainUserDomain ForeignKey
Service	1	0..*	Endpoint	Endpoint	GLUE2EndpointService

					ForeignKey
Service	1	0..*	Share	Share	GLUE2ShareService ForeignKey
Service	1	0..*	Manager	Manager	GLUE2ManagerService ForeignKey
Service	0..*	0..*	Service	Service (both)	GLUE2ServiceService ForeignKey
Endpoint	0..*	0..*	Share	Share	GLUE2ShareEndpoint ForeignKey
Endpoint	1	0..*	AccessPolicy	AccessPolicy	GLUE2AccessPolicyEndpoint ForeignKey
Endpoint	0..1	0..*	Activity	Activity	GLUE2ActivityEndpoint ForeignKey
Share	0..*	0..*	Resource	Share	GLUE2ShareResource ForeignKey
Share	0..1	0..*	Activity	Activity	GLUE2ActivityShare ForeignKey
Share	1	0..*	MappingPolicy	MappingPolicy	GLUE2MappingPolicyShare ForeignKey
Manager	1	1..*	Resource	Resource	GLUE2ResourceManager ForeignKey
Resource	0..1	0..*	Activity	Activity	GLUE2ActivityResource ForeignKey
Activity	0..*	0..*	Activity	Activity (both)	GLUE2ActivityActivity ForeignKey
ComputingService	1	0..*	ToStorageService	ToStorageService	GLUE2ToStorageService ComputingService ForeignKey
ComputingManager	1	0..*	Application Environment	ApplicationEnvironment	GLUE2ApplicationEnvironment ComputingManager ForeignKey
ComputingManager	0..1	0..*	Benchmark	Benchmark	GLUE2Benchmark ComputingManager ForeignKey
Benchmark	*	0..1	Execution Environment	Benchmark	GLUE2Benchmark ExecutionEnvironment ForeignKey
ExecutionEnvironment	0..*	0..*	Application Environment	ApplicationEnvironment	GLUE2ApplicationEnvironment ExecutionEnvironment ForeignKey
ApplicationEnvironment	1	0..*	ApplicationHandle	ApplicationHandle	GLUE2ApplicationHandle ApplicationEnvironment ForeignKey
ToStorageService	-	1	StorageService	ToStorageService	GLUE2ToStorageService StorageService ForeignKey
StorageService	1	0..*	StorageAccess Protocol	StorageAccessProtocol	GLUE2StorageAccessProtocol StorageService ForeignKey
StorageService	1	0..*	StorageService Capacity	StorageServiceCapacity	GLUE2StorageServiceCapacity StorageService ForeignKey

StorageAccessProtocol	0..*	0..*	ToComputingService	ToComputingService	GLUE2ToComputingService StorageAccessProtocol ForeignKey
StorageShare	1	0..*	StorageShare Capacity	StorageShareCapacity	GLUE2StorageShareCapacity StorageShare ForeignKey
ToComputingService	-	1	ComputingService	ToComputingService	GLUE2ToComputingService ComputingService ForeignKey
ToComputingService	-	1	StorageService	ToComputingService	GLUE2ToComputingService StorageService ForeignKey

Table 1: Foreign Key attributes

3.7   Structuring the LDAP entries

In LDAP, object instances (entries) are arranged in a hierarchical structure called the Directory Information Tree (DIT). An LDAP entry consists of set of attributes taken from the object classes associated with the object. An LDAP entry MUST be composed of at least one structural object class and MAY use several auxiliary object classes. Each entry MUST have a unique Distinguished Name (DN) constructed from an ordered series of Relative Distinguished Names (RDNs), each of which consists of an attribute name and its value taken from a structural object class. The RDNs are required to be unique only to the extent that the full DN of every object needs to be unique. The DNs through their hierarchically ordered RDNs define the tree structure.

In the GLUE2 rendering approach the GLUE2 entries are built from object classes that are grouped into the same entry only if there is an inheritance relationship in the model. This results in an LDAP tree of GLUE2 entries where each non-related model entities have their own separate node. As for the DN it is natural to use the unique *ID* of the model entity to form the RDN. In case of entries with multiple object classes, the ID of the object class derived immediately from the abstract object class **GLUE2Entity** is used.

For example, GLUE2ComputingEndpoint entry consists of attributes of the object classes **GLUE2Entity**, **GLUE2Endpoint,** and **GLUE2ComputingEndpoint**. Following the example the unrelated model entities *ComputingEndpoint* and *ComputingManager* rendered as **GLUE2ComputingEndpoint** and **GLUE2ComputingManager**, are separate nodes in the tree. The RDNs of **GLUE2ComputingEndpoint** and **GLUE2ComputingManager** are **GLUE2EndpointID=X** and **GLUE2ManagerID=Y.**

It was also decided to define an additional structural object class not derived from the model to facilitate grouping of same type of entries under a single node in the tree. This grouping node SHOULD have a **GLUE2Group** object class with a single attribute **GLUE2GroupID**.The attribute specifies the entity class of the entries to be grouped. Please note that this attribute is NOT a GLUE2 ID as defined in GFD.147 (i.e. does not have to be universally unique and not a URI) but is rather a Local ID, meant to identify the grouping, and follows the restrictions of LocalID_t as in GFD.147. A **GLUE2Group** grouping entry MAY be inserted at any point in the DIT. The grouping facilitates queries by restricting the query to the subtree below the **GLUE2Group** entry and also improves visual presentation (e.g. avoiding very long object lists in an LDAP browser). Implementations MAY define circumstances in which **Group**s will always be used, and MAY also define how the **GroupID**s are constructed. However it should be emphasized that **Group**s are specific to an LDAP implementation.

For example, *ComputingActivity* objects represent jobs in a computing system, and hence may have a very large multiplicity. It may therefore be useful to introduce a **GLUE2Group** entry with attribute **GLUE2GroupID=ComputingActivities** as their parent in the tree to allow them to be manipulated and displayed as a unit.

When deciding the DIT for the GLUE2 rendering the following considerations were taken: it may be convenient for different LDAP implementations to use a different DIT, and for the tree to be restructured as information is aggregated for different purposes. The GLUE 2 abstract information model ensures that any entity can be uniquely referenced by its unique *ID*, and the rendering choices for the associations of the model via GLUE2ForeignKey described earlier allows all entity relations to be followed directly. This means DNs are not needed to identify entries or to express associations.

Therefore it was agreed that as part of the GLUE2 LDAP rendering the DIT structure is not mandated. Implementers are free to build their own DIT. Some of the existing production implementations are presented in Appendix A.

Nevertheless a single restriction is presented: the LDAP tree requires a root DN, also called the base DN. For the DIT of a LDAP tree containing GLUE2 information the **o=glue** MUST be used. This enables both GLUE2 and Glue 1 information to be present in the same LDAP server since the Glue 1 tree has the root **o=grid.** Having different base DNs means that it is not possible to perform single queries across both trees and the separation also ensures that Glue 1 clients are not affected by the presence of GLUE 2 information in the same server.

An additional restriction is MANDATORY:

- All **GLUE2Extension** entries MUST appear immediately below the object they extend, since they are logically part of the object, it would actually not make sense to do otherwise.

3.8   Aggregation

In this context, aggregation means composition of different LDAP trees under the same tree. At the time of writing, there is no defined way of aggregating different GLUE2 documents into one. In this section we will attempt to define a minimal structure that has proven to be effective in some implementation,

The GLUE2Group object class can also be used to do aggregation, instead of being used to group object the same kind. This object can be seen as an "insertion point", that is, a node of the LDAP DIT under which subtrees of other LDAP trees can be merged.

In the purpose of reaching a minimum common aggregation strategy, it is decided that the special **GLUE2Group** with **GLUE2GroupID**=grid is reserved for merging *AdminDomain*s hosting grid *Service*s from different sources. **GLUE2GroupID**=grid is an insertion point for *Domain* aggregation.

Additionally, the other two special GLUE2GroupID strings "resource", "services" are reserved for aggregation of services coming from different sources. A "resource" can be used for backward compatibility with Glue1 service aggregation, while "services" can be used by those who are not bound to any Glue1 implementation. **GLUE2GroupID**=resource/services is an insertion point for *Service* aggregation.

Hence, an implementer willing to realise *Domain* aggregation MUST follow the restrictions written below:

- The aggregation GLUE2Group entry MUST appear right after the o=glue. That is, the DN of such entry MUST be exactly: GLUE2GroupID=grid,o=glue

- The aggregated trees should appear right after such entry. That is, each LDAP entry belonging to the aggregated tree with its own RDN MUST be concatenated with the suffix GLUE2GroupID=grid,o=glue, i.e. <RDN>,GLUE2GroupID=grid,o=glue

Examples of how production implementers realised aggregation are shown in Appendix A.

3.9   OID Assignments

The GLUE 2.0 LDAP implementation utilizes the sub tree of 1.3.6.1.4.1.6757 which is assigned to the Global Grid Forum. The sub tree OIDs mapped to each LDAP object class are shown in Table 2. Table 3 gives an example of how OIDs are assigned to attributes for *AdminDomain* and its ancestor LDAP object classes.

OID are important for the LDAP server, to uniquely identify and validate object classes and attributes contained in the LDIF entries that will populate the LDAP database. These are placed in the LDAP schema as part of the definition of each LDAP object class and attribute.

Information consumers and LDAP clients will search data using more human readable query parameters, and can therefore completely avoid knowing these OIDs.

It is however important on the server side to have a simple and consistent way of assigning these OIDs so that future extensions of the GLUE2 schema are easy to rollout.

For this reason the numbering schema in previous version of this document was revised. LDAP Object classes and their attributes OID follow these simple rules:

- For each entity *E* in GFD.147, an OID is assigned, in the form:
   1.3.6.1.4.1.6757.100.1.1.X
   Where X uniquely identifies the entity *E,* X is a positive integer, X>0.

- For each attribute *A* that belongs to the entity *E* with OID 1.3.6.1.4.1.6757.100.1.1.X, an OID is assigned of the form:
   1.3.6.1.4.1.6757.100.1.1.X.Y
   Where Y uniquely identifies the attribute *A*. Y is a positive integer, Y>0.

3.9.1   Adding new object classes or attributes
Within this framework, an implementer willing to add a new attribute to an existing LDAP object class 1.3.6.1.4.1.6757.100.1.1.X has to look for the attribute with OID 1.3.6.1.4.1.6757.100.1.1.X.Y with the highest Y, and define a new attribute with OID 1.3.6.1.4.1.6757.100.1.1.X.Z where Z=Y+1. Always add attributes increasing the Y number.

> Example: Since **GLUE2AdminDomain** OID is 1.3.6.1.4.1.6757.100.1.1.6 (see table2), the new attribute will have OID 1.3.6.1.4.1.6757.100.1.1.6.Y. To choose Y, let's look at the defined attributes for **GLUE2AdminDomain**: the highest Y is 3 (see table 3), hence the new attribute will have OID 1.3.6.1.4.1.6757.100.1.1.6.4.

Similarly, an implementer willing to add a new LDAP object class and its attributes will have to define a new OID 1.3.6.1.4.1.6757.100.1.1.W where W=X+1, X being the highest used value within all the existing object classes OIDs 1.3.6.1.4.1.6757.100.1.1.X. Then he will use the OIDs 1.3.6.1.4.1.6757.100.1.1.W.Y, Y>0, for each of the new attributes of the object class.

> Example: Check table 2. Let OIDs in that table be 1.3.6.1.4.1.6757.100.1.1.X. The highest X used for object class OIDs is 36. A new object must have W=X+1, hence one can define the new LDAP object class to have OID 1.3.6.1.4.1.6757.100.1.1.37 and all its attributes to be OID 1.3.6.1.4.1.6757.100.1.1.37.1 OID=1.3.6.1.4.1.6757.100.1.1.37.2 , … , and so on.

Main Entities		
OID	LDAP object class NAME	GFD.147 entity
1.3.6.1.4.1.6757.100.1.1.1	**GLUE2Entity <>**	*Entity <>*
1.3.6.1.4.1.6757.100.1.1.2	**GLUE2Extension**	*Extension*
1.3.6.1.4.1.6757.100.1.1.3	**GLUE2Location**	*Location*
1.3.6.1.4.1.6757.100.1.1.4	**GLUE2Contact**	*Contact*
1.3.6.1.4.1.6757.100.1.1.5	**GLUE2Domain**	*Domain*
1.3.6.1.4.1.6757.100.1.1.6	**GLUE2AdminDomain**	*AdminDomain*

1.3.6.1.4.1.6757.100.1.1.7	**GLUE2UserDomain**	*UserDomain*
1.3.6.1.4.1.6757.100.1.1.8	**GLUE2Service**	*Service*
1.3.6.1.4.1.6757.100.1.1.9	**GLUE2Endpoint**	*Endpoint*
1.3.6.1.4.1.6757.100.1.1.10	**GLUE2Share**	*Share*
1.3.6.1.4.1.6757.100.1.1.11	**GLUE2Manager**	*Manager*
1.3.6.1.4.1.6757.100.1.1.12	**GLUE2Resource**	*Resource*
1.3.6.1.4.1.6757.100.1.1.13	**GLUE2Activity**	*Activity*
1.3.6.1.4.1.6757.100.1.1.14	**GLUE2Policy**	*Policy*
1.3.6.1.4.1.6757.100.1.1.15	**GLUE2AccessPolicy**	*AccessPolicy*
1.3.6.1.4.1.6757.100.1.1.16	**GLUE2MappingPolicy**	*MappingPolicy*
Computing Service Entities		
OID	**LDAP object class NAME**	**GFD.147 entity**
1.3.6.1.4.1.6757.100.1.1.17	**GLUE2ComputingService**	*ComputingService*
1.3.6.1.4.1.6757.100.1.1.18	**GLUE2ComputingEndpoint**	*ComputingEndpoint*
1.3.6.1.4.1.6757.100.1.1.19	**GLUE2ComputingShare**	*ComputingShare*
1.3.6.1.4.1.6757.100.1.1.20	**GLUE2ComputingManager**	*ComputingManager*
1.3.6.1.4.1.6757.100.1.1.21	**GLUE2Benchmark**	*Benchmark*
1.3.6.1.4.1.6757.100.1.1.22	**GLUE2ExecutionEnvironment**	*ExecutionEnvironment*
1.3.6.1.4.1.6757.100.1.1.23	**GLUE2ApplicationEnvironment**	*ApplicationEnvironment*
1.3.6.1.4.1.6757.100.1.1.24	**GLUE2ApplicationHandle**	*ApplicationHandle*
1.3.6.1.4.1.6757.100.1.1.25	**GLUE2ComputingActivity**	*ComputingActivity*
1.3.6.1.4.1.6757.100.1.1.26	**GLUE2ToStorageService**	*ToStorageService*
Storage Service Entities		
OID	**LDAP object class NAME**	**GFD.147 entity**
1.3.6.1.4.1.6757.100.1.1.27	**GLUE2StorageService**	*StorageService*
1.3.6.1.4.1.6757.100.1.1.28	**GLUE2StorageServiceCapacity**	*StorageServiceCapacity*
1.3.6.1.4.1.6757.100.1.1.29	**GLUE2StorageAccessProtocol**	*StorageAccessProtocol*
1.3.6.1.4.1.6757.100.1.1.30	**GLUE2StorageEndpoint**	*StorageEndpoint*
1.3.6.1.4.1.6757.100.1.1.31	**GLUE2StorageShare**	*StorageShare*
1.3.6.1.4.1.6757.100.1.1.32	**GLUE2StorageShareCapacity**	*StorageShareCapacity*
1.3.6.1.4.1.6757.100.1.1.33	**GLUE2StorageManager**	*StorageManager*
1.3.6.1.4.1.6757.100.1.1.34	**GLUE2DataStore**	*DataStore*
1.3.6.1.4.1.6757.100.1.1.35	**GLUE2ToComputingService**	*ToComputingService*
1.3.6.1.4.1.6757.100.1.1.36	**GLUE2Group**	*Group*

Table 2: OID assigned to LDAP object classes and their corresponding entity in GFD.147.

