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deegree Web Map Print Service
v.2.5

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Change log

Date	Description	Author
2008-06-13	Initialized English version	Markus Lupp
2009-03-26	SMTP authentication added	Hanko Rubach
2009-11-30	New Request Types described for GetAvailableTemplates and DescribeTemplate (deegree2 >=2.4)	Hanko Rubach

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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 deegree1 was not able to handle. This documentation describes setup and configuration of deegree Web Map Print Service (WMPS), a service for creating large format, high resolution maps for a defined extent or scale. Data sources are OGC Web Map Services but also different kinds of vector data formats. The printout is done on a central plotter that is directly accessed by the service or via a saved print file (*.pdf, *.html, *.rtf).
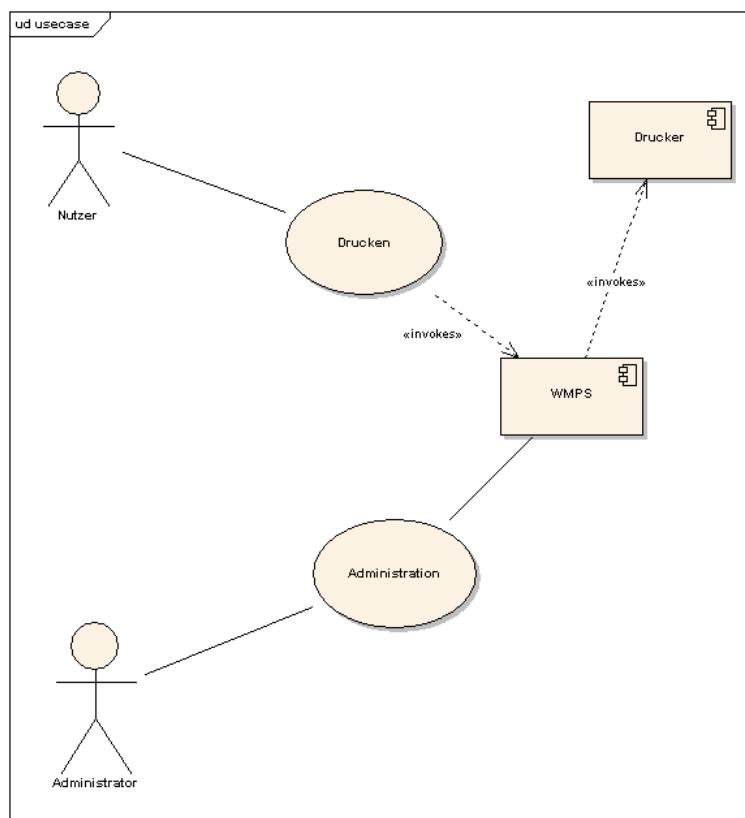

Figure 1: Use case diagram for WMPS

An administrator is responsible for connecting the print service to different data sources and the used printer as well as offering templates to the users of the service.

Besides a WMPS, 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 Map Print Service offers great flexibility regarding its configuration and adaption to different data sources, formats and server environments. The configuration of WMPS is similar to the configuration of other deegree web services and requires editing of different XML files which control the functionality of the server.

The web services of deegree are realized as Java modules controlled by one central servlet (a "dispatcher"). This servlet has to be integrated into 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 WMPS to run you need:

- ➢ Java (JRE or JSDK) version 1.5.x
- ➢ Tomcat 5.5.x (do not use 5.5.26!)

For installation of these components refer to the corresponding documentation at java.sun.com and tomcat.apache.org.

2.2 deegree Web Map Print Service release

So far no demo download package is available for deegree WMPS. Therefore you have to get the necessary files from the deegree SVN.

To set up a print service you need to set up the following components:

- ➢ a configuration for the WMPS
- ➢ a deegree2.jar (either precompiled or created from the classes in the SVN.

Your `$wmps_home$` will contain the following structure:

directory	Content
./WEB-INF	Required by Tomcat, containing all libraries, configuration- and data-files
./WEB-INF/conf/wmps	WMS configuration files

Table 1: Directory structure of a WMPS installation

2.3 Testing the installation

Check the installation by issuing the following request:

```
http://MyServer:8080/deegree/wmps?request=GetCapabilities&
version=1.0.0&service=WMPS
```

3 Functionality

The functionality of the print service is generally speaking to respond to printing requests that use the query format described in the following as well as the asynchronous processing of printing requests. Asynchrony is necessary as it is possible that:

a) several printing requests arrive simultaneously, but only one printer is available,

b) the processing of a print service takes a longer period of time and the network connection to the client can/should not be kept during this time.

After receiving a printing request, this is first stored in a request queue (a database). As soon as the printing service again has enough resources – no printing request is in procession – the oldest print request is fetched from the queue and passed on for procession (Fig. 2).

Using its configuration, that is in most part identical to one of deegree WMS, the print service decides which part of a request is passed on to available WMSs and which part it processes itself. The former means that after calculating of the corresponding BoundingBox and picture size the map is requested in a number of tiles to not overstep the capacities of the used WMS. To take over part of the map creation process the service needs access to the corresponding vector data sources (e.g. Databases). The requests to these data sources do not have to be tiled as it can be assumed that the requested data volume is acceptable. Furthermore the printing service respectively its administrator is responsible for defining the amount of time a service may use to process a request.

In a first step the print service draws the background layers from the used WMS, afterwards the vector data that is directly processes by the printing service is drawn on top. After completing the printing process the user who sent the printing request is informed via E-Mail. Depending on the requested image format the Email also states that the map printout has to be fetched from the administrator or includes a link to the created document.

