Information Services in Globus ToolKit 4

Author: Stefan Georgiev,
Master student at ISI Hagenberg
Course: Formal Methods Seminar

Contents

- Introduction
- Aggregator Framework
  - Aggregator Sources
  - Aggregator Services
- MDS Index Service
- Examples
  - Command line interface
  - JAVA API
  - Web Interface

Information Services
General Overview

- *Information Services are implemented in Globus ToolKit by the Monitoring and Discovery System (MDS)*:
- This system allows users to discover what resources are considered part of a *Virtual Organization (VO)* and to monitor those resources

Basic Functionality

- Monitoring: the process of observing resources or services for such purposes as fixing problems and tracking usage
- Discovery: the process of finding a suitable resource to perform a task: for example, finding a host on which to run a job.

MDS

- MDS is a suite of web services
- Services acquire their information through an extensible interface which can be used to
  - query Web-Services Resource Framework (WSRF) services for resource property information,
  - execute a program to acquire data, or
  - interface with third-party monitoring systems.
- Makes heavy use of XML to simplify the tasks of registering information sources

MDS Services

- MDS4 includes three different WSRF-based services:
  - MDS Index: Collects live monitoring information from services and enables XPath queries against that information.
  - MDS Trigger: Compares live monitoring information against rules to detect special conditions and can be configured to take action based on these conditions
  - MDS Archive: Stores all values received from information sources in persistent storage