Entity attributes		
OID	**LDAP Attribute Name**	**GFD.147 Attribute name**
--	**GLUE2EntityID**	*ID*
1.3.6.1.4.1.6757.100.1.1.1.2	**GLUE2EntityName**	*Name*
1.3.6.1.4.1.6757.100.1.1.1.3	**GLUE2EntityOtherInfo**	*OtherInfo*
1.3.6.1.4.1.6757.100.1.1.1.4	**GLUE2EntityCreationTime**	*CreationTime*
1.3.6.1.4.1.6757.100.1.1.1.5	**GLUE2EntityValidity**	*Validity*
Domain attributes		
OID	**LDAP Attribute Name**	**GFD.147 Attribute name**
1.3.6.1.4.1.6757.100.1.1.5.1	**GLUE2DomainID**	*ID*
1.3.6.1.4.1.6757.100.1.1.5.2	**GLUE2DomainDescription**	*Description*
1.3.6.1.4.1.6757.100.1.1.5.3	**GLUE2DomainWWW**	*WWW*
AdminDomain attributes		
OID	**LDAP Attribute Name**	**GFD.147**

		Attribute name
1.3.6.1.4.1.6757.100.1.1.6.1	**GLUE2AdminDomainDistributed**	*Distributed*
1.3.6.1.4.1.6757.100.1.1.6.2	**GLUE2AdminDomainOwner**	*Owner*
1.3.6.1.4.1.6757.100.1.1.6.3	**GLUE2AdminDomainAdminDomainForeignKey**	*AdminDomain* to *AdminDomain* association

Table 3: OID assigned to LDAP attributes of the AdminDomain entity and its ancestors. Note that GLUE2EnityID does not exist, as it is an abstract entity, so there is no corresponding LDAP attribute and OID.

4.   Security Considerations

Using LDAP to implement the GLUE 2.0 specification raises several considerations especially in the field of data integrity.

LDAP is not a relational database, thus it cannot ensure relationship integrity. This must be ensured by other means.

LDAP cannot ensure most data types referred in the GLUE 2.0 specification, thus this implementation uses the generic types "DirectoryString" and "Integer" specified in [rfc4517].

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6.   Contributors & Acknowledgements

We gratefully acknowledge the contributions made to this document.

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10. References

[glue-2] "GFD.147, GLUE 2.0 Specification". http://ogf.org/documents/GFD.147.pdf

[glue-1] GLUE Schema Specification version 1.3. http://forge.gridforum.org/sf/go/doc14185

[rfc4512] RFC 4512. "Lightweight Directory Access Protocol (LDAP): Directory Information Models". http://tools.ietf.org/html/rfc4512

[rfc4517] RFC 4517. "Lightweight Directory Access Protocol (LDAP): Syntaxes and Matching Rules". http://tools.ietf.org/html/rfc4517

[rfc4520] RFC 4520. "Internet Assigned Numbers Authority (IANA) Considerations for the Lightweight Directory Access Protocol (LDAP)". http://tools.ietf.org/html/rfc4520

11. Appendix A: Example LDAP tree structures in existing server side implementations

This section gives a detailed explanation of how the DIT has been realised by the gLite and ARC grid middlewares. Historically, these two decided to follow different approaches, but through agreements on how aggregation is done, it was possible to connect the different trees.

Aggregation is used to combine information taken from different trees into a single DIT. When aggregating DITs from different LDAP servers, entries MAY be added or removed as part of the aggregation process but the DIT relations between existing entries in that tree SHOULD be preserved.

Following the presentation of the general considerations and the minimal restrictions on the DIT as stated in Section 3.7, gLite and ARC defined the following GLUE2 LDAP DIT structure. The GLUE2 model can be used to describe Grid information on different levels, from lower to top:

1) gLite "Resource" or ARC "local" level
The bottom level, where no aggregation is usually done, contains a set of services operated on local resources within a same box or local network;

In the **gLite** model, all *Service*s are aggregated under the **GLUE2GroupID=resource,o=glue** LDAP entry. The software component that generates such data is called Resource BDII. Resource BDIIs are usually not exposed to information consumers directly. For this reason gLite Resource BDII does NOT contain **GLUE2AdminDomain** entries. These entries are added later by another component, Site BDII, described later. Resource BDIIs do not publish ComputingActivities for performance reasons.

In the **ARC** model, all *Service*s are aggregated under the **GLUE2GroupID=services,o=glue** LDAP entry. The software component that generates such data is called ARIS. ARIS is usually exposed to information consumers directly. This is a key difference with gLite BDII, as this service level tree MAY contain an LDAP entry with DN **GLUE2DomainID=<domainID>,o=glue** which contains information about the *AdminDomain* to which the services belong, where ID is a URI as mandated by GFD.147. ARIS tree includes the following groupings: **GLUE2GroupID=ComputingActivities**, **GLUE2GroupID=ExecutionEnvironments**, **GLUE2GroupID=ApplicationEnvironments**. These are placed in the trees according to Figure 1.

2) gLite "Site" or Domain level
In the **gLite** model, local information from different sources like Resource BDIIs or ARIS local trees then MAY be merged or aggregated at an intermediate level by a software component called Site BDII. The top of its tree is labeled with DN

   GLUE2DomainID=<domainName>,o=glue
where domainName is a free form string.

Right under this DN, Resource BDII's contents under the entity
   GLUE2GroupID=resource,o=glue
is aggregated with the DN suffix
   GLUE2GroupID=resource,GLUE2DomainID=<domainName>,o=glue.

As a consequence of agreements on the structure of the DIT finalized in 2012, ARIS's local content under
   GLUE2GroupID=services,o=glue
 is also aggregated as
   GLUE2GroupID=services,GLUE2DomainID=<domainName>,o=glue.

All these DNs suffixes listed above are usually referred to as "insertion points", to indicate that a tree coming from a different source with DN **GLUE2GroupID=resource,o=glue** or

GLUE2GroupID=services,o=glue will be inserted starting from the entity with the same **GLUE2GroupID** attribute value.

The content aggregated by a Site BDII is usually available for information consumers. ARC has no equivalent of a Site BDII and therefore no Domain level. The same information is distributed in ARIS, at the local level.

3) gLite "Top" or Global level

In the **gLite** model, information taken from the Site or the Resource/local levels is aggregated on a global top level by a component called Top BDII. The DIT representing the global level naturally accommodates the domain and local level trees as subtrees.

In this context, the insertion point **GLUE2GroupID=grid,o=glue** aggregates **GLUE2DomainID=<domainName>,o=glue** trees coming from different Site BDIIs, as

  GLUE2DomainID=<domainName>,GLUE2GroupID=grid,o=glue.

*Service*s contained in such trees will be aggregated with suffix

  GLUE2GroupID=resource,GLUE2DomainID=<domainName>,GLUE2GroupID=grid,o=glue

ARC does not have an equivalent to a Top BDII. All the information needed for the aggregation should be fetched by Top BDII directly from ARIS. While an agreement on how to achieve this has been already established, work with this respect is still ongoing.

The DITs for the three levels are shown on the figures below.

Notable properties of the common DIT structure are as follows:

- **GLUE2AdminDomain** entries only aggregate services as their child entries in the tree when those services are managed by that Domain.

- A **GLUE2Service** entry SHOULD aggregate all service related entries describing the specific service via placing all those entries under its subtree, unrelated entries MUST NOT appear there

Local-level DIT (gLite Resource BDII or ARC ARIS):
- gLite and ARC: Right beneath the o=glue root it contains a **GLUE2Group** entry with **GLUE2GroupID=resource** or **GLUE2GroupID=services** . This entry usually accommodates all the local *Services* with their complete subtrees.
- In ARC, right beneath the o=glue root it MAY contain GLUE2AdminDomain or GLUE2UserDomain entries.
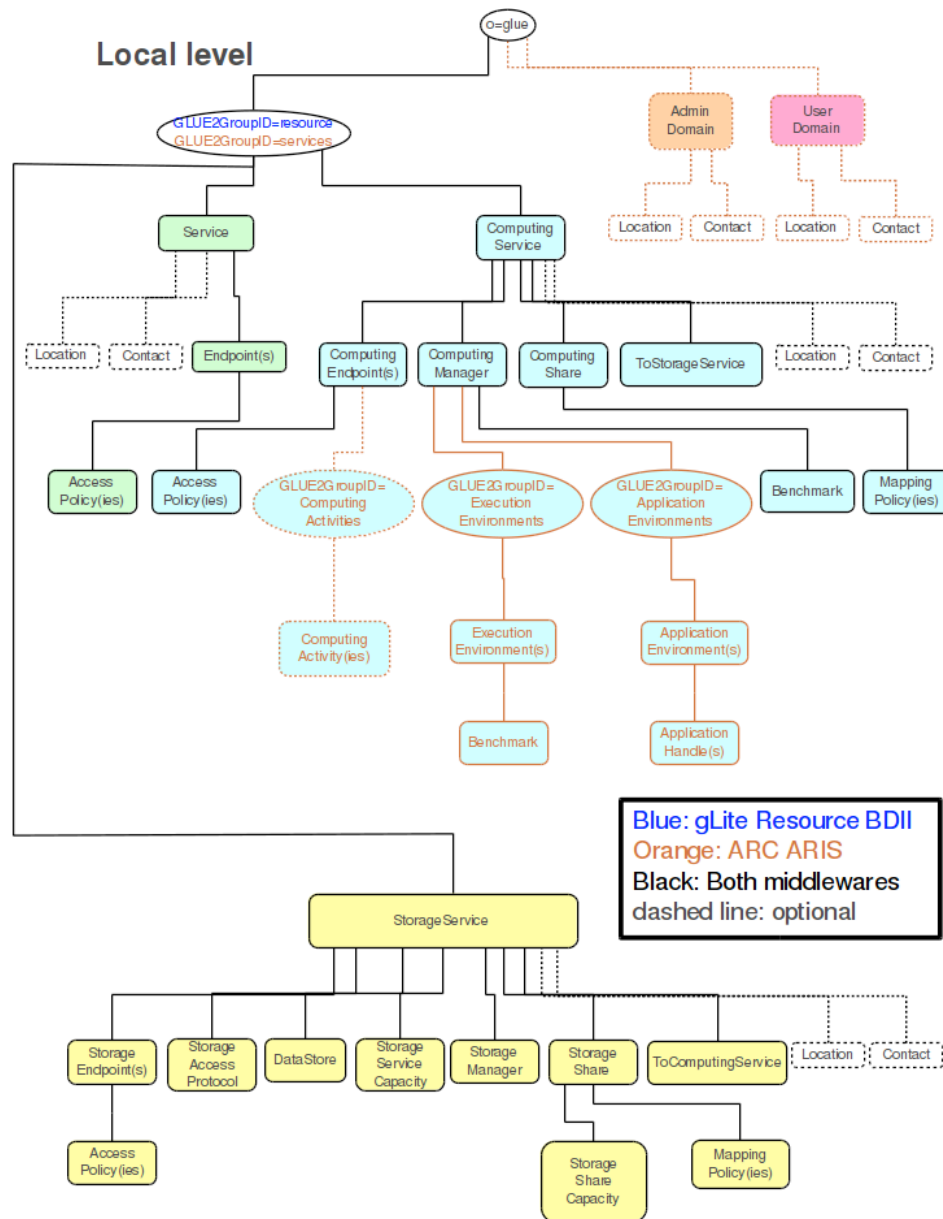
Figure 1: Example DIT structure of a local information source (gLite Resource BDII or ARIS ARC) publishing *Service*, *Computing Service* and *Storage Service* together with *Domain* information**.**

Domain-level DIT (gLite Site-BDII):

- Right beneath the o=glue root it contains only one **GLUE2AdminDomain** entry and might have a **GLUE2UserDomain**
- The **GLUE2AdminDomain** entry can have a **GLUE2Group** entry with **GLUE2GroupID=resource** or **GLUE2GroupID=services** attribute that contains all the service trees from the local level belonging to that domain.
- Right beneath the o=glue root it contains a **GLUE2Group** entry with **GLUE2GroupID=resource**. This entry is used to describe the LDAP service itself.
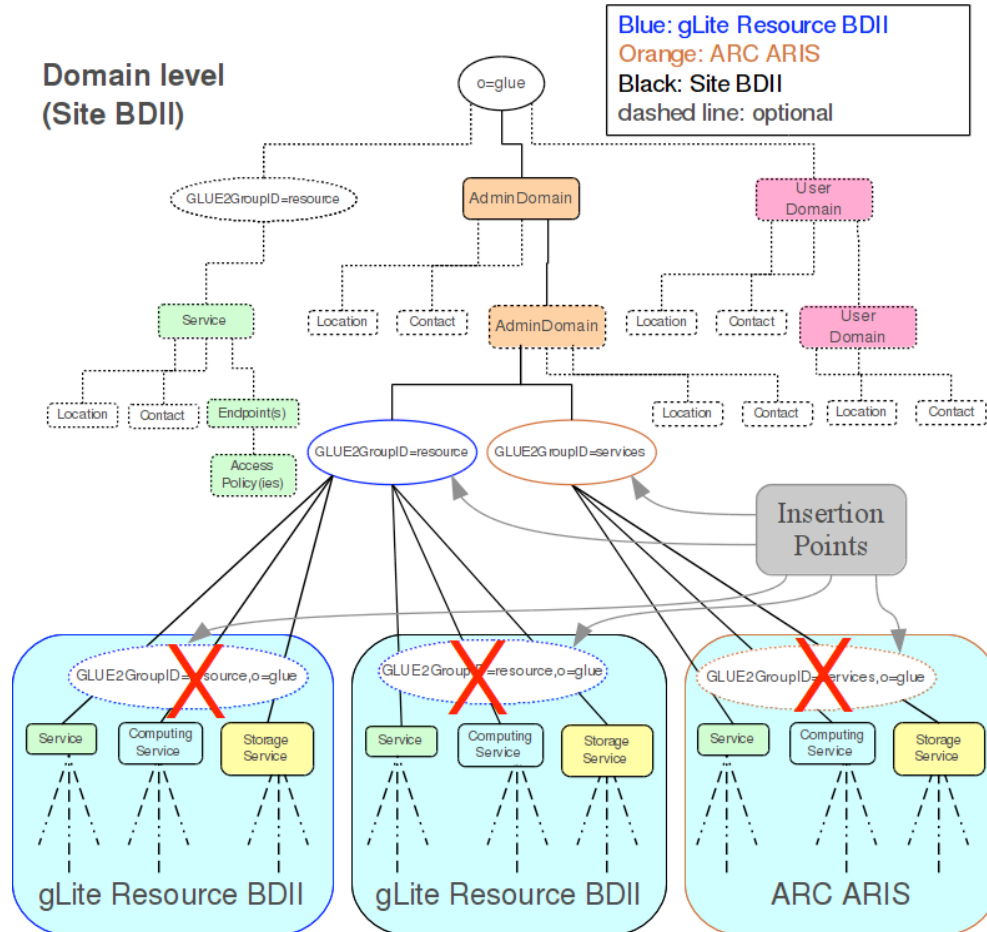
Figure 2: Example DIT structure for Site BDII aggregation of local information sources. Aggregation of the services from multiple local sources is done by moving every subtrees of the **GLUE2GroupID=resource** or **GLUE2groupID=services** entries under the **GLUE2AdminDomain** entry.

