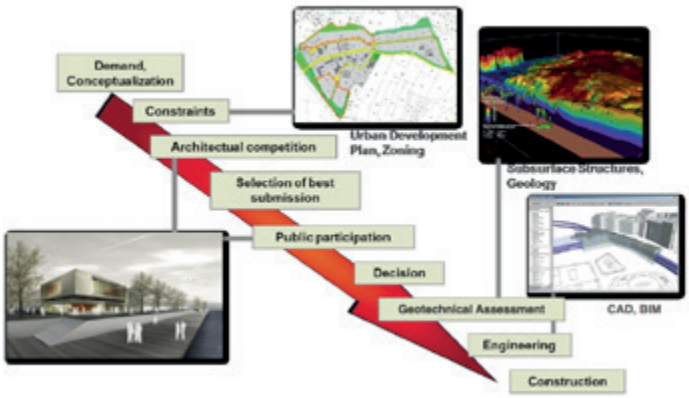
OGC ADVANCES 3D PORTRAYAL SERVICE STANDARD

OGC'S NEW 3D PORTRAYAL SERVICE STANDARD TARGETS IMPROVING THE SHARING, INTEGRATION, AND VIEWING OF THREE-DIMENSIONAL DATA. SCOTT SIMMONS AND RON EXLER REPORT

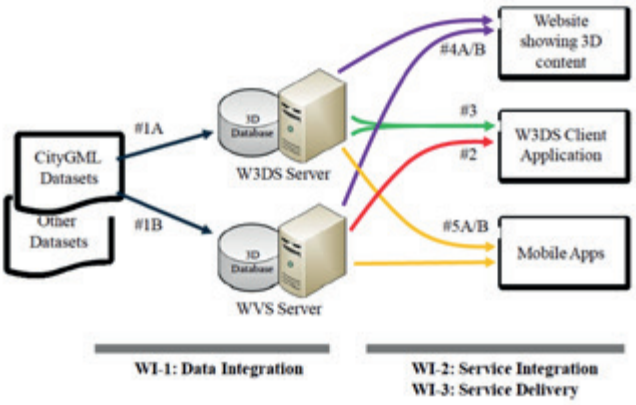
Compared to 2D maps, 3D perspective views in cities can improve the perception and interpretation of complex spatial information because they show not only the height of objects, but included façades suggest the usage of buildings. Perspective views have become a generally known and accepted medium for visualisation of spatial information.

Nevertheless, there are no standard approaches that address many of the complexities of 3D geodata visualisation. As a result, urban planners often have challenges viewing diverse 3D data sources together. The interoperability challenge, in part, is from differences in source and display formats – typically a multitude of raster, terrain and vector datasets. Interoperable 3D portrayal capabilities represent a valuable building block for various urban planning applications and systems, providing support for the various stakeholders, including planners, architects, construction engineers, developers and the public.

For urban planning, 3D portrayal can provide the means to analyse, visualise, communicate, assess, and decide about actual and planned situations. For example, a cadastral office could set up a 3D portrayal server that integrates and provides access to geospatial data that is relevant for planning purposes. The server could include thematic maps from a development office, building models from the cadastral data, and terrain models and subsurface data such as utility network models from an engineering department. City planners could easily access and use the 3D portrayal service data while architects could be provided with 3D context buildings as a basis for their design work. In addition, standards-based clients and viewers could be used to communicate alternative designs to the public and request their comments.



Examples of using 3D portrayal capabilities within the urban planning process.



Data flows of all experiments in the 3D portrayal interoperability experiment.

Other usage scenarios include security, tourism and navigation. 3D views can help security personnel develop escape routes for emergencies. 3D city maps can attract and assist tourists. Perspective views can also illustrate pedestrian and vehicle routes for improved guidance and navigation.

3D Portrayal Service

Standards enable the data sharing and viewing needed to bring these exciting urban applications to life. OGC's 3D Portrayal Service is a standardised common interface for web-based 3D portrayal supporting delivery of 3D scene data or 3D view images rendered on the server. The standard will be useful for publishing large and potentially very detailed city and landscape models in a distributed and heterogeneous environment. Significant use cases include navigating in a scene, retrieving feature information and analysing detailed information, such as simulation results.

The 3D Portrayal Service standard integrates two underlying display methods. The Web 3D Service (W3DS) follows a 3D graphics approach, delivering the geometric and texture data to the client for rendering and query, while the Web View Service (WVS) follows an image-based approach, delivering server-rendered image layers. Therefore W3DS and WVS function quite differently from a client-server perspective and the integrated 3D Portrayal Service standard allows 3D information to be served and rendered using the most appropriate mode for the user.

The OGC 3D Portrayal standards working group (SWG) plans to announce 3D Portrayal v1.0 as an adopted standard in July 2015. The SWG has these main objectives:

- Develop a standard service interface to visualise very large 3D geospatial datasets online via web browser and mobile devices;
- Represent real world objects with geometry and attributes; and
- Deliver content that includes 3D scene graph (X3DOM, OGC KML) as well as image-based rendering.

Standard in action

The 3D Portrayal Interoperability Experiment (3DPIE) demonstrated that multiple 3D source datasets could be rendered into a single client interface, handling a mass of data in a variety of 'standard' formats including some OGC standards, other organisations' standards, and various commercial formats. 3DPIE also demonstrated best practices in how to portray large datasets in urban planning scenarios, taking into account architectures and capabilities of interactive 3D graphics solutions.

Other complementary OGC standards address 3D data, including OGC CityGML. CityGML is an open data model and XML-based format for the storage and exchange of virtual 3D city models. The 3D Portrayal Service renders CityGML data to a client, typically a web browser.

Most of the geographic data used in 3DPIE was provided in the CityGML format. Other standard data formats included KML, OpenStreetMap, Web3D Consortium X3D and X3DOM – X3D is an ISO standard XML-based file format for representing 3D computer graphics, while X3DOM is an adaption of the X3D standard to HTML5, ensuring declarative 3D can be used inside standards-compliant web browsers. Fraunhofer IGD maintains the X3DOM reference implementation, which is dual-licensed under the MIT and GPL open source licenses. HTML5 was used in 3DPIE to provide a user interface for accessing the W3DS and portraying over X3DOM.

Using data from Paris, Berlin, Mainz, and Blacksburg, Virginia, the 3DPIE participants completed five experiments:

- Import raw data into W3DS and WVS servers
- Link WVS and W3DS
- Integrate multiple W3DS data sets in a 3D client
- Test W3DS/WVS for browser-based portrayal
- Test W3DS/WVS for mobile portrayal

3DPIE participants successfully tested and demonstrated how to set up 3D portrayal pipelines based on open formats and services for various client platforms and devices. Most importantly, complex sets of detailed 3D city models in the CityGML format, including geometry and textures, were integrated into various W3DS/WVS servers and were delivered to display on various devices. Lastly, The 3DPIE experiment also showed it is possible to use the OGC version, language, and content negotiation mechanism for plugging in 3D services into existing applications.

The future

The new 3D Portrayal Service standard will benefit those involved in the design, development, implementation, and use of 3D city models for web-browser based access and visualisation, both as scene graph rendering and image-based rendering. OGC's 3D Portrayal SWG is working to integrate the W3DS and WVS 3D standards into 3D Portrayal v1.0. The 3DPIE experiments illustrated the feasibility of and potential for an integrated geospatial 3D standard.

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Perspective imagery from a WVS displayed in the 3D viewer XNavigator. The montage shows 3D content from W3DS (left) and WVS (right) for the same camera position

OSM-3D merged with Berlin WVS