---

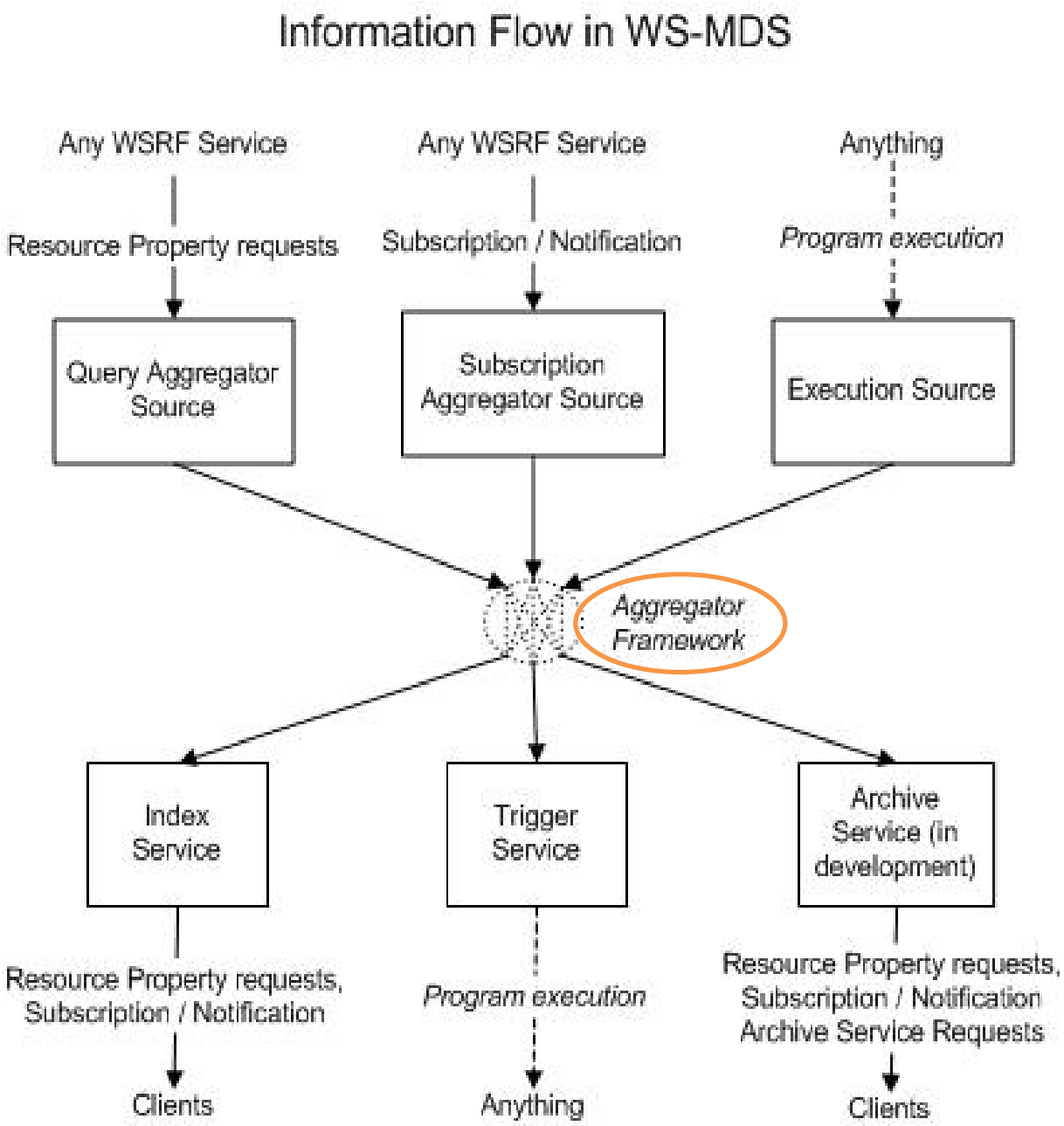
WSRF: Web-Services Resource Framework

Contents

- Introduction
- Aggregator Framework
  - Aggregator Sources
  - Aggregator Services
- MDS Index Service
- Examples
  - Command line interface
  - JAVA API
  - Web Interface

MDS Services 2

- The above are referred to Aggregator Services
- They collect information from or about WS-Resources via information sources, called Aggregator Sources
- The Aggregator Services and the Aggregator Sources are build on an Aggregator framework



Aggregator Sources

Aggregator Services

Information Sources (Aggregator Sources)

- A Java class that implements an interface to collect XML-formatted data
- MDS4 contains three aggregator sources:
  - the *Query Aggregator Source* ,
  - the *Subscription Aggregator Source* , and
  - the *Execution Aggregator Source*.

