Registry Service v.0.6.0

for the Planetary Data System

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1.1 Overview

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About Registry Service

The Registry Service provides functionality for tracking, auditing, locating, and maintaining artifacts within the system. The service provides a REST-based interface for interacting with the service.

Please send comments, change requests and bug reports to the PDS Operator at pds_operator@jpl.nasa.gov.

1.2 **Release Notes**

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Release Notes

The purpose of this section is to provide a description of a Registry Service release including any impact that the new or modified capabilities will have on the Discipline Nodes or the PDS user community. If viewing the web-based version of this document, a somewhat itemized list of changes for each release can be found on the Release Changes page.

Release 0.6.0

This release of the Registry Service is a component of the integrated release 1.1.0 of the PDS 2010 System. This release is intended as a prototype release in support of the assessment of the PDS4 standards and the system components to date. The new or modified capabilities for this release are as follows:

- The core functionality was moved from this package to the registry-core package to better satisfy JAR dependencies from other projects.
- Added additional support for Classifications in the registry.
- Added a configuration endpoint allowing the configuration file generated from the data model to be processed in one action.
- Added support for a RegistryPackage object to support batch operations.
- Added additional support for Service registrations.
- Modifications to support better alignment with the ebXML registry specification.

The liens for this release are as follows:

- Query support has been improved but is still case sensitive.
- The Federation and Registry objects have not been addressed yet.
- Need to generate a log file that conforms to the Report Service format.

Release 0.5.0

This release of the Registry Service is a component of the integrated release 1.0.0 of the PDS 2010 System. This release is intended as a prototype release in support of the assessment of the PDS4 standards. The new or modified capabilities for this release are as follows:

- Added support for registering Service and Classification objects.

- Added support for deleting Products and Associations.
- Added an interface for retrieving Auditable Events.
- Updated the status message to include counts of registered objects.

The liens for this release are as follows:

- Exception handling at this stage of development is minimal. Many error conditions have not yet been mapped to HTTP error codes.
- Query support is case sensitive and not fully implemented for each object type.
- Not all aspects of JSON support have been implemented.
- The Federation and Registry objects have not been addressed yet.
- Need to generate a log file that conforms to the Report Service format.

Release 0.4.0

This release of the Registry Service is a component of the integrated release 0.1.0 of the PDS 2010 System. This release is intended as a prototype release in support of the demonstration at the Management Council Face-to-Face meeting in August 2010. This initial release of the service provides the capability to register and browse data products and their associations.

1.3 **Installation**

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Installation

This section describes how to install the Registry Service software contained in the *registry-service* package. The following topics can be found in this section:

- System Requirements
- Unpacking the Package
- Deploying the Application
- Configuration

System Requirements

The Registry Service was developed using Java and Jersey and will run under a standard Java Application Server. The tool was specifically developed under Sun Java version 1.6, so the tool will execute correctly under 1.6 and future versions.

Since the tool was developed using Sun's Java, the target Java Application Server should support Sun's Java Runtime Environment (JRE). The application was tested using Apache's Tomcat version 6.0.X, which is the preferred Java Application Server for deployment. The software can be obtained from the Apache Tomcat web site. Other Java Application Servers should be compatible.

Although it is generally a useful tool for interacting with the Registry Service, the cURL command-line application is required by the *load_registry* script for populating the service with the supported object types. See the Configuration section for more information.

Unpacking the Package

Download the *registry-service* package from the PDS FTP site. The binary distribution is available in identical zip or tar/gzip packages. Unpack the selected binary distribution file with one of the following commands:

```
% unzip registry-service-0.6.0-bin.zip
or
% tar -xzvf registry-service-0.6.0-bin.tar.gz
```

Note: Depending on the platform, the native version of *tar* may produce an error when attempting to unpack the distribution file because many of the file paths are greater than 100 characters. If available, the GNU version of tar will resolve this problem. If that is not available or cannot be installed, the zipped package will work just fine in a UNIX environment.

The commands above result in the creation of the *registry-service-0.6.0* directory with the following directory structure:

- **README.txt**

  A README file directing the user to the available documentation for the project.

- **LICENSE.txt**

  The copyright notice from the California Institute of Technology detailing the restrictions regarding the use and distribution of this software. Although the license is strictly worded, the software has been classified as Technology and Software Publicly Available (TSPA) and is available for *anyone* to download and use.

