



deegree Web Catalogue Service v.2.2

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Change log

Date	Description	Author
2008-06-10	Created new documentation for deegree CSW 2.2 supporting OpenGIS Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile (1.0.0) based on documentation of deegree CSW 2.1.	Lyn Büsching

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1 Introduction

deegree is a Java Framework offering the main building blocks for Spatial Data Infrastructures (SDIs). Its entire architecture is developed using standards of the Open Geospatial Consortium (OGC) and ISO Technical Committee 211 – Geographic information / Geoinformatics (ISO/TC 211). deegree encompasses OGC Web Services as well as clients. deegree is Free Software protected by the GNU Lesser General Public License (GNU LGPL) and is accessible at <http://www.deegree.org>.

deegree2 is the new release of deegree supporting a number of features that deegree1 was not able to handle. This documentation describes setup and configuration of the deegree Web Catalogue Service (CSW), an implementation of OGC's Catalogue Service Implementation Specification 2.0.2 and the ISO 19115 / 19119 Application Profile 1.0.0.

deegree's Web Catalogue Service implementation (Catalogue Service – Web profile, therefore CSW) is able to serve different metadata formats in parallel based on the same physical datastore. This is possible because deegree CSW uses XSLT processing to transform requests as well as responses into the desired format. deegree CSW does not contain a data access modul of its own. It uses an OGC WFS (at the moment limited to deegree WFS) as datasource. So in future it will be possible to use deegree CSW on top of any other OGC compliant WFS to offer catalogue functionalities.

As deegree WFS is extremely flexible in regard to supporting different database schemas, it is possible to adjust deegree CSW to almost any existing metadata base – without the need for replication.

Besides the CSW, deegree comprises a number of additional services and clients. A complete list of deegree components can be found at:

<http://www.lat-lon.de> → Products

Downloads of packaged deegree components can be found at:

<http://www.deegree.org> → Download

deegree's Web Catalogue Service offers great flexibility regarding it's configuration and output formats. It works with a wide range of physical data sources and server environments. The configuration of CSW is similar to the configuration of other deegree Web Services and requires the editing of XML files which control the functionality of the server.

deegree CSW is an implementation of the OpenGIS® Catalogue Services Specification 2.0.2 - ISO 19115/ISO19119 Metadata Application Profile (1.0.0)(in short: ISO APP; OGC project document 07-045).

It supports the operations:

- GetCapabilities
- DescribeRecord
- GetRecords
- GetRecordByID and
- Transaction

deegree CSW does not yet support harvesting capability as defined by the ISO APP.

The web services of deegree are realized as Java modules controlled by one central servlet (the “dispatcher”). This servlet has to be deployed to the respective web server/servlet engine. Most of the common web servers support servlet technology, thus making deegree a universal product. The Apache-Tomcat 5.5 Servlet-Engine is recommended due to its widespread use and its status as an open-source product.

2 Download / Installation

2.1 Prerequisites

For deegree2 Web Catalogue Service to run you need:

- Java (JRE or JSDK) version 1.5.x
- Tomcat 5.5.x
- PostgreSQL 8.0 + PostGIS 1.0.x

For installation of these components refer to the corresponding documentation at java.sun.com, tomcat.apache.org, <http://www.postgresql.org/> and <http://www.postgis.org/>.

2.2 deegree Web Catalogue Service release

deegree Web Catalogue Service can be downloaded from <http://www.deegree.org>. The release is packed as a WAR-archive. Simply put this file into your `$TOMCAT_HOME$/webapps` directory and (re-)start Tomcat. The installation of deegree WFS is already done with this.

Note: It is also possible to extract the WAR archive into another place of your computer and direct Tomcat to this place. Because of this possibility, in the remainder of this document, the directory you extracted the files to is referred to as `csw_home` (`= $TOMCAT_HOME$/webapps/deegree-csw` in the standard case).

Your `csw_home` will contain the following structure:

directory	Content
<code>./client</code>	contains the generic client for testing
<code>./WEB-INF</code>	Required by Tomcat, containing all libraries, configuration- and data-files
<code>./WEB-INF/conf/csw</code>	WFS configuration files
<code>./WEB-INF/conf/scripts</code>	contains DB create scripts, Format converter ESRI metadata file -> ISO

Table 1: Directory structure of the CSW release

2.3 Setting up the example database

Create a postgis enabled database ('csw') within PostgreSQL with UTF-8 Encoding (consult the according PostgreSQL and PostGIS documentation). After that execute the according SQL scripts **create_database.sql** and afterwards **create_searchTables.sql** located in `csw_home/WEB-INF/conf/scripts`. To

create the indices also execute **create_normal_index.sql** and **create_spatial_index.sql**.

Then you have to connect the catalogue against the PostgreSQL instance in the file WEB-INF/conf/csw/featuretypes/csw.xsd like this, where csw is the name of your database:

```
<xsd:appinfo>
  <deegree:Prefix>app</deegree:Prefix>
  <deegree:Backend>POSTGIS</deegree:Backend>
  <deegree:DefaultSRS>EPSG:4326</deegree:DefaultSRS>
  <JDBCConnection xmlns="http://www.deegree.org/jdbc">
    <Driver>org.postgresql.Driver</Driver>
    <Url>jdbc:postgresql://localhost:5432/csw</Url>
    <User>USERNAME</User>
    <Password>PASSWORD</Password>
    <SecurityConstraints/>
    <Encoding>iso-8859-1</Encoding>
  </JDBCConnection>
  <deegree:SuppressXLinkOutput>true</deegree:SuppressXLinkOutput>
</xsd:appinfo>
```

2.4 Testing the installation

The deegree CSW demo download comes pre-configured for accessing a Postgis database. The database can be filled with a few example metadataset to enable to perform a few example requests. Metadata datasets will find it's way into the database via a Transaction Insert request which can be sent via the generic client located under the url **http://yourservername:port/deegree-csw/client/client.html**. Go to the 'Request' dropdown menu, and execute all 'Transaction' -> 'insert*.xml' requests. For further testing you have two options. Some example requests for demonstration of the principle behavior of the service will be explained in the following sections. You can also use the generic client to communicate with the CSW. Just check out the example requests in the dropdown menu.

request 1:

```
http://my.server.domain/deegree-csw/services?
SERVICE=CSW&ACCEPTVERSION=2.0.2&REQUEST=GetCapabilities
```

result:

```
<?xml version="1.0" encoding="UTF-8"?>
<csw:Capabilities xmlns:csw="http://www.opengis.net/cat/csw/2.0.2"
xmlns:gml="http://www.opengis.net/gml" xmlns:ogc="http://www.opengis.net/ogc"
xmlns:ows="http://www.opengis.net/ows" xmlns:xlink="http://www.w3.org/1999/xlink"
updateSequence="0" version="2.0.2">
  <ows:ServiceIdentification>
    <ows:Title>deegree demo CSW</ows:Title>
    <ows:Abstract>abstract</ows:Abstract>
```



```

<ows:Keywords>
  <ows:Keyword>degree</ows:Keyword>
</ows:Keywords>
<ows:ServiceType>CSW</ows:ServiceType>
<ows:ServiceTypeVersion>2.0.2</ows:ServiceTypeVersion>
<ows:Fees>NO FEES - IT'S FREE</ows:Fees>
<ows:AccessConstraints>NONE</ows:AccessConstraints>
</ows:ServiceIdentification>
<ows:ServiceProvider>
  <ows:ProviderName>lat/lon GmbH</ows:ProviderName>
  <ows:ProviderSite xlink:href="http://www.latlon.de" xlink:type="simple"/>
  <ows:ServiceContact>
    <ows:IndividualName/>
    <ows:ContactInfo>
      <ows:Phone>
        <ows:Voice>+49 228 18496-0</ows:Voice>
        <ows:Facsimile>+49 228 18496-29</ows:Facsimile>
      </ows:Phone>
      <ows:Address>
        <ows:DeliveryPoint>Aennchenstr. 19</ows:DeliveryPoint>
        <ows:DeliveryPoint>basement</ows:DeliveryPoint>
        <ows:City>Bonn</ows:City>
        <ows:AdministrativeArea>NRW</ows:AdministrativeArea>
        <ows:PostalCode>53177</ows:PostalCode>
        <ows:Country>Germany</ows:Country>
        <ows:ElectronicMailAddress>info@lat-lon.de</ows:ElectronicMailAddress>
      </ows:Address>
      <ows:OnlineResource xlink:href="http://localhost:8080/degree-
csw/services" xlink:type="simple"/>
      <ows:HoursOfService>9am-17pm</ows:HoursOfService>
      <ows:ContactInstructions>personal</ows:ContactInstructions>
    </ows:ContactInfo>
    <ows:Role>PointOfContact</ows:Role>
  </ows:ServiceContact>
</ows:ServiceProvider>
<ows:OperationsMetadata>
  <ows:Operation name="GetCapabilities">
    <ows:DCP>
      <ows:HTTP>
        <ows:Get xlink:href="http://localhost:8080/degree-csw/services"
xlink:type="simple"/>
      </ows:HTTP>
    </ows:DCP>
  </ows:Operation>
  <ows:Operation name="DescribeRecord">
    <ows:DCP>
      <ows:HTTP>
        <ows:Get xlink:href="http://localhost:8080/degree-csw/services"
xlink:type="simple"/>
        <ows:Post xlink:href="http://localhost:8080/degree-csw/services"
xlink:type="simple"/>
      </ows:HTTP>
    </ows:DCP>
    <ows:Parameter name="typeName">
      <ows:Value>csw:dataset</ows:Value>
      <ows:Value>csw:datasetcollection</ows:Value>
      <ows:Value>csw:application</ows:Value>
      <ows:Value>csw:service</ows:Value>
    </ows:Parameter>
    <ows:Parameter name="outputFormat">
      <ows:Value>application/xml</ows:Value>
    </ows:Parameter>
    <ows:Parameter name="schemaLanguage">
      <ows:Value>XMLSCHEMA</ows:Value>
    </ows:Parameter>
  </ows:Operation>
</ows:OperationsMetadata>

```

```

</ows:Operation>
<ows:Operation name="GetRecords">
  <ows:DCP>
    <ows:HTTP>
      <ows:Post xlink:href="http://localhost:8080/deegree-csw/services"
xlink:type="simple"/>
    </ows:HTTP>
  </ows:DCP>
  <ows:Parameter name="typeName">
    <ows:Value>csw:Record</ows:Value>
    <ows:Value>gmd:MD_Metadata</ows:Value>
    <ows:Value>csw:service</ows:Value>
  </ows:Parameter>
  <ows:Parameter name="outputFormat">
    <ows:Value>application/xml</ows:Value>
  </ows:Parameter>
  <ows:Parameter name="outputSchema">
    <ows:Value>DublinCore</ows:Value>
    <ows:Value>http://www.isotc211.org/2005/gmd</ows:Value>
    <ows:Value>http://www.opengis.net/cat/csw/2.0.2</ows:Value>
  </ows:Parameter>
  <ows:Parameter name="resultType">
    <ows:Value>RESULTS</ows:Value>
  </ows:Parameter>
  <ows:Parameter name="ElementSetName">
    <ows:Value>brief</ows:Value>
    <ows:Value>summary</ows:Value>
    <ows:Value>full</ows:Value>
  </ows:Parameter>
  <ows:Parameter name="CONSTRAINTLANGUAGE">
    <ows:Value>Filter</ows:Value>
    <ows:Value>CQL</ows:Value>
  </ows:Parameter>
</ows:Operation>
<ows:Operation name="GetRecordById">
  <ows:DCP>
    <ows:HTTP>
      <ows:Get xlink:href="http://localhost:8080/deegree-csw/services"
xlink:type="simple"/>
      <ows:Post xlink:href="http://localhost:8080/deegree-csw/services"
xlink:type="simple"/>
    </ows:HTTP>
  </ows:DCP>
</ows:Operation>
<ows:Operation name="Transaction">
  <ows:DCP>
    <ows:HTTP>
      <ows:Post xlink:href="http://localhost:8080/deegree-csw/services"
xlink:type="simple"/>
    </ows:HTTP>
  </ows:DCP>
  <ows:Parameter name="outputSchema">
    <ows:Value>http://www.isotc211.org/2005/gmd</ows:Value>
  </ows:Parameter>
</ows:Operation>
<ows:Constraint name="IsoProfiles">
  <ows:Value>http://www.isotc211.org/2005/gmd</ows:Value>
</ows:Constraint>
<ows:Constraint name="PostEncoding">
  <ows:Value>SOAP</ows:Value>
</ows:Constraint>
</ows:OperationsMetadata>
<ogc:Filter_Capabilities>
  <ogc:Spatial_Capabilities>
    <ogc:GeometryOperands>

