Development and operation of interoperable system for earth observation satellite image and spatial data in Asia

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Abstract

CEReS and RESTEC developed a prototype of interoperable system to exchange Earth observation satellite data and geo-spatial data of Asian region via the Internet in cooperation with JAXA. A standard interface of Web based GIS technology, that is, OpenGIS Consortium (OGC) technology is adopted to develop this interoperable system. The purpose of this prototype system is to verify the interoperability of multiple data sources dispersed in CEReS and in JAXA. Interoperable system is considered effective method to establish regional environmental database in distributed data servers in the Internet, and is expected to promote further development of practical application using regional environmental data.

1. Introduction

Earth observation data has not yet being used effectively in operational systems, though it is highly effective in practical applications like environmental monitoring. Through the rapid development of the Internet, GIS has grown from local applications to network applications to diffuse images, maps, and spatial data for multiple users in the Internet. Using Web based GIS technology, regional data such as Earth observation satellite data and map data created by different organizations can be accessed and combined together in accordance with user requirements. Thus, Web GIS technology is considered an effective method to establish various regional databases that allow public users to utilize them. And by adopting a standard interface of Web GIS technology, vendor free interoperable system can be developed which can exchange spatial data independently from the configuration of each system.

As a prototype of interoperable system, CEReS and RESTEC developed a Web Map Server (WMS), which provides Asia Land Cover Image, in the Internet. This WMS has a link with another Web GIS system of JAXA. JAXA system was developed as a part of joint research project between JAXA and the Ministry of Agriculture, Forestry and Fisheries of Japan (MAFF) for forest fire monitoring in Thailand.

2. Overview of interoperable system

2.1 OpenGIS Standards for Web Mapping

OpenGIS Consortium (OGC) is a non-profit international association, which specifies various standards for interoperable geo-location services. Among them, standard interface of Web GIS is included. Through the standard interface, spatial data can be exchanged flexibly in the Internet independently from hardware/software environment of each system.
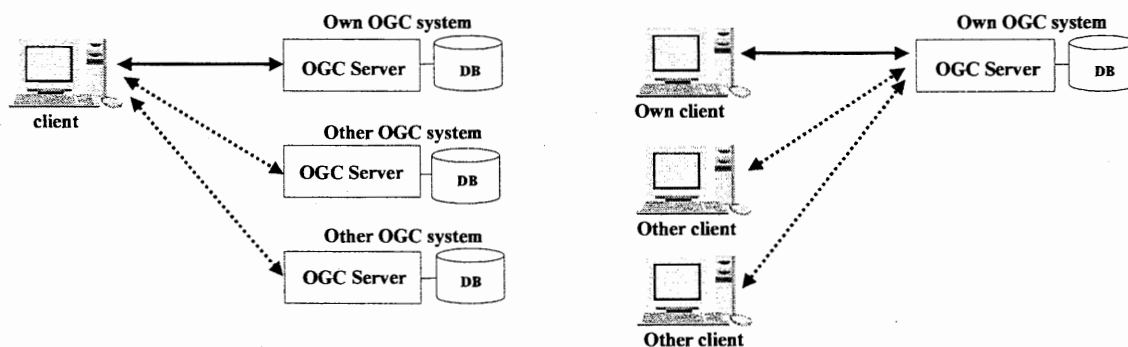

Figure 1. Example of OGC interoperability

2.2 System Configuration

OGC standards define various OGC Web Servers: Web Map Server (WMS) provides map images (JPEG, GIF, etc.) and Web Feature Server (WFS) provides spatial data (road, rivers, etc.).

CEReS and RESTEC developed a prototype of WMS that provides 1 km mesh Asia Land Cover Data generated by CEReS. Another system of JAXA consists of two WMSs, a WFS, and a web-based Viewer Client system. Web Map Servers provide Fire Risk map generated by MAFF, JERS-1/SAR mosaic image generated by JAXA, and other images. The Web Feature Server provides hotspot location data generated by MAFF derived from NOAA/AVHRR and DMSP/OLS. This JAXA system is designed to provide hotspot information and related images timely to the assumed target users, that is, forest fire monitoring operators in Thailand, with easy and simple operation to promote practical satellite data application.

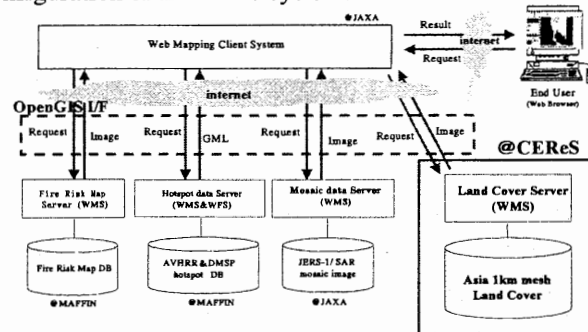Figure 2 shows the configuration of the whole system.

Figure 2. Overview of the system configuration
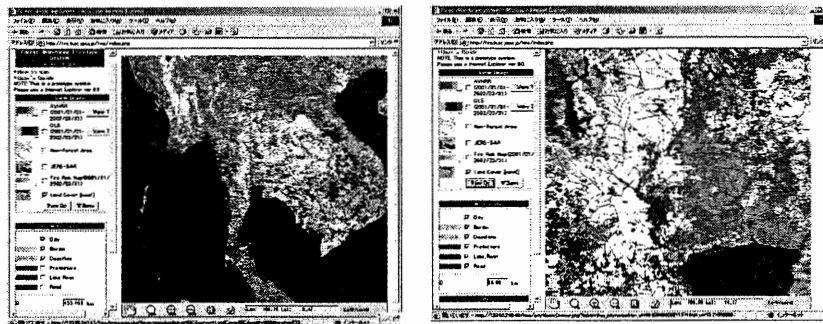
2.3 Output

Figure 3. Snapshot of the system

Figure 3 shows a snapshot of the prototype system. In these images, the base is land cover image, and map data such as prefecture border and river data are overlaid onto the base image. User can select the data layer and observation date using check boxes in the left frame.

2.4 Conclusions

This prototype WMS set at CEReS is successfully confirmed its interoperability with JAXA Web GIS system, which is also compliant with OGC standard interface. User can select and overlay hotspot and other information to overview the location of latest hotspot and its surrounding through the Viwer Client system in which multiple data are combined. As of now, this prototype system can be accessed freely with web browser via WWW (http://fire.tksc.jaxa.jp/fms/index.php)

3. Future Prospects

Further study of data providing services using this prototype WMS is in planning phase to promote regional application of Earth observation satellite data and geo-spatial data for effective use of archived data in CEReS and in JAXA. Interoperable Web GIS system has a possibility of expanding database infrastructure in the Internet in a distributed way, and furthermore, has a potential of expanding data providing services using geo location information.

References

[1]   OpenGIS Consortium Inc. Oct. 17, 2001, web Feature Server Implementation Specification version 0.0.14
[2]   OpenGIS Consortium Inc. Apr. 4, 2002, web Map Server Implementation Specification version 1.1.0