- **registry-service-0.6.0.war**

  This is the Web ARchive (WAR) file containing the Registry Service software including all dependent JAR files.

- **bin/**

  This directory contains the batch and shell scripts for registering the supported object types.

- **conf/**

  This directory contains the policy files identifying the supported object types.

- **doc/**

  This document directory contains a local web site with the Registry Service Guide, javadoc, unit test results and other configuration management related information. Just point your favorite browser to the *index.html* file in this directory.

- **examples/**

  This directory contains examples of artifact descriptions that can be registered with a service instance.

Deploying the Application

The Registry Service web application is packaged as a WAR file and is intended for installation under a standard Java Application Server. Prior to installation the WAR file should be renamed from *registry-service-0.6.0.war* to *registry-service.war*. A WAR file is normally copied directly to the *webapps* directory or installed via the Manager interface. Once this step is complete, the application is ready for operation.

If deploying to an Apache Tomcat server and using Derby as the backend database, you may want to permanently set the home directory of the database by adding the following to the *CATALINA_OPTS*

environment variable:

```
CATALINA_OPTS="-Dderby.system.home=/path/to/registrydb/home"
```

The *CATALINA_OPTS* environment variable is loaded from the Apache Tomcat startup scripts. If this value is not set, the Derby database home will default to the current working directory where the Apache Tomcat server was launched.

If deploying to Tomcat and using MySQL as the backend database, the default configuration assumes that you have MySQL installed with a database named *registry* and will use a default user name and password as specified below. If you want to change the URL, database name, user name, and/or password you will need to edit the *mysql.properties* file located in the *$TOMCAT_HOME/webapps/registry-service/WEB-INF/classes* directory. The following lines pertain to the default configuration:

```
javax.persistence.jdbc.url=jdbc:mysql://localhost:3306/registry
javax.persistence.jdbc.user=registry
javax.persistence.jdbc.password=p@ssw0rd
```

Additionally, if you are using a version of MySQL older than 5.x you will need to change the dialect. To do this simply add a "#" before the first hibernate.dialect entry and remove the "# from the second entry.

Before:

```
# For use with MySQL 5+
hibernate.dialect=org.hibernate.dialect.MySQL5InnoDBDialect
# For use with older versions of MySQL. See hibernate documentation.
#hibernate.dialect=org.hibernate.dialect.MySQLInnoDBDialect
```

After:

```
# For use with MySQL 5+
#hibernate.dialect=org.hibernate.dialect.MySQL5InnoDBDialect
# For use with older versions of MySQL. See hibernate documentation.
hibernate.dialect=org.hibernate.dialect.MySQLInnoDBDialect
```

Verify a successful installation by executing the command from the Ping portion of the Operation section.

Configuration

Once the Registry Service is installed and running, the list of supported object types must be registered with the service. The list of objects types corresponds with the types of products that a given instance of the Registry Service will support. Execute the *RegistryConfig* script from the *bin* directory in order to register the full set of object types:

```
% cd registry-service-0.6.0/bin
% RegistryConfig
```