```

```

    <ogc:GeometryOperand>gml:Envelope</ogc:GeometryOperand>
  </ogc:GeometryOperands>
</ogc:SpatialOperators>
  <ogc:SpatialOperator name="BBOX"/>
</ogc:SpatialOperators>
</ogc:Spatial_Capabilities>
<ogc:Scalar_Capabilities>
  <ogc:LogicalOperators/>
  <ogc:ComparisonOperators>
    <ogc:ComparisonOperator>Between</ogc:ComparisonOperator>
    <ogc:ComparisonOperator>Like</ogc:ComparisonOperator>
    <ogc:ComparisonOperator>NullCheck</ogc:ComparisonOperator>
  </ogc:ComparisonOperators>
  <ogc:ArithmeticOperators>
    <ogc:SimpleArithmetic/>
  </ogc:ArithmeticOperators>
</ogc:Scalar_Capabilities>
<ogc:Id_Capabilities>
  <ogc:EID/>
</ogc:Id_Capabilities>
</ogc:Filter_Capabilities>
</csw:Capabilities>

```

request2:

http://my.server.domain/deegree-csw/services?
SERVICE=CSW&ACCEPTVERSION=2.0.2&REQUEST=GetCapabilities&Sections=OperationsMetadata

result:

```

<?xml version="1.0" encoding="UTF-8"?>
<csw:Capabilities xmlns:csw="http://www.opengis.net/cat/csw/2.0.2"
  xmlns:gml="http://www.opengis.net/gml" xmlns:ogc="http://www.opengis.net/ogc"
  xmlns:ows="http://www.opengis.net/ows" xmlns:xlink="http://www.w3.org/1999/xlink"
  updateSequence="0" version="2.0.2">
  <ows:OperationsMetadata>
    <ows:Operation name="GetCapabilities">
      <ows:DCP>
        <ows:HTTP>
          <ows:Get xlink:href="http://localhost:8080/deegree-csw/services"
xlink:type="simple"/>
        </ows:HTTP>
      </ows:DCP>
    </ows:Operation>
    <ows:Operation name="DescribeRecord">
      <ows:DCP>
        <ows:HTTP>
          <ows:Get xlink:href="http://localhost:8080/deegree-csw/services"
xlink:type="simple"/>
          <ows:Post xlink:href="http://localhost:8080/deegree-csw/services"
xlink:type="simple"/>
        </ows:HTTP>
      </ows:DCP>
      <ows:Parameter name="typeName">
        <ows:Value>csw:dataset</ows:Value>
        <ows:Value>csw:datasetcollection</ows:Value>
        <ows:Value>csw:application</ows:Value>
        <ows:Value>csw:service</ows:Value>
      </ows:Parameter>
      <ows:Parameter name="outputFormat">

```

```

        <ows:Value>application/xml</ows:Value>
      </ows:Parameter>
      <ows:Parameter name="schemaLanguage">
        <ows:Value>XMLSCHEMA</ows:Value>
      </ows:Parameter>
    </ows:Operation>
    <ows:Operation name="GetRecords">
      <ows:DCP>
        <ows:HTTP>
          <ows:Post xlink:href="http://localhost:8080/deegree-csw/services"
xlink:type="simple"/>
        </ows:HTTP>
      </ows:DCP>
      <ows:Parameter name="typeName">
        <ows:Value>cs:Record</ows:Value>
        <ows:Value>gmd:MD_Metadata</ows:Value>
        <ows:Value>cs:service</ows:Value>
      </ows:Parameter>
      <ows:Parameter name="outputFormat">
        <ows:Value>application/xml</ows:Value>
      </ows:Parameter>
      <ows:Parameter name="outputSchema">
        <ows:Value>DublinCore</ows:Value>
        <ows:Value>http://www.isotc211.org/2005/gmd</ows:Value>
        <ows:Value>http://www.opengis.net/cat/csw/2.0.2</ows:Value>
      </ows:Parameter>
      <ows:Parameter name="resultType">
        <ows:Value>RESULTS</ows:Value>
      </ows:Parameter>
      <ows:Parameter name="ElementSetName">
        <ows:Value>brief</ows:Value>
        <ows:Value>summary</ows:Value>
        <ows:Value>full</ows:Value>
      </ows:Parameter>
      <ows:Parameter name="CONSTRAINTLANGUAGE">
        <ows:Value>Filter</ows:Value>
        <ows:Value>CQL</ows:Value>
      </ows:Parameter>
    </ows:Operation>
    <ows:Operation name="GetRecordById">
      <ows:DCP>
        <ows:HTTP>
          <ows:Get xlink:href="http://localhost:8080/deegree-csw/services"
xlink:type="simple"/>
          <ows:Post xlink:href="http://localhost:8080/deegree-csw/services"
xlink:type="simple"/>
        </ows:HTTP>
      </ows:DCP>
    </ows:Operation>
    <ows:Operation name="Transaction">
      <ows:DCP>
        <ows:HTTP>
          <ows:Post xlink:href="http://localhost:8080/deegree-csw/services"
xlink:type="simple"/>
        </ows:HTTP>
      </ows:DCP>
      <ows:Parameter name="outputSchema">
        <ows:Value>http://www.isotc211.org/2005/gmd</ows:Value>
      </ows:Parameter>
    </ows:Operation>
    <ows:Constraint name="IsoProfiles">
      <ows:Value>http://www.isotc211.org/2005/gmd</ows:Value>
    </ows:Constraint>
    <ows:Constraint name="PostEncoding">
      <ows:Value>SOAP</ows:Value>
    </ows:Constraint>
  </ows:Operations>
</ows:Service>

```

```

    </ows:Constraint>
  </ows:OperationsMetadata>
</csw:Capabilities>

```

request3:

```

http://my.server.domain/deegree-csw/services?
request=DescribeRecord&version=2.0.2&outputFormat=text/xml&schemaLanguage=XMLSCHEMA&typeName=csw:Record&namespace=csw:http://www.opengis.org/csw

```

result:

```

<?xml version="1.0" encoding="UTF-8"?>
<csw:DescribeRecordResponse xmlns:csw="http://www.opengis.net/cat/csw/2.0.2"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.opengis.net/cat/csw/2.0.2
D:\java\projekte\iso19115\CSW202_APIISO_100_FINAL\csw202_apiso100\csw\2.0.2\CSW-
discovery.xsd">
  <csw:SchemaComponent schemaLanguage="XMLSCHEMA"
targetNamespace="http://purl.org/dc/elements/1.1/">
    <xs:schema xmlns="http://purl.org/dc/elements/1.1/"
xmlns:xs="http://www.w3.org/2001/XMLSchema" attributeFormDefault="unqualified"
elementFormDefault="qualified" targetNamespace="http://purl.org/dc/elements/1.1/">
      <xs:annotation>
        <xs:documentation>
          Simple DC XML Schema, 2002-03-12
          by Pete Johnston (p.johnston@ukoln.ac.uk),
          Carl Lagoze (lagoze@cs.cornell.edu), Andy Powell (a.powell@ukoln.ac.uk),
          Herbert Van de Sompel (hvdsomp@yahoo.com).
          This schema defines terms for Simple Dublin Core, i.e. the 15
          elements from the http://purl.org/dc/elements/1.1/ namespace, with
          no use of encoding schemes or element refinements.
          Default content type for all elements is xs:string with xml:lang
          attribute available.
        </xs:documentation>
        <xs:appinfo>
          <rdf:RDF xmlns:dc="http://purl.org/dc/elements/1.1/"
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">
            <rdf:Description rdf:about="">
              <dc:title>Simple DC XML Schema</dc:title>
              <dc:date>2002-03-12</dc:date>
              <dc:description>This schema defines terms for Simple Dublin
Core, i.e. the 15
elements from the http://purl.org/dc/elements/1.1/ namespace, with
no use of encoding schemes or element refinements.
Default content type for all elements is xs:string with xml:lang
attribute available.</dc:description>
              <dc:publisher>The Dublin Core Metadata Initiative</dc:publisher>
              <dc:creator>Pete Johnston (p.johnston@ukoln.ac.uk)</dc:creator>
              <dc:creator>Carl Lagoze (lagoze@cs.cornell.edu)</dc:creator>
              <dc:creator>Andy Powell (a.powell@ukoln.ac.uk)</dc:creator>
              <dc:creator>Herbert Van de Sompel
(hvdsomp@yahoo.com)</dc:creator>
              <!-- dc:relation
rdf:resource="http://purl.org/dc/elements/1.1/"-->
            </rdf:Description>
          </rdf:RDF>
        </xs:appinfo>
      </xs:annotation>
    </csw:SchemaComponent>
  </csw:DescribeRecordResponse>

```

```

<xs:import namespace="http://www.w3.org/XML/1998/namespace"
schemaLocation="http://www.w3.org/2001/03/xml.xsd"/>
<xs:element name="title" type="elementType"/>
<xs:element name="creator" type="elementType"/>
<xs:element name="subject" type="elementType"/>
<xs:element name="description" type="elementType"/>
<xs:element name="publisher" type="elementType"/>
<xs:element name="contributor" type="elementType"/>
<xs:element name="date" type="elementType"/>
<xs:element name="type" type="elementType"/>
<xs:element name="format" type="elementType"/>
<xs:element name="identifier" type="elementType"/>
<xs:element name="source" type="elementType"/>
<xs:element name="language" type="elementType"/>
<xs:element name="relation" type="elementType"/>
<xs:element name="coverage" type="elementType"/>
<xs:element name="rights" type="elementType"/>
<xs:group name="elementsGroup">
  <xs:sequence>
    <xs:choice maxOccurs="unbounded" minOccurs="0">
      <xs:element ref="title"/>
      <xs:element ref="creator"/>
      <xs:element ref="subject"/>
      <xs:element ref="description"/>
      <xs:element ref="publisher"/>
      <xs:element ref="contributor"/>
      <xs:element ref="date"/>
      <xs:element ref="type"/>
      <xs:element ref="format"/>
      <xs:element ref="identifier"/>
      <xs:element ref="source"/>
      <xs:element ref="language"/>
      <xs:element ref="relation"/>
      <xs:element ref="coverage"/>
      <xs:element ref="rights"/>
    </xs:choice>
  </xs:sequence>
</xs:group>
<xs:complexType name="elementType">
  <xs:simpleContent>
    <xs:extension base="xs:string">
      <!--xs:attribute ref="xml:lang" use="optional"/-->
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
</xs:schema>
</csw:SchemaComponent>
</csw:DescribeRecordResponse>

```

3 Architecture

As mentioned above deegree CSW doesn't contain any direct data access modules. It uses deegree WFS through its API or – in future releases – any OGC WFS its their web interface. So deegree CSW can be seen as a kind of facade on top a WFS offering components for transforming incoming catalogue requests into WFS requests and transforming WFS responses into CSW responses.