The administrator can declare position and size of the map as well as its title, legend, scale bar and north arrow as well as an additional text using a template (see below).
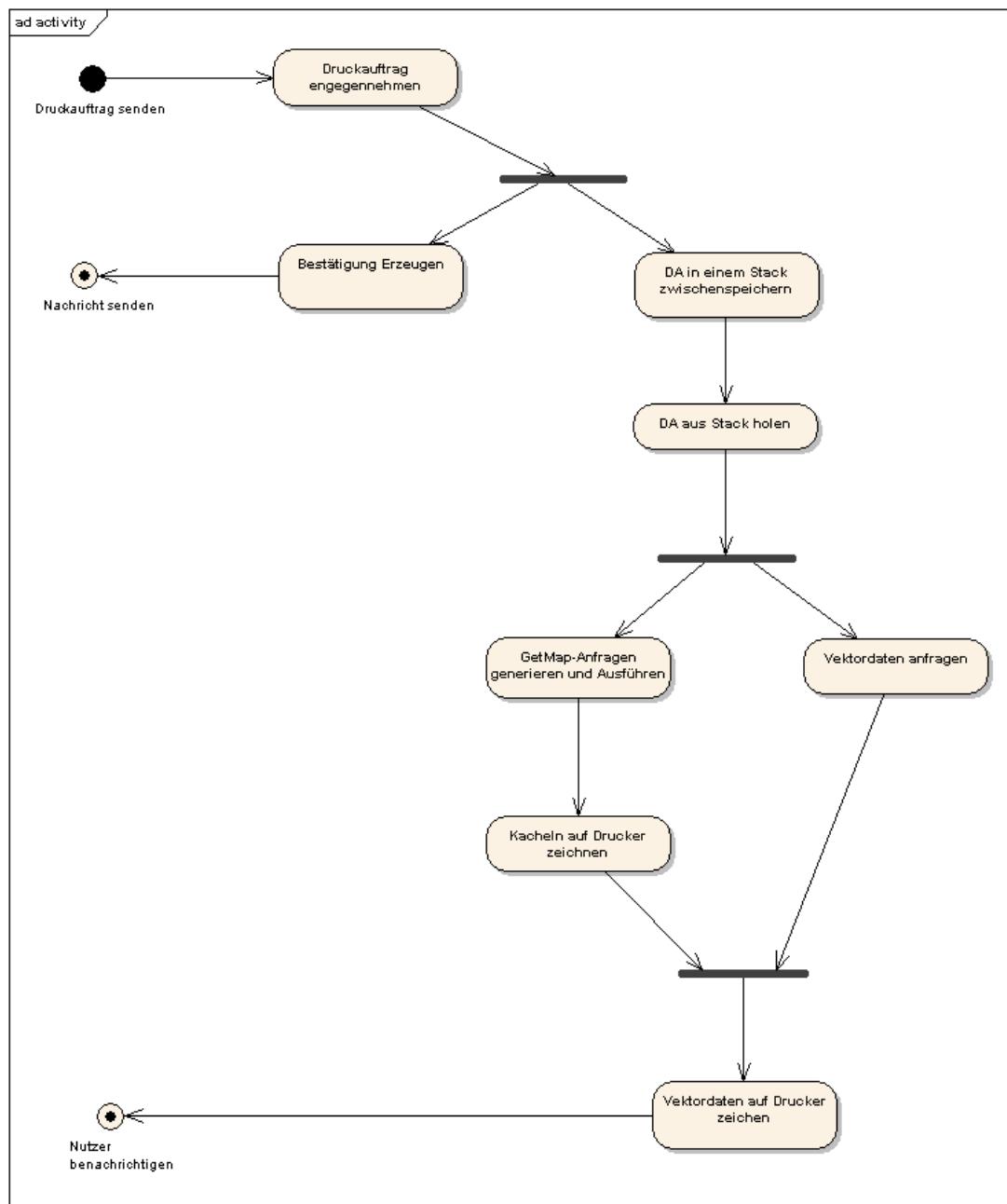
Figure 2: Activity diagram for processing of a print job

The print service support two operations: GetCapabilities and PrintMap. The first operation corresponds in regard to its functionality to other OGC Web Services (OWS). The response is a XML-document that in general looks like a WMS 1.1.1 Capabilities document and gives information about the capabilities of the WMPS. The second operation serves the need to create maps. As PrintMap is a asynchronous operation its response is a confirmation of receiving the request. After the print request is finished or it failed the user will be informed about the status.

4 Requests

4.1 GetCapabilities-Request

The GetCapabilities operation is only defined for HTTP-Get.

Request Parameter	Required/Optional	Description
REQUEST	R	Request name
VERSION=version	O	Version of Service (default 1.0.0)
SERVICE=WMPS	R	Service Type

Table 2: GetCapabilities request parameters

Example:

```
http://MyServer:8080/deegree/wmps?request=GetCapabilities&
version=1.0.0&service=WMPS
```

4.2 GetCapabilities-Response

The response to a GetCapabilities request is almost identical to the one by a OGC WMS 1.1.1. Only the Request section is adjusted so that instead of the WMS-specific operations only GetCapabilities and PrintMap can be listed.

Example:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<WMPS_Capabilities xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    version="1.1.1" updateSequence="1.1.0">
  <Service>
      <Name>WMPS</Name>
      <Title>deegree wmps</Title>
      <Abstract>wms reference implementation</Abstract>
      <KeywordList>
          <Keyword>deegree</Keyword>
          <Keyword>wmps</Keyword>
      </KeywordList>
      <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
         xlink:type="simple" xlink:href="http://www.deegree.org"/>
      <ContactInformation>
          <ContactPersonPrimary>
              <ContactPerson>Andreas Poth</ContactPerson>
              <ContactOrganization>lat/lon</ContactOrganization>
          </ContactPersonPrimary>
          <ContactPosition>Senior Consultant</ContactPosition>
          <ContactAddress>
              <AddressType>Postal</AddressType>
              <Address>Aennchenstr. 19</Address>
              <City>Bonn</City>
              <StateOrProvince>NRW</StateOrProvince>
              <PostCode>53177</PostCode>
              <Country>Germany</Country>
          </ContactAddress>
          <ContactVoiceTelephone>0049228184960</ContactVoiceTelephone>
          <ContactFacsimileTelephone>00492281849629</ContactFacsimileTelephone>
          <ContactElectronicMailAddress>info@lat-lon.de
          </ContactElectronicMailAddress>
      </ContactInformation>
      <Fees>none</Fees>
      <AccessConstraints>none</AccessConstraints>
```

```xml
            </Service>
    <Capability>
        <Request>
            <GetCapabilities>
                <Format>application/vnd.ogc.wms_xml</Format>
                <DCPType>
                    <HTTP>
                        <Get>
                            <OnlineResource
                                xmlns:xlink="http://www.w3.org/1999/xlink"
                                xlink:type="simple"
                                xlink:href="http://127.0.0.1:8080/deegree-
wmps/services?"/>
                        </Get>
                    </HTTP>
                </DCPType>
            </GetCapabilities>
            <PrintMap>
                <Format>default</Format>
                <Format>LegendOnBottom</Format>
                <Format>LegendRight</Format>
                <Format>MyTemplate</Format>
                <DCPType>
                    <HTTP>
                        <Get>
                            <OnlineResource
                                xmlns:xlink="http://www.w3.org/1999/xlink"
                                xlink:type="simple"
                                xlink:href="http://127.0.0.1:8080/deegree-
wmps/services?"/>
                        </Get>
                    </HTTP>
                </DCPType>
            </PrintMap>
        </Request>
        <Exception>
            <Format>application/vnd.ogc.se_xml</Format>
            <Format>application/vnd.ogc.se_inimage</Format>
            <Format>application/vnd.ogc.se_blank</Format>
        </Exception>
        <!-- optional; default = all false -->
        <UserDefinedSymbolization SupportSLD="1" UserLayer="1" UserStyle="1"
            RemoteWFS="0"/>
        <Layer queryable="0" cascaded="0" noSubsets="0">
            <Title>Test WMPS</Title>
            <Abstract>WMPS of the Geoportal of the Metropolregion
                Hamburg</Abstract>
            <KeywordList>
                <Keyword>deegree</Keyword>
                <Keyword>layer</Keyword>
            </KeywordList>
            <SRS>EPSG:4326</SRS>
            <LatLonBoundingBox minx="-180" miny="-90" maxx="180" maxy="90"/>
            <ScaleHint min="0" max="100000000"/>
            <Layer queryable="0" cascaded="0" noSubsets="0">
                <Title>MRH layers</Title>
                <SRS>EPSG:31467</SRS>
                <LatLonBoundingBox minx="6" miny="51" maxx="13" maxy="56"/>
                <Layer queryable="1" noSubsets="0" fixedWidth="0" fixedHeight="0">
                    <SRS>EPSG:31467</SRS>
                    <Name>mrh:kreise</Name>
                    <Title>Kreise der Metropolregion Hamburg</Title>
                    <Style>
                        <Name>default:mrh:kreise</Name>
                        <Title>default:mrh:kreise</Title>
                    </Style>
                </Layer>
                <Layer queryable="1" noSubsets="0" fixedWidth="0" fixedHeight="0">
                    <SRS>EPSG:31467</SRS>
```

