



Implementation of Distributed Service Oriented Framework for 3D Visualization in Web-GIS Clients

Sarawut Ninsawat*, Venkatesh Raghavan* and Shinji Masumoto**

*Graduate School for Creative Cities, Osaka City University.

**Graduate School of Science, Osaka City University.

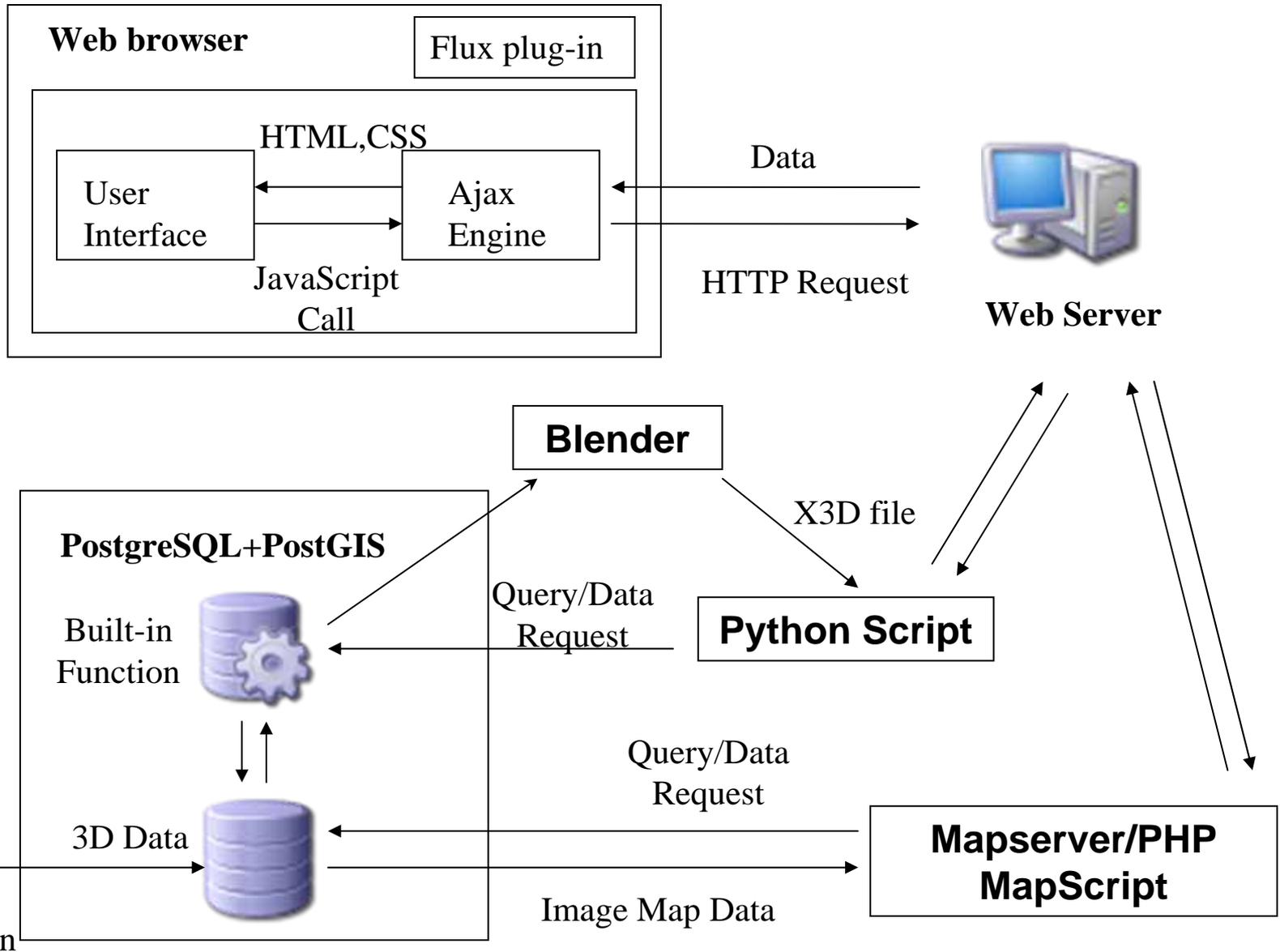




Introduction

- 3D visualization of geodata in Web-GIS clients has attracted wide interest recently.
- The combination of Virtual Reality Modeling Language (VRML) and GIS is not really a new topic.
- Most available solutions for 3D geodata visualization still require standalone applications
 - offer little flexibility in accessing of dynamic data
- In our earlier studies, the development of Web-GIS application providing 3D visualization of geological data that represented by X3D file format was developed
 - Interoperability across other systems is lacking
 - Specific to provided data and client constraint.

3D GIS with AJAX Web-GIS client Model



Open 3D GIS Demo

AppForMap::Demo::Classic - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://160.193.95.183/appformap3d/client_classic.phtml

Getting Started Latest Headlines Thai Students in Japa... Language Tools Japan National Tourist... LEXITRON Thai<-->En... Yahoo! Train