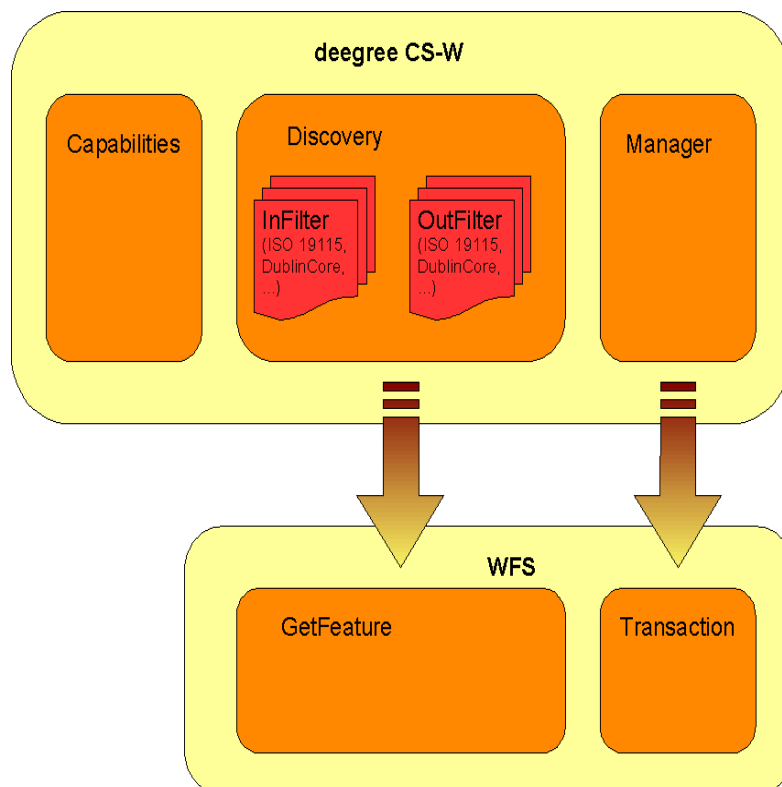


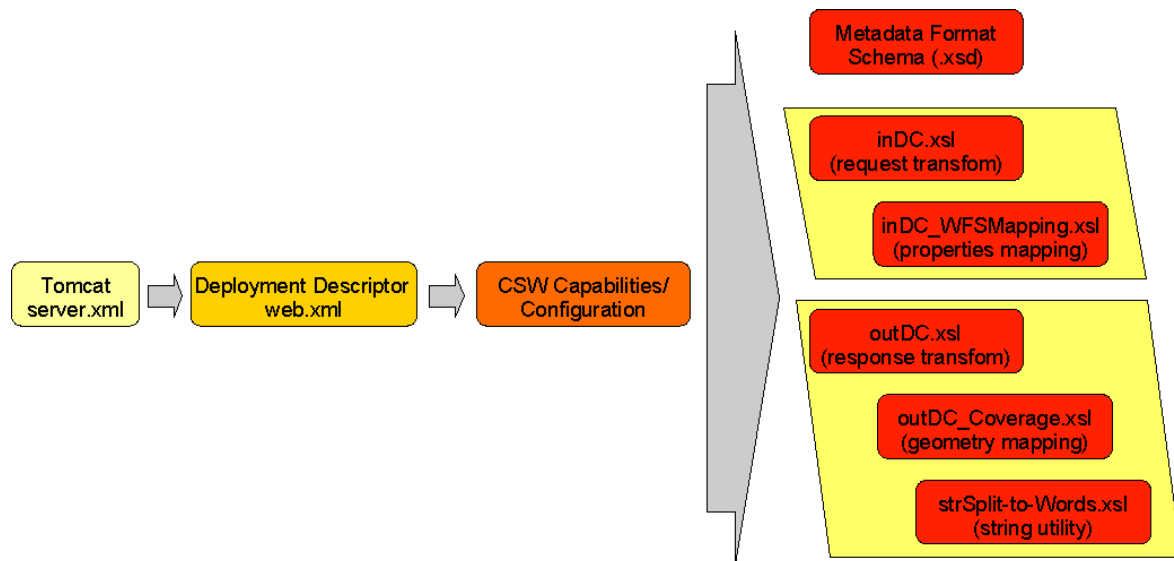
Figure 1: deegree CSW architecture

Figure 1 shows the dependency between deegree CSW and a WFS acting as its datasource. Because transformation modules/scripts are located on the CSW side it is possible to offer several metadata formats/schemas on top of the same WFS FeatureType.

4 Basic configuration

4.1 Structure of the configuration files

The following figure shows the relationships between the different configuration files that have to be adjusted:



4.2 The deegree CSW configuration document

The basic configuration allows usage of the full set of parameters that can be used for controlling the deegree CSW. This includes the parameters mentioned in the OGC CSW 2.0.2 specification for the Capabilities document, but also additional technical parameters.

In the following, the elements of the configuration file (an extended Capabilities document) will be described in detail. It is located at `csw_demo/WEB-INF/conf/csw/csw_capabilities.xml`. Appendix A includes an example of a complete configuration/capabilities document.

4.2.1 deegree-Parameters

The `<DefaultOnlineResource>` is the URL by which the CSW operations can be invoked. This parameter can be overwritten by the URLs defined in the request-definitions. Both parameters are mandatory. You have to adjust the `<DefaultOnlineResource>` to your system.


```
<degree:degreeParams>
  <degree:DefaultOnlineResource xlink:type="simple"
    xlink:href="http://localhost:8080/degree-csw/services"/>
  <degree:CacheSize>100</degree:CacheSize>
  <degree:RequestTimeLimit>60</degree:RequestTimeLimit>
  <degree:Encoding>ISO-8859-1</degree:Encoding>
  <degree:TransactionInputXSLT xlink:type="simple"
    xlink:href="transaction.xml"/>
  <degree:TransactionOutputXSLT xlink:type="simple"
    xlink:href="transactionOut.xml"/>
  <!-- this parameter will be used to define the default schema used by the
catalogue if OUTPUTSCHEMA parameter is missing. According to CSW specification this
must be OGCCORE which is not useful for GetRecordById requests -->
  <degree:DefaultOutputSchema>csw:profile</degree:DefaultOutputSchema>
  <degree:WFSResource xlink:type="simple" xlink:href="wfs_capabilities.xml"/>
</degree:degreeParams>
```

The `<CacheSize>` parameter defines the size of the cache available to degree-CSW in megabyte. This parameter is optional, its default value is 100 MB. By `<RequestTimeLimit>` the maximum time span is defined in seconds after which a request has to be processed. If this value is exceeded the processing is cancelled and an exception will be thrown. Its default value is 30 seconds. The encoding element defines the default character encoding to be used within the catalogue if embedded sources doesn't provide encoding informations. This element is optional, default value is 'UTF-8'.

Because degree CSW uses a WFS as datasource one must define the WFS to be used. This is done by setting the WFSResource element. If it's missing it is assumed that a file named 'wfs_capabilities.xml' is available in the same directory as the catalogue capabilities file. degree CSW also uses this element to determine if a WFS is 'local' or 'remote'. A 'local' WFS will be connected through the degree API; a 'remote' WFS uses HTTP connections defined by the OGC WFS 1.0.0 specification. A WFS will be handled as being 'local' if the capabilities document is referenced by a file URL or a relative path. Using a HTTP URL will force treating a WFS as 'remote'.

4.2.2 ServiceIdentification

The ServiceIdentification section is required for giving basic informations about the a CSW to the client/user. This information may be used to manage several catalogues within one client or to store a catalogue metadata in another catalogue. For details see OGC Catalogue Service 2.0.2 and the OWS Common specification.

```
<ows:ServiceIdentification>
  <ows:ServiceType>CSW</ows:ServiceType>
  <ows:ServiceTypeVersion>2.0.2</ows:ServiceTypeVersion>
  <ows:Title>degree v2.2 demo CSW</ows:Title>
  <ows:Abstract>abstract</ows:Abstract>
  <ows:Keywords>
    <ows:Keyword>degree</ows:Keyword>
  </ows:Keywords>
  <ows:Fees>NO FEES - IT'S FREE</ows:Fees>
```

```
<ows:AccessConstraints>NONE</ows:AccessConstraints>
</ows:ServiceIdentification>
```

4.2.3 ServiceProvider

This section provides informations about the person(s) and organisation(s) making a catalogue available. For details see OGC Catalogue Service 2.0.2 and the OWS Common specification.

4.2.4 OperationsMetadata

The OperationsMetadata sections provides information about each operation offered by a catalogue. Mainly these are the names of the operations and the parameters that have to be passed to them. Each parameter can be assigned to a list of possible values. At the moment deegree CSW supports GetCapabilities, GetRecords, DescribeRecord, GetRecordById, and Transaction operations.

For the parameter 'outputSchema' of the GetRecords operation deegree introduces two additional attributes.

```
<ows:Parameter name="outputSchema">
  <ows:Value deegree:input="xslt/inDC.xsl"
deegree:output="xslt/outDC.xsl">DublinCore</ows:Value>
  <ows:Value deegree:input="xslt/inISO.xsl"
deegree:output="xslt/outISO.xsl">http://www.isotc211.org/2005/gmd</ows:Value>
  <ows:Value deegree:input="xslt/inISO.xsl"
deegree:output="xslt/outISO.xsl">http://www.opengis.net/cat/csw/2.0.2</ows:Value>
</ows:Parameter>
```

The first additional attribute 'deegree:input' references a XSLT script that will be used to transform an incoming GetRecord request into a GetFeature request that will be understood by the underlying WFS. Vice versa the script referenced by 'deegree:output' transforms the feature collection returned from the WFS into a XML document that validates against the schema referenced by 'deegree:schema' attribute of the typeName parameter.

```
<ows:Parameter name="typeName">
  <ows:Value deegree:schema="schema/dc_dataset.xsd">csw:Record</ows:Value>
  <ows:Value
deegree:schema="schema/iso/19139/20060504/gmd/metadataEntity.xsd">gmd:MD_Metadata</ows:Value>
  <ows:Value
deegree:schema="schema/iso/19139/20060504/srv/serviceMetadata.xsd">csw:service</ows:Value>
</ows:Parameter>
```

This always should be referenced through an HTTP URL even if a relative path or a FILE URL is valid too. This schema will also be returned when performing a DescribeRecord request against a type. Details about how to construct the in- and out-scripts will be discussed below.

For general information on how to define service operations in a catalogues capabilities document see OGC Catalogue Service 2.0.2 and OWS Common specification.

4.2.5 Filter_Capabilities

The last section of the capabilities document contains a description of the capabilities of the filter functions offered by a catalogue. You can leave this as it comes with the demo installation because this represents the current capabilities of the deegree Filter Encoding implementation. For details see OGC Catalogue Service 2.0.2, OWS Common and Filter Encoding specification.

5 Advanced configuration

5.1 Manual Tomcat integration

The location of deegree's libraries and the central deegree configuration file `csw_capabilities.xml` should be registered with the Servlet Engine (in this case Apache Tomcat 5.5). Tomcat offers several possibilities to register and configure web contexts.

The easiest way to register deegree web services with Tomcat is to copy the `deegree-csw.war` file to the `$TOMCAT_HOME/webapps` directory. You can do this either with running or stopped tomcat. If the tomcat is started afterwards, the application should be automatically deployed. Tomcat will unpack the `deegree-wfs.war` file (which is nothing more than a .zip file) to the webapps directory automatically. The name of the .war sets the name of the service address:

`http://localhost:8080/deegree-csw`

If you want to do the Tomcat installation process manually use the steps described in the following.

Unpack the `deegree-csw.war` to a directory (e.g. `c:/deegree/webapps/deegree-csw`) of your choice.

Afterwards Tomcat needs information about the root directory of the WFS. The easiest way is to create a XML-file in the directory `$TOMCAT_HOME/conf/Catalina/localhost`, named the same as the service e.g. `deegree-wfs.xml`, and fill it with the following information

```
<Context docBase="c:/deegree/webapps/deegree-csw" path="/deegree-csw">
</Context>
```

where the `docBase` attribute reflects the physical location of the deegree service in the file system and the `path` attribute describes the virtual location of the main directory of the deegree web service. In the example, the root directory of the service is accessible at `http://my.server.domain/deegree-csw/`. For further information have a look at the Tomcat documentation included with the installation.

The name of the deegree-service directory is arbitrary whereas Tomcat definitely looks for a subdirectory `WEB-INF` (in capital letters – even on a Windows system) in the root directory. You will find this directory after tomcat automatically unpacked the war archive. Here the Deployment-Descriptor (`web.xml`) is located, which is analysed by Tomcat to identify the servlet(s) belonging to the application, their names, the parameters that are delivered to the servlet(s) and information about the existing access restrictions.

