2008 NSDI Cooperative Agreement Program

Category 2: Best Practices in Geospatial Service Oriented Architecture (SOA)

Documenting Best Practices in Geospatial SOA: Wetlands JD Analyzer

Installation and Configuration Version 1.0

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1. Introduction

1.1. Identification

This document is identified as the *EPA JD Analyst Application: Installation and Configuration* document. The production and maintenance of this document is the responsibility of Image Matters LLC.

1.2. Scope

This document covers how to properly install, configure, and use the JD Analyst Application (JDA).

1.3. Purpose and Objective

This document describes the configuration details of JDA and provides deployment instructions.

1.4. Organization

This document is organized into the following sections and appendices:

Section 1 defines purpose, objective, and change control procedure.

Section 2 describes the components which make up the application

Section 3 documents deployment and configuration notes

Section 4 describes how to use JDA

1.5. References

This section identifies the documents that are referenced directly in the requirements or were used to derive the requirements.

1.5.1. Applicable Documents

Applicable documents are those documents whose content is considered to form a part of the requirements. The specified parts of the applicable documents carry the same weight as if they were stated within the body of this document. The applicable documents are:

- OpenGIS® Web Processing Service Specification version 2.0.0, May 2004, http://www.opengeospatial.org/standards/wps
- OpenGIS® Web Map Service Specification version 1.1.1, January 2002, http://www.opengeospatial.org/standards/wms
- OpenGIS® Web Feature Service Specification version 1.0.0, May 2002, http://www.opengeospatial.org/standards/wfs

1.5.2. Reference Documents

Reference documents are those documents that, although not a part of this document, serve to amplify or clarify its contents. The specific reference documents are:

- OGC Filter Encoding Implementation Specification version 1.0.0, May 2001. (http://www.opengeospatial.org/standards/filter)
- OWS Common Implementation Specification version 0.2.0, January 2004. (http://www.opengeospatial.org/standards/common)
- Java™ 2 Platform Standard Edition API Specification version 1.4.2, 2003. (http://java.sun.com/j2se/1.4.2/docs/api/index.html)

2. Installation

The following steps are required for installation of JDA.

2.1. Install Java JRE 1.5+

JDA requires the Java Runtime Environment (JRE) version 1.5 or newer to operate. This can be downloaded from the Java website at http://www.java.com/en/download/index.jsp.

2.2. Install Apache Tomcat 5.5+

JDA runs inside of an application server. We recommend the Apache Tomcat application server, which may be downloaded at http://tomcat.apache.org/download-55.cgi.

2.3. Deploy JDA

Once Java and Tomcat have been installed and configured – please refer to each provider's documentation for details – JDA may be installed using the following steps:

1. Copy the JDA .WAR file into the $TOMCAT_HOME/webapps/ directory. Note the name of the .WAR file as this will be necessary to connect to the application later. This name (minus the ".WAR" will be referred to throughout this document as "$JDA_HOME")
    a. For example, if you deployed JDA file as "jd-analyst.war", $JDA_HOME would refer to "jd-analyst"
2. Start Tomcat (if not already running)
3. Open http://localhost:8080/*$JDA_HOME*/ in your web browser

3. Configuration

This section describes how to configure JDA.

3.1. Data Servers

JDA requires two WFS data sources to operate properly: one hosting National Wetlands Inventory (NWI) wetland features and one hosting the National Hydrography Dataset (NHD) stream features. JDA comes pre-configured for use with the OpenGEO/IU “Cloud” WFS (http://149.165.228.100:8080/geoserver/ows?service=WFS&version=1.1.0&request=GetCapabilities) hosting NWI features and the USGS Framework WFS (http://frameworkwfs.usgs.gov/framework/wfs/wfs.cgi?request=GetCapabilities) hosting NHD features.