Layers Reference Map CRS Export WMS

Refresh map

Itasca Demo

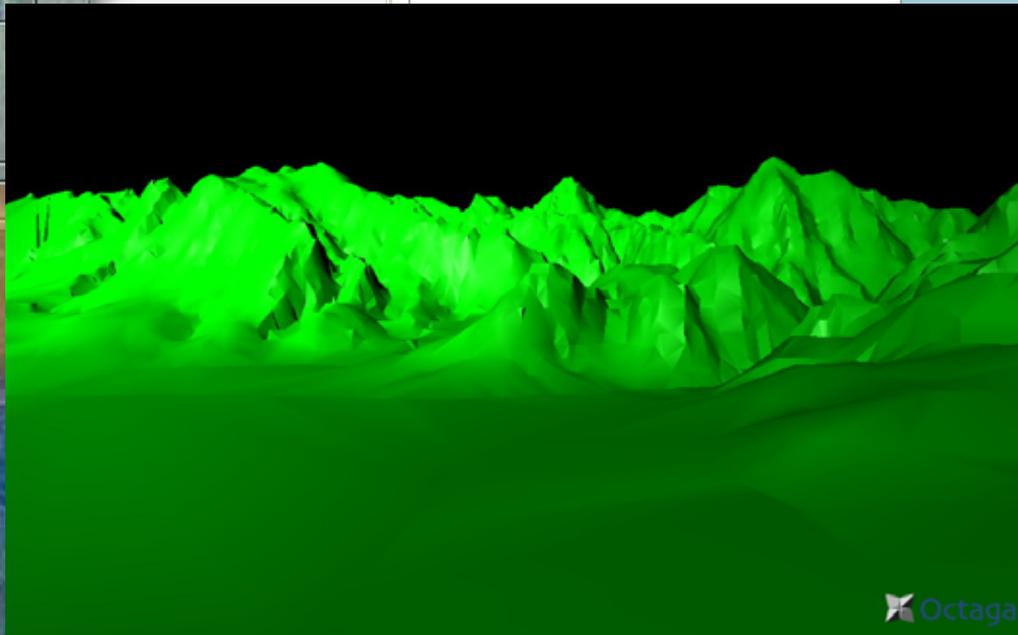
Create by AppForMap at 1158135298

440x350

1 2 3 4 5 km

Plane Rect:59964 , 3864476

Done

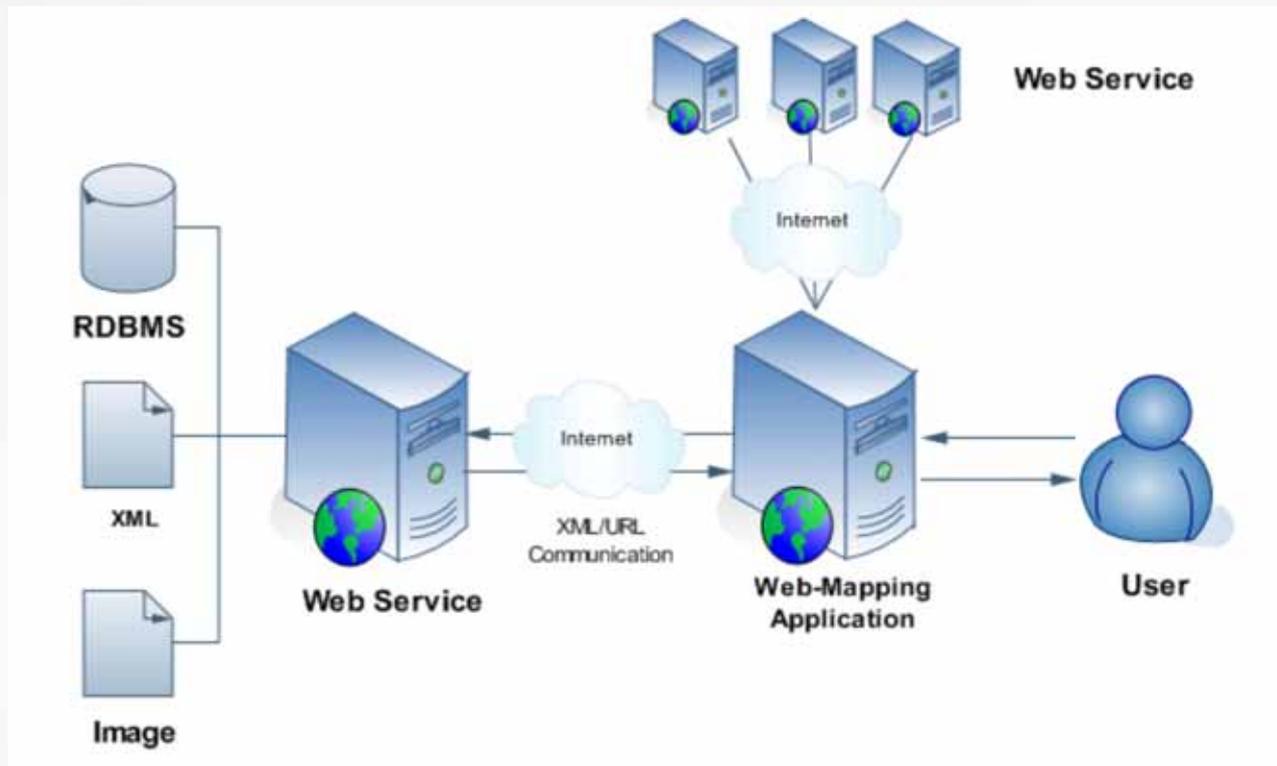




Web Service and SOA

- Web Service is a Software system designed to support interoperable Machine to Machine interaction over a network.
 - Defined by the W3C
 - Service is not a data
- Construct functional building blocks accessible over standard Internet protocols
 - Independent from platforms and programming languages.
 - These services can be new applications or just wrapped around existing systems to make them network-enabled.
- A collection of services that communicates with each other construct a Service Oriented Architecture (SOA)
 - Passing data from one service to one or more services,