Before starting deegree WFS the following dataset entry in `web.xml` is essential:

```
<?xml version="1.0"?>
<!DOCTYPE web-app PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
"http://java.sun.com/dtd/web-app_2_3.dtd">
<web-app>
  <description>deegree 2.2 - CSW</description>
  <filter>
    <filter-name>SOAPFilter</filter-name>
    <filter-class>org.deegree.enterprise.servlet.SOAPFacadeServletFilter</filter-
class>
  </filter>
  <servlet>
    <servlet-name>services</servlet-name>
    <servlet-class>org.deegree.enterprise.servlet.OGCServletController</servlet-
class>
    <init-param>
      <param-name>services</param-name>
      <param-value>csw</param-value>
    </init-param>
    <!-- CSW INITIALIZING PARAMETERS -->
    <init-param>
      <param-name>csw.handler</param-name>
      <param-value>org.deegree.enterprise.servlet.CSWHandler</param-value>
    </init-param>
    <init-param>
      <param-name>csw.config</param-name>
      <param-value>WEB-INF/conf/csw/csw_capabilities.xml</param-value>
    </init-param>
    <load-on-startup>1</load-on-startup>
  </servlet>
  <filter-mapping>
    <filter-name>SOAPFilter</filter-name>
    <url-pattern>/services</url-pattern>
  </filter-mapping>
  <servlet-mapping>
    <servlet-name>services</servlet-name>
    <url-pattern>/services</url-pattern>
  </servlet-mapping>
  <welcome-file-list>
    <welcome-file>/index.jsp</welcome-file>
  </welcome-file-list>
</web-app>
```

The name of the servlet and of the java-class representing the servlet should be indicated in the <servlet> tags. The servlet-name can be user defined, but care should be taken that the same name that is defined here is also used in the servlet-mapping. The servlet is located in the deegree2.jar library.

The tag <init-param> defines parameters that are analyzed by the servlet, while initializing. The transferred parameters are

- 'services': The value of this parameter contains a comma separated list of OWS that will be made available through the context. In the example only a 'csw' is defined to be available (other possible values at the moment are: wfs, wcs, sos, wps and csw).
- For each service listed in the 'service' init-param a handler class and a configuration file must be referenced.

- The name of the init-param for defining the handler starts with the service name ('csw' in the example) followed by '.handler'. The value of this parameter is the name of the handler class to be used. It is possible to write a different class for this and reference it accordingly. As default 'org.deegree.enterprise.servlet.CSWHandler' should be used.
- The name of the init-param for defining the main configuration file of a service also starts with the service name followed by '.config'. Notice that you can use a relative path to the configuration file starting at the WEB-INF directory of the context.

If you want to make more than one service available through a servlet context, web.xml looks like this (the example defines a 'csw' as well as a 'wfs'):

```
<?xml version="1.0"?>
<!DOCTYPE web-app PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
"http://java.sun.com/dtd/web-app_2_3.dtd">
<web-app>
  <description>deegree 2.2 - CSW</description>
  <filter>
    <filter-name>SOAPFilter</filter-name>
    <filter-class>org.deegree.enterprise.servlet.SOAPFacadeServletFilter</filter-
class>
  </filter>
  <servlet>
    <servlet-name>services</servlet-name>
    <servlet-class>org.deegree.enterprise.servlet.OGCServletController</servlet-
class>
    <init-param>
      <param-name>services</param-name>
      <param-value>csw,wfs</param-value>
    </init-param>
    <!-- CSW INITIALIZING PARAMETERS -->
    <init-param>
      <param-name>csw.handler</param-name>
      <param-value>org.deegree.enterprise.servlet.CSWHandler</param-value>
    </init-param>
    <init-param>
      <param-name>csw.config</param-name>
      <param-value>WEB-INF/conf/csw/csw_capabilities.xml</param-value>
    </init-param>
    <init-param>
      <param-name>wfs.handler</param-name>
      <param-value>org.deegree.enterprise.servlet.WFSHandler</param-value>
    </init-param>
    <init-param>
      <param-name>wfs.config</param-name>
      <param-value>WEB-INF/conf/csw/wfs_capabilities.xml</param-value>
    </init-param>
    <load-on-startup>1</load-on-startup>
  </servlet>
  <filter-mapping>
    <filter-name>SOAPFilter</filter-name>
    <url-pattern>/services</url-pattern>
  </filter-mapping>
  <servlet-mapping>
    <servlet-name>services</servlet-name>
    <url-pattern>/services</url-pattern>
```

```
</servlet-mapping>
<welcome-file-list>
  <welcome-file>/index.jsp</welcome-file>
</welcome-file-list>
</web-app>
```

In case you wish to run more than on deegree service, it is recommended to use the deegree-wms.war as this configuration already includes the services wfs, wcs and wms.

The tag `<servlet-mapping>` defines the alias name for the servlet. It is not necessary that the `<servlet-name>` and `<url-pattern>` are identical. `<url-pattern>` is the name for the parameter the servlet will be called through (part of the base-URL of the service that all requests have to use). Combined with the path settings in `$TOMCAT_HOME$/conf/Catalina/localhost/deegree-csw.xml` and respectively the name of the .war which you deployed in the `$TOMCAT_HOME$/webapps` (in our example deegree-csw) you should be able to point to your WFS (OWS) via the following URL: `http://my.server.domain/deegree-csw/services?`

5.2 Request and response formatting using XSLT

As mentioned above deegree CSW needs to transform incoming GetRecords requests to WFS GetFeature requests and resulting WFS GML Feature Collections to the requested metadata outputSchema. For this behavior for each supported metadata format/schema two XSLT scripts must be defined, one for input/requests and one for output/responses. The following example explains what those scripts must do. Other than in the demo release where the ISO 19115 schema is configured the next section describes the principally same DublinCore schema as supported metadata format and a deegree WFS serving a feature type named 'DublinCoreProduct' having the following GML application schema:

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="http://www.lat-lon.de"
  xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:gml="http://www.opengis.net/gml"
  xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:ll="http://www.lat-lon.de"
  elementFormDefault="qualified">
  <!-- import GML 2.1.2 schema definitions -->
  <xs:import namespace="http://www.opengis.net/gml"
    schemaLocation="./feature.xsd"/>
  <xs:import namespace="http://www.opengis.net/gml"
    schemaLocation="./geometry.xsd"/>
  <!-- ===== -->
  <!-- element definition -->
  <!-- ===== -->
  <xs:element name="FeatureCollection" type="ll:DCFeatureCollectionType"
    substitutionGroup="gml:_FeatureCollection"/>
  <xs:complexType name="csw:Record">
    <xs:complexContent>
      <xs:extension base="gml:AbstractFeatureType">
        <xs:sequence>
          <xs:element name="csw:DUBLINCORE.IDENTIFIER" type="xs:string"
            minOccurs="0"/>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
```

```

<xs:element name="csw:DUBLINCORE.CONTRIBUTOR" type="xs:string"
  minOccurs="0"/>
<xs:element name="csw:DUBLINCORE.CREATOR" type="xs:string"
  minOccurs="0"/>
<xs:element name="csw:DUBLINCORE.PUBLISHER" type="xs:string"
  minOccurs="0"/>
<xs:element name="csw:DUBLINCORE.SUBJECT" type="xs:string"
  minOccurs="0"/>
<xs:element name="csw:DUBLINCORE.DESCRPTION" type="xs:string"
  minOccurs="0"/>
<xs:element name="csw:DUBLINCORE.RELATION" type="xs:string"
  minOccurs="0"/>
<xs:element name="csw:DUBLINCORE.SOURCE" type="xs:string"
  minOccurs="0"/>
<xs:element name="csw:DUBLINCORE.RIGHTS" type="xs:string"
  minOccurs="0"/>
<xs:element name="csw:DUBLINCORE.FORMAT" type="xs:string"
  minOccurs="0"/>
<xs:element name="csw:DUBLINCORE.TYPE" type="xs:string"
  minOccurs="0"/>
<xs:element name="csw:DUBLINCORE.TITLE" type="xs:string"/>
<xs:element name="csw:DUBLINCORE.DATE" type="xs:date" minOccurs="0"/>
<xs:element name="csw:DUBLINCORE.LANGUAGE" type="xs:string"
  minOccurs="0"/>
<xs:element name="csw:DUBLINCORE.COVERAGE"
  type="gml:GeometryPropertyType" minOccurs="0"/>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="DCFeatureCollectionType">
  <xs:complexContent>
    <xs:extension base="gml:AbstractFeatureCollectionType">
      <xs:sequence/>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
</xs:schema>

```

For details about how to configure a deegree WFS please have a look to deegree WFS demo and documentation.

5.2.1 Input/request

According to OGC CSW specification a valid GetRecord request asking for all metadata objects having a subject that equals the literal 'geoscientificInformation' looks like this:

```

<?xml version="1.0" encoding="UTF-8"?>
<csw:GetRecords service="CSW" version="2.0.2" outputFormat="application/xml"
  outputSchema="http://www.opengis.net/cat/csw/2.0.2" resultType="RESULTS"
  xmlns:csw="http://www.opengis.net/cat/csw/2.0.2"
  xmlns:ogc="http://www.opengis.net/ogc"
  xmlns:apiso="http://www.opengis.net/cat/csw/apiso/1.0">
  <csw:Query typeNames="gmd:MD_Metadata">
    <csw:ElementSetName>brief</csw:ElementSetName>
    <csw:Constraint version="1.1.0">
      <ogc:Filter>
        <ogc:PropertyIsEqualTo>
          <ogc:PropertyName>apiso:subject</ogc:PropertyName>
          <ogc:Literal>geoscientificInformation</ogc:Literal>
        </ogc:PropertyIsEqualTo>
      </ogc:Filter>
    </csw:Constraint>
  </csw:Query>
</csw:GetRecords>

```



```

    </ogc:Filter>
  </csw:Constraint>
</csw:Query>
</csw:GetRecords>

```

The respective GetFeature request to be performed against the underlying WFS (see schema above) must look like (shorted version):

```

<?xml version="1.0" encoding="UTF-8"?>
<wfs:GetFeature xmlns:wfs="http://www.opengis.net/wfs"
  xmlns:app="http://www.deegree.org/app" xmlns:csw="http://www.opengis.net/cat/csw"
  xmlns:gml="http://www.opengis.net/gml" xmlns:java="java"
  xmlns:mapping="org.deegree.ogcwebservices.csw.iso_profile.Mapping2_0_2"
  xmlns:ogc="http://www.opengis.net/ogc" maxFeatures="10" outputFormat="text/xml;
  subtype=gml/3.1.1" resultType="hits" startPosition="1">
  <wfs:Query typeName="app:MD_Metadata">
    <wfs:PropertyName>app:fileIdentifier</wfs:PropertyName>
    <wfs:PropertyName>app:hierarchyLevelCode</wfs:PropertyName>
    (...)
    <ogc:Filter>
      <ogc:PropertyIsLike escape="\ " singleChar="?" wildCard="%">
        <ogc:PropertyName>app:MD_Metadata/app:commonQueryableProperties/app:CQP_Main/app:su
        bject</ogc:PropertyName>
        <ogc:Literal>%|geoscientificInformation|</ogc:Literal>
      </ogc:PropertyIsLike>
    </ogc:Filter>
  </wfs:Query>
</wfs:GetFeature>

```

If you have a close look to the the GetRecords and the GetFeature request above you see that their structure is more or less identical. The typeName of the GetFeature Query must be determined from the GetRecords outputSchema and the typeName of the GetRecords request.

The transformation of the filter expression is a bit tricky. In principle it should be no problem to substitute the value of PropertyName with the name known by the WFS. The problem is that a filter expression is a recursive datastructure with a possible unlimited depth of nested elements (see Filter Encoding specification for details).

The XSLT that enables the required transformation (shorted version) is given below:

```

<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:gml="http://www.opengis.net/gml" xmlns:ogc="http://www.opengis.net/ogc"
  xmlns:csw="http://www.opengis.net/cat/csw" xmlns:wfs="http://www.opengis.net/wfs"
  xmlns:java="java"
  xmlns:mapping="org.deegree.ogcwebservices.csw.iso_profile.Mapping2_0_2">
  <xsl:output method="xml" version="1.0" encoding="UTF-8" indent="yes"/>
  <xsl:param name="NSP">a:a</xsl:param>
  <xsl:variable name="map" select="mapping:new( )"/>
  <xsl:template match="csw:DescribeRecord">
    <xsl:copy-of select="."/>

```