The NWI WFS to use is configured in the $JDA_HOME/WEB-INF/applicationContext.xml file under the “wfsController” component and for each processor:

```
<bean id="wfsController"
      class="gov.epa.geoanalysis.controller.WfsResource">

      <!-- URL of the WFS -->
        <property name="featureServiceUrl"
            value="http://149.165.228.100:8080/geoserver/ows?service=WFS&
      amp;version=1.1.0" />

      <!-- Qualified Name of the Feature type -->
      <property name="featureType" value="fgdc:wetlands" />

      <!—Qualified Name of the Feature’s Geometry Attribute -->
      <property name="geometryProperty" value="fgdc:wkb_geometry" />
</bean>

<bean id="intersectionProcessor"
      class="gov.epa.geoanalysis.controller.IntersectionProcessor">

      <!-- Qualified Name of the Feature type -->
      <property name="wetlandsFeatureTypeString" value="fgdc:wetlands" />

      <!-- Qualified Name of the Feature’s Geometry Attribute -->
      <property name="wetlandsGeometryProperty"
            value="fgdc:wkb_geometry" />

      <!-- URL of the WFS -->
      <property name="wetlandsServiceUrl"
            value="http://149.165.228.100:8080/geoserver/ows?service=WFS&
      amp;version=1.1.0" />
</bean>
```

```
<bean id="proximityProcessor"
      class="gov.epa.geoanalysis.controller.ProximityProcessor">

      <!-- Qualified Name of the Feature type -->
      <property name="wetlandsFeatureTypeString" value="fgdc:wetlands" />

      <!-- Qualified Name of the Feature's Geometry Attribute -->
      <property name="wetlandsGeometryProperty"
            value="fgdc:wkb_geometry" />

      <!-- URL of the WFS -->
      <property name="wetlandsServiceUrl"
            value="http://149.165.228.100:8080/geoserver/ows?service=WFS&
      amp;version=1.1.0" />
</bean>
```

The location of saved reports (intersection and proximity results) is configured in the "reportService" component:

```
<bean id="reportService"
class="gov.epa.geoanalysis.controller.ReportService">
      <property name="dataDirectory"
            value="/opt/projects/epa/ga/reports/cloud" />
</bean>
```

Proxied or locally-rendered layers (such as the feature results) are rendered within the MapRenderer component. The pass-through URLs (for proxied) and local layer names are configured in the "mapRenderer" component:

```
<bean id="mapRenderer" class="gov.epa.geoanalysis.view.MapRenderer">
      <property name="wmsMap">
            <map>
                  <entry key="CONUS_Wetland_Polygons">
                        <value
      http://wetlandswms.er.usgs.gov/wmsconnector/com.esri.wms.Esrimap/US
FWS_WMS_CONUS_Wetlands
                              </value>
                        </entry>
                </entry>
            </map>
      </property>
      <property name="wmsLayerMap">
            <map>
                  <entry key="CONUS_Wetland_Polygons">
                        <value>CONUS_Wetland_Polygons</value>
                  </entry>
                        <value>NHDFLHI:Framework</value>
                  </entry>
            </map>
      </property>
</bean>
```

3.2. Configuring the WPS

The JDA WPS is a generic WPS implementation. One or more different processes may be configured in the $JDA_HOME/WEB-INF/applicationContext.xml file:

```
<bean id="wpsController" class="com.usersmarts.cx.wps.spi.WPSController">
   <property name="title" value="Geo-Analysis WPS" />
   <property name="abstr" value="WPS implementation for locating NHD
Streams using NWI Wetlands using proximity distances or intersections" />
   <property name="processors">
      <map>
         <entry key="gov.epa.geoanalysis.controller.ProximityProcessor">
            <ref bean="proximityProcessor" />
         </entry>
         <entry
            key="gov.epa.geoanalysis.controller.IntersectionProcessor">
            <ref bean="intersectionProcessor" />
         </entry>
      </map>
   </property>
</bean>
```

Each process must be implemented using the *com.usersmarts.cx.wps.spi.Processor* interface class.

4. Usage

This section describes how to use the JDA application client.

4.1. Using the WPS

The JDA WPS supports accepting WPS Execute requests via HTTP-POST and is configured by default to support both intersection and proximity processes. For both of these processes, a bounding box defining the area of interest from which to select NWI and NHD features and the total maximum number of features to use in calculations are supported. Additionally, for proximity processes, the maximum distance for which proximity may be determined is also supported.

