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Web 3D Service (W3DS) in Geoserver

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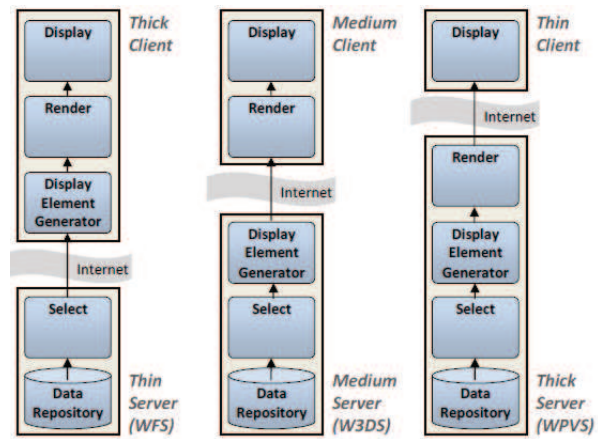
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Motivation

- The availability of 3D data “on demand”, through a service
 - The development of web clients where 3D data can be fully explored, while minimizing data communication
- Take advantage of the native WebGL support in recent browsers
 - No plug ins are necessary to see 3D in browsers
 - Browsers can be as fast as any native application to render 3D graphics
- Create and share a reference implementation of the W3DS draft
 - This implementation can be used for interoperability tests to improve the specification

Introduction

OGC visualization models



Built on top of existing open source software stacks

- Built on top of GeoServer
 - Previous experience with GeoServer
- Advantages
 - Web Services protocol already implemented
 - Common GIS formats already supported
 - An extensible architecture
- Disadvantages
 - High initial difficulty (Maven, JAVA Spring development framework, Apache Wicket)
 - GeoServer dependencies (GeoTools for example)
 - Scarse developers documentation

Main implementation tasks

- Register the W3DS service in the GeoServer architecture
- Each operation implementation have three major steps:
 - Parse and represent the request
 - Execute it
 - Write the result in the requested output format
- Add the X3D as a new supported format
- Update the GeoServer Web interface accordingly to the W3DS requirements
- Extend GeoTools support (PostGIS, styles, etc)

GetCapabilities - Request

Request String

```
http://3dwebgis.di.uminho.pt/geoserver3D/w3ds?  
VERSION=0.4.0&  
SERVICE=w3ds&  
REQUEST=GetCapabilities
```

GetCapabilities - Result

As usual, GetCapabilities shows the available operations. In this case, the new GetScene operation is shown.

GetScene Description

```
(...)  
<ows:Operation name="GetScene">  
  <ows:DCP>  
    <ows:HTTP>  
      <ows:Get xlink:href="http://3dwebgis.di.uminho.pt/geoserver3D/w3ds?">  
        <ows:Constraint name="GetEncoding">  
          <ows:AllowedValues>  
            <ows:Value>KVP</ows:Value>  
          </ows:AllowedValues>  
        </ows:Constraint>  
      </ows:Get>  
    </ows:HTTP>  
  </ows:DCP>  
</ows:Operation>  
(...)
```


GetCapabilities - Result

Part of the GetCapabilities result that show a layer description.

Layer Description

```
(...)  
<w3ds:Contents>  
  <w3ds:Layer>  
    <ows:Title>buildings_3d</ows:Title>  
    <ows:Abstract>Some 3D Buildings</ows:Abstract>  
    <ows:Identifier>geoserver3d:buildings_3d</ows:Identifier>  
    <ows:BoundingBox crs="EPSG:27492">  
      <ows:LowerCorner>-17119.121 193602.0</ows:LowerCorner>  
      <ows:UpperCorner>-10236.43 199013.891</ows:UpperCorner>  
    </ows:BoundingBox>  
    <w3ds:DefaultCRS>EPSG:27492</w3ds:DefaultCRS>  
    <w3ds:Queryable>true</w3ds:Queryable>  
    <w3ds:Tiled>false</w3ds:Tiled>  
  </w3ds:Layer>  
(...)
```

GetCapabilities - Result

Part of the GetCapabilities result that show a LOD Set definition.