The output from this command should show the registration of the Core object types and PDS object types. Since the config files referenced in the configuration script are slightly larger they are sent in chunks. Each config will get associated with a Registry Package and can be found by following the Location link that comes in the header of the response.

```
* About to connect() to localhost port 8080 (#0)
*   Trying ::1... connected
* Connected to localhost (::1) port 8080 (#0)
> POST /registry-service/registry/configure?name=Core+Objects&\
description=This+configures+the+core+set+of+registry+objects HTTP/1.1
> User-Agent: curl/7.19.7 (universal-apple-darwin10.0) libcurl/7.19.7 OpenSSL/0.9.8l
zlib/1.2.3
> Host: localhost:8080
> Accept: */*
> Content-type:application/xml
> Content-Length: 5295
> Expect: 100-continue
>
< HTTP/1.1 100 Continue
< HTTP/1.1 201 Created
< Server: Apache-Coyote/1.1
< Location: http://localhost:8080/registry-service/registry/packages/\
urn:uuid:bd6e4f7b-dfb0-443c-b845-3378077b1016
< Content-Type: text/plain
< Transfer-Encoding: chunked
< Date: Mon, 21 Mar 2011 19:55:52 GMT
<
* Connection #0 to host localhost left intact
* Closing connection #0
urn:uuid:bd6e4f7b-dfb0-443c-b845-3378077b1016

* About to connect() to localhost port 8080 (#0)
*   Trying ::1... connected
* Connected to localhost (::1) port 8080 (#0)
> POST /registry-service/registry/configure?name=PDS+Objects&\
description=This+configures+PDS+object+types HTTP/1.1
> User-Agent: curl/7.19.7 (universal-apple-darwin10.0) libcurl/7.19.7 OpenSSL/0.9.8l
zlib/1.2.3
```

```
> Host: localhost:8080
> Accept: */*
> Content-type:application/xml
> Content-Length: 18320
> Expect: 100-continue
>
< HTTP/1.1 100 Continue
< HTTP/1.1 201 Created
< Server: Apache-Coyote/1.1
< Location: http://localhost:8080/registry-service/registry/packages/\
urn:uuid:a07ad134-42ad-4781-9cbd-826bb9a8dfec
< Content-Type: text/plain
< Transfer-Encoding: chunked
< Date: Mon, 21 Mar 2011 19:55:53 GMT
<
* Connection #0 to host localhost left intact
* Closing connection #0
urn:uuid:a07ad134-42ad-4781-9cbd-826bb9a8dfec
```

The *RegistryConfig* script defaults to a Registry Service end point of *http://localhost:8080/registry-service*. If necessary, modify the script so that it corresponds with the target installation. In addition, this script should be executed prior to applying security to the service URLs since it does not account for a secured interface.

1.4 **Operation**

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Operation

This section describes how to operate the Registry Service software. The following topics can be found in this section:

- Service Interface
- Publish Artifacts
- Query Artifacts
- Update Status
- Delete Artifacts
- Ping
- Report
- Controlled Access

Service Interface

The Registry Service provides a REST-based interface accessible via HTTP for interacting with the service. Because the REST-based interface operates over HTTP, there are several options for interacting with the Registry Service:

- Registry User Interface

  The registry-ui component offers a Graphical User Interface (GUI) for interacting with the service.

- Web Browser

  Any standard web browser (e.g., Firefox, Safari, Internet Explorer, etc.) will allow interaction with the query and retrieval interfaces of the service.

- cURL

  The cURL utility offers the most flexible means for interacting with the service. The utility comes installed on most UNIX-based platforms and is available for download for the Windows platform. The examples in the sections that follow utilize *cURL* to interact with the service.

The Registry Service also allows messaging (acceptance of and return of content descriptions) in the form of XML or JavaScript Object Notation (JSON). More on this in the examples below. Each PDS Node may have their own installation of the Registry Service with its own service endpoint. Because of this, the examples

below use *http://localhost:8080* as the generic endpoint for the service.

Publish Artifacts

The Registry Service supports a wide range of artifacts for registration with the service. In ebXML terms, artifacts are referred to as Registry Objects. The following subsections provide examples for each of the supported Registry Object types.

Products

In PDS terms, a product can be a data product, document, element definition, mission description, schema, etc. Within the ebXML terminology this maps to an Extrinsic Object which is simply a way for a particular instantiation of a registry to extend its model. The following is an example of a product description in XML form:

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<extrinsicObject xmlns="http://registry.pds.nasa.gov"
  guid="1234v1.0"
  lid="1234"
  versionId="1.0"
  name="Product 1234 v1"
  objectType="Product"
  description="This is a new version test product 1234 v1" >
  <slot name="first-name">
    <value>John</value>
  </slot>
  <slot name="last-name">
    <value>Doe</value>
  </slot>
  <slot name="phone">
    <value>(818)123-4567</value>
    <value>(818)765-4321</value>
  </slot>
</extrinsicObject>
```

The product description above is contained in the *new_product.xml* file, which can be found in the */examples* directory of the software distribution package. The following command registers this product with the service:

```
% curl -X POST -H "Content-type:application/xml" -v -d @new_product.xml \
http://localhost:8080/registry-service/registry/extrinsics
```

A successful registration with the above command would produce the following output to standard out:

```
* About to connect() to localhost port 8080 (#0)
*   Trying ::1... Connection refused
*   Trying fe80::1... Connection refused
*   Trying 127.0.0.1... connected
* Connected to localhost (127.0.0.1) port 8080 (#0)
> POST registry-service/registry/extrinsics HTTP/1.1
> User-Agent: curl/7.16.3 (powerpc-apple-darwin9.0) ...
> Host: localhost:8080
> Accept: */*
> Content-type:application/xml
> Content-Length: 598
>
< HTTP/1.1 201 Created
< Server: Apache-Coyote/1.1
< Location: http://localhost:8080/registry-service/registry/extrinsics/1234/1.0
< Content-Type: application/xml
< Content-Length: 0
< Date: Wed, 14 Apr 2010 20:33:32 GMT
<
* Connection #0 to host localhost left intact
* Closing connection #0
urn:uuid:53451c5e-1809-4799-8dd8-060672f3e0e1
```

By inspecting the HTTP Response Location Header one can see the URL to the registered product. This header is a standard way for exchanging information about a newly created resource using HTTP. The last line of the response is the global unique identifier that the service assigned to the registered product. The following example details how to publish a new version of the above product to the service:

```
% curl -X POST -H "Content-type:application/xml" -v -d @new_product_v2.xml \
http://localhost:8080/registry-service/registry/extrinsics/1234
```

The value of *1234* in the example above represents the logical identifier of the original published product, which must be specified in order for the service to recognize it as a new version. The following is an example of a product description in JSON form:

```
{"description":"This is a new version test product 5678 v1",
 "name":"Product 5678 v1",
 "objectType":"Product",
 "versionId":"1.0",
 "lid":"5678",
 "slot":[{"name":"last-name","value":["Doe"]},
         {"name":"phone","value":["(818)123-4567","(818)765-4321"]},
         {"name":"first-name","value":["Jane"]}]}
```

The product description above is contained in the *json_product.txt* file. The following command registers this product with the service:

```
% curl -X POST -H "Content-type:application/json" -v -d @json_product.txt \
http://localhost:8080/registry-service/registry/extrinsics
```

Associations

In PDS terms, an association is a relationship between two registered artifacts. The following is an example of an association description in XML form:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<association xmlns="http://registry.pds.nasa.gov"
  sourceObject="1234v1.0"
  targetObject="1234v2.0"
  associationType="associatedTo"/>
```

The association description above is contained in the *new_association.xml* file. The following command registers this association with the service:

```
% curl -X POST -H "Content-type:application/xml" -v -d @new_association.xml \
http://localhost:8080/registry-service/registry/associations
```

Services

In PDS terms, a service is an electronic resource available within the system. A service can be as simple as a web site or as intricate as the Registry Service that is described in this documentation. The following is an example of a service description in XML form:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<service xmlns="http://registry.pds.nasa.gov"
  name="PDS Service"
  description="This is a service to test adding a service description to the registry">
  <serviceBinding
    name="PDS Main Site"
    description="This is the PDS main web site"
    accessURI="http://pds.jpl.nasa.gov">
    <specificationLink
```

```
      name="HTTP Specification Link"
      description="This is a link to the HTTP specification."
      specificationObject="urn:uuid:HTTPSpecificationDocument">
        <usageDescription>
          Use a browser to access the PDS site. The acceptable browsers are
          listed in the usage parameters.
        </usageDescription>
        <usageParameter>Firefox</usageParameter>
        <usageParameter>Safari</usageParameter>
        <usageParameter>Internet Explorer</usageParameter>
        <usageParameter>Chrome</usageParameter>
     </specificationLink>
   </serviceBinding>
</service>
```

The service description above is contained in the *new_service.xml* file. The following command registers this service with the service:

```
% curl -X POST -H "Content-type:application/xml" -v -d @new_service.xml \
http://localhost:8080/registry-service/registry/services
```

Schemes and Nodes

In order for the above artifacts to be accepted for registration by the service, the service must be preloaded with the list of supported object types. This procedure is detailed in the Configuration portion of the Installation section. For more information on scheme and node registration see the Scheme and Node Registration section of the documentation. If viewing this document in PDF form, see the appendix for details.

Query Artifacts

Although the Registry Service does not offer an advanced query interface, it does offer interfaces for discovering and retrieving artifact descriptions. The URLs shown in the examples below will work in a web browser.

Products

The following command retrieves a paged list of registered products from the service:

```
% curl -X GET -H "Accept:application/xml" -v \
http://localhost:8080/registry-service/registry/extrinsics
```

```
```

The interface above accepts a number of parameters for filtering the return results. The following command retrieves the latest product with logical identifier *1234* from the service:

```
% curl -X GET -H "Accept:application/xml" -v \
http://localhost:8080/registry-service/registry/extrinsics/1234
```

In order to retrieve the earliest product with logical identifier *1234*, append /*earliest* to the URL in the example above. In order to retrieve all products with logical identifier *1234*, append /*all* to the URL in the example above. In order to retrieve a specific product with logical identifier *1234*, append the version identifier (e.g., /*1.0*) to the URL in the example above. The following command retrieves the specific product with logical identifier *1234* and version identifier *1.0*, but in JSON form:

```
% curl -X GET -H "Accept:application/json" -v \
http://localhost:8080/registry-service/registry/extrinsics/1234/1.0
```

The example above will not work in a browser because it is not possible to set the HTTP Accept Header via a browser, but the following command will work in a browser by encoding the return type with a suffix in the URL:

```
% curl -X GET -v \
http://localhost:8080/registry-service/registry/extrinsics/1234/1.0.json
```

Associations

The following command retrieves a paged list of registered associations from the service:

```
% curl -X GET -H "Accept:application/xml" -v \
http://localhost:8080/registry-service/registry/associations
```

The interface above accepts a number of parameters for filtering the return results. In order to retrieve a specific association, append the global unique identifier (/<guid>) for that association to the URL in the

example above.

Services

The service does not yet support a general query of registered services but a specific service can be retrieved by specifying its global unique identifier as follows:

```
% curl -X GET -H "Accept:application/xml" -v \
http://localhost:8080/registry-service/registry/services/<guid>
```

Schemes and Nodes

The service does not yet support a general query of registered schemes but a specific scheme can be retrieved by specifying its global unique identifier as follows:

```
% curl -X GET -H "Accept:application/xml" -v \
http://localhost:8080/registry-service/registry/schemes/<guid>
```

In order to retrieve the only supported scheme (at this time), replace <guid> in the example above with *urn:registry:classificationScheme:ObjectType*. The following command retrieves the list of nodes associated with the *urn:registry:ObjectType* scheme:

```
% curl -X GET -H "Accept:application/xml" -v \
http://localhost:8080/registry-service/registry/schemes/\
urn:registry:classificationScheme:ObjectType/nodes
```

In order to retrieve a specific node, append the global unique identifier (/<guid>) for that node to the URL in the example above.

Events

The service tracks auditable events for each registered artifact including submission, approval, deprecation, etc. The service does not yet support a general query of these events but the associated events for a specific artifact can be retrieved by specifying the artifact's global unique identifier as follows:

```
% curl -X GET -H "Accept:application/xml" -v \
```

```
http://localhost:8080/registry-service/registry/events/<guid>
```

Update Status

When products are successfully registered with the service they are given a status of *Submitted*. The status for a specific product can be modified with the following command:

```
% curl -X POST -H "Content-type:application/xml" -v \
http://localhost:8080/registry-service/registry/extrinsics/1234/1.0/<action>
```

Valid values for <action> include *approve*, *deprecate* and *undeprecate*. The following diagram details the relationship of the status state with the above actions.
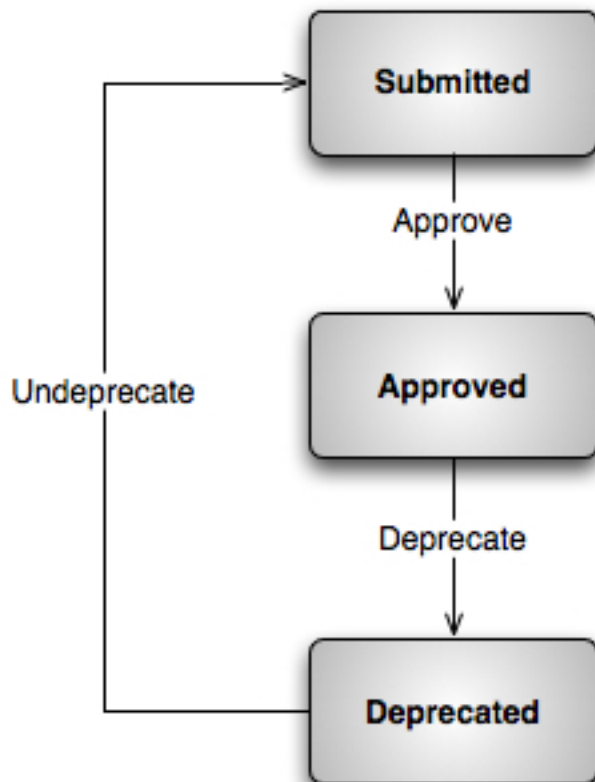
Delete Artifacts

The following command deletes the specific product with logical identifier *1234* and version identifier *1.0* from the service:

```
% curl -X DELETE -v \
http://localhost:8080/registry-service/registry/extrinsics/1234/1.0
```

The following two examples delete an association and a service, respectively, by specifying their global unique identifier:

```
% curl -X DELETE -v \
http://localhost:8080/registry-service/registry/associations/<guid>

% curl -X DELETE -v \
http://localhost:8080/registry-service/registry/services/<guid>
```

Ping

The following command checks to see if the registry service is up and running:

```
% curl -X GET -H "Content-type:application/xml" -v \
http://localhost:8080/registry-service/registry
```

Report

The following command details the status of the service along with registered counts by Registry Object type:

```
% curl -X GET -H "Content-type:application/xml" -v \
http://localhost:8080/registry-service/registry/report
```

Controlled Access

A given instance of the Registry Service may be configured to control access to specific URLs utilizing the software of the Security Service. If this is the case, the *curl* application can be used to obtain an authentication

cookie as follows:

```
% curl -X POST -H "Content-type:application/xml" -v -d @new_product.xml \
https://localhost:8443/registry-service/registry/extrinsics -u username:password \
-k -c tomcat_cookie.txt
```

The cookie file *tomcat_cookie.txt* can then be passed to the next *curl* command:

```
% curl -X POST -H "Content-type:application/xml" -v -d @new_product_v2.xml \
https://localhost:8443/registry-service/registry/extrinsics/1234 -k -b tomcat_cookie.txt
```

The example above also applies to a *DELETE* request.

1.5 Appendix - Scheme and Node Registration

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Scheme and Node Registration

This section describes classification scheme and classification node registration in more detail. At this point in time, only one classification scheme is supported by the Registry Service and that is the ObjectType scheme. This scheme is utilized by the service for determining the allowable object types (artifacts) for registration. These object types are represented by the classification nodes, which are children of the ObjectType classification scheme.

The standard scheme and associated nodes are registered during the installation of the service. That procedure is detailed in the Configuration portion of the Installation section. The rest of this section gives a little insight into the content of the scheme and node descriptions and how they are registered with the service. The following is an example of a scheme description in XML form:

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<classificationScheme xmlns="http://registry.pds.nasa.gov"
  guid="urn:registry:classificationScheme:ObjectTypeScheme:Test"
  name="TestObjectType"
  description="This is the canonical object type classification
  that is one of the core registry objects"
  isInternal="true"
  nodeType="UniqueCode"/>
```

The scheme description above is contained in the *new_scheme.xml* file, which can be found in the */examples* directory of the software distribution package. The following command registers this scheme with the service:

```
% curl -X POST -H "Content-type:application/xml" -v -d @new_scheme.xml \
http://localhost:8080/registry-service/registry/schemes
```

The following is an example of a node description in XML form:

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<classificationNode xmlns="http://registry.pds.nasa.gov"
  guid="urn:nasa:pds:profile:regrep:ObjectType:ProductTest"
  lid="urn:nasa:pds:profile:regrep:ObjectType:ProductTest"
```

```
   name="Product Test Node"
   description="This is the classification node for testing."
   parent="urn:registry:classificationScheme:ObjectTypeScheme:Test"
   code="ProductTest"/>
```

The node description above is contained in the *new_node_product.xml* file. The following command registers this node with the service:

```
% curl -X POST -H "Content-type:application/xml" -v -d @new_node_product.xml \
http://localhost:8080/registry-service/registry/\
schemes/urn:registry:classificationScheme:ObjectTypeScheme:Test/nodes
```