FOREST MONITORING PROTOTYPE SYSTEM USING WEB MAPPING TECHNOLOGY

Shinobu Kawahito*, Kaori Kuroiwa*,
*Remote Sensing Technology Center of Japan (RESTEC)
Roppongi First Bldg., 7F
1-9-9, Roppongi, Minato-ku, Tokyo 106-0032 Japan
kawahito@restec.or.jp

Shin-ichi Sobue**, Osamu Ochiai**
** National Space Development Agency of Japan (NASDA)
Harumi Island Triton Square, Office Tower X 23F,
1-8-10, Harumi, Chuo-ku, Tokyo 104-6023 Japan
sobue.shinichi@nasda.go.jp

Abstract: Forest fire monitoring prototype system was developed by National Development Agency of Japan (NASDA) and the Ministry of Agriculture, Forestry and Fisheries of Japan (MAFF) to verify the usefulness of interoperabile system to study new services of Earth observation satellite data distribution for a practical application. In this system, a standard interface of Web based GIS technology, OpenGIS Consortium (OGC) technology, was adopted. This system is also expected to encourage data sharing activities in Digital Asia Network (DAN) as a demonstration system.
Keywords: OpenGIS Consortium (OGC), Web Mapping, Web Map Server (WMS), Web Feature Server (WFS), Digital Asia Network (DAN)

1. Introduction

Though Earth observation data has been highly effective in earth monitoring, it has not yet being used effectively in operational systems. Using a standard interface of Web based GIS technology, that is OpenGIS Consortium (OGC) technology, a prototype system was developed to study new services for a practical application and verify the interoperability.of distributed servers. This study was carried as a joint research project for forest fire monitoring in Thailand between NASDA and the Ministry of Agriculture, Forestry and Fisheries of Japan (MAFF).

2. OpenGIS Standards for Web Mapping

OpenGIS Consortium (OGC) provides standard interface to build a interoperable Web Mapping system, in which spatial data can be exchanged in the Internet independently from hardware/software environment of each server. OGC standards define various OGC Web Servers: Web Map Server (WMS) provides map images (JPEG, GIF, etc.) and Web Feature Servers (WFS) provides spatial data (road, rivers, etc.).The forest monitoring prototype system consists of WMSs and WFS. Details are described in the following section..

3.System Overview

1) Target

- Usage : This system was desinged to provide hotspots and other related information to the end user.
- Area : Thailand is selected as it is known of having forest fires every year.
- User : Forest fire monitoring operators in Thailand

2) Data

Following data are provided in this system.

- AVHRR hotspots (daily data, produced by MAFF)
- DMSP/OLS hotspots (daily data, produced by MAFF)
- Fire risk map, which shows dryness of the surface and is derived from NOAA/AVHRR (10 day composite, produced by MAFF)
- JERS-1/SAR mosaic image (produced by NASDA)
- Non-forest area mask data (produced by MAFF)
- Map data, e.g. coastline, border (DCW, Global Map)

3) Use Case

The following scenario was assumed for this system.

- First, operators can find the latest fire locations and evaluate the risk of fire spreading by combining fire risk maps with the latest hotspots information. .
- For more detail, operators can zoom into an area. Also, operators can overlay hotspots onto the JERS-1/SAR mosaic image and/or map data to understand the surroundings.
- To check the location of hotspots, operators can see the lat/lon information on another window.
- Operators can searches past fire risk map and hotspot data stored in a database.

4) System Configuration

This system is composed of;

• Fire risk map server (WMS 1.1.0)

This server gets a request from the forest monitoring client, process the fire risk map based on the request, and send it to the client.

• JERS-1/SAR mosaic data server (WMS 1.1.0)

• Hotspot server (WMS 1.1.0 & WFS 0.0.14)

Hotspot WMS server gets a request, process the hotspot image accordingly, and send it to the client. And Hotspot WFS server sends the locations (lat/lon) of hotspots to the client.

• Forest monitoring client

The client sends requests to multiple servers, gets images and locations from servers, and overlay multiple images.

Figure 1 shows the configuration of the prototype system.

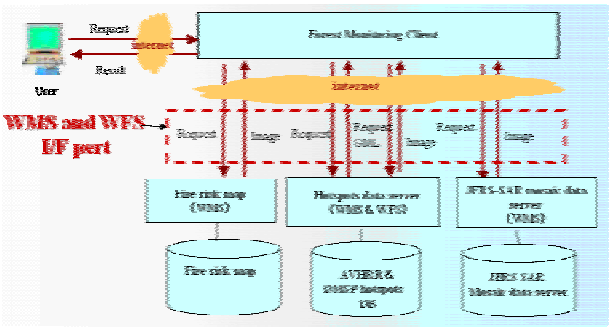

Figure 1 Overview of the system configuration

Also, table 1 shows the machine environment.

Table 1 Machine environment

Server name	OS	Software
Fire risk map server	Solaris 2.7	Apache (WWW server), Perl (Script language), IDL (Image processing software)
JERS-1/SAR mosaic data server	Linux 7.3	Apache, Perl, IDL
Hotspot data server	Linux 7.3	Apache, Perl, IDL
Forest monitoring Client	Linux 7.3	Apache, EarthNavi (Map Applet), PostgreSQL (DB), PHP, GD library

5) Output

Figure 2 shows a snapshot. In this image, the base image is fire risk map, and non-forest area mask data and AVHRR hotspots image are overlaid on the base image. User can select the data using check boxes in the left frame.

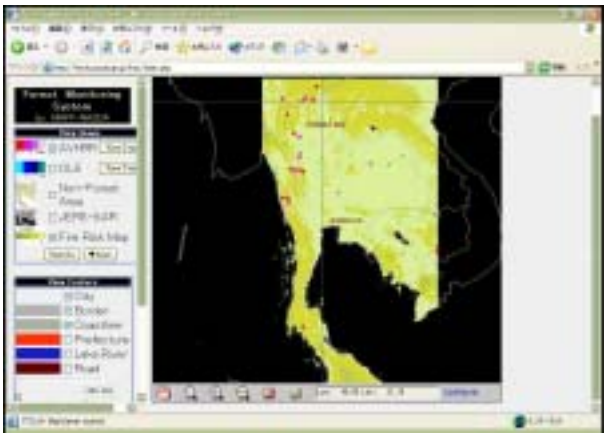

Figure 2 Display image
(Hotspots with fire risk map and map data)

Figure 3 legend of Fire risk map

4. Conclusions

We successfully developed a prototype system for forest fire monitoring wich can be handled with simple operation, and confirmed the interoperability of distributed servers using a standard interface. As of now, this prototype system can be accessed freely via WWW (http://fire.hq.nasda.go.jp/fms/index.php).

5. Future Prospects

Further studies are in planning phase to promote practical application of Earth observation satellite data. For example, upgrading current system to provide near-real time hotspot information with new data is undergo. Another study is to develop new systems to examine the usefulness of web mapping technology in the field of agriculture for drought monitoring and inundation monitoring. Those will be implemented taking users' comments into consideration.

In addition, this system is expected to encourage Digital Asia Network (DAN) as a demonstration system to develop other Web Mapping systems, to enlarge data sharing activities in South East Asia.

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

[3] OpenGIS Consortium Inc., Apr. 25, 2002, Geography Markup Language (GML) Implementation Specification, version 2.1