Global-level DIT (gLite Top BDII):

- Right beneath the o=glue root it contains a **GLUE2Group** entry with **GLUE2GroupID=grid**. This entry accommodates all the local *AdminDomains and UserDomains* with their complete subtrees
- Right beneath the o=glue root it contains a **GLUE2Group** entry with **GLUE2GroupID=resource**. This entry is used to describe the LDAP service itself.
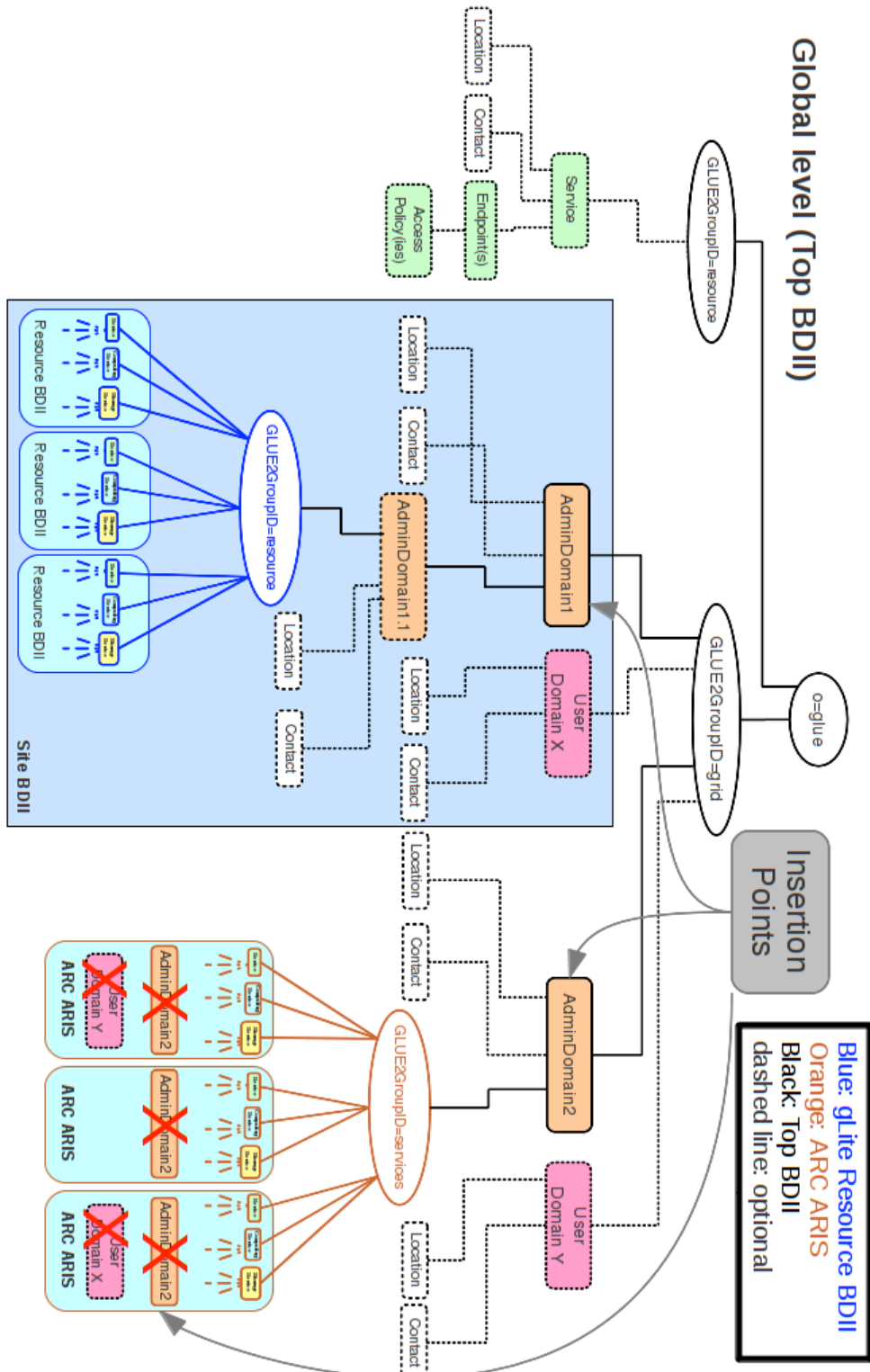
Figure 3: Example DIT structure for Top BDII aggregation from both Site BDII
and local level information sources.