Service Oriented Architecture





OGC Web Services

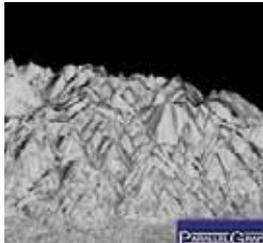
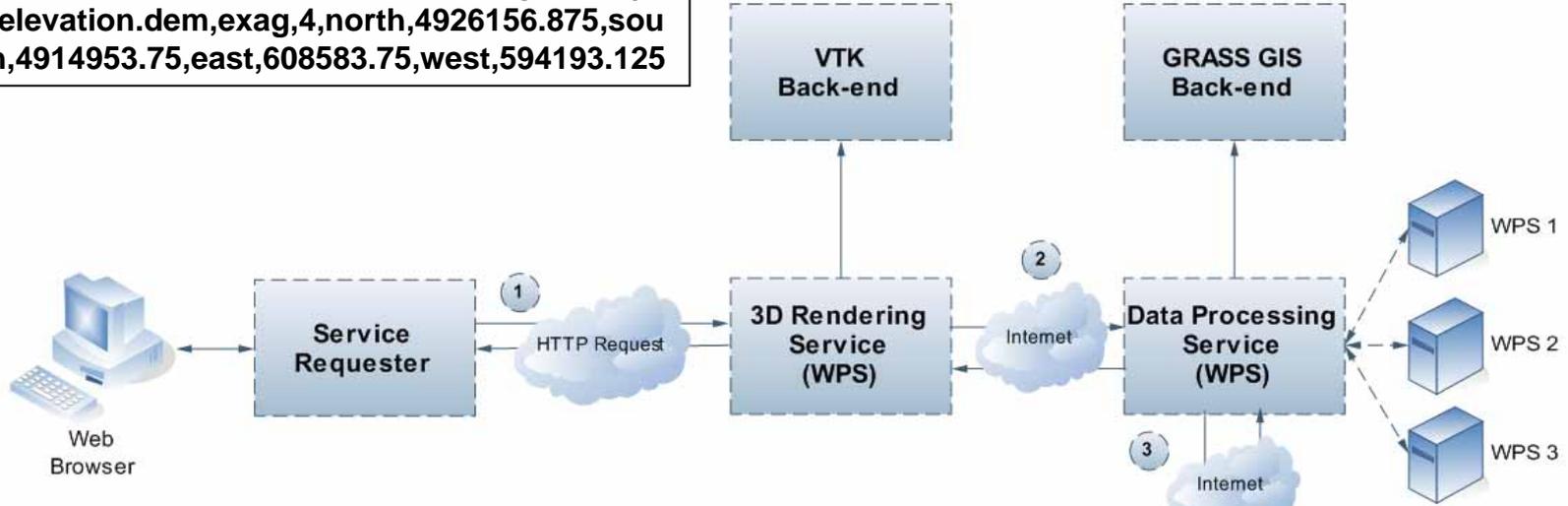
- OGC Web Service or OWS
 - Defined by Open Geospatial Consortium (OGC)
 - Allow distributed geospatial systems to communicate with each other across the Web using familiar technologies such as XML and HTTP.
 - Without Software vendor-constraints as long as followed standards
- OGC Web Service instance as WxS
 - WFS : Web Feature Service
 - WCS : Web Coverage Service
 - WPS : Web Processing Service



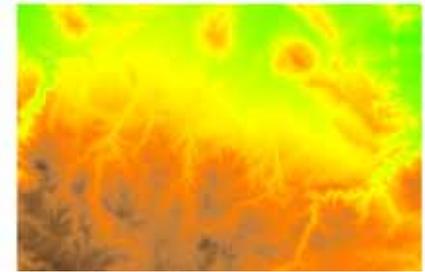
WxS instances

- WCS : Web Coverage Service
 - Spatial Data Infrastructure (SDI) of **raster data** defined by a range of properties or values.
- WFS : Web Feature Service
 - Like WCS but provide interface access for geospatial feature (Vector data).
- WPS : Web Processing Service
 - Provides client access to pre-programmed calculations and/or computation models that operate on spatially referenced data.
 - The result of request process are available to download for **further analysis at user's machine**.
- In this study, a Web Service enabled to shares 3D visualize capabilities to distributed client was implemented.
 - Providing a distributed service to other systems,
 - Accessing remote data is possible.