Aggregator Sources

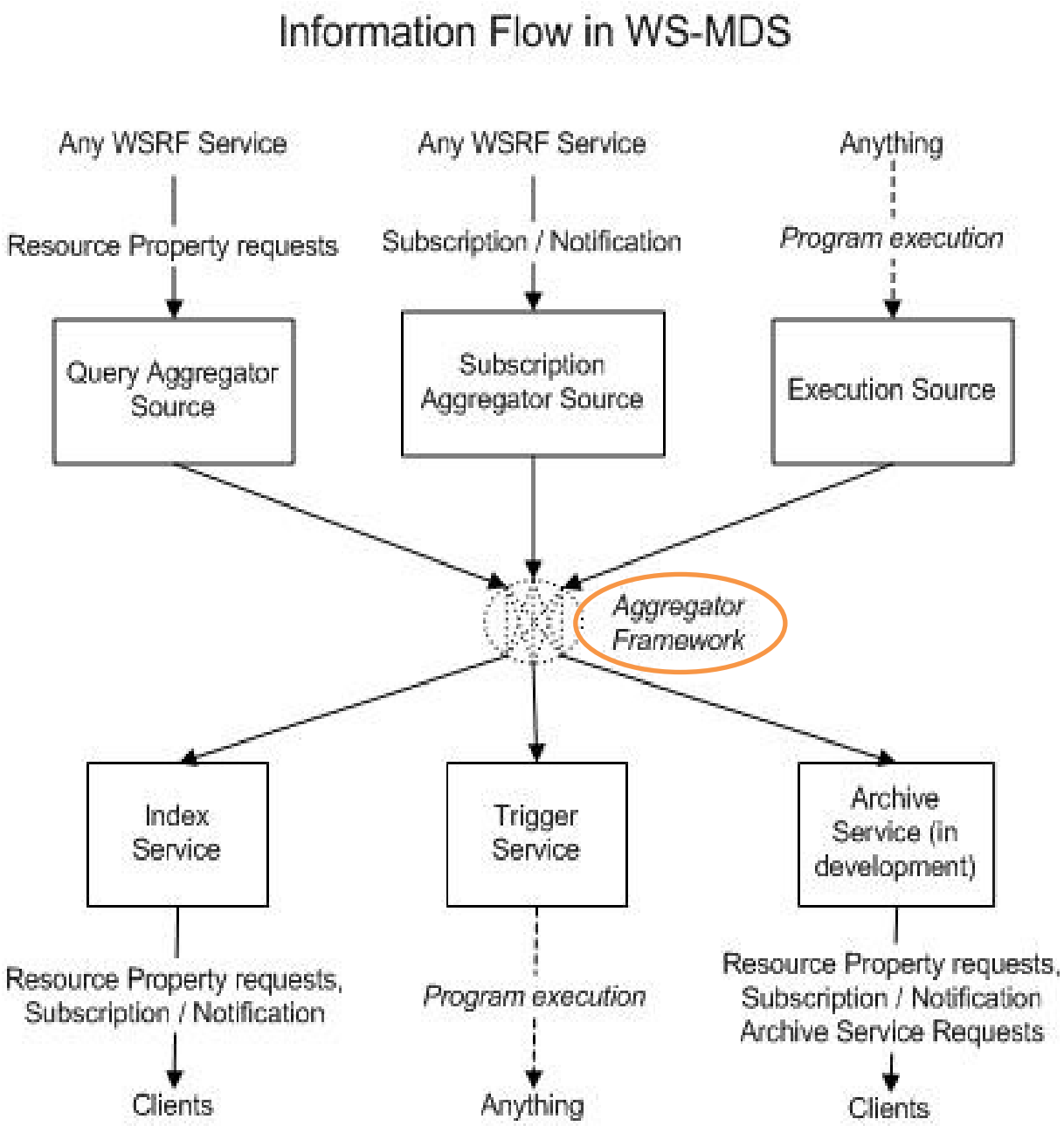
- the *Query Aggregator Source:*
  - `GetResourcePropertyPollType`; requests a single Resource Property from the remote resource.
  - `GetMultipleResourcePropertiesPollType`; requests multiple Resource Properties.
  - `QueryResourcePropertiesPollType`; requests a query be executed against the Resource Property Set of the remote resource.
- Subscription Aggregator Source:
  - The subscription source collects information from a registered resource using WS-Notification mechanisms. Data is delivered when property values change, rather than periodically.

Information Sources (Information Providers)

- An Aggregator Source or a WSRF service may use an external software component to create and update its resource properties
- Currently, MDS4 includes the following sources of information:
  - *Hawkeye*
  - *Ganglia*
  - *WS GRAM*
  - *Reliable File Transfer Service (RFT)*
  - *Community Authorization Service (CAS)*

Information Sources (Information Providers) 2

- *WS GRAM*: The job submission service component of GT4. This WSRF service publishes information about the local scheduler, including:
  - queue information
  - number of CPUs available and free
  - job count information
  - some memory statistics.
- *Reliable File Transfer Service (RFT)*: The file transfer service component of GT4. This WSRF service publishes:
  - status data of the server
  - transfer status for a file or set of files
  - number of active transfers
  - some status information about the resource running the service.



Aggregation Sources

Aggregation Services

Aggregator Framework

- A software framework used to build services that collect and aggregate data (WS MDS services)
- The aggregator framework builds on the *WS-ServiceGroup* and *WS-ResourceLifetime* specifications
- The aggregator framework collects data from an *aggregator source* and sends that data to an *aggregator sink* for processing

Service Groups

- The Aggregator Framework WSDL defines an [service group entry type] that holds both configuration information and data.
- Resources may be registered to an **AggregatorServiceGroupRP** using the service group *add* operation
- When the registration is made, the appropriate aggregation source and sinks will be informed
- Each Service Group registration is represented as a **ServiceGroupEntry** resource.