A standalone file of the following LDAP schema is available at:
    http://redmine.ogf.org/dmsf/glue-wg?folder_id=14

```
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#
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# File:    schema/00-Version.schema
# URL:     http://redmine.ogf.org/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: - Version file
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
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#
#
# Schema Version: 2.0
# Last updated: 2014-07-02
#

# File:    schema/01-Group.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: - Group
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Group

attributetype ( 1.3.6.1.4.1.6757.100.1.1.36.1
        NAME ( 'GLUE2GroupID' 'GLUE2GroupName' 'GLUE2GroupLocalID' )
        DESC 'Local ID, not unique'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.36
        NAME 'GLUE2Group'
        DESC 'Group object'
        STRUCTURAL
        MUST GLUE2GroupID
 )

# File:    schema/5-01-Entity.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 5.1 Entity
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University
```

```
# Entity <<abstract>>

attributetype ( 1.3.6.1.4.1.6757.100.1.1.1.2
        NAME 'GLUE2EntityName'
        DESC 'Human-readable name'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.1.3
        NAME 'GLUE2EntityOtherInfo'
        DESC 'Placeholder to publish info that does not fit in any other
      attribute'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.1.4
        NAME 'GLUE2EntityCreationTime'
        DESC 'Timestamp describing when the entity instance was generated'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.1.5
        NAME 'GLUE2EntityValidity'
        DESC 'The duration of the information presented in this object after
      its creation time'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.1
        NAME 'GLUE2Entity'
        DESC 'Base class'
        ABSTRACT
        MAY ( GLUE2EntityName $ GLUE2EntityOtherInfo $
GLUE2EntityCreationTime
      $ GLUE2EntityValidity )
 )

# File:    schema/5-02-Extension.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 5.2 Extension
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Extension

attributetype ( 1.3.6.1.4.1.6757.100.1.1.2.1
        NAME 'GLUE2ExtensionLocalID'
        DESC 'A local identifier unique within the class instance to which
it
```

```
        is associated'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.2.2
         NAME 'GLUE2ExtensionKey'
         DESC 'An identifier local to the container class instance'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.2.3
         NAME 'GLUE2ExtensionValue'
         DESC 'A value for the attribute named by the key'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.2.4
         NAME 'GLUE2ExtensionEntityForeignKey'
         DESC 'ForeignKey'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.2
         NAME 'GLUE2Extension'
         DESC 'A key/value pair enabling the association of extra
information'
         STRUCTURAL
         MUST ( GLUE2ExtensionLocalId $ GLUE2ExtensionKey $
GLUE2ExtensionValue
        $ GLUE2ExtensionEntityForeignKey )
 )

# File:    schema/5-03-Location.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 5.3 Location
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Location inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.3.1
         NAME 'GLUE2LocationID'
         DESC 'Globally unique ID'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.3.2
```

```
        NAME 'GLUE2LocationAddress'
        DESC 'Street address'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.3.3
        NAME 'GLUE2LocationPlace'
        DESC 'Name of town/city'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.3.4
        NAME 'GLUE2LocationCountry'
        DESC 'Country name'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.3.5
        NAME 'GLUE2LocationPostCode'
        DESC 'Postal code'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.3.6
        NAME 'GLUE2LocationLatitude'
        DESC 'The position of a place north or south of the equator measured
      from -90 degrees to +90 degrees with positive values going north and
      negative values going south'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.3.7
        NAME 'GLUE2LocationLongitude'
        DESC 'The position of a place east or west of Greenwich, England
      measured from -180 degrees to +180 degrees with positive values going
      east and negative values going west'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.3.8
        NAME 'GLUE2LocationServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
```

```
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.3.9
        NAME 'GLUE2LocationDomainForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )
objectclass ( 1.3.6.1.4.1.6757.100.1.1.3
        NAME 'GLUE2Location'
        SUP GLUE2Entity
        DESC 'A geographical position'
        STRUCTURAL
        MUST GLUE2LocationID
        MAY ( GLUE2LocationAddress $ GLUE2LocationPlace $
GLUE2LocationCountry
       $ GLUE2LocationPostCode $ GLUE2LocationLatitude $
GLUE2LocationLongitude
       $ GLUE2LocationServiceForeignKey $ GLUE2LocationDomainForeignKey )
 )

# File:    schema/5-04-Contact.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 5.4 Contact
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Contact inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.4.1
        NAME 'GLUE2ContactID'
        DESC 'Globally unique ID'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.4.2
        NAME 'GLUE2ContactDetail'
        DESC 'URL embedding the contact information. The syntax of URI
depends
       on the communication channel'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.4.3
        NAME 'GLUE2ContactType'
        DESC 'Type of contact'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.4.4
```

```
               NAME 'GLUE2ContactServiceForeignKey'
               DESC 'ForeignKey'
               EQUALITY caseExactMatch
               SUBSTR caseExactSubstringsMatch
               SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.4.5
               NAME 'GLUE2ContactDomainForeignKey'
               DESC 'ForeignKey'
               EQUALITY caseExactMatch
               SUBSTR caseExactSubstringsMatch
               SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.4
               NAME 'GLUE2Contact'
               SUP GLUE2Entity
               DESC 'Information enabling to establish a  communication with a
person
          or group of persons part of a domain'
               STRUCTURAL
               MUST ( GLUE2ContactID $ GLUE2ContactDetail $ GLUE2ContactType )
               MAY ( GLUE2ContactServiceForeignKey $ GLUE2ContactDomainForeignKey )
 )

# File:     schema/5-05-Domain.schema
# URL:      http://forge.gridforum.org/sf/projects/glue-wg
# Doc:      GLUE Specification 2.0 (March 3, 2009)
# Section: 5.5 Domain, 5.5.1 AdminDomain and 5.5.2 UserDomain
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Domain <<abstract>> inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.5.1
               NAME 'GLUE2DomainID'
               DESC 'A description of the domain'
               EQUALITY caseExactMatch
               SUBSTR caseExactSubstringsMatch
               SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
               SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.5.2
               NAME 'GLUE2DomainDescription'
               DESC 'A description of the domain'
               EQUALITY caseExactMatch
               SUBSTR caseExactSubstringsMatch
               SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
               SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.5.3
               NAME 'GLUE2DomainWWW'
               DESC 'The URL identifying a web page with more information about the
            domain'
               EQUALITY caseExactMatch
               SUBSTR caseExactSubstringsMatch
               SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )
```

```
objectclass ( 1.3.6.1.4.1.6757.100.1.1.5
        NAME 'GLUE2Domain'
        SUP GLUE2Entity
        DESC 'A Domain'
        STRUCTURAL
        MUST GLUE2DomainID
        MAY ( GLUE2DomainDescription $ GLUE2DomainWWW )
 )

###########################################################
# AdminDomain inherits from Domain
###########################################################
attributetype ( 1.3.6.1.4.1.6757.100.1.1.6.1
        NAME 'GLUE2AdminDomainDistributed'
        DESC 'True if the services managed by the AdminDomain are considered
      geographically distributed by the administrators themselves'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.6.2
        NAME 'GLUE2AdminDomainOwner'
        DESC 'Owner of the managed resources'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.6.4
        NAME 'GLUE2AdminDomainAdminDomainForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.6
        NAME 'GLUE2AdminDomain'
        DESC 'A collection of actors that can be assigned with
administrative
      roles and privileges to services via policies. An AdminDomain manages
      services that can be geographically distributed, nevertheless a
primary
      location should be identified.'
        SUP GLUE2Domain
        STRUCTURAL
        MAY ( GLUE2AdminDomainDistributed $ GLUE2AdminDomainOwner $
      GLUE2AdminDomainAdminDomainForeignKey )
 )

################################################
# UserDomain inherits from Domain
################################################
attributetype ( 1.3.6.1.4.1.6757.100.1.1.7.1
        NAME 'GLUE2UserDomainLevel'
        DESC 'The number of hops to reach the root for hierarchically
organized
      domains described by the composed by association (0 is for the root).'
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )
```

```
attributetype ( 1.3.6.1.4.1.6757.100.1.1.7.2
        NAME 'GLUE2UserDomainUserManager'
        DESC 'The Endpoint ID managing the users part of the domain and the
      related attributes such as groups or roles'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.7.3
        NAME 'GLUE2UserDomainMember'
        DESC 'An identifier for a user in this user domain'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.7.5
        NAME 'GLUE2UserDomainUserDomainForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.7
        NAME 'GLUE2UserDomain'
        DESC 'A collection of actors that can be assigned with user roles
and
      privileges to services or shares via policies'
        SUP GLUE2Domain
        STRUCTURAL
        MAY ( GLUE2UserDomainLevel $ GLUE2UserDomainUserManager $
      GLUE2UserDomainMember $ GLUE2UserDomainUserDomainForeignKey )
 )


# File:    schema/5-06-Service.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 5.6 Service
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Service inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.8.1
        NAME 'GLUE2ServiceID'
        DESC 'Globally unique ID'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.8.2
        NAME 'GLUE2ServiceCapability'
        DESC 'The provided capability according to the OGSA architecture (it
is
      given by the sum of all the capabilities provided by the related
      endpoints)'
```

```
             EQUALITY caseExactMatch
             SUBSTR caseExactSubstringsMatch
             SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.8.3
        NAME 'GLUE2ServiceType'
        DESC 'The type of service according to a middleware classification'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.8.4
        NAME 'GLUE2ServiceQualityLevel'
        DESC 'Maturity of the service in terms of quality of the software
      components'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.8.5
        NAME 'GLUE2ServiceStatusInfo'
        DESC 'A URL providing additional information like monitoring
aspects'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.8.6
        NAME 'GLUE2ServiceComplexity'
        DESC 'Human-readable summary description of the complexity in terms
of
      the number of endpoint types, shares and resources. The syntax should
      be: EndpointType=X, Share=Y, Resource=Z.'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.8.7
        NAME 'GLUE2ServiceAdminDomainForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.8.8
        NAME 'GLUE2ServiceServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.8
        NAME 'GLUE2Service'
```

```
       SUP GLUE2Entity
        DESC 'An abstracted, logical view of actual software components that
      participate in the creation of an entity providing one or more
      functionalities useful in a Grid environment. A service exposes zero
or
      more endpoints having well-defined interfaces, zero or more shares and
      zero or more managers and the related resources. The service is
      autonomous and denotes a weak aggregation among endpoints, the
      underlying managers and the related resources, and the defined shares.
      The service enables to identify the whole set of entities providing
the
      functionality with a persistent name.'
        STRUCTURAL
        MUST ( GLUE2ServiceID $ GLUE2ServiceType $ GLUE2ServiceQualityLevel
$
      GLUE2ServiceAdminDomainForeignKey )
      MAY ( GLUE2ServiceCapability $ GLUE2ServiceStatusInfo $
      GLUE2ServiceComplexity $ GLUE2ServiceServiceForeignKey )
 )


# File:    schema/5-07-Endpoint.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 5.7 Endpoint
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Endpoint inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.1
        NAME 'GLUE2EndpointID'
        DESC 'Globally unique ID'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.2
        NAME 'GLUE2EndpointURL'
        DESC 'Network location of the endpoint to contact the related
service'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.3
        NAME 'GLUE2EndpointCapability'
        DESC 'The provided capability according to the OGSA architecture'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.4
        NAME 'GLUE2EndpointTechnology'
        DESC 'Technology used to implement the endpoint'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
```

```
           SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
           SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.5
           NAME 'GLUE2EndpointInterfaceName'
           DESC 'Identification of a type and version of the interface'
           EQUALITY caseExactMatch
           SUBSTR caseExactSubstringsMatch
           SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
           SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.6
           NAME 'GLUE2EndpointInterfaceVersion'
           DESC 'The version of the primary interface protocol'
           EQUALITY caseExactMatch
           SUBSTR caseExactSubstringsMatch
           SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
           SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.7
           NAME 'GLUE2EndpointInterfaceExtension'
           DESC 'Identification of an extension to the interface'
           EQUALITY caseExactMatch
           SUBSTR caseExactSubstringsMatch
           SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.8
           NAME 'GLUE2EndpointWSDL'
           DESC 'URL of the WSDL document describing the offered interface
         (applies to Web Services endpoint)'
           EQUALITY caseExactMatch
           SUBSTR caseExactSubstringsMatch
           SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.9
           NAME 'GLUE2EndpointSupportedProfile'
           DESC 'URI identifying a supported profile'
           EQUALITY caseExactMatch
           SUBSTR caseExactSubstringsMatch
           SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.10
           NAME 'GLUE2EndpointSemantics'
           DESC 'URI of a document providing a human-readable description of
the
         semantics of the endpoint functionalities'
           EQUALITY caseExactMatch
           SUBSTR caseExactSubstringsMatch
           SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.11
           NAME 'GLUE2EndpointImplementor'
           DESC 'Main organization implementing this software component'
           EQUALITY caseExactMatch
           SUBSTR caseExactSubstringsMatch
           SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
```

```
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.12
        NAME 'GLUE2EndpointImplementationName'
        DESC 'Name of the implementation'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.13
        NAME 'GLUE2EndpointImplementationVersion'
        DESC 'Version of the implementation (e.g., major version.minor
      version.patch version)'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.14
        NAME 'GLUE2EndpointQualityLevel'
        DESC 'Maturity of the endpoint in terms of quality of the software
      components'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.15
        NAME 'GLUE2EndpointHealthState'
        DESC 'A state representing the health of the endpoint in terms of
its
      capability of properly delivering the functionalities'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.16
        NAME 'GLUE2EndpointHealthStateInfo'
        DESC 'Textual explanation of the state endpoint'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.17
        NAME 'GLUE2EndpointServingState'
        DESC 'A state specifying if the endpoint is accepting new requests
and
      if it is serving the already accepted requests'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )
```

```
attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.18
        NAME 'GLUE2EndpointStartTime'
        DESC 'The timestamp for the start time of the endpoint'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.19
        NAME 'GLUE2EndpointIssuerCA'
        DESC 'Distinguished name of Certification Authority issuing the
      certificate for the endpoint'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.20
        NAME 'GLUE2EndpointTrustedCA'
        DESC 'Distinguished name of the trusted Certification Authority'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.21
        NAME 'GLUE2EndpointDowntimeAnnounce'
        DESC 'The timestamp for the announcement of the next scheduled
      downtime'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.22
        NAME 'GLUE2EndpointDowntimeStart'
        DESC 'The starting timestamp of the next scheduled downtime'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.23
        NAME 'GLUE2EndpointDowntimeEnd'
        DESC 'The ending timestamp of the next scheduled downtime'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.24
        NAME 'GLUE2EndpointDowntimeInfo'
        DESC 'Description of the next scheduled downtime'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )
```

```
attributetype ( 1.3.6.1.4.1.6757.100.1.1.9.25
        NAME 'GLUE2EndpointServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.9
        NAME 'GLUE2Endpoint'
        SUP GLUE2Entity
        DESC 'A network location having a well-defined interface and
exposing
        the service functionalities'
         STRUCTURAL
         MUST ( GLUE2EndpointID $ GLUE2EndpointURL $
GLUE2EndpointInterfaceName
        $ GLUE2EndpointQualityLevel $ GLUE2EndpointHealthState $
        GLUE2EndpointServingState $ GLUE2EndpointServiceForeignKey )
         MAY ( GLUE2EndpointCapability $ GLUE2EndpointTechnology $
        GLUE2EndpointInterfaceVersion $ GLUE2EndpointInterfaceExtension $
        GLUE2EndpointWSDL $ GLUE2EndpointSupportedProfile $
        GLUE2EndpointSemantics $ GLUE2EndpointImplementor $
        GLUE2EndpointImplementationName $ GLUE2EndpointImplementationVersion $
        GLUE2EndpointHealthStateInfo $ GLUE2EndpointStartTime $
        GLUE2EndpointIssuerCA $ GLUE2EndpointTrustedCA $
        GLUE2EndpointDowntimeAnnounce $ GLUE2EndpointDowntimeStart $
        GLUE2EndpointDowntimeEnd $ GLUE2EndpointDowntimeInfo )
 )

# File:    schema/5-08-Share.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 5.8 Share
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Share <<abstract>> inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.10.1
        NAME 'GLUE2ShareID'
        DESC 'Globally unique ID'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.10.2
        NAME 'GLUE2ShareDescription'
        DESC 'Description of this share'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.10.3
        NAME 'GLUE2ShareEndpointForeignKey'
        DESC 'ForeignKey'
```

```
                EQUALITY caseExactMatch
                SUBSTR caseExactSubstringsMatch
                SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.10.4
        NAME 'GLUE2ShareResourceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.10.5
        NAME 'GLUE2ShareServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.10
        NAME 'GLUE2Share'
        SUP GLUE2Entity
        DESC 'A share'
        STRUCTURAL
        MUST ( GLUE2ShareID $ GLUE2ShareServiceForeignKey )
        MAY ( GLUE2ShareDescription $ GLUE2ShareEndpointForeignKey $
      GLUE2ShareResourceForeignKey )
 )

# File:    schema/5-09-Manager.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 5.9 Manager
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Manager <<abstract>> inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.11.1
        NAME 'GLUE2ManagerID'
        DESC 'Globally unique ID'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.11.2
        NAME 'GLUE2ManagerProductName'
        DESC 'The name of the software product which implements the Manager
      functionality'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.11.3
        NAME 'GLUE2ManagerProductVersion'
```

```
        DESC 'The version of the software product which implements the
Manager
       functionality'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.11.4
        NAME 'GLUE2ManagerServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.11
        NAME 'GLUE2Manager'
        SUP GLUE2Entity
        DESC 'A manager'
        STRUCTURAL
        MUST ( GLUE2ManagerID $ GLUE2ManagerProductName $
      GLUE2ManagerServiceForeignKey )
        MAY GLUE2ManagerProductVersion
 )

# File:    schema/5-10-Resource.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 5.10 Resource
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Resource <<abstract>> inherits from Entity
# No attributes

attributetype ( 1.3.6.1.4.1.6757.100.1.1.12.1
        NAME 'GLUE2ResourceID'
        DESC 'Globally unique ID'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.12.2
        NAME 'GLUE2ResourceManagerForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.12
        NAME 'GLUE2Resource'
        SUP GLUE2Entity
        DESC 'A resource'
        STRUCTURAL
        MUST ( GLUE2ResourceID $ GLUE2ResourceManagerForeignKey )
```

```
 )

# File:    schema/5-11-Activity.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 5.11 Activity
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Activity inherits from Entity
# No attributes

attributetype ( 1.3.6.1.4.1.6757.100.1.1.13.1
        NAME 'GLUE2ActivityID'
        DESC 'Globally unique ID'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.13.2
        NAME 'GLUE2ActivityUserDomainForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.13.3
        NAME 'GLUE2ActivityEndpointForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.13.4
        NAME 'GLUE2ActivityShareForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.13.5
        NAME 'GLUE2ActivityResourceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.13.6
        NAME 'GLUE2ActivityActivityForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
```

```
       SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.13
        NAME 'GLUE2Activity'
        SUP GLUE2Entity
        DESC 'An activity is a unit of work managed by a Service and
submitted
       via an Endpoint'
        STRUCTURAL
        MUST GLUE2ActivityID
        MAY ( GLUE2ActivityUserDomainForeignKey $
       GLUE2ActivityEndpointForeignKey $ GLUE2ActivityShareForeignKey $
       GLUE2ActivityResourceForeignKey $ GLUE2ActivityActivityForeignKey )
 )


# File:    schema/5-12-Policy.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 5.12 Policy, 5.12.1 AccessPolicy, 5.12.2 MappingPolicy
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Policy <<abstract>> inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.14.1
        NAME 'GLUE2PolicyID'
        DESC 'Scheme adopted to define the policy rules'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.14.2
        NAME 'GLUE2PolicyScheme'
        DESC 'Scheme adopted to define the policy rules'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.14.3
        NAME 'GLUE2PolicyRule'
        DESC 'A policy rule'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.14.4
        NAME 'GLUE2PolicyUserDomainForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.14
        NAME 'GLUE2Policy'
```

```
        SUP GLUE2Entity
        DESC 'A policy'
        STRUCTURAL
        MUST ( GLUE2PolicyID $ GLUE2PolicyScheme $ GLUE2PolicyRule )
        MAY ( GLUE2PolicyUserDomainForeignKey )
 )

###########################################################
# AccessPolicy inherits from Policy
###########################################################
attributetype ( 1.3.6.1.4.1.6757.100.1.1.15.1
        NAME 'GLUE2AccessPolicyEndpointForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.15
        NAME 'GLUE2AccessPolicy'
        DESC 'Statements, rules or assertions that provide coarse-
granularity
      information about the authorization of access by groups of actors to
an
      Endpoint'
           SUP 'GLUE2Policy'
        STRUCTURAL
        MUST GLUE2AccessPolicyEndpointForeignKey
 )

###########################################################
# MappingPolicy inherits from Policy
###########################################################
attributetype ( 1.3.6.1.4.1.6757.100.1.1.16.1
        NAME 'GLUE2MappingPolicyShareForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.16
        NAME 'GLUE2MappingPolicy'
        DESC 'Statements, rules or assertions that provide coarse-
granularity
      information about the mapping or UserDomain requests to a Share'
        SUP 'GLUE2Policy'
        STRUCTURAL
        MUST GLUE2MappingPolicyShareForeignKey
 )

# File:    schema/6-01-ComputingService.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 6.1 ComputingService
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# ComputingService inherits from Service

attributetype ( 1.3.6.1.4.1.6757.100.1.1.17.1
        NAME 'GLUE2ComputingServiceTotalJobs'
```

```
         DESC 'Number of total jobs'
       EQUALITY    integerMatch
       ORDERING    integerOrderingMatch
       SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.17.2
       NAME 'GLUE2ComputingServiceRunningJobs'
       DESC 'Number of running jobs'
       EQUALITY    integerMatch
       ORDERING    integerOrderingMatch
       SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
       SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.17.3
       NAME 'GLUE2ComputingServiceWaitingJobs'
       DESC 'Number of jobs waiting in the underlying computing managers
       (i.e., Local Resource Manager System or LRMS)'
       EQUALITY    integerMatch
       ORDERING    integerOrderingMatch
       SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
       SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.17.4
       NAME 'GLUE2ComputingServiceStagingJobs'
       DESC 'Number of jobs that are staging files in/out'
       EQUALITY    integerMatch
       ORDERING    integerOrderingMatch
       SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
       SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.17.5
       NAME 'GLUE2ComputingServiceSuspendedJobs'
       DESC 'Number of jobs which started their execution, but are
suspended
       (e.g., for preemption)'
       EQUALITY    integerMatch
       ORDERING    integerOrderingMatch
       SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
       SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.17.6
       NAME 'GLUE2ComputingServicePreLRMSWaitingJobs'
       DESC 'Number of jobs that are in the Grid layer waiting to be passed
to
       the underlying computing manager (i.e., LRMS)'
       EQUALITY    integerMatch
       ORDERING    integerOrderingMatch
       SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
       SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.17
        NAME 'GLUE2ComputingService'
        DESC 'The computing service is autonomous and denotes a weak
       aggregation among computing endpoints, the underlying computing
       managers and related execution environments, and the defined computing
       shares. The computing service enables to identify the whole set of
```

```
       entities providing the computing functionality with a persistent
name.'
        SUP GLUE2Service
        STRUCTURAL
        MAY ( GLUE2ComputingServiceTotalJobs $
GLUE2ComputingServiceRunningJobs
      $ GLUE2ComputingServiceWaitingJobs $ GLUE2ComputingServiceStagingJobs
$
      GLUE2ComputingServiceSuspendedJobs $
      GLUE2ComputingServicePreLRMSWaitingJobs )
 )


# File:    schema/6-02-ComputingEndpoint.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 6.2 ComputingEndpoint
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# ComputingEndpoint inherits from Endpoint

attributetype ( 1.3.6.1.4.1.6757.100.1.1.18.1
        NAME 'GLUE2ComputingEndpointStaging'
        DESC 'Supported staging functionalities'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.18.2
        NAME 'GLUE2ComputingEndpointJobDescription'
        DESC 'Supported type of job description language'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.18.3
        NAME 'GLUE2ComputingEndpointTotalJobs'
        DESC 'Number of total jobs'
      EQUALITY    integerMatch
      ORDERING    integerOrderingMatch
      SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.18.4
        NAME 'GLUE2ComputingEndpointRunningJobs'
        DESC 'Number of running jobs'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.18.5
        NAME 'GLUE2ComputingEndpointWaitingJobs'
        DESC 'Number of jobs waiting in the underlying computing managers
      (i.e., Local Resource Manager System or LRMS)'
        EQUALITY    integerMatch
```

```
              ORDERING     integerOrderingMatch
              SYNTAX       1.3.6.1.4.1.1466.115.121.1.27
              SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.18.6
        NAME 'GLUE2ComputingEndpointStagingJobs'
        DESC 'Number of jobs that are staging files in/out'
        EQUALITY     integerMatch
        ORDERING     integerOrderingMatch
        SYNTAX       1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.18.7
        NAME 'GLUE2ComputingEndpointSuspendedJobs'
        DESC 'Number of jobs which started their execution, but are
suspended
       (e.g., for preemption)'
        EQUALITY     integerMatch
        ORDERING     integerOrderingMatch
        SYNTAX       1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.18.8
        NAME 'GLUE2ComputingEndpointPreLRMSWaitingJobs'
        DESC 'Number of jobs that are in the Grid layer waiting to be passed
to
       the underlying computing manager (i.e.,LRMS)'
        EQUALITY     integerMatch
        ORDERING     integerOrderingMatch
        SYNTAX       1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.18.9
        NAME 'GLUE2ComputingEndpointComputingServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.18
        NAME 'GLUE2ComputingEndpoint'
        DESC 'Endpoint for creating, monitoring, and controlling
computational
       activities called jobs; it can be used to expose also complementary
       capabilities (e.g., reservation, proxy manipulation)'
        SUP GLUE2Endpoint
        STRUCTURAL
        MAY ( GLUE2ComputingEndpointStaging $
       GLUE2ComputingEndpointJobDescription $
        GLUE2ComputingEndpointTotalJobs $
       GLUE2ComputingEndpointRunningJobs $
        GLUE2ComputingEndpointWaitingJobs $
       GLUE2ComputingEndpointStagingJobs $
       GLUE2ComputingEndpointSuspendedJobs $
       GLUE2ComputingEndpointPreLRMSWaitingJobs $
        GLUE2ComputingEndpointComputingServiceForeignKey )
 )
```

```
# File:    schema/6-03-ComputingShare.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 6.3 ComputingShare
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# ComputingShare inherits from Share

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.1
        NAME 'GLUE2ComputingShareMappingQueue'
        DESC 'Name of a queue available in the underlying computing manager
      (i.e., LRMS) where jobs of this share are submitted (different shares
      can be mapped into the same queue; it is not foreseen that a single
      share can be mapped into many different queues)'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.2
        NAME 'GLUE2ComputingShareMaxWallTime'
        DESC 'The maximum obtainable wall clock time per slot that can be
      granted to the job upon user request (unnormalized value)'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.3
        NAME 'GLUE2ComputingShareMaxMultiSlotWallTime'
        DESC 'The maximum obtainable wall clock time limit that MAY be
granted
      to a multi-slot job upon user request'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.4
        NAME 'GLUE2ComputingShareMinWallTime'
      DESC 'The minimum wall clock time per slot for a job (unnormalized
      value); if a job requests a lower time, than it can be rejected; if a
      job requests at least this value, but runs for a shorter time, than it
      might be accounted for this value'
      EQUALITY    integerMatch
      ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.5
        NAME 'GLUE2ComputingShareDefaultWallTime'
        DESC 'The default wall clock time per slot allowed to a job by the
      computing manager (i.e., LRMS) if no limit is requested in the job
      submission description. Once this time is expired the job will most
      likely be killed or removed from the queue (unnormalized value)'
```

```
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.6
        NAME 'GLUE2ComputingShareMaxCPUTime'
        DESC 'The maximum obtainable CPU time that can be granted to the job
     upon user request per slot (unnormalized value)'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.7
        NAME 'GLUE2ComputingShareMaxTotalCPUTime'
        DESC 'The maximum obtainable CPU time that can be granted to the job
     upon user request across all assigned slots; this property is a limit
     for the sum of the CPU time used in all the slots occupied by a
     multi-slot job (unnormalized value)'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.8
        NAME 'GLUE2ComputingShareMinCPUTime'
        DESC 'The minimum CPU time per slot for a job (unnormalized value);
if
     a job requests a lower time, than it can be rejected; if a job
requests
     at least this value, but uses the CPU for a shorter time, than it
might        be accounted for this value'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.9
        NAME 'GLUE2ComputingShareDefaultCPUTime'
        DESC 'The default CPU time per slot allowed to each job by the
     computing manager (i.e., LRMS ) if no limit is requested in the job
     submission description (unnormalized value)'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.10
        NAME 'GLUE2ComputingShareMaxTotalJobs'
        DESC 'The maximum allowed number of jobs in this share'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.11
```

```
               NAME 'GLUE2ComputingShareMaxRunningJobs'
               DESC 'The maximum allowed number of jobs in running state in this
           share'
               EQUALITY    integerMatch
               ORDERING    integerOrderingMatch
               SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
               SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.12
               NAME 'GLUE2ComputingShareMaxWaitingJobs'
               DESC 'The maximum allowed number of jobs in waiting state in this
           share'
               EQUALITY    integerMatch
               ORDERING    integerOrderingMatch
               SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
               SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.13
               NAME 'GLUE2ComputingShareMaxPreLRMSWaitingJobs'
               DESC 'The maximum allowed number of jobs that are in the Grid layer
           waiting to be passed to the underlying computing manager (i.e., LRMS)
           for this share'
               EQUALITY    integerMatch
               ORDERING    integerOrderingMatch
               SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
               SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.14
               NAME 'GLUE2ComputingShareMaxUserRunningJobs'
               DESC 'The maximum allowed number of jobs in running state per Grid
user
           in this share'
               EQUALITY    integerMatch
               ORDERING    integerOrderingMatch
               SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
               SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.15
               NAME 'GLUE2ComputingShareMaxSlotsPerJob'
               DESC 'The maximum number of slots which could be allocated to a
single
           job (defined to be 1 for a computing service accepting only single-
slot
           jobs)'
               EQUALITY    integerMatch
               ORDERING    integerOrderingMatch
               SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
               SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.16
               NAME 'GLUE2ComputingShareMaxStageInStreams'
               DESC 'The maximum number of streams to stage files in'
               EQUALITY    integerMatch
               ORDERING    integerOrderingMatch
               SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
               SINGLE-VALUE
 )
```

```
attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.17
        NAME 'GLUE2ComputingShareMaxStageOutStreams'
        DESC 'The maximum number of streams to stage files out'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.18
        NAME 'GLUE2ComputingShareSchedulingPolicy'
        DESC 'Implied scheduling policy of the share'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.19
        NAME 'GLUE2ComputingShareMaxMainMemory'
        DESC 'The maximum RAM that a job can use'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.20
        NAME 'GLUE2ComputingShareGuaranteedMainMemory'
        DESC 'The amount of physical RAM that a job is guaranteed to have
      available for its use'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.21
        NAME 'GLUE2ComputingShareMaxVirtualMemory'
        DESC 'The maximum virtual memory that a job can use'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.22
        NAME 'GLUE2ComputingShareGuaranteedVirtualMemory'
        DESC 'The amount of virtual memory that a job is guaranteed to have
      available for its use'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.23
        NAME 'GLUE2ComputingShareMaxDiskSpace'
        DESC 'The maximum disk space that a job can use excluding shared
area
      such as cache'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
```

```
        SYNTAX        1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.24
        NAME 'GLUE2ComputingShareDefaultStorageService'
        DESC 'ID of the default Storage Service to be used to store files by
     jobs in case no destination Storage Service is explicitly stated'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.25
        NAME 'GLUE2ComputingSharePreemption'
        DESC 'True if the computing manager (i.e., LRMS) enables preemption
of
     jobs; a preempted job is supposed to be automatically resumed'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.26
        NAME 'GLUE2ComputingShareServingState'
        DESC 'A state specifying if the share is open to place new requests
and
     if it is open to offer the already present requests for execution'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.27
        NAME 'GLUE2ComputingShareTotalJobs'
        DESC 'Number of total jobs in any state'
        EQUALITY      integerMatch
        ORDERING      integerOrderingMatch
        SYNTAX        1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.28
        NAME 'GLUE2ComputingShareRunningJobs'
        DESC 'Number of running jobs submitted via any type of interface
(local
     and Grid)'
        EQUALITY      integerMatch
        ORDERING      integerOrderingMatch
        SYNTAX        1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.29
        NAME 'GLUE2ComputingShareLocalRunningJobs'
        DESC 'Number of running jobs submitted via a local interface'
        EQUALITY      integerMatch
        ORDERING      integerOrderingMatch
        SYNTAX        1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
```

```
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.30
        NAME 'GLUE2ComputingShareWaitingJobs'