LOD Set Description

```
(...)  
<w3ds:LODSet>  
<w3ds:LOD>  
  <ows:Title>LOD1</ows:Title>  
  <ows:Abstract>prismatic building shells</ows:Abstract>  
  <ows:Identifier>bldgs_lod1</ows:Identifier>  
  <w3ds:LODValue>CityGML:1</w3ds:LODValue>  
  <w3ds:DefaultRange>3000.0</w3ds:DefaultRange>  
</w3ds:LOD>  
<w3ds:LOD>  
  <ows:Title>LOD2</ows:Title>  
  <ows:Abstract>buildings with roof structures</ows:Abstract>  
(...)
```

GetCapabilities - Result

Part of the GetCapabilities result that show a Tile Set definition.

Tile Set Description

```
(...)  
<w3ds:TileSet>  
  <ows:Identifier>dem_tileset</ows:Identifier>  
  <w3ds:CRS>EPSG:27492</w3ds:CRS>  
  <w3ds:TileSizes>4000.0 2000.0 1000.0 500.0</w3ds:TileSizes>  
  <w3ds:LowerCorner>-17096.156000 193503.057000</w3ds:LowerCorner>  
</w3ds:TileSet>  
(...)
```

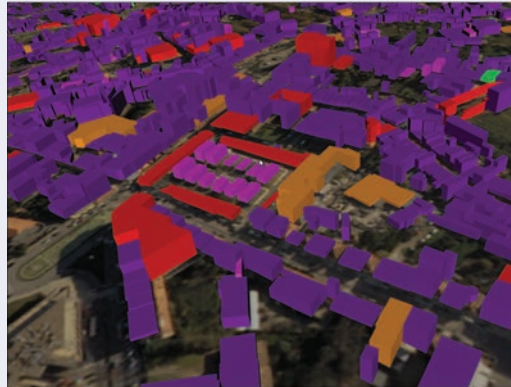
GetScene - Request

Request String

```
http://3dwebgis.di.uminho.pt/cgi-bin/proxy.cgi?  
url=http://3dwebgis.di.uminho.pt/geoserver3D/w3ds?  
VERSION=0.4.0&  
SERVICE=w3ds&  
REQUEST=GetScene&  
CRS=EPSG:4326&  
FORMAT=text/html&  
LAYERS=buildings_3d,dem_3d&  
BOUNDINGBOX=-8.301200,41.437741,-8.294825,41.444161&  
STYLES=buildings_by_type,dem_texture_igp
```

GetScene - Result

X3D Scene Rendering



GetTile

Request String

```
http://3dwebgis.di.uminho.pt:8080/geoserver3D/w3ds?  
version=0.4&  
service=w3ds&  
request=GetTile&  
CRS=EPSG:27492&  
FORMAT=model/x3d+xml&  
LAYER=dem_tiled_3d&  
TILELEVEL=0&  
TILEROW=5&GetTile  
TILECOL=7&  
style=dem_texture_igp
```

GetTile - Result

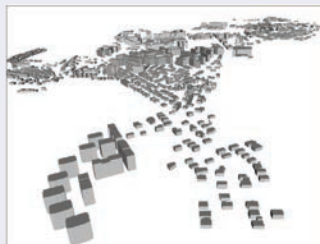
X3D Tile Rendered with texture defined in the style



W3DS in action

Movies

- `file:videos/OSM_Postes_Cabos.mpeg`
- `file:videos/Predios_Camaras_Conduatas.mpeg`



Conclusions

- W3DS is necessary for 3D WebGIS applications as WMS has been for web mapping
- W3DS (open source) implementations are necessary to do interoperability experiments
- A fully operational W3DS implementation was presented
- The service can be downloaded (as WAR) or as source for local deployment
- A working demo service is available at <http://3dwebgis.di.uminho.pt/geoserver3D/>

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