```xml
                <Name>mrh:gemeinden</Name>
                <Title>Gemeinden der Metropolregion Hamburg</Title>
                <Style>
                    <Name>default:mrh:gemeinden</Name>
                    <Title>default:mrh:gemeinden</Title>
                </Style>
            </Layer>
        </Layer>
        <Layer queryable="0" cascaded="0" noSubsets="0">
            <Title>Hamburg layers</Title>
            <SRS>EPSG:31467</SRS>
            <LatLonBoundingBox minx="6" miny="51" maxx="13" maxy="56"/>
            <Layer queryable="1" noSubsets="0" fixedWidth="0" fixedHeight="0">
                <SRS>EPSG:31467</SRS>
                <Name>hamburg:bezirke</Name>
                <Title>Bezirke von Hamburg</Title>
                <Style>
                    <Name>default:hamburg:bezirke</Name>
                    <Title>default:hamburg:bezirke</Title>
                </Style>
            </Layer>
            <Layer queryable="1" noSubsets="0" fixedWidth="0" fixedHeight="0">
                <Name>hamburg:FFH-Flaechen</Name>
                <Title>hamburg:FFH-Flaechen</Title>
            </Layer>
            <Layer queryable="1" noSubsets="0" fixedWidth="0" fixedHeight="0">
                <Name>hamburg:gewaesserguete99_flaechen</Name>
                <Title>hamburg:gewaessergute99_flaechen</Title>
            </Layer>
            <Layer queryable="1" noSubsets="0" fixedWidth="0" fixedHeight="0">
                <Name>hamburg:wasserschutzgebiete</Name>
                <Title>hamburg:wasserschutzgebiete</Title>
            </Layer>
            <Layer queryable="1" noSubsets="0" fixedWidth="0" fixedHeight="0">
                <Name>hamburg:landschaftsschutzgebiete</Name>
                <Title>hamburg:landschaftsschutzgebiete</Title>
            </Layer>
            <Layer queryable="1" noSubsets="0" fixedWidth="0" fixedHeight="0">
                <Name>hamburg:oberflaechengewaesser</Name>
                <Title>hamburg:oberflaechengewaesser</Title>
            </Layer>
            <Layer queryable="1" noSubsets="0" fixedWidth="0" fixedHeight="0">
                <Name>hamburg:gewaesserflaechen</Name>
                <Title>hamburg:gewaesserflaechen</Title>
            </Layer>
        </Layer>
    </Layer>
  </Capability>
</WMPS_Capabilities>
```

4.3 GetAvailableTemplates

(deegree2 >=2.4)

The GetAvailableTemplates operation is only defined for HTTP-Get. It returns a list of templates, which are provided by the WMPS.

Request Parameter	Required/ Optional	Description
REQUEST=GetAvailableTemplates	R	Requests list of available templates
VERSION=version	O	Version of Service (default 1.0.0)
SERVICE=WMPS	R	Service Type

Table 3: GetAvailableTemplates request parameters

Examplerequest:

```
http://localhost:8080/deegree-wmps/services?
SERVICE=WMPS&REQUEST=GetAvailableTemplates&version=1.0.0
```

Exampleresponse:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<deegreewmps:GetAvailableTemplatesResponse
xmlns:deegreewmps="http://www.deegree.org/wmps">
    <Template xmlns="http://www.deegree.org/wmps">template_2</Template>
    <Template xmlns="http://www.deegree.org/wmps">template_1</Template>
    <Template xmlns="http://www.deegree.org/wmps">default</Template>
</deegreewmps:GetAvailableTemplatesResponse>
```

4.4 DescribeTemplate

(deegree2 >=2.4)

The DescribeTemplate operation is only defined for HTTP-Get. It returns the available elements of a requested template.

Request Parameter	Required/Optional	Description
REQUEST=DescribeTemplate	R	Describes chosen template
VERSION=version	O	Version of Service (default 1.0.0)
SERVICE=WMPS	R	Service Type
TEMPLATE=templatename	R	

Table 4: DescribeTemplate request parameters

Examplerequest:

```
http://localhost:8080/deegree-wmps/services?
SERVICE=WMPS&REQUEST=DescribeTemplate&version=1.0.0&template=report1
```