Contents

- Introduction
- Aggregator Framework
  - Aggregator Sources
  - Aggregator Services
- MDS Index Service
- Examples
  - Command line interface
  - JAVA API
  - Web Interface

MDS

- Standard aggregator sinks:
  - The service group sink (used by the *Index Service*) publishes received data as content in the AggregatingServiceGroup entry. This data can therefore be retrieved by querying the index for its 'entries' resource property.
  - The *Trigger Service* provides an aggregator sink which receives data, applies tests to that data, and if the tests match, runs a specified executable

MDS Index Service in detail

- Supports Xpath queries on the latest values obtained by the aggregator sources
- The Index contains registrations represented as ServiceGroup Entries
- Registrations have a lifetime: if not renewed periodically they expire and are deleted
- Thus the Index is self-cleaning
- The Index Service is a registry similar to UDDI, but much more flexible

Contents

- Introduction
- Aggregator Framework
  - Aggregator Sources
  - Aggregator Services
- MDS Index Service
- Examples
  - Command line interface
  - JAVA API
  - Web Interface

Simple usage

- A typical example of using the default Index Service is with the wsrf-query Java WS Core command. For example:

```
$GLOBUS_LOCATION/bin/wsrf-query -s
  https://localhost:8443/wsrf/services/Defau
  ltIndexService '/*'
```

displays all the resource properties collected by the default Index Service on your local host.

Some Java WS Core user commands

- Request single resource property:
  wsrf-get-property
- Request one or more resource properties:
  wsrf-get-properties
- Query resource properties with XPath:
  wsrf-query or **globus-xpath-query**
- Subscribe to a WSRF Topic: **wsn-subscribe**

Globus® Toolkit Java API

- Packages for globus_wsrf_mds_index:
  - org.globus.mds.aggregator.types
  - org.globus.mds.index
  - org.globus.mds.index.impl
  - org.globus.mds.usefulrp.types

Example

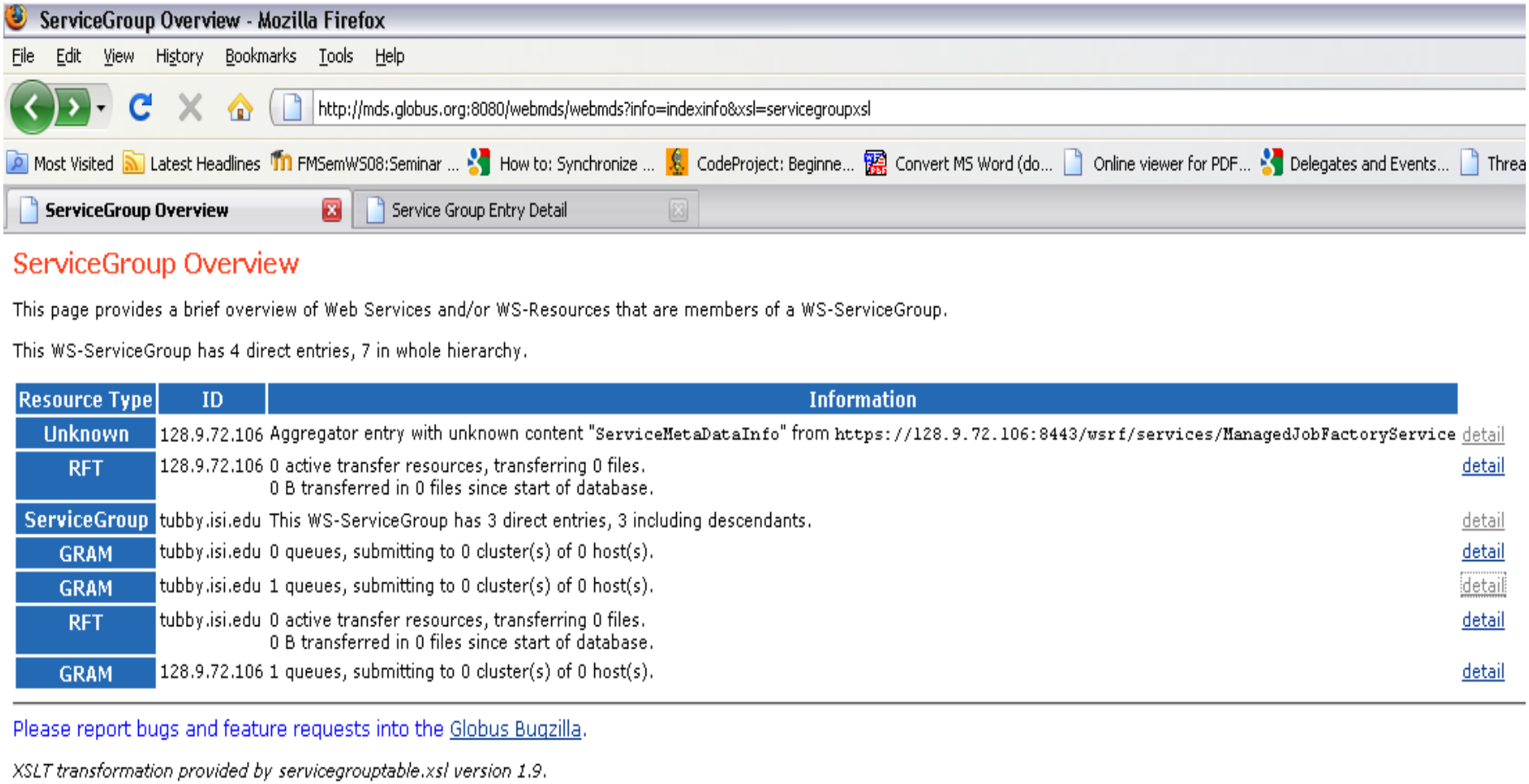
1. Create index service EPR
2. Get QueryResourceProperties portType
3. The following XPath query retrieves all the files with the specified name
4. Create request to QueryResourceProperties
5. Invoke QueryResourceProperties
6. Save the entries from the index Service