        DESC 'Number of jobs waiting in the underlying computing managers
       (i.e., LRMS) submitted via any type of interface (local and
       Grid)'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )
attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.31
        NAME 'GLUE2ComputingShareLocalWaitingJobs'
        DESC 'Number of jobs waiting in the underlying computing managers
       (i.e., LRMS) submitted via a local interface'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )
attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.32
        NAME 'GLUE2ComputingShareSuspendedJobs'
        DESC 'Number of jobs which started their execution, but are
suspended
       (e.g., for preemption)'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )
attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.33
        NAME 'GLUE2ComputingShareLocalSuspendedJobs'
        DESC 'Number of local jobs which started their execution, but are
       suspended (e.g., for preemption)'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )
attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.34
        NAME 'GLUE2ComputingShareStagingJobs'
        DESC 'Number of jobs that are staging files in/out'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )
attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.35
        NAME 'GLUE2ComputingShareLocalStagingJobs'
        DESC 'Number of local jobs that are staging files in/out'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )
attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.36
```

```
        NAME 'GLUE2ComputingSharePreLRMSWaitingJobs'
        DESC 'Number of jobs that are in the Grid layer waiting to be passed
to
     the underlying computing manager (i.e., LRMS)'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.37
        NAME 'GLUE2ComputingShareEstimatedAverageWaitingTime'
        DESC 'Estimated time to last for a new job from the acceptance to
the
     start of its execution'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.38
        NAME 'GLUE2ComputingShareEstimatedWorstWaitingTime'
        DESC 'Estimated worst waiting time assuming that all jobs run for
the
     maximum wall time'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.39
        NAME 'GLUE2ComputingShareFreeSlots'
        DESC 'Number of free slots'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.40
        NAME 'GLUE2ComputingShareFreeSlotsWithDuration'
        DESC 'Number of free slots with their time limits. Syntax: ns[:t]
     [ns:t]* where the pair ns:t means that there are ns free slots for the
     duration of t (expressed in seconds); the time limit information is
     optional'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.41
        NAME 'GLUE2ComputingShareUsedSlots'
        DESC 'Number of slots used by running jobs'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.42
```

```
              NAME 'GLUE2ComputingShareRequestedSlots'
              DESC 'Number of slots which are needed to execute all waiting and
         staging jobs'
              EQUALITY    integerMatch
              ORDERING    integerOrderingMatch
              SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
              SINGLE-VALUE
  )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.43
              NAME 'GLUE2ComputingShareReservationPolicy'
              DESC 'Type of reservation policy'
              EQUALITY caseExactMatch
              SUBSTR caseExactSubstringsMatch
              SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
              SINGLE-VALUE
  )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.44
              NAME 'GLUE2ComputingShareTag'
              DESC 'UserDomain-defined tag (the values SHOULD use namespace to
avoid
         collision)'
              EQUALITY caseExactMatch
              SUBSTR caseExactSubstringsMatch
              SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
  )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.45
              NAME 'GLUE2ComputingShareComputingEndpointForeignKey'
              DESC 'ForeignKey'
              EQUALITY caseExactMatch
              SUBSTR caseExactSubstringsMatch
              SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
  )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.46
              NAME 'GLUE2ComputingShareExecutionEnvironmentForeignKey'
              DESC 'ForeignKey'
              EQUALITY caseExactMatch
              SUBSTR caseExactSubstringsMatch
              SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
  )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.19.47
              NAME 'GLUE2ComputingShareComputingServiceForeignKey'
              DESC 'ForeignKey'
              EQUALITY caseExactMatch
              SUBSTR caseExactSubstringsMatch
              SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
              SINGLE-VALUE
  )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.19
              NAME 'GLUE2ComputingShare'
              DESC 'A utilization target for a set of execution environments
defined
         by a set of configuration parameters and characterized by status
         information'
              SUP GLUE2Share
              STRUCTURAL
              MUST ( GLUE2ComputingShareServingState )
              MAY ( GLUE2ComputingShareMappingQueue $
```

```
        GLUE2ComputingShareMaxWallTime $
        GLUE2ComputingShareMaxMultiSlotWallTime $
        GLUE2ComputingShareMinWallTime $
        GLUE2ComputingShareDefaultWallTime $ GLUE2ComputingShareMaxCPUTime $
        GLUE2ComputingShareMaxTotalCPUTime $ GLUE2ComputingShareMinCPUTime $
        GLUE2ComputingShareDefaultCPUTime $ GLUE2ComputingShareMaxTotalJobs $
        GLUE2ComputingShareMaxRunningJobs $ GLUE2ComputingShareMaxWaitingJobs
$
        GLUE2ComputingShareMaxPreLRMSWaitingJobs $
        GLUE2ComputingShareMaxUserRunningJobs $
        GLUE2ComputingShareMaxSlotsPerJob $
        GLUE2ComputingShareMaxStageInStreams $
        GLUE2ComputingShareMaxStageOutStreams $
        GLUE2ComputingShareSchedulingPolicy $ GLUE2ComputingShareMaxMainMemory
$
        GLUE2ComputingShareGuaranteedMainMemory $
        GLUE2ComputingShareMaxVirtualMemory $
        GLUE2ComputingShareGuaranteedVirtualMemory $
        GLUE2ComputingShareMaxDiskSpace $
        GLUE2ComputingShareDefaultStorageService $
        GLUE2ComputingSharePreemption $ GLUE2ComputingShareTotalJobs $
        GLUE2ComputingShareRunningJobs $ GLUE2ComputingShareLocalRunningJobs $
        GLUE2ComputingShareWaitingJobs $ GLUE2ComputingShareLocalWaitingJobs $
        GLUE2ComputingShareSuspendedJobs $
        GLUE2ComputingShareLocalSuspendedJobs $ GLUE2ComputingShareStagingJobs
$
        GLUE2ComputingShareLocalStagingJobs $
        GLUE2ComputingSharePreLRMSWaitingJobs $
        GLUE2ComputingShareEstimatedAverageWaitingTime $
        GLUE2ComputingShareEstimatedWorstWaitingTime $
        GLUE2ComputingShareFreeSlots $
        GLUE2ComputingShareFreeSlotsWithDuration $
        GLUE2ComputingShareUsedSlots $ GLUE2ComputingShareRequestedSlots $
        GLUE2ComputingShareReservationPolicy $ GLUE2ComputingShareTag $
        GLUE2ComputingShareComputingEndpointForeignKey $
        GLUE2ComputingShareExecutionEnvironmentForeignKey $
        GLUE2ComputingShareComputingServiceForeignKey )
 )


# File:    schema/6-04-ComputingManager.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 6.4 ComputingManager
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# ComputingManager inherits from Manager

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.1
        NAME 'GLUE2ComputingManagerReservation'
        DESC 'True if the computing manager (i.e, LRMS) supports advance
      reservation'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.2
        NAME 'GLUE2ComputingManagerBulkSubmission'
        DESC 'True if the computing manager (i.e, LRMS) supports the bulk
```

```
      submission'
       EQUALITY caseExactMatch
       SUBSTR caseExactSubstringsMatch
       SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
       SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.3
       NAME 'GLUE2ComputingManagerTotalPhysicalCPUs'
       DESC 'Number of managed physical CPUs accessible via any of the
      available endpoints (there is one physical CPU per socket)'
       EQUALITY    integerMatch
       ORDERING    integerOrderingMatch
       SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
       SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.4
       NAME 'GLUE2ComputingManagerTotalLogicalCPUs'
       DESC 'Number of managed logical CPUs accessible via any of the
      available endpoints (a logical CPU corresponds to a CPU visible to the
      operating system)'
       EQUALITY    integerMatch
       ORDERING    integerOrderingMatch
       SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
       SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.5
       NAME 'GLUE2ComputingManagerTotalSlots'
       DESC 'Number of managed slots'
       EQUALITY    integerMatch
       ORDERING    integerOrderingMatch
       SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
       SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.6
       NAME 'GLUE2ComputingManagerSlotsUsedByLocalJobs'
       DESC 'Number of slots used by jobs submitted via local interface'
       EQUALITY    integerMatch
       ORDERING    integerOrderingMatch
       SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
       SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.7
       NAME 'GLUE2ComputingManagerSlotsUsedByGridJobs'
       DESC 'Number of slots used by jobs submitted via a Grid interface'
       EQUALITY    integerMatch
       ORDERING    integerOrderingMatch
       SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
       SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.8
       NAME 'GLUE2ComputingManagerHomogeneous'
       DESC 'True if the computing manager has only one type of execution
      environment'
       EQUALITY caseExactMatch
       SUBSTR caseExactSubstringsMatch
       SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
       SINGLE-VALUE
```

```
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.9
        NAME 'GLUE2ComputingManagerNetworkInfo'
        DESC 'Type of internal network available among all the managed
      execution environment instances'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.10
        NAME 'GLUE2ComputingManagerLogicalCPUDistribution'
        DESC 'Syntax: X1:Y1, …, Xn:Yn where Xi is the number of logical CPUs
      and Yi is the number of boxes for the execution environment i'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.11
        NAME 'GLUE2ComputingManagerWorkingAreaShared'
        DESC 'A working area is an allocated storage extent that holds the
home
      directories of the Grid jobs; this property is true if the working
area
      is shared across different execution environment instances (i.e.,
      cluster nodes)'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.12
        NAME 'GLUE2ComputingManagerWorkingAreaGuaranteed'
        DESC 'True if the job is guaranteed the full extent of the
      WorkingAreaTotal attribute'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.13
        NAME 'GLUE2ComputingManagerWorkingAreaTotal'
        DESC 'Total size of working area available to all the Grid jobs
either
      as a shared area across all the execution environments
      (WorkingAreaShared is true) or local to a certain execution
environment        (WorkingAreaShared is false); even if individual quota
per job is
      enforced, this is not advertised'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.14
        NAME 'GLUE2ComputingManagerWorkingAreaFree'
        DESC 'Free size of working area available to all the Grid jobs
```

```
either
       as a shared area across all the execution environments
       (WorkingAreaShared is true) or local to a certain execution
environment         (WorkingAreaShared is false); (even if individual quota
per job is
       enforced, this is not advertised)'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.15
       NAME 'GLUE2ComputingManagerWorkingAreaLifeTime'
       DESC 'Lifetime of the Grid job files present in the working area;
the
       lifetime is related to the end time of thejob'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.16
        NAME 'GLUE2ComputingManagerWorkingAreaMultiSlotTotal'
        DESC 'Total size of working area available to all the multi-slot
Grid
       jobs either as a shared area across all the execution environments
       (WorkingAreaShared is true) or local to a certain execution
environment
       (WorkingAreaShared is false); even if individual quota per job is
       enforced, this is not advertised'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.17
        NAME 'GLUE2ComputingManagerWorkingAreaMultiSlotFree'
        DESC 'Free size of working area available to all the multi-slot Grid
       jobs either as a shared area across all the execution environments
       (WorkingAreaShared is true) or local to a certain execution
environment
       (WorkingAreaShared is false); (even if individual quota per job is
        enforced, this is not advertised)'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.18
        NAME 'GLUE2ComputingManagerWorkingAreaMultiSlotLifeTime'
        DESC 'Lifetime of the multi-slot Grid job files present in the
working
       area; the lifetime is related to the end time of the job'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )
```

```
attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.19
        NAME 'GLUE2ComputingManagerCacheTotal'
        DESC 'Total size of a temporary storage area where frequently
accessed
       data can be stored for rapid access by consequent Grid jobs'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.20
        NAME 'GLUE2ComputingManagerCacheFree'
        DESC 'Free size of a temporary storage area where frequently
accessed
       data can be stored for rapid access by consequent Grid jobs; in the
       computation of the free size, files which are not claimed by any job
       can be considered as deleted'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.21
        NAME 'GLUE2ComputingManagerTmpDir'
        DESC 'The absolute path of a temporary directory local to an
execution
       environment instance (i.e., worker node). This directory must be
       available to programs using the normal file access primitives
       (open/read/write/close)'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.22
        NAME 'GLUE2ComputingManagerScratchDir'
        DESC 'The absolute path for a shared directory available for
       application data. Typically a POSIX accessible transient disk space
       shared between the execution environment instances. It may be used by
       MPI applications or to store intermediate files that need further
       processing by local jobs or as staging area, specially if the
execution
       environment instances have no Internet connectivity'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.23
        NAME 'GLUE2ComputingManagerApplicationDir'
        DESC 'The path of the directory available for application
installation.
       Typically a PO-SIX accessible disk space with transient to permanent
       allocation to the users'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )
```

```
attributetype ( 1.3.6.1.4.1.6757.100.1.1.20.24
        NAME 'GLUE2ComputingManagerComputingServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.20
        NAME 'GLUE2ComputingManager'
        DESC 'A software component locally managing one or more execution
      environments. It can describe also aggregated information about the
      managed resources. The computing manager is also known as Local
      Resource Management System (LRMS).'
        SUP GLUE2Manager
        STRUCTURAL
        MAY ( GLUE2ComputingManagerReservation $
      GLUE2ComputingManagerBulkSubmission $
      GLUE2ComputingManagerTotalPhysicalCPUs $
      GLUE2ComputingManagerTotalLogicalCPUs $
      GLUE2ComputingManagerTotalSlots $
      GLUE2ComputingManagerSlotsUsedByLocalJobs $
      GLUE2ComputingManagerSlotsUsedByGridJobs $
      GLUE2ComputingManagerHomogeneous $
      GLUE2ComputingManagerNetworkInfo $
      GLUE2ComputingManagerLogicalCPUDistribution $
      GLUE2ComputingManagerWorkingAreaShared $
      GLUE2ComputingManagerWorkingAreaGuaranteed $
      GLUE2ComputingManagerWorkingAreaTotal $
      GLUE2ComputingManagerWorkingAreaFree $
      GLUE2ComputingManagerWorkingAreaLifeTime $
      GLUE2ComputingManagerWorkingAreaMultiSlotTotal $
      GLUE2ComputingManagerWorkingAreaMultiSlotFree $
      GLUE2ComputingManagerWorkingAreaMultiSlotLifeTime $
      GLUE2ComputingManagerCacheTotal $ GLUE2ComputingManagerCacheFree $
      GLUE2ComputingManagerTmpDir $ GLUE2ComputingManagerScratchDir $
      GLUE2ComputingManagerApplicationDir $
        GLUE2ComputingManagerComputingServiceForeignKey )
 )

# File:    schema/6-05-Benchmark.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 6.5 Benchmark
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# Benchmark inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.21.1
        NAME 'GLUE2BenchmarkID'
        DESC 'Globally unique ID'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.21.2
        NAME 'GLUE2BenchmarkType'
```

```
        DESC 'Type of benchmark'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.21.3
        NAME 'GLUE2BenchmarkValue'
        DESC 'Value'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.21.4
        NAME 'GLUE2BenchmarkExecutionEnvironmentForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.21.5
        NAME 'GLUE2BenchmarkComputingManagerForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.21
        NAME 'GLUE2Benchmark'
        SUP GLUE2Entity
        DESC 'Benchmark information about an entity providing computing
      capacity'
        STRUCTURAL
        MUST ( GLUE2BenchmarkID $ GLUE2BenchmarkType $ GLUE2BenchmarkValue )
        MAY ( GLUE2BenchmarkExecutionEnvironmentForeignKey $
      GLUE2BenchmarkComputingManagerForeignKey )
 )

# File:    schema/6-06-ExecutionEnvironment.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 6.6 ExecutionEnvironment
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# ExecutionEnvironment inherits from Resource

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.1
        NAME 'GLUE2ExecutionEnvironmentPlatform'
        DESC 'The architecture platform of this execution environment'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )
```

```
attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.2
        NAME 'GLUE2ExecutionEnvironmentVirtualMachine'
        DESC 'True if the execution environment is based on a virtual
machine
       (in this case, the values of the other attributes are related to the
       virtualized environment and not to the hosting environment)'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.3
        NAME 'GLUE2ExecutionEnvironmentTotalInstances'
        DESC 'Number of execution environment instances'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.4
        NAME 'GLUE2ExecutionEnvironmentUsedInstances'
        DESC 'Number of used execution environment instances; an instance is
       used when, according to the policies of the  Manager (i.e., LRMS), it
       cannot accept new jobs because it already runs the maximum number of
       allowed jobs'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.5
        NAME 'GLUE2ExecutionEnvironmentUnavailableInstances'
        DESC 'Number of unavailable execution environment instances because
of
       failures or maintenance'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.6
        NAME 'GLUE2ExecutionEnvironmentPhysicalCPUs'
        DESC 'Number of physical CPUs in an execution environment instance'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.7
        NAME 'GLUE2ExecutionEnvironmentLogicalCPUs'
        DESC 'Number of logical CPUs in an execution environment instance'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )
```

```
attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.8
        NAME 'GLUE2ExecutionEnvironmentCPUMultiplicity'
        DESC 'Information about the multiplicity of both physical CPUs and
      cores available in an execution environment instance'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.9
        NAME 'GLUE2ExecutionEnvironmentCPUVendor'
        DESC 'Name of the physical CPU vendor'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.10
        NAME 'GLUE2ExecutionEnvironmentCPUModel'