```

</xsl:template>
<xsl:template match="csw:GetRecords">
  <!-- will be used for GetRecords requests -->
  <wfs:GetFeature outputFormat="text/xml; subtype=gml/3.1.1"
xmlns:gml="http://www.opengis.net/gml" xmlns:app="http://www.deegree.org/app">
    <xsl:if test="./@maxRecords != '' ">
      <xsl:attribute name="maxFeatures"><xsl:value-of
select="./@maxRecords"/></xsl:attribute>
    </xsl:if>
    <xsl:if test="./@startPosition != '' ">
      <xsl:attribute name="startPosition"><xsl:value-of
select="./@startPosition"/></xsl:attribute>
    </xsl:if>
    <xsl:if test="./@resultType = 'HITS' ">
      <xsl:attribute name="resultType">hits</xsl:attribute>
    </xsl:if>
    <xsl:if test="./@resultType = 'RESULTS' ">
      <xsl:attribute name="resultType">results</xsl:attribute>
    </xsl:if>
    <xsl:for-each select="./csw:Query">
      <wfs:Query>
        <xsl:attribute name="typeName">
          app:MD_Metadata
        </xsl:attribute>
        <xsl:apply-templates select="."/>
      </wfs:Query>
    </xsl:for-each>
  </wfs:GetFeature>
  <xsl:apply-templates select="csw:ResponseHandler"/>
</xsl:template>
<xsl:template match="csw:ResponseHandler"/>
<xsl:template match="csw:Query">
  <xsl:apply-templates select="csw:ElementSetName"/>
  <xsl:for-each select="./child:*">
    <xsl:if test="local-name(.) = 'ElementName' ">
      <wfs:PropertyName>
        <xsl:apply-templates select="."/>
      </wfs:PropertyName>
    </xsl:if>
  </xsl:for-each>
  <xsl:apply-templates select="csw:Constraint"/>
  <xsl:apply-templates select="ogc:SortBy"/>
</xsl:template>
<xsl:template match="ogc:SortBy">
  <ogc:SortBy>
    <xsl:for-each select="./child:*">
      <ogc:SortProperty>
        <ogc:PropertyName>
          <xsl:value-of
select="mapping:mapSortProperty( $map, ./ogc:PropertyName, $NSP )"/>
        </ogc:PropertyName>
        <xsl:copy-of select="ogc:SortOrder"/>
      </ogc:SortProperty>
    </xsl:for-each>
  </ogc:SortBy>
</xsl:template>
<xsl:template match="csw:ElementSetName">
  <xsl:if test=".= 'brief' ">
    <wfs:PropertyName>app:fileidentifier</wfs:PropertyName>
    <wfs:PropertyName>app:hierarchyLevelCode</wfs:PropertyName>
    (..)
  </xsl:if>
  <xsl:if test=".= 'summary' ">
    <wfs:PropertyName>app:fileidentifier</wfs:PropertyName>
    <wfs:PropertyName>app:language</wfs:PropertyName>
  </xsl:if>

```

```
(..)
</xsl:if>
<xsl:if test=" . = 'full' "/>
<xsl:if test=" . = 'hits' ">
  <wfs:PropertyName>_COUNT_</wfs:PropertyName>
</xsl:if>
</xsl:template>
<xsl:template match="csw:Constraint">
  <ogc:Filter>
    <xsl:apply-templates select="ogc:Filter"/>
  </ogc:Filter>
</xsl:template>
<xsl:template match="ogc:Filter">
  <xsl:apply-templates select="ogc:And"/>
  <xsl:apply-templates select="ogc:Or"/>
  <xsl:apply-templates select="ogc:Not"/>
  <xsl:if test="local-name(./child::*[1]) != 'And' and local-
name(./child::*[1]) != 'Or' and local-name(./child::*[1]) != 'Not'">
    <xsl:for-each select="./child:*">
      <xsl:choose>
        <xsl:when test="local-name(.) = 'PropertyIsEqualTo'">
          <xsl:call-template name="propertyIsEqualTo"/>
        </xsl:when>
        <xsl:otherwise>
          <xsl:call-template name="copyProperty"/>
        </xsl:otherwise>
      </xsl:choose>
    </xsl:for-each>
  </xsl:if>
</xsl:template>
<xsl:template match="ogc:And | ogc:Or | ogc:Not">
  <xsl:copy>
    <xsl:apply-templates select="ogc:And"/>
    <xsl:apply-templates select="ogc:Or"/>
    <xsl:apply-templates select="ogc:Not"/>
    <xsl:for-each select="./child:*">
      <xsl:if test="local-name(.) != 'And' and local-name(.) != 'Or' and local-
name(.) != 'Not'">
        <xsl:choose>
          <xsl:when test="local-name(.) = 'PropertyIsEqualTo'">
            <xsl:call-template name="propertyIsEqualTo"/>
          </xsl:when>
          <xsl:otherwise>
            <xsl:call-template name="copyProperty"/>
          </xsl:otherwise>
        </xsl:choose>
      </xsl:if>
    </xsl:for-each>
  </xsl:copy>
</xsl:template>
<xsl:template name="propertyIsEqualTo">
  <xsl:variable name="propName" select="ogc:PropertyName"/>
  <xsl:choose>
    <xsl:when test="contains( $propName, 'subject') or
contains( $propName, 'AlternateTitle') or
contains( $propName, 'ResourceIdentifier') or
contains( $propName, 'ResourceLanguage') or
contains( $propName, 'GeographicDescriptionCode') or
contains( $propName, 'TopicCategory') ">
      <ogc:PropertyIsLike>
        <xsl:attribute name="wildCard">%</xsl:attribute>
        <xsl:attribute name="singleChar">?</xsl:attribute>
        <xsl:attribute name="escape">\</xsl:attribute>
        <xsl:if test="boolean( ./@matchCase )">
```

```

        <xsl:attribute name="matchCase"><xsl:value-of
select="./@matchCase"/></xsl:attribute>
    </xsl:if>
    <ogc:PropertyName>
        <xsl:apply-templates select="$propName"/>
    </ogc:PropertyName>
    <xsl:for-each select="./child::*">
        <xsl:if test="local-name(.) = 'Literal'">
            <ogc:Literal>
                <xsl:value-of select="mapping:getLiteralValueIsEqualTo( $map,
. )"/>
            </ogc:Literal>
        </xsl:if>
        <xsl:if test="local-name(.) != 'PropertyName' and local-name(.) !=
'Literal' ">
            <xsl:copy-of select="."/>
        </xsl:if>
    </xsl:for-each>
</ogc:PropertyIsLike>
</xsl:when>
<xsl:otherwise>
    <ogc:PropertyIsEqualTo>
        <xsl:if test="boolean( ./@matchCase )">
            <xsl:attribute name="matchCase"><xsl:value-of
select="./@matchCase"/></xsl:attribute>
        </xsl:if>
        <ogc:PropertyName>
            <xsl:apply-templates select="$propName"/>
        </ogc:PropertyName>
        <xsl:for-each select="./child::*">
            <xsl:if test="local-name(.) != 'PropertyName' ">
                <xsl:copy-of select="."/>
            </xsl:if>
        </xsl:for-each>
    </ogc:PropertyIsEqualTo>
</xsl:otherwise>
</xsl:choose>
</xsl:template>
<xsl:template name="copyProperty">
    <xsl:choose>
        <xsl:when test="local-name(.) = 'PropertyIsLike' ">
            <xsl:copy>
                <xsl:variable name="wildCard" select="./@wildCard"/>
                <xsl:attribute name="wildCard"><xsl:value-of
select="$wildCard"/></xsl:attribute>
                <xsl:attribute name="singleChar"><xsl:value-of
select="./@singleChar"/></xsl:attribute>
                <xsl:attribute name="escape"><xsl:value-of
select="./@escape"/></xsl:attribute>
                <xsl:if test="boolean( ./@matchCase )">
                    <xsl:attribute name="matchCase"><xsl:value-of
select="./@matchCase"/></xsl:attribute>
                </xsl:if>
                <xsl:variable name="propName" select="ogc:PropertyName"/>
                <ogc:PropertyName>
                    <xsl:apply-templates select="$propName"/>
                </ogc:PropertyName>
                <xsl:for-each select="./child::*">
                    <xsl:if test="local-name(.) != 'PropertyName'">
                        <ogc:Literal>
                            <xsl:value-of select="mapping:getLiteralValueIsLike( $map, .,
$propName, wildCard )"/>
                        </ogc:Literal>
                    </xsl:if>
                </xsl:for-each>
            </xsl:copy>
        </xsl:when>
    </xsl:choose>

```

```

        </xsl:copy>
      </xsl:when>
      <xsl:otherwise>
        <xsl:copy>
          <xsl:if test="boolean( ./@matchCase )">
            <xsl:attribute name="matchCase"><xsl:value-of
select="./@matchCase"/></xsl:attribute>
          </xsl:if>
          <xsl:variable name="propName" select="ogc:PropertyName"/>
          <ogc:PropertyName>
            <xsl:apply-templates select="$propName"/>
          </ogc:PropertyName>
          <xsl:for-each select="./child::*">
            <xsl:if test="local-name(.) != 'PropertyName' ">
              <xsl:copy-of select="."/>
            </xsl:if>
          </xsl:for-each>
        </xsl:copy>
      </xsl:otherwise>
    </xsl:choose>
  </xsl:template>
  <xsl:template match="ogc:PropertyName | csw:ElementName">
    <xsl:value-of select="mapping:mapPropertyValue( $map, ., $NSP )"/>
  </xsl:template>
</xsl:stylesheet>

```

As a matter of course other metadata format/schema like DublinCore (which is currently configured with this demo) or FGDC need special input transformation script. But notice this may map GetRecord requests to the same WFS feature type!

In principle it is possible to use more extensive mappings and to put these mappings into a Java class invoked by the XSLT processor.

Example:

```

<xsl:stylesheet version="1.0" ...
  xmlns:java="java" xmlns:mapping="de.latlon.catalog.Mapping">

  <xsl:variable name="HIERARCHY">
    ...
  </xsl:variable>
  ...
  <xsl:template match="ogc:PropertyName | csw:ElementName">
    <!-- mapping property name value -->
    <xsl:value-of select="mapping:mapPropertyValue( ., $HIERARCHY )"/>
  </xsl:template>
  ...

```

5.2.2 output/response

Like the incoming request the response returned from the WFS must be transformed. The request described above will lead to a WFS response that looks like this:

```
<?xml version="1.0" encoding="UTF-8"?>
```

```

<wfs:FeatureCollection numberOfFeatures="1" xmlns:gml="http://www.opengis.net/gml"
xmlns:wfs="http://www.opengis.net/wfs" xmlns:app="http://www.deegree.org/app"
xmlns:xlink="http://www.w3.org/1999/xlink">
  <gml:boundedBy>
    <gml:Envelope srsName="EPSG:4326">
      <gml:pos srsDimension="2">-114.1 36.98</gml:pos>
      <gml:pos srsDimension="2">-109.21 42.01</gml:pos>
    </gml:Envelope>
  </gml:boundedBy>
  <gml:featureMember>
    <app:MD_Metadata gml:id="MD_Metadata_42">
      <gml:boundedBy>
        <gml:Envelope srsName="EPSG:4326">
          <gml:pos srsDimension="2">-114.1 36.98</gml:pos>
          <gml:pos srsDimension="2">-109.21 42.01</gml:pos>
        </gml:Envelope>
      </gml:boundedBy>
      <app:contact>
        <app:CI_RespParty gml:id="CI_RespParty_37">
          <app:individualname>Metadata Administrator</app:individualname>
          <app:organisationname>Utah State Government</app:organisationname>
          <app:role>
            <app:CI_RoleCode gml:id="CI_RoleCode_7">
              <app:codelistvalue>pointOfContact</app:codelistvalue>
            </app:CI_RoleCode>
          </app:role>
          <app:contactInfo>
            <app:CI_Contact gml:id="CI_Contact_29">
              <app:address>
                <app:CI_Address gml:id="CI_Address_27">
                  <app:deliveryPoint>
                    <app:DeliveryPoint gml:id="DeliveryPoint_9">
                      <app:deliverypoint>5130 State Office
Building</app:deliverypoint>
                    </app:DeliveryPoint>
                  </app:deliveryPoint>
                  <app:city>Salt Lake City</app:city>
                  <app:postalCode>84114</app:postalCode>
                  <app:country>USA</app:country>
                  <app:electronicMailAddress>
                    <app:ElectronicMailAddress
gml:id="ElectronicMailAddress_24">
                      <app:email>cclark@utah.gov</app:email>
                    </app:ElectronicMailAddress>
                  </app:electronicMailAddress>
                </app:CI_Address>
              </app:address>
            </app:CI_Contact>
          </app:contactInfo>
        </app:CI_RespParty>
      </app:contact>
      <app:dataIdentification>
        <app:MD_DataIdentification gml:id="MD_DataIdentification_42">
          <gml:boundedBy>
            <gml:Envelope srsName="EPSG:4326">
              <gml:pos srsDimension="2">-114.1 36.98</gml:pos>
              <gml:pos srsDimension="2">-109.21 42.01</gml:pos>
            </gml:Envelope>
          </gml:boundedBy>
          <app:identificationInfo>
            <app:MD_Identification gml:id="MD_Identification_42">
              <app:citation>
                <app:CI_Citation gml:id="CI_Citation_49">
                  <app:title>Municipalities 2004 (Archive)</app:title>
                </app:CI_Citation>
              </app:citation>
            </app:MD_Identification>
          </app:identificationInfo>
        </app:MD_DataIdentification>
      </app:dataIdentification>
    </app:MD_Metadata>
  </gml:featureMember>
</wfs:FeatureCollection>

```

```

<app:publicationdate>2002-01-01T00:00:00</app:publicationdate>
  <app:context>Identification</app:context>
</app:CI_Citation>
</app:citation>
<app:abstract><![CDATA[These data were first created through a
cooperative effort of the Governors Office of Planning and Budget, the Utah
Department of Transportation, the Utah State Tax Commission, and AGRC. All
incorporated municipalities in the state through dates varying from 1984 to 1992
were initially represented. Updates for further annexations and deannexations were
completed with the cooperative efforts of the State Tax Commission, Property Tax
Division, and AGRC, and currentness now ranges from 1993 through the end of the
2003 calendar year. Data developed with coordinate geometry (COGO) from legal
descriptions were used. When necessary the data were adjusted to conform to known
physical features. Due to adjustments to resolve conflicting or ambiguous data, the
result was more a physical cadastre than a legal one. In other words, this dataset
does not represent exact legal boundaries as per surveyed description, but, rather
a set of boundaries used for the administrative purposes that conforms to logical
administrative rules (e.g. no two cities or redevelopment areas may cover the same
geogrpahic extent).]]></app:abstract>
</app:MD_Identification>
</app:identificationInfo>
<app:topicCategory>
  <app:MD_TopicCategoryCode gml:id="MD_TopicCategoryCode_8">
    <app:category>geoscientificInformation</app:category>
  </app:MD_TopicCategoryCode>
</app:topicCategory>
<app:boundingBox>
  <app:EX_GeogrBBOX gml:id="EX_GeogrBBOX_40">
    <gml:boundedBy>
      <gml:Envelope srsName="EPSG:4326">
        <gml:pos srsDimension="2">-114.1 36.98</gml:pos>
        <gml:pos srsDimension="2">-109.21 42.01</gml:pos>
      </gml:Envelope>
    </gml:boundedBy>
    <app:geom>
      <gml:Surface srsName="EPSG:4326">
        <gml:patches>
          <gml:PolygonPatch>
            <gml:exterior>
              <gml:LinearRing>
                <gml:posList srsDimension="2">-114.1 36.98
-114.1 42.01 -109.21 42.01 -109.21 36.98 -114.1 36.98</gml:posList>
              </gml:LinearRing>
            </gml:exterior>
          </gml:PolygonPatch>
        </gml:patches>
      </gml:Surface>
    </app:geom>
    <app:queryBBOXOverlap>0.0</app:queryBBOXOverlap>
    <app:crs>EPSG:4326</app:crs>
  </app:EX_GeogrBBOX>
</app:boundingBox>
<app:language>en</app:language>
</app:MD_DataIdentification>
<app:dataIdentification>
  <app:fileIdentifier>{8E41FF20-873E-44F2-
AEF9-5205E203D41C}</app:fileIdentifier>
  <app:dateStamp>2006-12-15T00:00:00</app:dateStamp>
  <app:hierarchyLevelCode>
    <app:HierarchyLevelCode gml:id="HierarchyLevelCode_5">
      <app:codelistvalue>dataset</app:codelistvalue>
    </app:HierarchyLevelCode>
  </app:hierarchyLevelCode>
</app:commonQueryableProperties>

```

```

<app:CQP_Main gml:id="CQP_Main_42">
  <gml:boundedBy>
    <gml:Envelope srsName="EPSG:4326">
      <gml:pos srsDimension="2">-114.1 36.98</gml:pos>
      <gml:pos srsDimension="2">-109.21 42.01</gml:pos>
    </gml:Envelope>
  </gml:boundedBy>
  <app:subject>|Administration||Ownership||Municipal Boundaries||
Cities||Towns||boundaries||State of Utah||Beaver County||Box Elder County||Cache
County||Carbon County||Daggett County||Davis County||Duchesne County||Emery
County||Garfield County||Grand County||Iron County||Juab County||Kane County||
Millard County||Morgan County||Piute County||Rich County||Salt Lake County||San
Juan County||Sanpete County||Sevier County||Summit County||Tooele County||Uintah
County||Utah County||Wasatch County||Washington County||Wayne County||Weber
County||geoscientificInformation|</app:subject>
  <app:title>Municipalities 2004 (Archive)</app:title>
  <app:abstract><![CDATA[These data were first created through a
cooperative effort of the Governors Office of Planning and Budget, the Utah
Department of Transportation, the Utah State Tax Commission, and AGRC. All
incorporated municipalities in the state through dates varying from 1984 to 1992
were initially represented. Updates for further annexations and deannexations were
completed with the cooperative efforts of the State Tax Commission, Property Tax
Division, and AGRC, and currentness now ranges from 1993 through the end of the
2003 calendar year. Data developed with coordinate geometry (COGO) from legal
descriptions were used. When necessary the data were adjusted to conform to known
physical features. Due to adjustments to resolve conflicting or ambiguous data, the
result was more a physical cadastre than a legal one. In other words, this dataset
does not represent exact legal boundaries as per surveyed description, but, rather
a set of boundaries used for the administrative purposes that conforms to logical
administrative rules (e.g. no two cities or redevelopment areas may cover the same
geogrpahic extent).]]></app:abstract>
  <app:anyText><![CDATA[Municipalities 2004 (Archive)These data were
first created through a cooperative effort of the Governors Office of Planning and
Budget, the Utah Department of Transportation, the Utah State Tax Commission, and
AGRC. All incorporated municipalities in the state through dates varying from 1984
to 1992 were initially represented. Updates for further annexations and
deannexations were completed with the cooperative efforts of the State Tax
Commission, Property Tax Division, and AGRC, and currentness now ranges from 1993
through the end of the 2003 calendar year. Data developed with coordinate geometry
(COGO) from legal descriptions were used. When necessary the data were adjusted to
conform to known physical features. Due to adjustments to resolve conflicting or
ambiguous data, the result was more a physical cadastre than a legal one. In other
words, this dataset does not represent exact legal boundaries as per surveyed
description, but, rather a set of boundaries used for the administrative purposes
that conforms to logical administrative rules (e.g. no two cities or redevelopment
areas may cover the same geogrpahic extent).(...)]></app:anyText>
  <app:identifier>{8E41FF20-873E-44F2-AEF9-5205E203D41C}</app:identifier>
  <app:modified>2006-12-15T00:00:00</app:modified>
  <app:type>dataset</app:type>
  <app:publicationDate>2002-01-01T00:00:00</app:publicationDate>
  <app:resourceIdentifier>|{8E41FF20-873E-44F2-AEF9-5205E203D41C}|
</app:resourceIdentifier>
  <app:resourceLanguage>|en|</app:resourceLanguage>
  <app:bbox>
    <app:CQP_BBOX gml:id="CQP_BBOX_40">
      <gml:boundedBy>
        <gml:Envelope srsName="EPSG:4326">
          <gml:pos srsDimension="2">-114.1 36.98</gml:pos>
          <gml:pos srsDimension="2">-109.21 42.01</gml:pos>
        </gml:Envelope>
      </gml:boundedBy>
      <app:geom>
        <gml:Surface srsName="EPSG:4326">
          <gml:patches>

```



```

        <gml:PolygonPatch>
          <gml:exterior>
            <gml:LinearRing>
              <gml:posList srsDimension="2">-114.1 36.98
-114.1 42.01 -109.21 42.01 -109.21 36.98 -114.1 36.98</gml:posList>
            </gml:LinearRing>
          </gml:exterior>
        </gml:PolygonPatch>
      </gml:patches>
    </gml:Surface>
  </app:geom>
</app:CQP_BBBOX>
<app:topicCategory>|geoscientificInformation|</app:topicCategory>
</app:CQP_Main>
</app:commonQueryableProperties>
</app:MD_Metadata>
</gml:featureMember>
</wfs:FeatureCollection>

```

Transforming the incoming WFS FeatureCollection into a valid GetRecords outputSchema is a bit complicated. The required XSLT - Script is too long to print it right here. It can be found at `csw_home/WEB-INF/conf/csw/xslt/out.ISO.xsl`

The problematic part of the transformation is contained within the included XSLT script. The reason for this is, that ISO requires a different format for geographic extent as will the one used by WFS. In our example we use Postgis database for storing metadata. In our database schema we define a column to take geometries, one for each dataset. Unfortunately a box isn't a geometry so we have to transform the boxes (as extent of the metadatasets) into polygons (having five vertices). Vice versa we must transform the polygon returned from the WFS (if requested) into the box format required for ISO.

If you use other formats for storing geometries (e.g. four number columns containing the four corner coordinates of a metadatasets boundingbox) you have to rewrite the transformation method. Or you may delegate the job to a static method of a java class that will referenced from the XSLT script.

But beside this a bit complicated aspect of offering a metadata format/schema on basis of a WFS feature type it should be clear that it won't be a principle problem to write more than one output transforming script to support more than one metadata format based on the same physical datasource.

Appendix A Example CSW configuration document

Example for a full deegree CSW configuration/capabilities document (including some options that are not supported by deegree CSW yet):