Exampleresponse:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<deegreewmps:DescribeTemplateResponse xmlns:deegreewmps="http://www.deegree.org/wmps">
  <Parameter xmlns="http://www.deegree.org/wmps" name="TITLE" type="java.lang.String"/>
  <Parameter xmlns="http://www.deegree.org/wmps" name="LOGO_URL" type="java.lang.String"/>
  <Parameter xmlns="http://www.deegree.org/wmps" name="AUTHOR" type="java.lang.String"/>
  <Parameter xmlns="http://www.deegree.org/wmps" name="DESCRIPTION" type="java.lang.String"/>
  <Parameter xmlns="http://www.deegree.org/wmps" name="DATE" type="java.lang.String"/>
  <Parameter xmlns="http://www.deegree.org/wmps" name="SCALE" type="java.lang.String"/>
  <Parameter xmlns="http://www.deegree.org/wmps" name="NOTES" type="java.lang.String"/>
  <Parameter xmlns="http://www.deegree.org/wmps" name="COPYRIGHT" type="java.lang.String"/>
</deegreewmps:DescribeTemplateResponse>
```

4.5 PrintMap-Request

Using the PrintMap request a user initializes a print request. This includes besides the content that has to be printed information about the template that defined how the elements to be printed have to be ordered. Information about available templates can be extracted from the Format elements of the PrintMap request in the WMPS capabilities document. The number of templates available is declared by the administrator of the service. A template named 'default' is always available. The PrintMap request is defined for Key-Value-Pair encoding for HTTP-Get as well as XML encoding for HTTP-Post.

4.6 KVP - HTTP Get

Request Parameter	Required/Optional	Description
REQUEST=PrintMap	R	Request name
VERSION=Version	O	Version of the service (default 1.0.0)
LAYERS=Layer list	R	Comma-separated list of requested layers.
STYLES=Style list	R	Comma-separated list of requested styles.
SRS=namespace:identifier	R	Spatial reference system
BBOX=minx,miny,maxx,maxy	C	BoundingBox of map is needed if CENTER and SCALE are not supplied.
CENTER=x,y	C	Centre point of the map, has to be supplied if BBOX is not defined. SCALE is required for this Parameter.
SCALE=n	C	Scale of the map: has to be supplied if BBOX is not defined.
TRANSPARENT=TRUE/FALSE	O	Background transparency (default = FALSE)
BGCOLOR=color	O	Definition of background colour as hexadecimal (default = 0xFFFFFF)
TITLE=title	O	Title of the map.
COPYRIGHT=Copyright notice	O	Copyright-notice
LEGEND=TRUE/FALSE	O	Declares if a legend is to be printed

Request Parameter	Required/Optional	Description
		(default = false)
SCALEBAR=TRUE/FALSE	O	Declares if a scale bar is to be printed (default = false)
NOTE=Text	O	Additional text to be printed.
TEMPLATE=name	O	Template to be used for arrangement of map elements (default = default)
DPI=n	O	Print resolution (default is specified in WMPS configuration) (deegree2 >=2.4)
EMAILADDRESS=mail_adresse	R	Address that will be notified about success or failure of printing process.

Table 5: GetCapabilities request parameters

4.7 XML-encoding HTTP-POST

The request encoding is defined by the following schema:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="http://www.deegree.org/wmps"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:deegree="http://www.deegree.org/wmps"
xmlns:sld="http://www.opengis.net/sld"
xmlns:gml="http://www.opengis.net/gml" elementFormDefault="qualified">
   <xs:import namespace="http://www.opengis.net/gml"
        schemaLocation="geometryBasic0d1d.xsd"/>
   <xs:import namespace="http://www.opengis.net/sld"
        schemaLocation="StyledLayerDescriptor.xsd"/>
   <xs:element name="PrintMap">
     <xs:complexType>
        <xs:sequence>
           <xs:element name="Layers" type="deegree:LayersType"/>
           <xs:choice>
              <xs:element ref="gml:Envelope"/>
              <xs:sequence>
                 <xs:element name="Center" type="deegree:CenterType"/>
                 <xs:element name="ScaleDenomiator" type="xs:positiveInteger"/>
              </xs:sequence>
           </xs:choice>
           <xs:element name="Transparent" type="xs:boolean" minOccurs="0"
                default="false"/>
           <xs:element name="BGColor" type="xs:string" minOccurs="0"
                default="0xFFFFFF"/>
           <xs:element name="Legend" type="xs:boolean" minOccurs="0"
                default="false"/>
           <xs:element name="ScaleBar" type="xs:boolean" minOccurs="0"
                default="false"/>
           <xs:element name="Template" type="xs:string" minOccurs="0"
                default="default"/>
           <xs:element name="EMailAddress" type="xs:string"/>
           <xs:element name="TextAreas" type="deegree:TextAreasType"
                minOccurs="0"/>
        </xs:sequence>
        <xs:attribute name="version" type="xs:string" use="required"/>
     </xs:complexType>
   </xs:element>
   <xs:complexType name="LayersType">
     <xs:sequence>
```

```xml
        <xs:choice>
            <xs:element ref="sld:NamedLayer" minOccurs="1" maxOccurs="unbounded"/>
            <xs:element ref="sld:UserLayer" minOccurs="1" maxOccurs="unbounded"/>
        </xs:choice>
    </xs:sequence>
</xs:complexType>
<xs:complexType name="TextAreaType">
    <xs:sequence>
        <xs:element name="Name" type="xs:string"/>
        <xs:element name="Text" type="xs:string"/>
    </xs:sequence>
</xs:complexType>
<xs:complexType name="TextAreasType">
    <xs:sequence>
        <xs:element name="TextArea" type="deegree:TextAreaType" minOccurs="1"
            maxOccurs="unbounded"/>
    </xs:sequence>
</xs:complexType>
<xs:complexType name="CenterType">
    <xs:sequence>
        <xs:element ref="gml:pos"/>
    </xs:sequence>
</xs:complexType>
</xs:schema>
```

In the current version of the service only sld:NamedLayer are supported for declaration of the layers to be printed.

Example:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<deegree:PrintMap xmlns:deegree="http://www.deegree.org/wmps"
xmlns:sld="http://www.opengis.net/sld" xmlns:gml="http://www.opengis.net/gml"
version="1.0.0">
    <deegree:Layers>
        <sld:NamedLayer>
            <sld:Name>europe:physical</sld:Name>
            <sld:NamedStyle>
                <sld:Name>default</sld:Name>
            </sld:NamedStyle>
        </sld:NamedLayer>
        <sld:NamedLayer>
            <sld:Name>europe:major_rivers</sld:Name>
            <sld:NamedStyle>
                <sld:Name>default</sld:Name>
            </sld:NamedStyle>
        </sld:NamedLayer>
    </deegree:Layers>
    <!-- either bbox using gml envelope -->
    <gml:Envelope srsName="EPSG:4326">
        <gml:pos>3 42</gml:pos>
        <gml:pos>12 55</gml:pos>
    </gml:Envelope>
    <!-- or deegree specific 'Center' with gml pos →
    <!--
    <deegree:Center srsName="EPSG:4326">
        <gml:pos>3 42</gml:pos>
    </deegree:Center>
    <deegree:ScaleDenominator>100000</deegree:ScaleDenominator>
    -->
    <deegree:DPI>72</deegree:DPI>
    <deegree:Transparent>false</deegree:Transparent>
    <deegree:BGColor>0xFF34F2</deegree:BGColor>
    <deegree:Legend>true</deegree:Legend>
    <deegree:ScaleBar>true</deegree:ScaleBar>
    <deegree:Template>MyPrintTemplate</deegree:Template>
```

```
    <deegree:EMailAddress>poth@lat-lon.de</deegree:EMailAddress>
    <deegree:TextAreas>
        <deegree:TextArea>
            <deegree:Name>Title</deegree:Name>
            <deegree:Text>Meine Karte</deegree:Text>
        </deegree:TextArea>
        <deegree:TextArea>
            <deegree:Name>Copyright</deegree:Name>
            <deegree:Text>(c) deegree 2009</deegree:Text>
        </deegree:TextArea>
        <deegree:TextArea>
            <deegree:Name>MeineBeschreibung1</deegree:Name>
            <deegree:Text>Dies ist meine erste gedruckte Karte</deegree:Text>
        </deegree:TextArea>
        <deegree:TextArea>
            <deegree:Name>MeineBeschreibung2</deegree:Name>
            <deegree:Text>Dies ist ein weiterer Beispieltext</deegree:Text>
        </deegree:TextArea>
    </deegree:TextAreas>
</deegree:PrintMap>
```

4.8 PrintMap-Response

As a PrintMap request initiates an asynchronous operation, its response is divided into two independent parts. Instantly after the request is sent by the user, he receives a response that notifies him/her if the request was received successfully or if there were errors in parsing it. Errors can e.g. be caused by incomplete requests or requests for resources that are not present (also see chapter Exceptions). The confirmation of the successful acceptance of the request is defined by an XML document according to the following schema:

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="http:www.deegree.org/wmps"
 xmlns:wmps="http:www.deegree.org/wmps" xmlns:xs="http://www.w3.org/2001/XMLSchema"
 elementFormDefault="qualified" attributeFormDefault="unqualified">
    <xs:element name="PrintMapResponse" type="wmps:PrintMapResponseType"/>
    <xs:complexType name="PrintMapResponseType">
        <xs:sequence>
            <xs:element name="timestamp" type="xs:time"/>
            <xs:element name="message" type="xs:string" minOccurs="0"/>
            <xs:element name="expectedProcessingTime" type="xs:duration"
                    minOccurs="0"/>
        </xs:sequence>
    </xs:complexType>
</xs:schema>
```