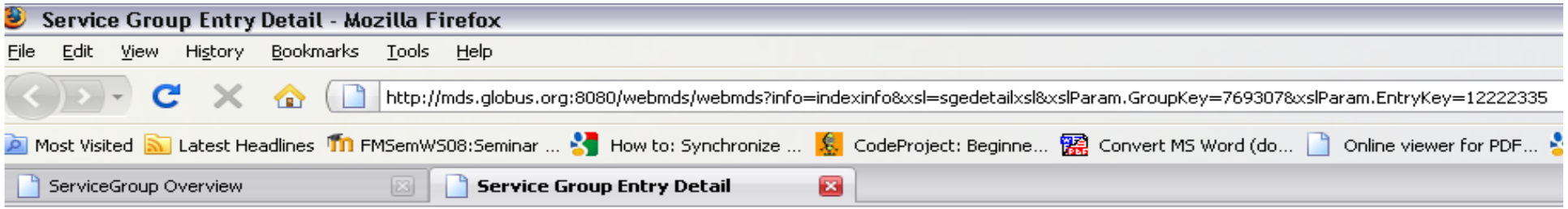
```
EndpointReferenceType indexEPR = new EndpointReferenceType();
indexEPR.setAddress(new Address(indexURI));

WSResourcePropertiesServiceAddressingLocator queryLocator;
queryLocator = new WSResourcePropertiesServiceAddressingLocator();

QueryResourceProperties_PortType query = null;
query = queryLocator.getQueryResourcePropertiesPort(indexEPR);

String xpathQuery = "//*[local-name()='Entry'][./*/*/*[local-name()='Name']/text()='"
        + name + "']";

QueryExpressionType queryExpr = new QueryExpressionType();
queryExpr.setDialect(new URI(WSRFConstants.XPATH_1_DIALECT));
queryExpr.setValue(xpathQuery);
QueryResourceProperties_Element queryRequest = new QueryResourceProperties_Element(
        queryExpr);

QueryResourcePropertiesResponse queryResponse = null;
queryResponse = query.queryResourceProperties(queryRequest);

MessageElement[] entries = queryResponse.get_any();
```

Visualizing Index Service with WebMDS

- WebMDS is a web-based interface to WSRF resource property information that is available as a user-friendly front-end to the Index Service
- WebMDS is built and installed as part of a default GT installation
- To visualize the Index Service:
  - Deploy the servlet into a servlet container such as Tomcat.
  - Point your web browser at `http://your-tomcat-host:your-tomcat-port/webmds`
  - Click on the link labelled "*A list of resources registered to the local default index service*".