```
<?xml version="1.0" encoding="UTF-8"?>
<csw:Capabilities xmlns:gmd="http://www.isotc211.org/2005/gmd" version="2.0.0"
updateSequence="0" xmlns:ows="http://www.opengis.net/ows"
xmlns:ogc="http://www.opengis.net/ogc" xmlns:csw="http://www.opengis.net/cat/csw"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:deegree="http://www.deegree.org/csw"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <deegree:deegreeParams>
    <deegree:DefaultOnlineResource xlink:type="simple"
xlink:href="http://localhost:8080/deegree-csw/services"/>
    <deegree:CacheSize>100</deegree:CacheSize>
    <deegree:RequestTimeLimit>60</deegree:RequestTimeLimit>
    <deegree:Encoding>ISO-8859-1</deegree:Encoding>
    <deegree:TransactionInputXSLT xlink:type="simple"
xlink:href="xslt/transaction.xslt"/>
    <deegree:TransactionOutputXSLT xlink:type="simple"
xlink:href="xslt/transactionOut.xslt"/>
    <!-- this parameter will be used to define the default schema used by the
catalogue if OUTPUTSCHEMA parameter is missing. According to CS-W specification
this must be OGCCORE which is not useful for GetRecordById requests -->
    <deegree:DefaultOutputSchema>http://www.isotc211.org/2005/gmd</deegree:DefaultOutputSchema>
    <deegree:WFSResource xlink:type="simple" xlink:href="wfs_capabilities.xml"/>
  </deegree:deegreeParams>
  <ows:ServiceIdentification>
    <ows:ServiceType>CSW</ows:ServiceType>
    <ows:ServiceTypeVersion>2.0.2</ows:ServiceTypeVersion>
    <ows:Title>deegree demo CSW</ows:Title>
    <ows:Abstract>abstract</ows:Abstract>
    <ows:Keywords>
      <ows:Keyword>deegree</ows:Keyword>
    </ows:Keywords>
    <ows:Fees>NO FEES - IT'S FREE</ows:Fees>
    <ows:AccessConstraints>NONE</ows:AccessConstraints>
  </ows:ServiceIdentification>
  <ows:ServiceProvider>
    <ows:ProviderName>lat/lon GmbH</ows:ProviderName>
    <ows:ProviderSite xlink:type="simple" xlink:href="http://www.latlon.de"/>
    <ows:ServiceContact>
      <ows:IndividualName/>
      <ows:PositionName/>
      <ows:ContactInfo>
        <ows:Phone>
          <ows:Voice>++49 228 18496-0</ows:Voice>
          <ows:Facsimile>++49 228 18496-29</ows:Facsimile>
        </ows:Phone>
        <ows:Address>
          <ows:DeliveryPoint>Aennchenstr. 19</ows:DeliveryPoint>
          <ows:DeliveryPoint>basement</ows:DeliveryPoint>
          <ows:City>Bonn</ows:City>
          <ows:AdministrativeArea>NRW</ows:AdministrativeArea>
          <ows:PostalCode>53177</ows:PostalCode>
          <ows:Country>Germany</ows:Country>
          <ows:ElectronicMailAddress>info@lat-lon.de</ows:ElectronicMailAddress>
        </ows:Address>
        <ows:OnlineResource xlink:type="simple" xlink:href="http://localhost:8080/deegree-csw/services"/>
        <ows:HoursOfService>9am-17pm</ows:HoursOfService>
        <ows:ContactInstructions>personal</ows:ContactInstructions>
      </ows:ContactInfo>
    </ows:ServiceContact>
  </ows:ServiceProvider>
</csw:Capabilities>
```

```

</ows:ContactInfo>
<ows:Role>PointOfContact</ows:Role>
</ows:ServiceContact>
</ows:ServiceProvider>
<ows:OperationsMetadata>
  <ows:Operation name="GetCapabilities">
    <ows:DCP>
      <ows:HTTP>
        <ows:Get xlink:type="simple" xlink:href="http://localhost:
8080/deegree-csw/services"/>
      </ows:HTTP>
    </ows:DCP>
  </ows:Operation>
  <ows:Operation name="DescribeRecord">
    <ows:DCP>
      <ows:HTTP>
        <ows:Get xlink:type="simple" xlink:href="http://localhost:
8080/deegree-csw/services"/>
        <ows:Post xlink:type="simple" xlink:href="http://localhost:
8080/deegree-csw/services"/>
      </ows:HTTP>
    </ows:DCP>
    <ows:Parameter name="typeName">
      <!-- gmd:MD_Metadata -->
      <ows:Value>csw:dataset</ows:Value>
      <ows:Value>csw:datasetcollection</ows:Value>
      <ows:Value>csw:application</ows:Value>
      <ows:Value>csw:service</ows:Value>
    </ows:Parameter>
    <ows:Parameter name="outputFormat">
      <ows:Value>application/xml</ows:Value>
    </ows:Parameter>
    <ows:Parameter name="schemaLanguage">
      <ows:Value>XMLSCHEMA</ows:Value>
    </ows:Parameter>
  </ows:Operation>
  <ows:Operation name="GetRecords">
    <ows:DCP>
      <ows:HTTP>
        <ows:Post xlink:type="simple" xlink:href="http://localhost:
8080/deegree-csw/services"/>
      </ows:HTTP>
    </ows:DCP>
    <ows:Parameter name="typeName">
      <ows:Value deegree:schema="schema/dc_dataset.xsd">csw:Record</ows:Value>
      <ows:Value
deegree:schema="schema/iso/19139/20060504/gmd/metadataEntity.xsd">gmd:MD_Metadata</
ows:Value>
      <ows:Value
deegree:schema="schema/iso/19139/20060504/srv/serviceMetadata.xsd">csw:service</ows
:Value>
    </ows:Parameter>
    <ows:Parameter name="outputFormat">
      <ows:Value>application/xml</ows:Value>
    </ows:Parameter>
    <ows:Parameter name="outputSchema">
      <ows:Value deegree:input="xslt/inDC.xsl"
deegree:output="xslt/outDC.xsl">DublinCore</ows:Value>
      <ows:Value deegree:input="xslt/inISO.xsl"
deegree:output="xslt/outISO.xsl">http://www.isotc211.org/2005/gmd</ows:Value>
      <ows:Value deegree:input="xslt/inISO.xsl"
deegree:output="xslt/outISO.xsl">http://www.opengis.net/cat/csw/2.0.2</ows:Value>
    </ows:Parameter>
    <ows:Parameter name="resultType">
      <ows:Value>RESULTS</ows:Value>

```

```

</ows:Parameter>
<ows:Parameter name="ElementSetName">
  <ows:Value>brief</ows:Value>
  <ows:Value>summary</ows:Value>
  <ows:Value>full</ows:Value>
</ows:Parameter>type
  <ows:Parameter name="CONSTRAINTLANGUAGE">
    <ows:Value>Filter</ows:Value>
    <ows:Value>CQL</ows:Value>
  </ows:Parameter>
</ows:Operation>
<ows:Operation name="GetRecordById">
  <ows:DCP>
    <ows:HTTP>
      <ows:Get xlink:type="simple" xlink:href="http://localhost:
8080/deegree-csw/services"/>
      <ows:Post xlink:type="simple" xlink:href="http://localhost:
8080/deegree-csw/services"/>
    </ows:HTTP>
  </ows:DCP>
</ows:Operation>
<ows:Operation name="Transaction">
  <ows:Parameter name="outputSchema">
    <ows:Value deegree:input="xslt/transaction.xsl"
deegree:output="xslt/transactionOut.xsl">http://www.isotc211.org/2005/gmd</ows:Valu
e>
  </ows:Parameter>
<ows:DCP>
  <ows:HTTP>
    <ows:Post xlink:href="http://localhost:8080/deegree-csw/services"/>
  </ows:HTTP>
</ows:DCP>
</ows:Operation>
<ows:Constraint name="IsoProfiles">
  <ows:Value>http://www.isotc211.org/2005/gmd</ows:Value>
</ows:Constraint>
<ows:Constraint name="PostEncoding">
  <ows:Value>SOAP</ows:Value>
</ows:Constraint>
</ows:OperationsMetadata>
<ogc:Filter_Capabilities>
  <ogc:Spatial_Capabilities>
    <ogc:Spatial_Operators>
      <ogc:BBBOX/>
    </ogc:Spatial_Operators>
  </ogc:Spatial_Capabilities>
  <ogc:Scalar_Capabilities>
    <ogc:Logical_Operators/>
    <ogc:Comparison_Operators>
      <ogc:Between/>
      <ogc:EqualTo/>
      <ogc:GreaterThan/>
      <ogc:GreaterThanEqualTo/>
      <ogc:LessThan/>
      <ogc:LessThanEqualTo/>
      <ogc:Like/>
      <ogc:NotEqualTo/>
      <ogc:NullCheck/>
    </ogc:Comparison_Operators>
    <ogc:Arithmetic_Operators>
      <ogc:Simple_Arithmetic/>
    </ogc:Arithmetic_Operators>
  </ogc:Scalar_Capabilities>
</ogc:Filter_Capabilities>
</csw:Capabilities>

```

Appendix B deegree WFS configuration for accessing example metadatasets

WFS capabilities:

```
<?xml version="1.0" encoding="UTF-8"?>
<wfs:WFS_Capabilities xmlns:deegree="http://www.deegree.org/wfs"
xmlns:ows="http://www.opengis.net/ows" xmlns:ogc="http://www.opengis.net/ogc"
xmlns:wfs="http://www.opengis.net/wfs" xmlns:gml="http://www.opengis.net/gml"
xmlns:xlink="http://www.w3.org/1999/xlink" version="1.1.0" updateSequence="0">
  <!-- except the deegree-section and the Service section all other settings are
optional and will be set by default if not available. As a result of this a user is
able to up a WFS with minmal definitions as 'RootDirectory',
'DefaultOnlineResource' and 'DataDirectory' -->
  <deegree:deegreeParams>
    <!-- The DefaultOnlineResource will be used if a required OnlineResource is
not defined -->
    <deegree:DefaultOnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:type="simple" xlink:href="http://localhost:8080/deegree-csw/services"/>
    <!-- optional; default = 100 (MB) -->
    <deegree:CacheSize>250</deegree:CacheSize>
    <!-- maximum time for the execution of a request until an exception of time-
exceed is thrown.
optional; default 30 seconds -->
    <deegree:RequestTimeLimit>120</deegree:RequestTimeLimit>
    <!-- list of directories to be scanned for featuretypes/datastores to be
served by a WFS. deegree will look for datastore configuration files in these
directories and add the contained feature types to the featuretype list if not
already present.
optional; default: same directory as configuration -->
    <deegree:DataDirectoryList>
      <deegree:DataDirectory>./featuretypes</deegree:DataDirectory>
    </deegree:DataDirectoryList>
  </deegree:deegreeParams>
  <!-- ===== -->
  <!-- SERVICE IDENTIFICATION SECTION -->
  <!-- ===== -->
  <ows:ServiceIdentification>
    <ows:ServiceType>WFS</ows:ServiceType>
    <ows:ServiceTypeVersion>1.1.0</ows:ServiceTypeVersion>
    <ows:Title>deegree WFS Test</ows:Title>
    <ows:Abstract>Test Web Feature Service</ows:Abstract>
    <ows:Keywords>
      <ows:Keyword>Persons</ows:Keyword>
      <ows:Keyword>deegree</ows:Keyword>
      <ows:Keyword>Test</ows:Keyword>
      <ows:Type>String</ows:Type>
    </ows:Keywords>
    <ows:Fees>None</ows:Fees>
    <ows:AccessConstraints>None</ows:AccessConstraints>
  </ows:ServiceIdentification>
  <!-- ===== -->
  <!-- SERVICE PROVIDER SECTION -->
  <!-- ===== -->
  <ows:ServiceProvider>
    <ows:ProviderName>lat/lon GmbH</ows:ProviderName>
    <ows:ProviderSite xlink:href="http://www.lat-lon.de"/>
    <ows:ServiceContact>
      <ows:IndividualName>Markus Schneider</ows:IndividualName>
      <ows:PositionName>deegree core developer</ows:PositionName>
      <ows:ContactInfo>
```