Example:

```
<?xml version="1.0" encoding="UTF-8"?>
<PrintMapResponse xmlns="http:www.deegree.org/wmps">
    <timestamp>14:20:00-05:00</timestamp>
    <message>Ihr Druckauftrag wurde erfolgreich entgegen genommen. Sie werden per
        Email benachrichtigt, sobald der Auftrag abgearbeitet ist</message>
    <expectedProcessingTime>PT2H30M</expectedProcessingTime>
</PrintMapResponse>
```

The element <timestamp> declares the time that the print job was received by the WMPS. Using the optional element <message> it is possible to get textual information about the successful incoming of the request. The element <expectedProcessingTime> is also optional and gives the expected processing

time for the print job; in the example it amount to two hours and 30 minutes (not yet implemented).

After returning the incoming affirmation the connection between client and server is closed. If during processing of the print job a problem occurs, e.g. because the printer rejects further jobs or one of the embedded data sources is not accessible, or if the job is successfully finished, the user can not be informed instantenous. Instead, he will be sent an email to the address provided with the print request that informs about the status of the print job and e.g. asks the user to fetch the map from the corresponding administrator.

4.9 Response in case of error

If an error occurs during receiving of a request or during processing of a GetCapabilities request , the user is informed instantaneous by sending of an exception. The format of the response corresponds to the format defined for OGC Web Services by by OWS common 1.1.0.

5 Basic configuration

The configuration of the print service corresponds essentially to the deegree WMS configuration that is referred to at this place. As one of the additional configuration elements the definition of <deegreewmps:CacheDatabase> is needed. This element defines the parameters needed for establishing the connection to a database used for intermediate storage of requests. It is defined inside the <deegreewmps:DeegreeParam> element.

```xml
<deegreewmps:DeegreeParam>
...
<deegreewmps:CacheDatabase>
    <deegreewmps:JDBCConnection xmlns="http://www.deegree.org/jdbc">
      <deegreewmps:Driver>driver</deegreewmps:Driver>
      <deegreewmps:Url>database.url</deegreewmps:Url>
      <deegreewmps:User>username</deegreewmps:User>
      <deegreewmps:Password>password</deegreewmps:Password>
    </deegreewmps:JDBCConnection>
</deegreewmps:CacheDatabase>
...
</deegreewmps:DeegreeParam>
```

Additionally it is necessary to define <deegreewmps:PrintMapParam> inside of <deegreewmps:DeegreeParam>.

```xml
<deegreewmps:DeegreeParam>
...
<deegreewmps:PrintMapParam>
    <!-- default: 300 (dpi) -->
     <deegreewmps:TargetResolution>300</deegreewmps:TargetResolution>
    <!-- default format 'pdf'. Supported formats 'pdf','rtf','html' -->
    <deegreewmps:Format>pdf</deegreewmps:Format>
    <deegreewmps:Template>
      <deegreewmps:Directory>../../Template</deegreewmps:Directory>
    </deegreewmps:Template>
    <deegreewmps:PlotDirectory>download</deegreewmps:PlotDirectory>
    <deegreewmps:OnlineResource>
      http://MyServer:8081/portal
    </deegreewmps:OnlineResource>
    <deegreewmps:PlotImageDirectory>
      WEB-INF/temp/image
    </deegreewmps:PlotImageDirectory>
    <deegreewmps:MailHost>mail.lat-lon.de</deegreewmps:MailHost>
     <deegreewmps:MailHostUser>loginname</deegreewmps:MailHostUser>
    <deegreewmps:MailHostPassword>password</deegreewmps:MailHostPassword>
    <deegreewmps:AdministratorEMailAddress>poth@lat-lon.de
    </deegreewmps:AdministratorEMailAddress>
    <deegreewmps:MailTextTemplate>
      The PrintMap request recieved has been successfully printed out in the
      format requested. You can access the result at {0}/{1}
    </deegreewmps:MailTextTemplate>
  </deegreewmps:PrintMapParam>
...
</deegreewmps:DeegreeParam>
```

Using the element <deegreewmps:PrintMapParam> the format of respones to PrintMap requests is declared. The default behavious is to export the result as 'pdf', alternatively the formats 'html' and 'rtf' can be used. The print templates

(see below) have to be made accessible in a defined directory, that is declared using <deegreewmsp:Template>.

The directory for intermediate storage of partial results is defined by <deegreewmps:PlotImageDirectory>. It serves solely the temporary storage of intermediate results and should therefore not be visible outside of the application. The element <deegreewmps:PlotDirectory> defines the directory used for the final print results. Depending on the way of access (directly or indirectly by a separate web application) this should either be visible or not outside of the application. The optional <deegreewmps:OnlineResource> declares the base address that resulting files are made available with.

As already explained above, the user will be achkowledged via email as soon as his job is successfully finished. This email includes a link that allows the download of the result. The administrator has to declare the used email host using <deegreewmsp:MailHost>. <deegreewmps:MailHostUser> and <deegreewmps:MailHostPassword> are optional in case authentication is required. The element <deegreewmps:AdministratorEMailAddress> defines the sender that is used for the sent email. A complete WMPS Capabilities document can be found in annex 2.