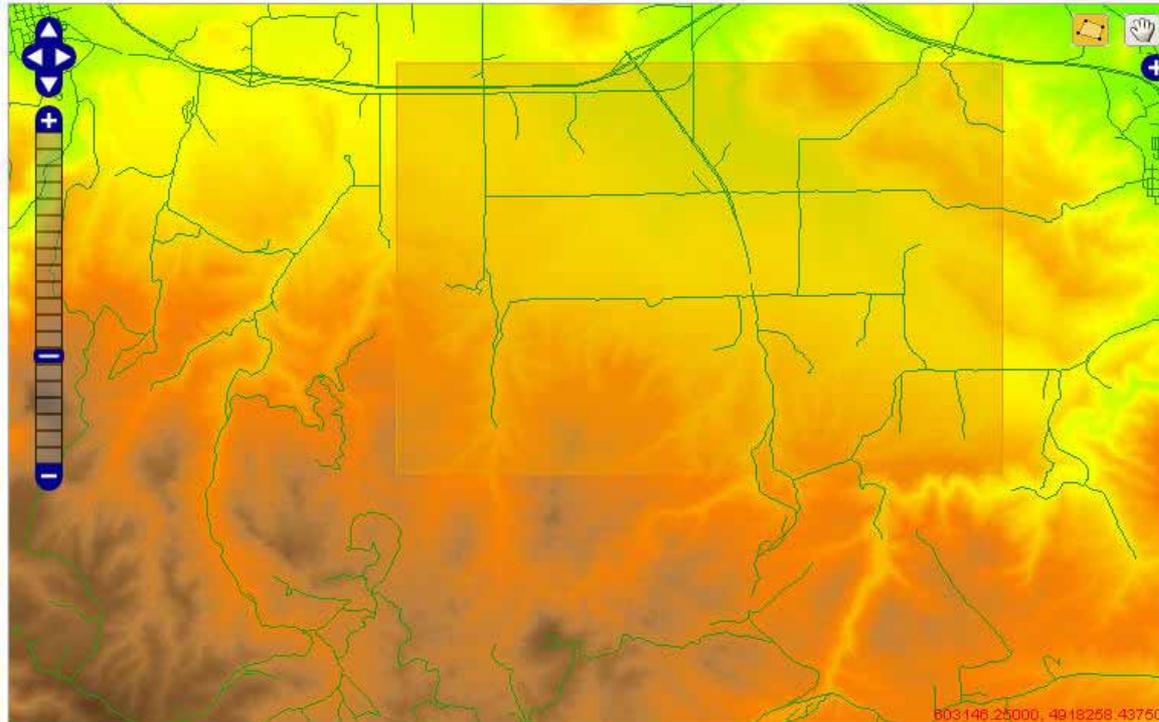
<http://wpserver/cgi-bin/cgi-bin/wps.py?service=wps&version=0.4.0&request=execute&Identifier=vrmI&Datainputs=layer,elevation.dem,exag,4,north,4926156.875,south,4914953.75,east,608583.75,west,594193.125>



<http://siteURL/wcs?version=1.0.0&service=WCS&request=GetCoverage&coverage=dem&resx=10&resy=10&BBOX=4926156.875,4914953.75,608583.75,594193.125>



Prototype Application



Current Bouding Box

Click on "Create VRML view" to create 3D Scene from current map view.

UL X: 590607.188

UL Y: 4926461.563

LR X: 608372.813

LR Y: 4915258.438

[Create VRML view](#)

Drawing Box

Using drawing tool bar to draw your specific area. Then Click on "Create VRML view" to create 3D Scene from specific area.