```

    <ows:Phone>
      <ows:Voice>+49 228 184960</ows:Voice>
      <ows:Facsimile>+49 228 1849629</ows:Facsimile>
    </ows:Phone>
    <ows:Address>
      <ows:DeliveryPoint>Aennchenstr. 19</ows:DeliveryPoint>
      <ows:City>Bonn</ows:City>
      <ows:AdministrativeArea>Northrhine-Westfalia</ows:AdministrativeArea>
      <ows:PostalCode>53177</ows:PostalCode>
      <ows:Country>Germany</ows:Country>
      <ows:ElectronicMailAddress>mschneider@lat-
lon.de</ows:ElectronicMailAddress>
    </ows:Address>
    <ows:OnlineResource xlink:href="http://localhost:8080/deegree-
csw/services"/>
    <ows:HoursOfService>24x7</ows:HoursOfService>
    <ows:ContactInstructions>Don't call us. We'll call
you.</ows:ContactInstructions>
    <ows:ContactInfo>
      <ows:Role>PointOfContact</ows:Role>
    </ows:ServiceContact>
  </ows:ServiceProvider>
<!-- ===== -->
<!-- OPERATIONS METADATA SECTION -->
<!-- ===== -->
<ows:OperationsMetadata>
  <ows:Operation name="GetCapabilities">
    <ows:DCP>
      <ows:HTTP>
        <ows:Get xlink:href="http://localhost:8080/deegree-csw/services?"/>
      </ows:HTTP>
    </ows:DCP>
    <ows:Parameter name="AcceptVersions">
      <ows:Value>1.1.0</ows:Value>
      <ows:Value>1.0.0</ows:Value>
    </ows:Parameter>
    <ows:Parameter name="AcceptFormats">
      <ows:Value>text/xml</ows:Value>
    </ows:Parameter>
    <ows:Parameter name="Sections">
      <ows:Value>ServiceIdentification</ows:Value>
      <ows:Value>ServiceProvider</ows:Value>
      <ows:Value>OperationsMetadata</ows:Value>
      <ows:Value>FeatureTypeList</ows:Value>
      <ows:Value>ServesGMLObjectTypesList</ows:Value>
      <ows:Value>SupportsGMLObjectTypesList</ows:Value>
      <ows:Value>Filter_Capabilities</ows:Value>
    </ows:Parameter>
  </ows:Operation>
  <ows:Operation name="DescribeFeatureType">
    <ows:DCP>
      <ows:HTTP>
        <ows:Get xlink:href="http://localhost:8080/deegree-csw/services?"/>
        <ows:Post xlink:href="http://localhost:8080/deegree-csw/services"/>
      </ows:HTTP>
    </ows:DCP>
    <ows:Parameter name="outputFormat">
      <ows:Value>text/xml; subtype=gml/3.1.1</ows:Value>
    </ows:Parameter>
  </ows:Operation>
  <ows:Operation name="GetFeature">
    <ows:DCP>
      <ows:HTTP>
        <ows:Get xlink:href="http://localhost:8080/deegree-csw/services?"/>
        <ows:Post xlink:href="http://localhost:8080/deegree-csw/services"/>

```

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        </ows:HTTP>
    </ows:DCP>
    <ows:Parameter name="resultType">
        <ows:Value>results</ows:Value>
        <ows:Value>hits</ows:Value>
    </ows:Parameter>
    <ows:Parameter name="outputFormat">
        <ows:Value>text/xml; subtype=gml/3.1.1</ows:Value>
    </ows:Parameter>
</ows:Operation>
<ows:Operation name="Transaction">
    <ows:DCP>
        <ows:HTTP>
            <ows:Get xlink:href="http://localhost:8080/deegree-csw/services?"/>
        </ows:HTTP>
    </ows:DCP>
</ows:Operation>
<ows:Parameter name="srsName">
    <ows:Value>EPSG:4326</ows:Value>
</ows:Parameter>
<ows:Constraint name="DefaultMaxFeatures">
    <ows:Value>200</ows:Value>
</ows:Constraint>
<ows:Constraint name="LocalTraverseXLinkScope">
    <ows:Value>0</ows:Value>
    <ows:Value>*</ows:Value>
</ows:Constraint>
<ows:Constraint name="RemoteTraverseXLinkScope">
    <ows:Value>0</ows:Value>
    <ows:Value>*</ows:Value>
</ows:Constraint>
<ows:Constraint name="DefaultLockExpiry">
    <ows:Value>5</ows:Value>
</ows:Constraint>
</ows:OperationsMetadata>
<!-- ===== -->
<!-- FEATURE TYPE LIST SECTION -->
<!-- ===== -->
<wfs:FeatureTypeList/>
<!-- ===== -->
<!-- FILTER CAPABILITIES SECTION -->
<!-- ===== -->
<ogc:Filter_Capabilities>
    <ogc:Spatial_Capabilities>
        <ogc:GeometryOperands>
            <ogc:GeometryOperand>gml:Envelope</ogc:GeometryOperand>
            <ogc:GeometryOperand>gml:Point</ogc:GeometryOperand>
            <ogc:GeometryOperand>gml:LineString</ogc:GeometryOperand>
            <ogc:GeometryOperand>gml:Polygon</ogc:GeometryOperand>
        </ogc:GeometryOperands>
        <ogc:SpatialOperators>
            <ogc:SpatialOperator name="BBOX"/>
            <ogc:SpatialOperator name="Equals"/>
            <ogc:SpatialOperator name="Disjoint"/>
            <ogc:SpatialOperator name="Intersects"/>
            <ogc:SpatialOperator name="Touches"/>
            <ogc:SpatialOperator name="Crosses"/>
            <ogc:SpatialOperator name="Within"/>
            <ogc:SpatialOperator name="Contains"/>
            <ogc:SpatialOperator name="Overlaps"/>
            <ogc:SpatialOperator name="Beyond"/>
        </ogc:SpatialOperators>
    </ogc:Spatial_Capabilities>
    <ogc:Scalar_Capabilities>
        <ogc:LogicalOperators/>
    </ogc:Scalar_Capabilities>
</ogc:Filter_Capabilities>

```

```

<ogc:ComparisonOperators>
  <ogc:ComparisonOperator>LessThan</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>GreaterThan</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>LessThanEqualTo</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>GreaterThanEqualTo</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>EqualTo</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>Like</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>Between</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>NullCheck</ogc:ComparisonOperator>
</ogc:ComparisonOperators>
<ogc:ArithmeticOperators>
  <ogc:SimpleArithmetic/>
</ogc:ArithmeticOperators>
</ogc:Scalar_Capabilities>
<ogc:Id_Capabilities>
  <ogc:EID/>
  <ogc:FID/>
</ogc:Id_Capabilities>
</ogc:Filter_Capabilities>
</wfs:WFS_Capabilities>

```

Datastore configuration (ISO 19115):

\$csw_home\$/WEB-INF/conf/csw/featuretypes/csw.xsd

Because of the amount of data the gml application schema can no be shown here.

Datastore configuration (Dublin core):

Not configured with this demos!

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="http://www.opengis.net/cat/csw"
  xmlns:gml="http://www.opengis.net/gml" xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wfs="http://www.deegree.org/wfs"
  xmlns:csw="http://www.opengis.net/cat/csw" elementFormDefault="qualified"
  attributeFormDefault="unqualified">
  <xs:import namespace="http://www.opengis.net/gml"
  schemaLocation="http://schemas.opengis.net/gml/3.1.1/base/feature.xsd"/>
  <!-- configuration for the persistence backend to be used -->
  <xs:annotation>
    <xs:appinfo>
      <wfs:Prefix>csw</wfs:Prefix>
      <wfs:Backend>POSTGIS</wfs:Backend>
      <wfs:DefaultSRS>EPSG:4326</wfs:DefaultSRS>
      <JDBCConnection xmlns="http://www.deegree.org/jdbc">
        <Driver>org.postgresql.Driver</Driver>
        <Url>jdbc:postgresql://hurricane:5432/csw</Url>
        <User>deegreetest</User>
        <Password>deegreetest</Password>
        <SecurityConstraints/>
        <Encoding>iso-8859-1</Encoding>
      </JDBCConnection>
    </xs:appinfo>
  </xs:annotation>
  <!-- ===== -->
  <xs:element name="Record" type="csw:RecordType"
    substitutionGroup="gml:_Feature"/>
  <!-- ===== -->
  <xs:complexType name="RecordType">

```



```

<xs:annotation>
  <xs:appinfo>
    <wfs:table>dublincore</wfs:table>
    <wfs:gmlId prefix="DC_">
      <wfs:MappingField field="IDENTIFIER" type="VARCHAR"/>
    </wfs:gmlId>
  </xs:appinfo>
</xs:annotation>
<xs:complexContent>
  <xs:extension base="gml:AbstractFeatureType">
    <xs:sequence>
      <xs:element name="DUBLINCORE.IDENTIFIER" type="xs:string">
        <xs:annotation>
          <xs:appinfo>
            <wfs:Content>
              <wfs:MappingField field="identifier"
                type="VARCHAR"/>
            </wfs:Content>
          </xs:appinfo>
        </xs:annotation>
      </xs:element>
      <xs:element name="DUBLINCORE.CONTRIBUTOR" type="xs:string">
        <xs:annotation>
          <xs:appinfo>
            <wfs:Content>
              <wfs:MappingField field="contributor"
                type="VARCHAR"/>
            </wfs:Content>
          </xs:appinfo>
        </xs:annotation>
      </xs:element>
      <xs:element name="DUBLINCORE.CREATOR" type="xs:string">
        <xs:annotation>
          <xs:appinfo>
            <wfs:Content>
              <wfs:MappingField field="creator"
                type="VARCHAR"/>
            </wfs:Content>
          </xs:appinfo>
        </xs:annotation>
      </xs:element>
      <xs:element name="DUBLINCORE.PUBLISHER" type="xs:string">
        <xs:annotation>
          <xs:appinfo>
            <wfs:Content>
              <wfs:MappingField field="publisher"
                type="VARCHAR"/>
            </wfs:Content>
          </xs:appinfo>
        </xs:annotation>
      </xs:element>
      <xs:element name="DUBLINCORE.SUBJECT" type="xs:string">
        <xs:annotation>
          <xs:appinfo>
            <wfs:Content>
              <wfs:MappingField field="subject"
                type="VARCHAR"/>
            </wfs:Content>
          </xs:appinfo>
        </xs:annotation>
      </xs:element>
      <xs:element name="DUBLINCORE.DESRIPTION" type="xs:string">
        <xs:annotation>
          <xs:appinfo>
            <wfs:Content>

```

```

        <wfs:MappingField field="abstract"
            type="VARCHAR"/>
    </wfs:Content>
</xs:appinfo>
</xs:annotation>
</xs:element>
<xs:element name="DUBLINCORE.RELATION" type="xs:string">
    <xs:annotation>
        <xs:appinfo>
            <wfs:Content>
                <wfs:MappingField field="relation"
                    type="VARCHAR"/>
            </wfs:Content>
        </xs:appinfo>
    </xs:annotation>
</xs:element>
<xs:element name="DUBLINCORE.SOURCE" type="xs:string">
    <xs:annotation>
        <xs:appinfo>
            <wfs:Content>
                <wfs:MappingField field="source"
                    type="VARCHAR"/>
            </wfs:Content>
        </xs:appinfo>
    </xs:annotation>
</xs:element>
<xs:element name="DUBLINCORE.RIGHTS" type="xs:string">
    <xs:annotation>
        <xs:appinfo>
            <wfs:Content>
                <wfs:MappingField field="rights"
                    type="VARCHAR"/>
            </wfs:Content>
        </xs:appinfo>
    </xs:annotation>
</xs:element>
<xs:element name="DUBLINCORE.FORMAT" type="xs:string">
    <xs:annotation>
        <xs:appinfo>
            <wfs:Content>
                <wfs:MappingField field="format"
                    type="VARCHAR"/>
            </wfs:Content>
        </xs:appinfo>
    </xs:annotation>
</xs:element>
<xs:element name="DUBLINCORE.TYPE" type="xs:string">
    <xs:annotation>
        <xs:appinfo>
            <wfs:Content>
                <wfs:MappingField field="type" type="VARCHAR"/>
            </wfs:Content>
        </xs:appinfo>
    </xs:annotation>
</xs:element>
<xs:element name="DUBLINCORE.TITLE" type="xs:string">
    <xs:annotation>
        <xs:appinfo>
            <wfs:Content>
                <wfs:MappingField field="title"
                    type="VARCHAR"/>
            </wfs:Content>
        </xs:appinfo>
    </xs:annotation>
</xs:element>

```

```

<xs:element name="DUBLINCORE.DATE" type="xs:string">
  <xs:annotation>
    <xs:appinfo>
      <wfs:Content>
        <wfs:MappingField field="dcdate"
          type="VARCHAR"/>
      </wfs:Content>
    </xs:appinfo>
  </xs:annotation>
</xs:element>
<xs:element name="DUBLINCORE.LANGUAGE" type="xs:string">
  <xs:annotation>
    <xs:appinfo>
      <wfs:Content>
        <wfs:MappingField field="language"
          type="VARCHAR"/>
      </wfs:Content>
    </xs:appinfo>
  </xs:annotation>
</xs:element>
<xs:element name="DUBLINCORE.COVERAGE"
  type="gml:GeometryPropertyType">
  <xs:annotation>
    <xs:appinfo>
      <wfs:Content>
        <wfs:MappingField field="geom"
          type="GEOMETRY"/>
      </wfs:Content>
    </xs:appinfo>
  </xs:annotation>
</xs:element>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<!-- ===== -->
</xs:schema>

```