In addition to the configuration of the capabilities the print templates have also to be configured. Internally deegree WMPS uses the Open Source project Jasper-Reports. This uses templates allowing to position graphics and textual elements freely on the printing template. For creation and adaptation of the templates iReport can be used (figure 3). Besides a map picture, a legend and north arrow as predefined graphical elements a template can include an arbitrary number of static or dynamic textual areas as well as static graphical elements. Dynamic elements are those that are created at run-time out of the information give as part of the PrintMap request. The content of static elements is declared at design time (e.g. a logo).
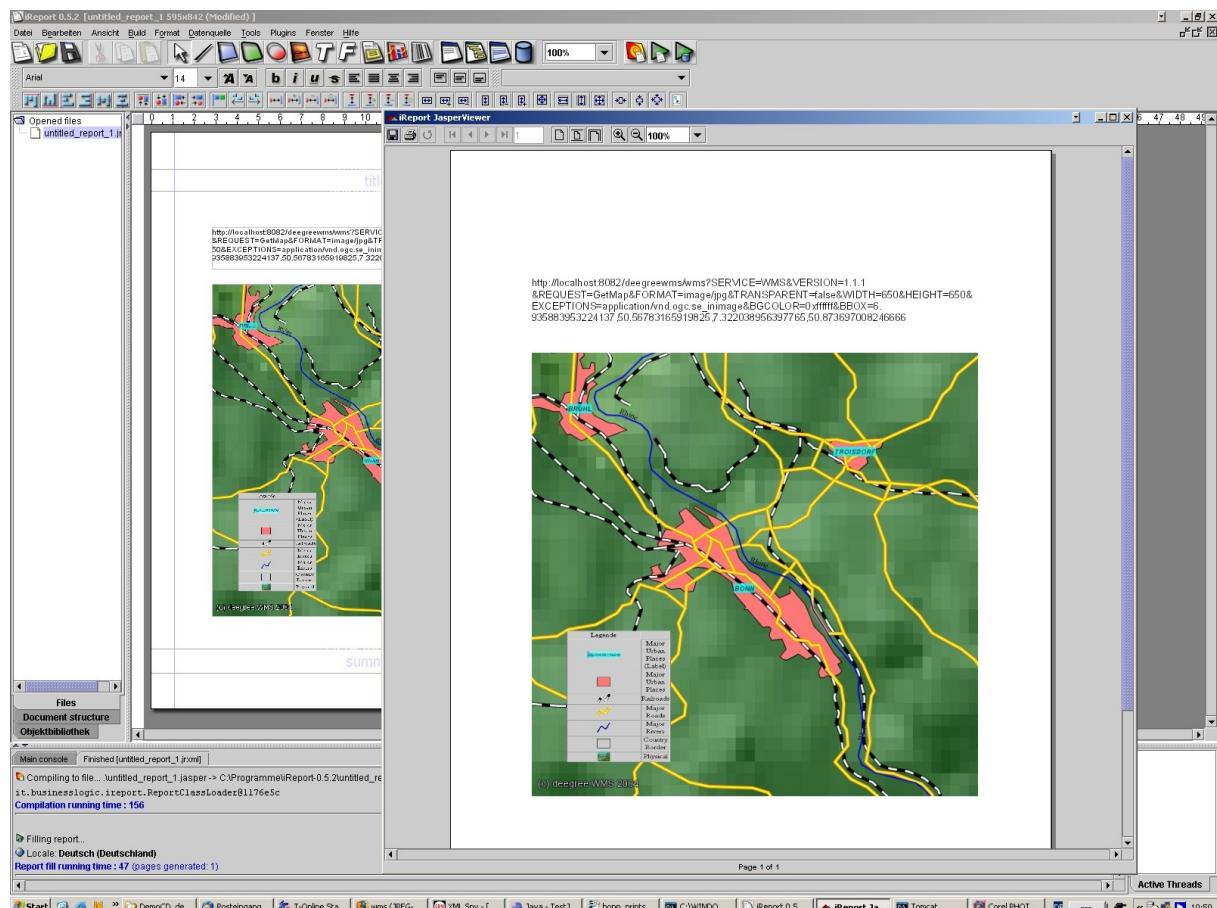
Figure 3: Example for creation of a simple print template

Appendix A Schema definition for error messages (from OWS Common 1.1.0)

```xml
<?xml version="1.0" encoding="UTF-8"?>
<schema targetNamespace="http://www.opengis.net/ows"
 xmlns:ows="http://www.opengis.net/ows" xmlns="http://www.w3.org/2001/XMLSchema"
 elementFormDefault="qualified" version="1.1.0" xml:lang="en">
    <annotation>
        <appinfo>owsExceptionReport.xsd 2005-09-19</appinfo>
        <documentation>This XML Schema Document encodes the Exception Report
            response to all OWS operations.
            Copyright (c) Open Geospatial Consortium (2005) </documentation>
    </annotation>
    <!-- ==============================================================
      elements and types
    ============================================================== -->
    <element name="ExceptionReport">
        <annotation>
            <documentation>Report message returned to the client that requested any
            OWS operation when the server detects an error while processing that
            operation request. </documentation>
        </annotation>
        <complexType>
            <sequence>
                <element ref="ows:Exception" maxOccurs="unbounded">
                    <annotation>
                        <documentation>Unordered list of one or more Exception
                         elements that each describes an error. These Exception
                         elements shall be interpreted by clients as being independent
                              of one another (not hierarchical). </documentation>
                    </annotation>
                </element>
            </sequence>
            <attribute name="version" use="required">
                <annotation>
                    <documentation>Specification version for OWS operation. The
string value shall contain one x.y.z "version" value (e.g., "2.1.3"). A version
number shall contain three non-negative integers separated by decimal points, in
the form "x.y.z". The integers y and z shall not exceed 99. Each version shall be
for the Implementation Specification (document) and the associated XML Schemas to
which requested operations will conform. An Implementation Specification version
normally specifies XML Schemas against which an XML encoded operation response must
conform and should be validated. See Version negotiation subclause for more
information. </documentation>
                </annotation>
                <simpleType>
                    <restriction base="string">
                        <pattern value="\d+\.\d?\d\.\d?\d"/>
                    </restriction>
                </simpleType>
            </attribute>
            <attribute name="language" type="language" use="optional">
                <annotation>
                    <documentation>Identifier of the language used by all included
exception text values. These language identifiers shall be as specified in IETF RFC
1766. When this attribute is omitted, the language used is not identified.
</documentation>
                </annotation>
            </attribute>
        </complexType>
    </element>
    <!-- ============================================================ -->
    <element name="Exception" type="ows:ExceptionType"/>
    <!-- ============================================================ -->
    <complexType name="ExceptionType">
        <annotation>
            <documentation>An Exception element describes one detected error that a
                server chooses to convey to the client. </documentation>
```

```xml
        </annotation>
        <sequence>
            <element name="ExceptionText" type="string" minOccurs="0"
                    maxOccurs="unbounded">
                <annotation>
                    <documentation>Ordered sequence of text strings that describe
this specific exception or error. The contents of these strings are left open to
definition by each server implementation. A server is strongly encouraged to
include at least one ExceptionText value, to provide more information about the
detected error than provided by the exceptionCode. When included, multiple
ExceptionText values shall provide hierarchical information about one detected
error, with the most significant information listed first. </documentation>
                </annotation>
            </element>
        </sequence>
        <attribute name="exceptionCode" type="string" use="required">
            <annotation>
                <documentation>A code representing the type of this exception,
                    which shall be selected from a set of exceptionCode values
                    specified for the specific service operation and server.
                </documentation>
            </annotation>
        </attribute>
        <attribute name="locator" type="string" use="optional">
            <annotation>
                <documentation>When included, this locator shall indicate to the
client where an exception was encountered in servicing the client's operation
request. This locator should be included whenever meaningful information can be
provided by the server. The contents of this locator will depend on the specific
exceptionCode and OWS service, and shall be specified in the OWS Implementation
Specification. </documentation>
            </annotation>
        </attribute>
    </complexType>
</schema>
```