UL X: 596548.594

UL Y: 4925547.5

LR X: 605829.844

LR Y: 4919172.5

[Create VRML view](#)

Processing Status

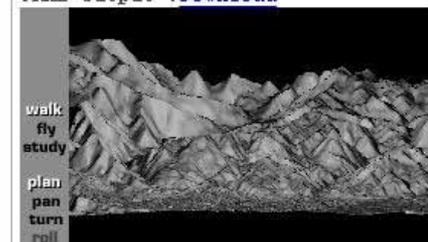
Parameters

Vertical exaggeration :

Default : 2

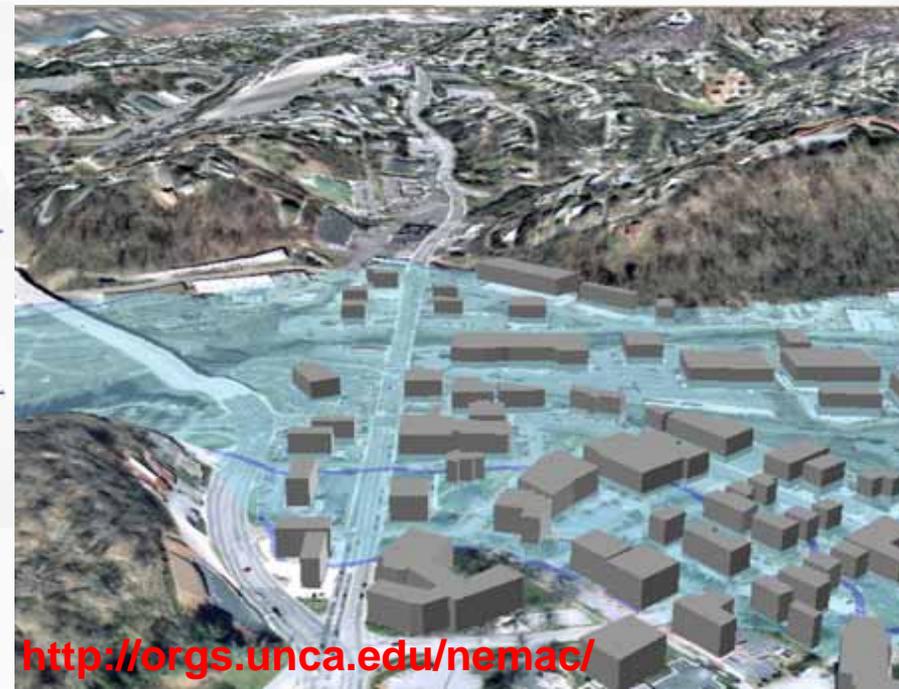
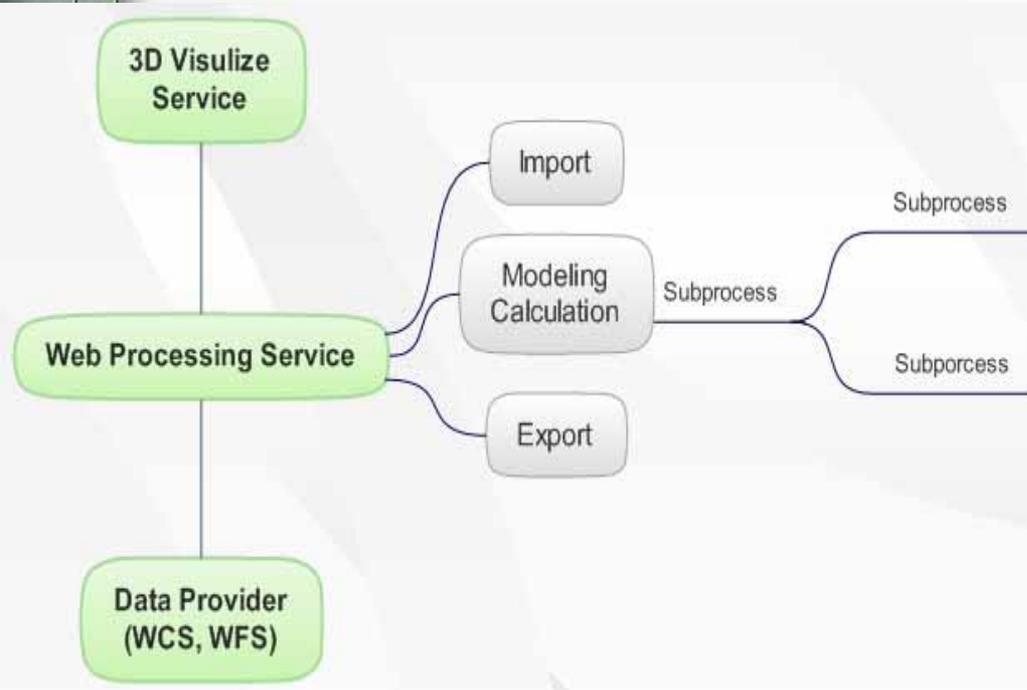
Result for downloading