        DESC 'Physical CPU model as defined by the vendor'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.11
        NAME 'GLUE2ExecutionEnvironmentCPUVersion'
        DESC 'Physical CPU version as defined by the vendor'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.12
        NAME 'GLUE2ExecutionEnvironmentCPUClockSpeed'
        DESC 'Nominal clock speed of the physical CPU'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.13
        NAME 'GLUE2ExecutionEnvironmentCPUTimeScalingFactor'
        DESC 'Factor used by the  Manager (i.e., LRMS) to scale the CPU time
      (CPU Time divided by CPUTimeScalingFactor); for the reference
execution
      environment, this attribute is equal to 1'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.14
        NAME 'GLUE2ExecutionEnvironmentWallTimeScalingFactor'
        DESC 'Factor used by the  Manager (i.e., LRMS) to scale the Wall
time
      (Wall Time divided by WallTimeScalingFactor)'
```

```
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.15
        NAME 'GLUE2ExecutionEnvironmentMainMemorySize'
        DESC 'Amount of RAM (if many jobs run in the same execution
     environment, they compete for the total RAM)'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.16
        NAME 'GLUE2ExecutionEnvironmentVirtualMemorySize'
        DESC 'The amount of Virtual Memory (RAM+Swap)'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.17
        NAME 'GLUE2ExecutionEnvironmentOSFamily'
        DESC 'Family of the operating system'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.18
        NAME 'GLUE2ExecutionEnvironmentOSName'
        DESC 'Name of the operating system'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.19
        NAME 'GLUE2ExecutionEnvironmentOSVersion'
        DESC 'Version of the operating system'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.20
        NAME 'GLUE2ExecutionEnvironmentConnectivityIn'
        DESC 'Permission for direct inbound connectivity, even if limited'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.21
        NAME 'GLUE2ExecutionEnvironmentConnectivityOut'
```

```
        DESC 'Permission for direct outbound connectivity, even if limited'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.22
        NAME 'GLUE2ExecutionEnvironmentNetworkInfo'
        DESC 'Type of internal network available among the execution
      environment instances'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.22.23
        NAME 'GLUE2ExecutionEnvironmentComputingManagerForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.22
        NAME 'GLUE2ExecutionEnvironment'
        DESC 'A description of hardware, operating system and network
      characteristics that defines the environment available to and
      requestable by a Grid job when submitted to a  Service via a Endpoint;
      the description also includes information about the
      total/available/used instances of the execution environment'
        SUP GLUE2Resource
        STRUCTURAL
        MUST ( GLUE2ExecutionEnvironmentPlatform $
      GLUE2ExecutionEnvironmentMainMemorySize $
      GLUE2ExecutionEnvironmentOSFamily $
      GLUE2ExecutionEnvironmentConnectivityIn $
      GLUE2ExecutionEnvironmentConnectivityOut )
        MAY ( GLUE2ExecutionEnvironmentVirtualMachine $
      GLUE2ExecutionEnvironmentTotalInstances $
      GLUE2ExecutionEnvironmentUsedInstances $
      GLUE2ExecutionEnvironmentUnavailableInstances $
      GLUE2ExecutionEnvironmentPhysicalCPUs $
      GLUE2ExecutionEnvironmentLogicalCPUs $
      GLUE2ExecutionEnvironmentCPUMultiplicity $
      GLUE2ExecutionEnvironmentCPUVendor $
      GLUE2ExecutionEnvironmentCPUModel $
      GLUE2ExecutionEnvironmentCPUVersion $
      GLUE2ExecutionEnvironmentCPUClockSpeed $
      GLUE2ExecutionEnvironmentCPUTimeScalingFactor $
      GLUE2ExecutionEnvironmentWallTimeScalingFactor $
      GLUE2ExecutionEnvironmentVirtualMemorySize $
      GLUE2ExecutionEnvironmentOSName $
      GLUE2ExecutionEnvironmentOSVersion $
      GLUE2ExecutionEnvironmentNetworkInfo $
      GLUE2ExecutionEnvironmentComputingManagerForeignKey )
 )


# File:    schema/6-07-ApplicationEnvironment.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
```

```
# Section: 6.7 ApplicationEnvironment
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# ApplicationEnvironment inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.1
        NAME 'GLUE2ApplicationEnvironmentID'
        DESC 'Globally unique ID'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.2
        NAME 'GLUE2ApplicationEnvironmentAppName'
        DESC 'Name of the application environment'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.3
        NAME 'GLUE2ApplicationEnvironmentAppVersion'
        DESC 'Version of the application environment'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.4
        NAME 'GLUE2ApplicationEnvironmentRepository'
        DESC 'URL of a service which offers a repository and/or a name
service
       for this application environment'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.5
        NAME 'GLUE2ApplicationEnvironmentState'
        DESC 'State about the installation'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.6
        NAME 'GLUE2ApplicationEnvironmentRemovalDate'
        DESC 'Date and time after which the application can be removed'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )
```

```
attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.7
        NAME 'GLUE2ApplicationEnvironmentLicense'
        DESC 'The type of license'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.8
        NAME 'GLUE2ApplicationEnvironmentDescription'
        DESC 'The description of this application environment'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.9
        NAME 'GLUE2ApplicationEnvironmentBestBenchmark'
        DESC 'Type of benchmark which best identify the sensitivity of this
      application to the performance aspect'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.10
        NAME 'GLUE2ApplicationEnvironmentParallelSupport'
        DESC 'The type of supported parallel execution framework'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.11
        NAME 'GLUE2ApplicationEnvironmentMaxSlots'
        DESC 'Maximum number of slots that can be used to run jobs using the
      application environment at the same time'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.12
        NAME 'GLUE2ApplicationEnvironmentMaxJobs'
        DESC 'Maximum number of jobs that can use the application
environment
      at the same time'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.13
        NAME 'GLUE2ApplicationEnvironmentMaxUserSeats'
        DESC 'Maximum number of user seats that can use the application
      environment at the same time'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
```

```
            SYNTAX        1.3.6.1.4.1.1466.115.121.1.27
            SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.14
            NAME 'GLUE2ApplicationEnvironmentFreeSlots'
            DESC 'Available number slots that can be used to run jobs using the
        application environment at the same time'
            EQUALITY     integerMatch
            ORDERING     integerOrderingMatch
            SYNTAX        1.3.6.1.4.1.1466.115.121.1.27
            SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.15
            NAME 'GLUE2ApplicationEnvironmentFreeJobs'
            DESC 'Number of new jobs that could start their execution and use
the
        application environment at the same time'
            EQUALITY     integerMatch
            ORDERING     integerOrderingMatch
            SYNTAX        1.3.6.1.4.1.1466.115.121.1.27
            SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.16
            NAME 'GLUE2ApplicationEnvironmentFreeUserSeats'
            DESC 'Free seats for additional users that can use the application
        environment at the same time'
            EQUALITY     integerMatch
            ORDERING     integerOrderingMatch
            SYNTAX        1.3.6.1.4.1.1466.115.121.1.27
            SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.17
            NAME 'GLUE2ApplicationEnvironmentExecutionEnvironmentForeignKey'
            DESC 'ForeignKey'
            EQUALITY caseExactMatch
            SUBSTR caseExactSubstringsMatch
            SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.23.18
            NAME 'GLUE2ApplicationEnvironmentComputingManagerForeignKey'
            DESC 'ForeignKey'
            EQUALITY caseExactMatch
            SUBSTR caseExactSubstringsMatch
            SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
            SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.23
            NAME 'GLUE2ApplicationEnvironment'
            SUP GLUE2Entity
            DESC 'Description of the application software or environment
        characteristic available within one or more execution environments'
             STRUCTURAL
             MUST ( GLUE2ApplicationEnvironmentID $
        GLUE2ApplicationEnvironmentAppName $
        GLUE2ApplicationEnvironmentComputingManagerForeignKey )
        MAY ( GLUE2ApplicationEnvironmentAppVersion $
        GLUE2ApplicationEnvironmentRepository $
```

```
            GLUE2ApplicationEnvironmentState $
            GLUE2ApplicationEnvironmentRemovalDate $
            GLUE2ApplicationEnvironmentLicense $
            GLUE2ApplicationEnvironmentDescription $
            GLUE2ApplicationEnvironmentBestBenchmark $
            GLUE2ApplicationEnvironmentParallelSupport $
            GLUE2ApplicationEnvironmentMaxSlots $
            GLUE2ApplicationEnvironmentMaxJobs $
            GLUE2ApplicationEnvironmentMaxUserSeats $
            GLUE2ApplicationEnvironmentFreeSlots $
            GLUE2ApplicationEnvironmentFreeJobs $
            GLUE2ApplicationEnvironmentFreeUserSeats $
            GLUE2ApplicationEnvironmentExecutionEnvironmentForeignKey )
 )

# File:    schema/6-08-ApplicationHandle.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 6.8 ApplicationHandle
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# ApplicationHandle inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.24.1
        NAME 'GLUE2ApplicationHandleID'
        DESC 'Type of handle for an application environment'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.24.2
        NAME 'GLUE2ApplicationHandleType'
        DESC 'Type of handle for an application environment'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.24.3
        NAME 'GLUE2ApplicationHandleValue'
        DESC 'Actionable value to trigger the handle method'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.24.4
        NAME 'GLUE2ApplicationHandleApplicationEnvironmentForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.24
        NAME 'GLUE2ApplicationHandle'
```

```
        SUP GLUE2Entity
        DESC 'Technique for bootstrapping and/or accessing the application'
        STRUCTURAL
        MUST ( GLUE2ApplicationHandleID $ GLUE2ApplicationHandleType $
     GLUE2ApplicationHandleValue $
GLUE2ApplicationHandleApplicationEnvironmentForeignKey )
 )

# File:    schema/6-09-ComputingActivity.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 6.9 ComputingActivity
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# ComputingActivity inherits from Activity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.1
        NAME 'GLUE2ComputingActivityType'
        DESC 'Type of computing activity'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.2
        NAME 'GLUE2ComputingActivityIDFromEndpoint'
        DESC 'The job ID as assigned by the computing endpoint'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.3
        NAME 'GLUE2ComputingActivityLocalIDFromManager'
        DESC 'The local ID of the job as assigned by the computing manager
     (i.e., LRMS)'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.4
        NAME 'GLUE2ComputingActivityJobDescription'
        DESC 'Job description language used to specify the job request'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.5
        NAME 'GLUE2ComputingActivityState'
        DESC 'The state of the job according to the Grid state model for
jobs'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )
```

```
attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.6
        NAME 'GLUE2ComputingActivityRestartState'
        DESC 'The state from which a failed job can restart upon a client
       request'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.7
        NAME 'GLUE2ComputingActivityExitCode'
        DESC 'The exit code as returned by the executable of the job'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.8
        NAME 'GLUE2ComputingActivityComputingManagerExitCode'
        DESC 'The exit code provided by the computing manager (i.e., LRMS)'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.9
        NAME 'GLUE2ComputingActivityError'
        DESC 'Error messages as provided by the software components involved
in
       the management of the job'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.10
        NAME 'GLUE2ComputingActivityWaitingPosition'
        DESC 'For a waiting job in the computing manager (i.e., LRMS), the
       position of the job in the queue'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.11
        NAME 'GLUE2ComputingActivityUserDomain'
        DESC 'User domain selected by the job owner in the job submission
       request (an owner can belong to several user domains, it should decide
       which one to choose when submitting a job)'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.12
        NAME 'GLUE2ComputingActivityOwner'
        DESC 'The Grid identity of the jobs owner; in case of anonymity is
       required, the value CONFIDENTIAL should be advertised'
```

```
            EQUALITY caseExactMatch
            SUBSTR caseExactSubstringsMatch
            SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
            SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.13
            NAME 'GLUE2ComputingActivityLocalOwner'
            DESC 'The local user name to which the  jobs owner is mapped into'
            EQUALITY caseExactMatch
            SUBSTR caseExactSubstringsMatch
            SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
            SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.14
            NAME 'GLUE2ComputingActivityRequestedTotalWallTime'
            DESC 'The total wall clock time requested by the job; for multi-slot
        jobs, it represents the sum of wall clock time needed in each required
        slot'
            EQUALITY    integerMatch
            ORDERING    integerOrderingMatch
            SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
            SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.15
            NAME 'GLUE2ComputingActivityRequestedTotalCPUTime'
            DESC 'The total CPU time requested by the job for multi-slot jobs,
it
        represents the sum of CPU time needed in each required slot'
            EQUALITY    integerMatch
            ORDERING    integerOrderingMatch
            SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
            SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.16
            NAME 'GLUE2ComputingActivityRequestedSlots'
            DESC 'The number of requested slots'
            EQUALITY    integerMatch
            ORDERING    integerOrderingMatch
            SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
            SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.17
            NAME 'GLUE2ComputingActivityRequestedApplicationEnvironment'
            DESC 'Serialization of the Name and Version of the requested
        Application Environment to match the Name and Version properties of
the
        Application Environment (the serialization of the Name and Version is
        delegated to the implementers)'
            EQUALITY caseExactMatch
            SUBSTR caseExactSubstringsMatch
            SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.18
            NAME 'GLUE2ComputingActivityStdIn'
            DESC 'The name of the file which is used as the standard input of
the
        job'
```

```
              EQUALITY caseExactMatch
              SUBSTR caseExactSubstringsMatch
              SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
              SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.19
              NAME 'GLUE2ComputingActivityStdOut'
              DESC 'The name of the file which contains the standard output of the
       job'
              EQUALITY caseExactMatch
              SUBSTR caseExactSubstringsMatch
              SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
              SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.20
              NAME 'GLUE2ComputingActivityStdErr'
              DESC 'The name of the file which contains the standard error of the
       job'
              EQUALITY caseExactMatch
              SUBSTR caseExactSubstringsMatch
              SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
              SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.21
              NAME 'GLUE2ComputingActivityLogDir'
              DESC 'The name of the directory which contains the logs related to
the
       job and generated by the Grid layer (usually the directory is private
       to the job)'
              EQUALITY caseExactMatch
              SUBSTR caseExactSubstringsMatch
              SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
              SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.22
              NAME 'GLUE2ComputingActivityExecutionNode'
              DESC 'Hostname associated to the execution environment instance
(i.e.,
       worker node) running the job; multi-node jobs are described by several
       instances of this attribute'
              EQUALITY caseExactMatch
              SUBSTR caseExactSubstringsMatch
              SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.23
              NAME 'GLUE2ComputingActivityQueue'
              DESC 'The name of the Computing Manager (i.e, LRMS) queue to which
this
       job was queued'
              EQUALITY caseExactMatch
              SUBSTR caseExactSubstringsMatch
              SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
              SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.24
              NAME 'GLUE2ComputingActivityUsedTotalWallTime'
              DESC 'The totally consumed wall clock time by the job (in case of
```

```
        multi-slot jobs, this value refers to the sum of the wall clock time
        consumed in each slot)'
         EQUALITY    integerMatch
         ORDERING    integerOrderingMatch
         SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.25
         NAME 'GLUE2ComputingActivityUsedTotalCPUTime'
         DESC 'The totally consumed CPU time by the job (in case of multi-
slot
        jobs, this value refers to the sum of the consumed CPU time in each
        slot)'
         EQUALITY    integerMatch
         ORDERING    integerOrderingMatch
         SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.26
         NAME 'GLUE2ComputingActivityUsedMainMemory'
         DESC 'The RAM used by the job'
         EQUALITY    integerMatch
         ORDERING    integerOrderingMatch
         SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.27
         NAME 'GLUE2ComputingActivitySubmissionTime'
         DESC 'Time when the job was submitted to a computing endpoint'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )


attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.28
         NAME 'GLUE2ComputingActivityComputingManagerSubmissionTime'
         DESC 'Time when the job was submitted to the Computing Manager
(i.e.,
        LRMS) by the Grid layer'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.29
         NAME 'GLUE2ComputingActivityStartTime'
         DESC 'Time when the job entered in the Computing Manager (i.e.,
LRMS)
        running state'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.30
         NAME 'GLUE2ComputingActivityComputingManagerEndTime'
```

```
         DESC 'Time when the job entered its final Computing Manager (i.e.,
       LRMS) state'
          EQUALITY caseExactMatch
          SUBSTR caseExactSubstringsMatch
          SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
          SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.31
         NAME 'GLUE2ComputingActivityEndTime'
         DESC 'Time when the job entered its final Grid state'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.32
         NAME 'GLUE2ComputingActivityWorkingAreaEraseTime'