Anhang C: Schema definition for PrintMap requests

```xml
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="http://www.deegree.org/wmps"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:deegree="http://www.deegree.org/wmps"
xmlns:sld="http://www.opengis.net/sld"
xmlns:gml="http://www.opengis.net/gml" elementFormDefault="qualified">
    <xs:import namespace="http://www.opengis.net/gml"
        schemaLocation="geometryBasic0d1d.xsd"/>
    <xs:import namespace="http://www.opengis.net/sld"
        schemaLocation="StyledLayerDescriptor.xsd"/>
    <xs:element name="PrintMap">
        <xs:complexType>
            <xs:sequence>
                <xs:element name="Layers" type="deegree:LayersType"/>
                <xs:choice>
                    <xs:element ref="gml:Envelope"/>
                    <xs:sequence>
                        <xs:element name="Center" type="deegree:CenterType"/>
                        <xs:element name="ScaleDenomiator" type="xs:positiveInteger"/>
                    </xs:sequence>
                </xs:choice>
                <xs:element name="Transparent" type="xs:boolean" minOccurs="0"
                    default="false"/>
                <xs:element name="BGColor" type="xs:string" minOccurs="0"
                    default="0xFFFFFF"/>
                <xs:element name="Legend" type="xs:boolean" minOccurs="0"
                    default="false"/>
                <xs:element name="ScaleBar" type="xs:boolean" minOccurs="0"
                    default="false"/>
                <xs:element name="Template" type="xs:string" minOccurs="0"
                    default="default"/>
                <xs:element name="EMailAddress" type="xs:string"/>
                <xs:element name="TextAreas" type="deegree:TextAreasType"
                    minOccurs="0"/>
            </xs:sequence>
            <xs:attribute name="version" type="xs:string" use="required"/>
        </xs:complexType>
    </xs:element>
    <xs:complexType name="LayersType">
        <xs:sequence>
            <xs:choice>
                <xs:element ref="sld:NamedLayer" minOccurs="1" maxOccurs="unbounded"/>
                <xs:element ref="sld:UserLayer" minOccurs="1" maxOccurs="unbounded"/>
            </xs:choice>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="TextAreaType">
        <xs:sequence>
            <xs:element name="Name" type="xs:string"/>
            <xs:element name="Text" type="xs:string"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="TextAreasType">
        <xs:sequence>
            <xs:element name="TextArea" type="deegree:TextAreaType" minOccurs="1"
                maxOccurs="unbounded"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="CenterType">
        <xs:sequence>
            <xs:element ref="gml:pos"/>
        </xs:sequence>
    </xs:complexType>
</xs:schema>
```