VRML output : [Download](#)



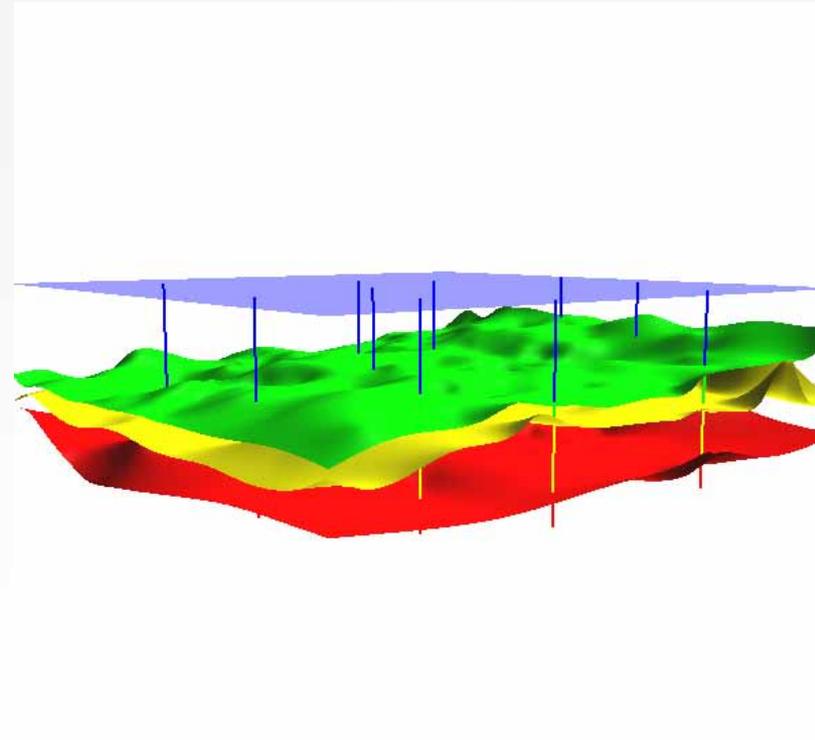
3D simulation scenarios

- Many simulation scenarios have been carried on the web-based application for spatial decision support systems.
 - Show potential dangerous area as two-dimensional maps.
- Back-end data analysis and modeling functionalities
 - Building real-time 3D visualization of analytical results.
 - Provided by GRASS or Web Processing Service capabilities