         DESC 'A working area is an allocated storage extent that holds the
home
       directories of the Grid jobs; the time when the dedicated working area
       of this job will be removed'
          EQUALITY caseExactMatch
          SUBSTR caseExactSubstringsMatch
          SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
          SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.33
         NAME 'GLUE2ComputingActivityProxyExpirationTime'
         DESC 'The expiration time of the proxy related to the job'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.34
         NAME 'GLUE2ComputingActivitySubmissionHost'
         DESC 'The name of the host from which the job was submitted (e.g.,
IP
       address, port and host name)'
          EQUALITY caseExactMatch
          SUBSTR caseExactSubstringsMatch
          SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
          SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.35
         NAME 'GLUE2ComputingActivitySubmissionClientName'
         DESC 'The name of the software client which was used to submit the
job'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.36
         NAME 'GLUE2ComputingActivityOtherMessages'
         DESC 'Optional job messages provided by either the Grid Layer or the
       Computing Manager'
```

```
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.37
        NAME 'GLUE2ComputingActivityComputingEndpointForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.38
        NAME 'GLUE2ComputingActivityComputingShareForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.25.39
        NAME 'GLUE2ComputingActivityExecutionEnvironmentForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.25
        NAME 'GLUE2ComputingActivity'
        DESC 'An activity managed by an OGSA execution capability service'
        SUP 'GLUE2Activity'
        STRUCTURAL
        MUST ( GLUE2ComputingActivityState $ GLUE2ComputingActivityOwner )
        MAY ( GLUE2ComputingActivityType $
      GLUE2ComputingActivityIDFromEndpoint $
      GLUE2ComputingActivityLocalIDFromManager $
      GLUE2ComputingActivityJobDescription $
      GLUE2ComputingActivityRestartState $
      GLUE2ComputingActivityExitCode $
      GLUE2ComputingActivityComputingManagerExitCode $
      GLUE2ComputingActivityError $
      GLUE2ComputingActivityWaitingPosition $
      GLUE2ComputingActivityUserDomain $
      GLUE2ComputingActivityLocalOwner $
      GLUE2ComputingActivityRequestedTotalWallTime $
      GLUE2ComputingActivityRequestedTotalCPUTime $
      GLUE2ComputingActivityRequestedSlots $
      GLUE2ComputingActivityRequestedApplicationEnvironment $
      GLUE2ComputingActivityStdIn $
      GLUE2ComputingActivityStdOut $
      GLUE2ComputingActivityStdErr $
      GLUE2ComputingActivityLogDir $
      GLUE2ComputingActivityExecutionNode $
      GLUE2ComputingActivityQueue $
      GLUE2ComputingActivityUsedTotalWallTime $
      GLUE2ComputingActivityUsedTotalCPUTime $
      GLUE2ComputingActivityUsedMainMemory $
```

```
        GLUE2ComputingActivitySubmissionTime $
        GLUE2ComputingActivityComputingManagerSubmissionTime $
        GLUE2ComputingActivityStartTime $
        GLUE2ComputingActivityComputingManagerEndTime $
        GLUE2ComputingActivityEndTime $
        GLUE2ComputingActivityWorkingAreaEraseTime $
        GLUE2ComputingActivityProxyExpirationTime $
        GLUE2ComputingActivitySubmissionHost $
        GLUE2ComputingActivitySubmissionClientName $
        GLUE2ComputingActivityOtherMessages $
        GLUE2ComputingActivityComputingEndpointForeignKey $
        GLUE2ComputingActivityComputingShareForeignKey $
        GLUE2ComputingActivityExecutionEnvironmentForeignKey )
 )

# File:    schema/6-10-ToStorageService.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 6.10 ToStorageService
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# ToStorageService inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.26.1
        NAME 'GLUE2ToStorageServiceID'
        DESC 'Globally unique ID'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.26.2
        NAME 'GLUE2ToStorageServiceLocalPath'
        DESC 'The local path of the computing service enabling to access a
      remote path in the associated storage service (this is typically an
      NFS mount point)'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.26.3
        NAME 'GLUE2ToStorageServiceRemotePath'
        DESC 'The remote path in the storage service which is associated the
      local path in the computing service (this is typically an NFS exported
      directory)'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.26.4
        NAME 'GLUE2ToStorageServiceComputingServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
```

```
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.26.5
        NAME 'GLUE2ToStorageServiceStorageServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.26
        NAME 'GLUE2ToStorageService'
        SUP GLUE2Entity
        DESC 'Description of a POSIX access via a file system technology
      enabling the computing service to access the associated storage
      service'
        STRUCTURAL
        MUST ( GLUE2ToStorageServiceID $
      GLUE2ToStorageServiceLocalPath $
      GLUE2ToStorageServiceRemotePath $
      GLUE2ToStorageServiceComputingServiceForeignKey $
      GLUE2ToStorageServiceStorageServiceForeignKey )
 )

# File:    schema/7-01-StorageService.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 7.1 StorageService
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# StorageService inherits from Service
# No attributes

objectclass ( 1.3.6.1.4.1.6757.100.1.1.27
        NAME 'GLUE2StorageService'
        DESC 'Description of the size and state of an homogeneous storage
      extent'
        SUP GLUE2Service
    STRUCTURAL
 )


# File:    schema/7-02-StorageServiceCapacity.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 7.2 StorageServiceCapacity
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# StorageServiceCapacity inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.28.1
        NAME 'GLUE2StorageServiceCapacityID'
        DESC 'Globally unique ID'
      EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )
```

```
attributetype ( 1.3.6.1.4.1.6757.100.1.1.28.2
        NAME 'GLUE2StorageServiceCapacityType'
        DESC 'Type of storage capacity'
       EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.28.3
        NAME 'GLUE2StorageServiceCapacityTotalSize'
        DESC 'Size of dedicated storage extent'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.28.4
        NAME 'GLUE2StorageServiceCapacityFreeSize'
        DESC 'Size of free storage extent'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.28.5
        NAME 'GLUE2StorageServiceCapacityUsedSize'
        DESC 'Size of used storage extent'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.28.6
        NAME 'GLUE2StorageServiceCapacityReservedSize'
        DESC 'Size of reserved storage extent'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.28.7
        NAME 'GLUE2StorageServiceCapacityStorageServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.28
        NAME 'GLUE2StorageServiceCapacity'
        SUP GLUE2Entity
        DESC 'Description of the size and state of an homogeneous storage
      extent'
       STRUCTURAL
        MUST ( GLUE2StorageServiceCapacityID $
       GLUE2StorageServiceCapacityType $
```

```
                GLUE2StorageServiceCapacityStorageServiceForeignKey )
             MAY ( GLUE2StorageServiceCapacityTotalSize $
           GLUE2StorageServiceCapacityFreeSize $
           GLUE2StorageServiceCapacityUsedSize $
           GLUE2StorageServiceCapacityReservedSize )
 )


# File:    schema/7-03-StorageAccessProtocol.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 7.3 StorageAccessProtocol
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# StorageAccessProtocol inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.29.1
         NAME 'GLUE2StorageAccessProtocolID'
         DESC 'Globally unique ID'
        EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.29.2
         NAME 'GLUE2StorageAccessProtocolType'
         DESC 'The name of the protocol'
        EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.29.3
         NAME 'GLUE2StorageAccessProtocolVersion'
         DESC 'The version of the protocol'
        EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.29.4
         NAME 'GLUE2StorageAccessProtocolMaxStreams'
         DESC 'The number of parallel streams this protocol supports'
         EQUALITY    integerMatch
         ORDERING    integerOrderingMatch
         SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.29.5
         NAME 'GLUE2StorageAccessProtocolStorageServiceForeignKey'
         DESC 'ForeignKey'
         EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )
```

```
objectclass ( 1.3.6.1.4.1.6757.100.1.1.29
        NAME 'GLUE2StorageAccessProtocol'
        SUP GLUE2Entity
        DESC 'A type of protocol available to access the available storage
      capacities'
        STRUCTURAL
        MUST ( GLUE2StorageAccessProtocolID $
      GLUE2StorageAccessProtocolType $
      GLUE2StorageAccessProtocolVersion $
      GLUE2StorageAccessProtocolStorageServiceForeignKey )
        MAY ( GLUE2StorageAccessProtocolMaxStreams )
 )



# File:    schema/7-04-StorageEndpoint.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 7.4 StorageEndpoint
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# StorageEndpoint inherits from Endpoint
# No attributes

attributetype ( 1.3.6.1.4.1.6757.100.1.1.30.1
        NAME 'GLUE2StorageEndpointStorageServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.30
        NAME 'GLUE2StorageEndpoint'
        DESC 'A network location having a well-defined interface and
exposing
      the service functionalities'
        SUP GLUE2Endpoint
        STRUCTURAL
        MAY GLUE2StorageEndpointStorageServiceForeignKey
 )

# File:    schema/7-05-StorageShare.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 7.5 StorageShare
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# StorageShare inherits from Share

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.1
        NAME 'GLUE2StorageShareServingState'
        DESC 'A state specifying if the share is open to place new requests
and
      if it is open to offer the already present requests for
      execution'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
```

```
            SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.2
          NAME 'GLUE2StorageSharePath'
          DESC 'A namespace where files are logically assigned to when they
are
        stored into this
        share'
        EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.3
          NAME 'GLUE2StorageShareAccessMode'
          DESC 'An identifier for the type of access and usage allowed for
this
        share'
        EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.4
          NAME 'GLUE2StorageShareSharingID'
          DESC 'Local ID common to the storage shares which use the same
storage
        share capacities (dedicated is a reserved term and means that the
        storage share capacities are not shared with other storage share
        capacities part of different storage shares)'
        EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.5
          NAME 'GLUE2StorageShareAccessLatency'
          DESC 'The maximum latency category for a file stored in this share
to
        be made available for reading'
        EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.6
          NAME 'GLUE2StorageShareRetentionPolicy'
          DESC 'The quality of retention, which indicates the probability of
the
        storage system losing a file'
        EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.7
          NAME 'GLUE2StorageShareExpirationMode'
          DESC 'Support for files with infinite and/or finite lifetimes, and
what
```

```
        actions the storage service may take upon the expiration of a file'
        EQUALITY caseExactMatch
         SUBSTR caseExactSubstringsMatch
         SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.8
        NAME 'GLUE2StorageShareDefaultLifeTime'
        DESC 'The default lifetime assigned to the file if no explicit
lifetime
      is specified'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.9
        NAME 'GLUE2StorageShareMaximumLifeTime'
        DESC 'The maximum lifetime that can be requested for a file'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.10
        NAME 'GLUE2StorageShareTag'
        DESC 'A user defined tag for additional information'
       EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.11
        NAME 'GLUE2StorageShareStorageEndpointForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.12
        NAME 'GLUE2StorageShareDataStoreForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.31.13
        NAME 'GLUE2StorageShareStorageServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.31
        NAME 'GLUE2StorageShare'
```

```
       DESC 'A utilization target for a set of storage resources defined by
a
       set of configuration parameters and characterized by status
       information'
        SUP GLUE2Share
        STRUCTURAL
        MUST ( GLUE2StorageShareServingState $
       GLUE2StorageShareSharingID $
       GLUE2StorageShareAccessLatency )
        MAY ( GLUE2StorageSharePath $
       GLUE2StorageShareAccessMode $
       GLUE2StorageShareRetentionPolicy $
       GLUE2StorageShareExpirationMode $
       GLUE2StorageShareDefaultLifeTime $
       GLUE2StorageShareMaximumLifeTime $
       GLUE2StorageShareTag $
       GLUE2StorageShareStorageEndpointForeignKey $
       GLUE2StorageShareDataStoreForeignKey $
       GLUE2StorageShareStorageServiceForeignKey )
 )

# File:    schema/7-06-StorageShareCapacity.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 7.6 StorageShareCapacity
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# StorageShareCapacity inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.32.1
        NAME 'GLUE2StorageShareCapacityID'
        DESC 'Globally unique ID'
       EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.32.2
        NAME 'GLUE2StorageShareCapacityType'
        DESC 'Type of storage capacity'
       EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.32.3
        NAME 'GLUE2StorageShareCapacityTotalSize'
        DESC 'Size of dedicated storage extent'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.32.4
        NAME 'GLUE2StorageShareCapacityFreeSize'
        DESC 'Size of free storage extent'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
```

```
        SYNTAX       1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.32.5
        NAME 'GLUE2StorageShareCapacityUsedSize'
        DESC 'Size of used storage extent'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.32.6
        NAME 'GLUE2StorageShareCapacityReservedSize'
        DESC 'Size of reserved storage extent'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.32.7
        NAME 'GLUE2StorageShareCapacityStorageShareForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.32
        NAME 'GLUE2StorageShareCapacity'
        SUP GLUE2Entity
        DESC 'Description of the size and state of an homogeneous storage
      extent'
        STRUCTURAL
        MUST ( GLUE2StorageShareCapacityID $ GLUE2StorageShareCapacityType $
      GLUE2StorageShareCapacityStorageShareForeignKey )
        MAY ( GLUE2StorageShareCapacityTotalSize $
      GLUE2StorageShareCapacityFreeSize $
      GLUE2StorageShareCapacityUsedSize $
      GLUE2StorageShareCapacityReservedSize )
 )

# File:    schema/7-07-StorageManager.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 7.7 StorageManager
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# StorageManager inherits from Manager
# No attributes

attributetype ( 1.3.6.1.4.1.6757.100.1.1.33.1
        NAME 'GLUE2StorageManagerStorageServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )
```

```
objectclass ( 1.3.6.1.4.1.6757.100.1.1.33
        NAME 'GLUE2StorageManager'
        DESC 'The primary software component locally managing one or more
      storage resources. It can describe also aggregated information about
      the managed resources.'
        SUP 'GLUE2Manager'
        STRUCTURAL
        MAY GLUE2StorageManagerStorageServiceForeignKey
 )

# File:    schema/7-08-DataStore.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 7.8 DataStore
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# DataStore inherits from Resource

attributetype ( 1.3.6.1.4.1.6757.100.1.1.34.1
        NAME 'GLUE2DataStoreType'
        DESC 'Type of storage resource'
       EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.34.2
        NAME 'GLUE2DataStoreLatency'
        DESC 'The maximum latency category for a file stored in this
resource
      to be made available for reading'
       EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.34.3
        NAME 'GLUE2DataStoreTotalSize'
        DESC 'Size of storage extent'
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.34.4
        NAME 'GLUE2DataStoreFreeSize'
        DESC 'Size of free storage extent '
        EQUALITY    integerMatch
        ORDERING    integerOrderingMatch
        SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.34.5
        NAME 'GLUE2DataStoreUsedSize'
        DESC 'Size of used storage extent'
        EQUALITY    integerMatch
```

```
          ORDERING    integerOrderingMatch
          SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
          SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.34.6
        NAME 'GLUE2DataStoreStorageManagerForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.34
        NAME 'GLUE2DataStore'
        DESC 'Abstraction of a sufficiently homogeneous storage device
      providing a storage capacity, managed by a local software component
      (storage manager), part of a storage service, reachable via one or
      more endpoints and having one or more shares defined on it. A storage
      resource refers to a category with summary information on the
capacity'
        SUP 'GLUE2Resource'
        STRUCTURAL
        MUST ( GLUE2DataStoreType $
      GLUE2DataStoreLatency )
        MAY ( GLUE2DataStoreTotalSize $
      GLUE2DataStoreFreeSize $
      GLUE2DataStoreUsedSize $
      GLUE2DataStoreStorageManagerForeignKey )
 )


# File:    schema/7-09-ToComputingService.schema
# URL:     http://forge.gridforum.org/sf/projects/glue-wg
# Doc:     GLUE Specification 2.0 (March 3, 2009)
# Section: 7.9 ToComputingService
# Authors: Laurence Field (laurence.field@cern.ch), CERN
#          David Horat (david.horat@cern.ch), CERN
#          Florido Paganelli (florido.paganelli@hep.lu.se), Lund University

# ToComputingService inherits from Entity

attributetype ( 1.3.6.1.4.1.6757.100.1.1.35.1
        NAME 'GLUE2ToComputingServiceID'
        DESC 'Globally unique ID'
      EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.35.2
        NAME 'GLUE2ToComputingServiceNetworkInfo'
        DESC 'Type of network available among the storage service and
computing
      service'
      EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )
```

```
attributetype ( 1.3.6.1.4.1.6757.100.1.1.35.3
        NAME 'GLUE2ToComputingServiceBandwidth'
        DESC 'The nominal bandwidth available between the storage service
and
      computing service'
         EQUALITY    integerMatch
         ORDERING    integerOrderingMatch
         SYNTAX      1.3.6.1.4.1.1466.115.121.1.27
         SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.35.4
        NAME 'GLUE2ToComputingServiceStorageAccessProtocolForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.35.5
        NAME 'GLUE2ToComputingServiceComputingServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

attributetype ( 1.3.6.1.4.1.6757.100.1.1.35.6
        NAME 'GLUE2ToComputingServiceStorageServiceForeignKey'
        DESC 'ForeignKey'
        EQUALITY caseExactMatch
        SUBSTR caseExactSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
        SINGLE-VALUE
 )

objectclass ( 1.3.6.1.4.1.6757.100.1.1.35
        NAME 'GLUE2ToComputingService'
        SUP GLUE2Entity
        DESC 'Description of the network link quality of a storage service
to a
      computing service'
         STRUCTURAL
         MUST ( GLUE2ToComputingServiceID $
      GLUE2ToComputingServiceComputingServiceForeignKey $
      GLUE2ToComputingServiceStorageServiceForeignKey )
         MAY ( GLUE2ToComputingServiceNetworkInfo $
      GLUE2ToComputingServiceBandwidth $
      GLUE2ToComputingServiceStorageAccessProtocolForeignKey )
 )
```