Anhang B: WMPS Capabilities schema

```xml
<?xml version="1.0" encoding="UTF-8"?>
<WMT_PS_Capabilities xmlns:deegree="http://www.deegree.org/wmps"
                     xmlns:deegreewmps="http://www.deegree.org/wmps"
                     xmlns:gml="http://www.opengis.net/gml" version="1.1.1"
                     updateSequence="1.1.0">
  <deegreewmps:DeegreeParam>
    <deegreewmps:DefaultOnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
                                       xlink:type="simple"
                                       xlink:href="http://127.0.0.1:8080/deegree-
wmps/services"/>
    <!-- default = 100 (MB) -->
    <deegreewmps:CacheSize>100</deegreewmps:CacheSize>
    <!-- maximum lifetime of the processes in the wmps; default = 3600 (sec)-->
    <deegreewmps:MaxLifeTime>3600</deegreewmps:MaxLifeTime>
    <!-- maximum time for the execution of a request until an exception of time-ex
    ceed is thrown default 15 Sekunden -->
    <deegreewmps:RequestTimeLimit>35</deegreewmps:RequestTimeLimit>
    <!-- determines the quality of the map/image generated from a PrintMap request.
      the parameter only will be evaluated if the desired format is able to handle
      it. the range of values is 0 ... 1, where 1 is best and 0 is worst. Default
       is 0.95          -->
    <deegreewmps:MapQuality>1.00</deegreewmps:MapQuality>
    <!-- maximum map width that can be requested. default = 1000 -->
    <deegreewmps:MaxMapWidth>5000</deegreewmps:MaxMapWidth>
    <!-- maximum map height that can be requested. default = 1000 -->
    <deegreewmps:MaxMapHeight>5000</deegreewmps:MaxMapHeight>
    <!-- copyright note that will be  drawed at the letf side of the maps bottom -->
    <Copyright>(c) deegreewmps 2006</Copyright>
    <!-- returns the URl where the DTD for OGC wmps capabilities DOCTYPE definiton
        is located. default =
         http://schemas.opengis.net/wmps/1.1.1/wmps_MS_Capabilities.dtd -->
    <deegreewmps:DTDLocation>
      <deegreewmps:OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
       xlink:type="simple"
       xlink:href="http://schemas.opengis.net/wmps/1.1.1/WMS_MS_Capabilities.dtd">
      </deegreewmps:OnlineResource>
    </deegreewmps:DTDLocation>
    <!-- define a proxy server if the wmps is seperated by a firewall from the DTD-
          location or the locations of connected REMOTEWFS, REMOTEWCS and REMOTEWMS
          as an alternative you can set commandline parameters at the call of the
          java interpreter like this: java -DproxyHost=131.220.106.104
           -DproxyPort=1234 -classpath ...
    -->
    <!--Proxy proxyHost="131.220.106.104" proxyPort="1234"/-->
    <deegreewmps:CacheDatabase>
      <deegreewmps:JDBCConnection xmlns="http://www.deegree.org/jdbc">
        <deegreewmps:Driver>org.hsqldb.jdbcDriver</deegreewmps:Driver>
        <deegreewmps:Url>jdbc:hsqldb:file:/D:/Deploy/wmps_dmz1/database/wmpsPrintMap
          </deegreewmps:Url>
        <deegreewmps:User>sa</deegreewmps:User>
        <deegreewmps:Password></deegreewmps:Password>
      </deegreewmps:JDBCConnection>
    </deegreewmps:CacheDatabase>
    <deegreewmps:PrintMapParam>
      <deegreewmps:Format>pdf</deegreewmps:Format>
      <deegreewmps:Template>
        <deegreewmps:Directory>../../Template</deegreewmps:Directory>
      </deegreewmps:Template>
```

```xml
<deegreewmps:PlotDirectory>
  D:\Java\Projekte\wuppertal-portal\webapps\portal_dmz1\download
</deegreewmps:PlotDirectory>
<deegreewmps:OnlineResource>
    http://10.19.1.222:8081/portal
</deegreewmps:OnlineResource>
<deegreewmps:PlotImageDirectory>
  ../download/image
</deegreewmps:PlotImageDirectory>
<deegreewmps:MailHost>mail.lat-lon.de</deegreewmps:MailHost>
<deegreewmps:MailHostUser>loginname</deegreewmps:MailHostUser>
<deegreewmps:MailHostPassword>password</deegreewmps:MailHostPassword>
<deegreewmps:AdministratorEMailAddress>poth@lat-lon.de
</deegreewmps:AdministratorEMailAddress>
    </deegreewmps:PrintMapParam>
</deegreewmps:DeegreeParam>
<Service>
  <Name>deegreewmps wmps</Name>
  <Title>deegreewmps wmps</Title>
  <!-- abstract und keywords are optional -->
  <Abstract>wmps reference implementation</Abstract>
  <KeywordList>
    <Keyword>deegreewmps</Keyword>
    <Keyword>WMPS</Keyword>
  </KeywordList>
  <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink" xlink:type="simple"
                  xlink:href="http://127.0.0.1:8080/deegree-wmps/services">
  </OnlineResource>
  <ContactInformation>
    <ContactPersonPrimary>
      <ContactPerson>Andreas Poth</ContactPerson>
      <ContactOrganization>lat/lon</ContactOrganization>
    </ContactPersonPrimary>
    <ContactPosition>Developer</ContactPosition>
    <ContactAddress>
      <AddressType>Office</AddressType>
      <Address>Aennchenstr. 19</Address>
      <City>Bonn</City>
      <StateOrProvince>NRW</StateOrProvince>
      <PostCode>53177</PostCode>
      <Country>Germany</Country>
    </ContactAddress>
    <ContactVoiceTelephone>004922818496-0</ContactVoiceTelephone>
    <ContactFacsimileTelephone>004922818496-29</ContactFacsimileTelephone>
    <ContactElectronicMailAddress>poth@lat-lon.de</ContactElectronicMailAddress>
  </ContactInformation>
  <Fees>none</Fees>
  <AccessConstraints>none</AccessConstraints>
</Service>
<Capability>
  <Request>
    <!-- by default available -->
    <GetCapabilities>
      <!-- default and mandatory = application/vnd.ogc.wmps_xml -->
      <Format>application/vnd.ogc.wmps_xml</Format>
      <DCPType>
            <HTTP>
                <Get>
                        <OnlineResource
                            xmlns:xlink="http://www.w3.org/1999/xlink"
                            xlink:type="simple"
                  xlink:href="http://127.0.0.1:8080/deegree-wmps/services?"/>
```

```xml
                    </Get>
                    <!-- POST isn't supported -->
            </HTTP>
        </DCPType>
    </GetCapabilities>
    <!-- by default available -->
    <PrintMap>
      <!-- default = image/gif; image/png; image/jpg -->
      <!-- mandatory = image/png -->
      <Format>image/gif</Format>
      <Format>image/png</Format>
      <Format>image/jpg</Format>
      <Format>image/tif</Format>
      <Format>image/bmp</Format>
      <DCPType>
            <HTTP>
                    <Get>
                        <OnlineResource
xmlns:xlink="http://www.w3.org/1999/xlink" xlink:type="simple"
xlink:href="http://127.0.0.1:8080/deegree-wmps/services?"/>
                    </Get>
                    <Post>
                        <OnlineResource
xmlns:xlink="http://www.w3.org/1999/xlink" xlink:type="simple"
xlink:href="http://127.0.0.1:8080/deegree-wmps/services"/>
                    </Post>
            </HTTP>
        </DCPType>
    </PrintMap>
  </Request>
  <Exception>
    <!-- default & mandatory= application/vnd.ogc.se_xml -->
    <Format>application/vnd.ogc.se_xml</Format>
    <Format>application/vnd.ogc.se_inimage</Format>
    <Format>application/vnd.ogc.se_blank</Format>
  </Exception>
  <!-- optional; default = all false -->
  <UserDefinedSymbolization SupportSLD="1" UserLayer="1" UserStyle="1"
                            RemoteWFS="0"/>
  <!-- cascaded is optional and default=false -->
  <!-- TOP LAYER -->
  <Layer queryable="0" cascaded="0" noSubsets="0">
   <Name>TopLevel</Name>
   <Title>deegree demo-CD top-level-layer</Title>
   <!-- abstract and keyword are optonal -->
   <Abstract>the top-level-layer of the deegree demo-CD</Abstract>
   <KeywordList>
     <Keyword>deegree</Keyword>
     <Keyword>demo-CD</Keyword>
     <Keyword>layer</Keyword>
   </KeywordList>
   <SRS>EPSG:4326</SRS>
   <SRS>EPSG:31466</SRS>
   <SRS>EPSG:31467</SRS>
   <!--<LatLonBoundingBox minx="-10" miny="-10" maxx="10" maxy="10"/>-->
   <LatLonBoundingBox minx="-180" miny="-90" maxx="180" maxy="90"/>
   <!-- default 0 ; 9E99  -->
   <ScaleHint min="0" max="999999999"/>
   <!-- Bonner daten -->
   <Layer queryable="1" noSubsets="0" fixedWidth="0" fixedHeight="0">
     <Name>gemischte_bauflaeche</Name>
     <Title>Bonn</Title>
```

```xml
        <SRS>EPSG:31466</SRS>
        <deegree:DataSource failOnException="1" queryable="1"
                            xmlns:app="http://www.deegree.org/app">
            <deegree:Type>LOCALWFS</deegree:Type>
            <deegree:Name>app:gemischte_bauflaeche</deegree:Name>
            <deegree:GeometryProperty>app:GEOM</deegree:GeometryProperty>
        </deegree:DataSource>
        <Style>
            <Name>default:gemischte_bauflaeche</Name>
            <Title>Legend</Title>
            <!--LegendURL width="72" height="72">
                <Format>image/gif</Format>
                <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
                 xlink:type="simple"
            xlink:href="http://www.exploremaps.com/Media/Legend%20for%20web.jpg"/>
            </LegendURL-->
        </Style>
    </Layer>
    <!-- Demo CD layers -->
    <Layer queryable="1" opaque="0" noSubsets="0" fixedWidth="0" fixedHeight="0">
      <Name>europe:country</Name>
      <Title>Country border</Title>
      <SRS>EPSG:4326</SRS>
      <deegree:DataSouce failOnException="1" queryable="1"
                         xmlns:app="http://www.deegree.org/app">
            <deegree:Type>REMOTEWMS</deegree:Type>
            <deegree:OWSCapabilities>
                <deegree:OnlineResource
                    xmlns:xlink="http://www.w3.org/1999/xlink"
                    xlink:type="simple"
                    xlink:href="http://127.0.0.1:808/deegree-wms/services?
                service=WMS&amp;version=1.1.1&amp;request=GetCapabilities"/>
            </deegree:OWSCapabilities>
            <deegree:FilterCondition>
                <deegree:WMSRequest><!
[CDATA[Version=1.1.1&FORMAT=image/png&TRANSPARENT=false&EXCEPTIONS=application/vnd.
ogc.se_inimage&BGCOLOR=0xffffff&LAYERS=country&STYLES=]]></deegree:WMSRequest>
            </deegree:FilterCondition>
      </deegree:DataSouce>
      <Style>
            <Name>default:country</Name>
            <Title>country border</Title>
            <!--LegendURL width="72" height="72">
                <Format>image/gif</Format>
                <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
                                xlink:type="simple"
            xlink:href="http://www.exploremaps.com/Media/Legend%20for%20web.jpg"/>
            </LegendURL-->
      </Style>
    </Layer>
  </Layer>
 </Capability>
</WMT_PS_Capabilities>
```