4.1.1. Execute Request Example

Below is a sample proximity process request defining all three variables:

```
<wps:Execute service="WPS" version="1.0.0"
      xmlns:wps="http://www.opengis.net/wps/1.0.0"
      xmlns:ows="http://www.opengis.net/ows/1.1"
      xmlns:xlink="http://www.w3.org/1999/xlink"
      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
      <ows:Identifier>
            gov.epa.geoanalysis.controller.ProximityProcessor
```

```
      </ows:Identifier>
      <wps:DataInputs>
            <wps:Input>
                  <ows:Identifier>distance</ows:Identifier>
                  <ows:Title>
                        Maximum Proximity Distance in meters
                  </ows:Title>
                  <wps:Data>
                        <wps:LiteralData>1000</wps:LiteralData>
                  </wps:Data>
            </wps:Input>
            <wps:Input>
                  <ows:Identifier>maxWetlands</ows:Identifier>
                  <ows:Title>
                        Maximum Number of Wetlands to use
                  </ows:Title>
                  <wps:Data>
                        <wps:LiteralData>10</wps:LiteralData>
                  </wps:Data>
            </wps:Input>
            <wps:Input>
                  <ows:Identifier>bbox</ows:Identifier>
                  <ows:Title>Area of Interest</ows:Title>
                  <wps:Data>
                     <ows:BoundingBox crs="urn:ogc:def:crs:EPSG::4326"
                              dimensions="2" >
                              <ows:LowerCorner>
                                    38.7 -77.3
                              </ows:LowerCorner>
                              <ows:UpperCorner>
                                    39.0 -77.0
                              </ows:UpperCorner>
                        </ows:BoundingBox>
                  </wps:Data>
            </wps:Input>
      </wps:DataInputs>
</wps:Execute>
```

Results from the intersection and proximity processes are represented as OGC WFS features within a feature collection (See WFS specifications for more details). Each result is a feature representing either the intersection of an NWI wetland and a NHD stream or the closest NHD stream to a given NWI wetland.

The following is a sample Intersection process request:

```
<wps:Execute service="WPS" version="1.0.0"
      xmlns:wps="http://www.opengis.net/wps/1.0.0"
      xmlns:ows="http://www.opengis.net/ows/1.1"
      xmlns:xlink="http://www.w3.org/1999/xlink"
      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
      <ows:Identifier>
            gov.epa.geoanalysis.controller.IntersectionProcessor
```

```
      </ows:Identifier>
      <wps:DataInputs>
            <wps:Input>
                  <ows:Identifier>maxWetlands</ows:Identifier>
                  <ows:Title>
                        Maximum Number of Wetlands to use
                  </ows:Title>
                  <wps:Data>
                        <wps:LiteralData>10</wps:LiteralData>
                  </wps:Data>
            </wps:Input>
            <wps:Input>
                  <ows:Identifier>bbox</ows:Identifier>
                  <ows:Title>Area of Interest</ows:Title>
                  <wps:Data>
                     <ows:BoundingBox crs="urn:ogc:def:crs:EPSG::4326"
                              dimensions="2" >
                              <ows:LowerCorner>
                                    38.7 -77.3
                              </ows:LowerCorner>
                              <ows:UpperCorner>
                                    39.0 -77.0
                              </ows:UpperCorner>
                        </ows:BoundingBox>
                  </wps:Data>
            </wps:Input>
      </wps:DataInputs>
</wps:Execute>
```

4.1.2. ProcessDescriptions Examples

The WPS ProcessDescriptions responses for Intersection and Proximity are shown below.

4.1.2.1 Intersection Process Description

```
<wps:ProcessDescriptions
      xmlns:wps="http://www.opengis.net/wps/1.0.0"
      xmlns:ows="http://www.opengis.net/ows/1.1"
      service="WPS" lang="en-US" version="1.0.0">

    <wps:ProcessDescription wps:processVersion="1"
            statusSupported="false" storeSupported="false">
        <ows:Identifier>
            gov.epa.geoanalysis.controller.IntersectionProcessor
        </ows:Identifier>
        <ows:Title>
            Wetland-Stream Intersection Process
        </ows:Title>
        <ows:Abstract>
            Locates NHD Streams that intersect NWI Wetlands
        </ows:Abstract>
        <wps:ProcessVersion>1</wps:ProcessVersion>
        <wps:DataInputs>
```

```
            <wps:Input>
                <ows:Identifier>bbox</ows:Identifier>
                <wps:SupportedCRSs>
                    <wps:Default>
                        <wps:CRS>EPSG:4326</wps:CRS>
                    </wps:Default>
                    <wps:Supported>
                        <wps:CRS>EPSG:4326</wps:CRS>
                    </wps:Supported>
                </wps:SupportedCRSs>
            </wps:Input>
            <wps:Input>
                <ows:Identifier>maxWetlands</ows:Identifier>
                <wps:LiteralData>
                    <ows:DataType
ows:reference="http://www.w3.org/TR/xmlschema-2/">int</ows:DataType>
                    <ows:AnyValue />
                </wps:LiteralData>
            </wps:Input>
        </wps:DataInputs>
        <wps:ProcessOutputs>
            <wps:Output>
                <ows:Identifier>features</ows:Identifier>
                <wps:ComplexOutput>
                    <wps:Default>
                        <wps:Format>
                            <wps:MimeType>text/xml</wps:MimeType>
                            <wps:Encoding>UTF-8</wps:Encoding>
                            <wps:Schema>
                        http://schemas.opengis.net/wfs/1.1.0/wfs.xsd
                            </wps:Schema>
                        </wps:Format>
                    </wps:Default>
                    <wps:Supported>
                        <wps:Format>
                            <wps:MimeType>text/xml</wps:MimeType>
                            <wps:Encoding>UTF-8</wps:Encoding>
                            <wps:Schema>
                        http://schemas.opengis.net/wfs/1.1.0/wfs.xsd
                            </wps:Schema>
                        </wps:Format>
                    </wps:Supported>
                </wps:ComplexOutput>
            </wps:Output>
        </wps:ProcessOutputs>
    </wps:ProcessDescription>
</wps:ProcessDescriptions>
```