WebMDS


ServiceGroup Overview - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://mds.globus.org:8080/webmds/webmds?info=indexinfo&xsl=servicegroupxsl
Most Visited Latest Headlines FMSemWS08:Seminar ... How to: Synchronize ... CodeProject: Beginne... Convert MS Word (do... Online viewer for PDF... Delegates and Events... Threa
ServiceGroup Overview
Service Group Entry Detail
ServiceGroup Overview
This page provides a brief overview of Web Services and/or WS-Resources that are members of a WS-ServiceGroup.
This WS-ServiceGroup has 4 direct entries, 7 in whole hierarchy.
Resource Type | ID | Information
Unknown | 128.9.72.106 | Aggregator entry with unknown content "ServiceMetaDataInfo" from https://128.9.72.106:8443/wsrf/services/ManagedJobFactoryService | detail
RFT | 128.9.72.106 | 0 active transfer resources, transferring 0 files. 0 B transferred in 0 files since start of database. | detail
ServiceGroup | tubby.isi.edu | This WS-ServiceGroup has 3 direct entries, 3 including descendants. | detail
GRAM | tubby.isi.edu | 0 queues, submitting to 0 cluster(s) of 0 host(s). | detail
GRAM | tubby.isi.edu | 1 queues, submitting to 0 cluster(s) of 0 host(s). | detail
RFT | tubby.isi.edu | 0 active transfer resources, transferring 0 files. 0 B transferred in 0 files since start of database. | detail
GRAM | 128.9.72.106 | 1 queues, submitting to 0 cluster(s) of 0 host(s). | detail
Please report bugs and feature requests into the Globus Bugzilla.
XSLT transformation provided by servicegrouptable.xsl version 1.9.



Service Group Entry Detail

Service Group EPR

- Address: https://tubby.isi.edu:8443/wsrf/services/DefaultIndexServiceEntry
- GroupKey: 769307
- EntryKey: 12222335

Member Service EPR

- Address: https://tubby.isi.edu:8443/wsrf/services/ManagedJobFactoryService
- ResourceID: Fork

Content

- AggregatorConfig:
  - GetResourcePropertyPollType:
    - PollIntervalMillis: 60000
    - ResourcePropertyName: glue:GLUECE
- AggregatorData:
  - GLUECE:
    - ComputingElement:
      - Name: default
      - UniqueID: default
      - Info:
        - TotalCPUs: 2
      - State:
        - EstimatedResponseTime: 0
        - FreeCPUs: 2
        - RunningJobs: 0
        - Status: enabled
        - TotalJobs: 0
        - WaitingJobs: 0
        - WorstResponseTime: 0
      - Policy:
        - MaxCPUTime: 0
        - MaxRunningJobs: 0
        - MaxTotalJobs: 0
        - MaxWallClockTime: 0
        - Priority: 0

Please report bugs and feature requests into the Globus Bugzilla.

XSLT transformation provided by sgedetail.xsl version 1.5.

References:

- *A Globus Primer.Or, Everything You Wanted to Know about Globus,but Were Afraid To Ask*. *Describing Globus Toolkit Version 4.* Ian Foster
- Information Services(MDS): Key Concepts.

http://www.globus.org/toolkit/docs/4.0/info/key-index.html

- GT 4.0 Index Service: Developer's Guide

http://www.globus.org/toolkit/docs/4.0/info/index/developer-index.html

- GT 4.0 Index Service: Public Interface Guide

http://www.globus.org/toolkit/docs/4.0/info/index/WS_MDS_Index_Public_Interfaces.html

- GT 4.2.1 WS Monitoring and Discovery (WS MDS): System Administrator's Guide

http://www.globus.org/toolkit/docs/4.2/4.2.1/info/admin/#mdsAdmin

Thank you