Future Work

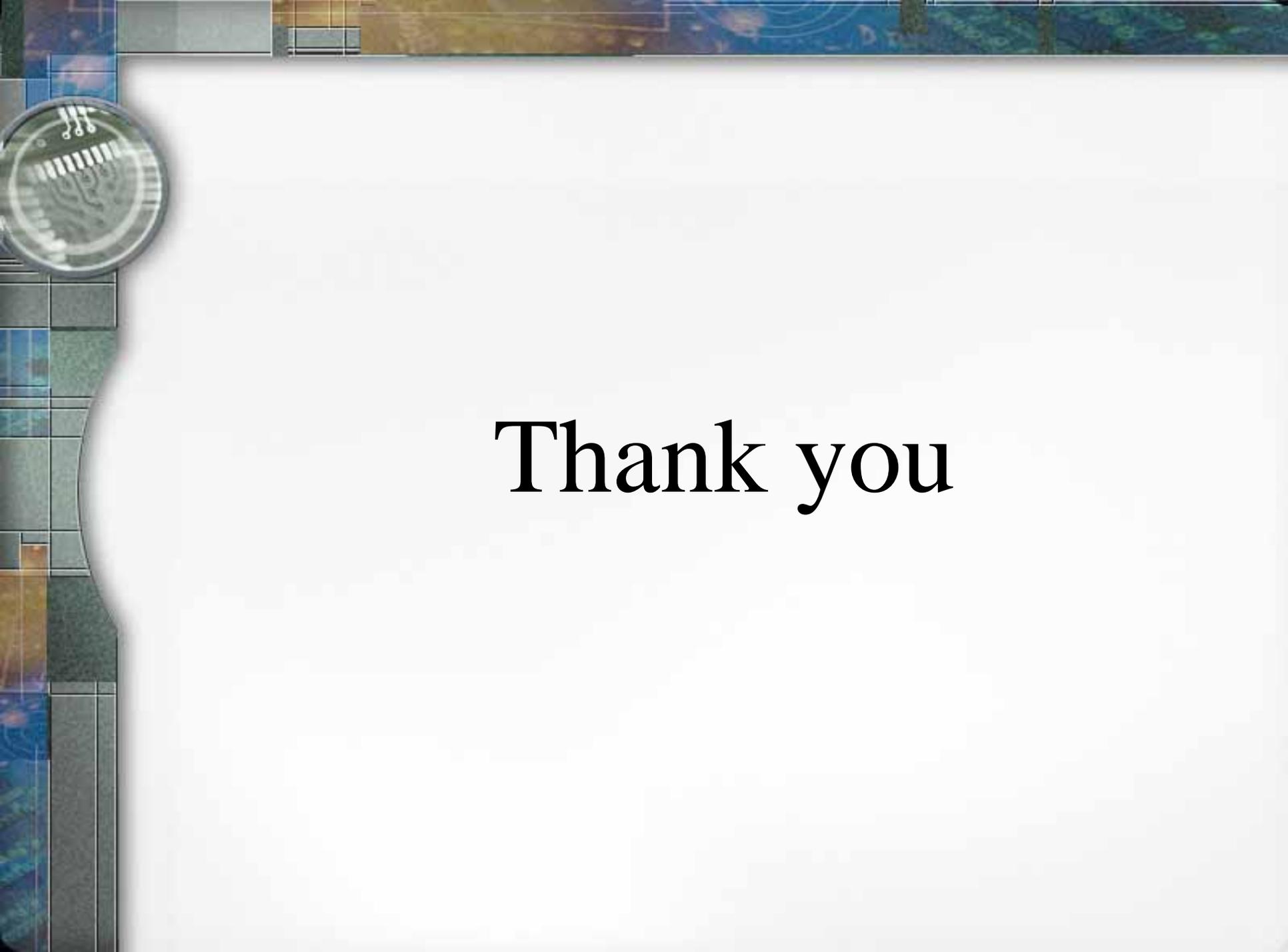
- Current system, only single 3D geospatial data can be represented as the 3D scene.
- The merging of data from difference source and also difference type has not been facilitated to enable different levels of the visualization.
 - For example, Borehole data with Geological layers





Conclusion

- A novel solution using various open standards (VRML, WPS and WCS) for the development of SOA for 3D geospatial visualization was proposed.
- SOA workflow was clearly demarcated based on their function.
 - Data Provider, Processing Service and Service Requester
- Therefore the Web-GIS application was extended for enabling visualization of geospatial data as 3D scene, which can be explored interactively by a user.
 - Both distributed Processing service and Data provider service.



Thank you