4.1.2.2 Proximity Process Description

```
<wps:ProcessDescriptions
      xmlns:wps="http://www.opengis.net/wps/1.0.0"
      xmlns:ows="http://www.opengis.net/ows/1.1"
```

```
      service="WPS" lang="en-US" version="1.0.0">

    <wps:ProcessDescription wps:processVersion="1"
            statusSupported="false" storeSupported="false">
        <ows:Identifier>
            gov.epa.geoanalysis.controller.ProximityProcessor
        </ows:Identifier>
        <ows:Title>Wetland-Stream Proximity Process</ows:Title>
        <ows:Abstract>
            Locates nearby NHD Streams based on distance from NWI
      Wetlands
        </ows:Abstract>
        <wps:ProcessVersion>1</wps:ProcessVersion>
        <wps:DataInputs>
            <wps:Input>
                <ows:Identifier>bbox</ows:Identifier>
                <wps:SupportedCRSs>
                    <wps:Default>
                        <wps:CRS>EPSG:4326</wps:CRS>
                    </wps:Default>
                    <wps:Supported>
                        <wps:CRS>EPSG:4326</wps:CRS>
                    </wps:Supported>
                </wps:SupportedCRSs>
            </wps:Input>
            <wps:Input>
                <ows:Identifier>maxWetlands</ows:Identifier>
                <wps:LiteralData>
                    <ows:DataType
ows:reference="http://www.w3.org/TR/xmlschema-2/">int</ows:DataType>
                    <ows:AnyValue />
                </wps:LiteralData>
            </wps:Input>
            <wps:Input>
                <ows:Identifier>distance</ows:Identifier>
                <wps:LiteralData>
                    <ows:DataType
ows:reference="http://www.w3.org/TR/xmlschema-2/">double</ows:DataType>
                    <wps:UOMs>
                        <wps:Default>
                            <ows:UOM>meters</ows:UOM>
                        </wps:Default>
                        <wps:Supported>
                            <ows:UOM>meters</ows:UOM>
                        </wps:Supported>
                    </wps:UOMs>
                    <ows:AnyValue />
                </wps:LiteralData>
            </wps:Input>
        </wps:DataInputs>
        <wps:ProcessOutputs>
            <wps:Output>
                <ows:Identifier>features</ows:Identifier>
```

```
                <wps:ComplexOutput>
                    <wps:Default>
                        <wps:Format>
                            <wps:MimeType>text/xml</wps:MimeType>
                            <wps:Encoding>UTF-8</wps:Encoding>
                            <wps:Schema>
                        http://schemas.opengis.net/wfs/1.1.0/wfs.xsd
                            </wps:Schema>
                        </wps:Format>
                    </wps:Default>
                    <wps:Supported>
                        <wps:Format>
                            <wps:MimeType>text/xml</wps:MimeType>
                            <wps:Encoding>UTF-8</wps:Encoding>
                            <wps:Schema>
                        http://schemas.opengis.net/wfs/1.1.0/wfs.xsd
                            </wps:Schema>
                        </wps:Format>
                    </wps:Supported>
                </wps:ComplexOutput>
            </wps:Output>
        </wps:ProcessOutputs>
    </wps:ProcessDescription>
</wps:ProcessDescriptions>
```