

IMPLEMENTING SPATIALLY ENABLED PORTAL AND CONTENT MANAGEMENT SYSTEMS

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ABSTRACT

This paper discusses the need for integrating of Geographic Web Services in Portal and Content Management System (CMS) to cater to wide variety of application needs. A typical process to make a web-GIS client to be available in a popular Portal/CMS system and creation of relationship between spatial objects and Portal's content is presented.

Three prototype systems that provide such GIS-aware Portal/CMS architecture for historical information management in Hanoi city of Vietnam are described. They do not only allow collaborative development of database for historical Point of Interest for Hanoi City but also allow visualization of such information in a new spatial perspective. This trend of software could promote the widespread of geo-spatial information and Geo-Informatics technologies and help in improving location-based content availability for a wide variety of user needs.

1. INTRODUCTION

Spatial information is essential for mapping and geographic analysis that is applicable in a wide variety of social applications like tourism, historical analysis. Implementation of appropriate mechanism for sharing of geo-referenced data accelerates the development of geographic information services and enhances the availability of information to cater to various social needs. Free and Open Source Software (FOSS) for Geo-Informatics (4G) have now matured and can provide community services with participation at grassroots level so as to advance a sustainable and clean model of socio-economic development. However, Geo-Informatics technology is not easily accessible to general users because of limited availability of spatial information in web applications where supported data types are largely text and graphics.

With the increasing availability and demand for geo-referenced data in the last couple of years, and in view of the diversity of applications and services requiring such information, it is more necessary now than ever before that the divide between Geo-informatics technology and community needs is narrowed. Innovative and interdisciplinary approaches

need to be devised in order to cater to community-level demands on Geo-informatics technology such as the Location Based Services (LBS) and space-borne observations.

In this paper we describe an interoperable Geographic Information Services framework by implementing GIS-aware architecture in popular Portal and Content Management Systems (CMS) and its application for historical information management in Hanoi city of Vietnam.

2. BRIEFING ABOUT PORTAL AND CONTENT MANAGEMENT SYSTEM

Recently, Portal and CMS are widely used to deliver information and promote interaction amongst communities. FOSS Portal & CMS systems offer a feature-rich framework for building community portals including a suite of functional tools (e.g. news, calendar, web-log, survey, advertisement, forum), an advanced administration area, a security, user management mechanism and an open Application Programming Interface (API) for expansion of new modules to cater to various needs.

Popular FOSS Portal and CMS like Joomla and Drupal (on PHP) and Plone (on Zope/Python) or Rainbow (on .NET) are now widely used to create online newspapers or social networks. The ease in using and customizing them enable anybody who has basic IT skill to create and operate his/her own community portal without having to do hard coding.

However, popular data types in these CMS framework are text and graphic-based. Spatial data is not well supported, thereby limiting the use of GIS content and technologies for community needs. Recently, TYDAC's Neapoljs (www.neapoljs.com) is a professional all-in-one web mapping application framework, content management system and application development environment; all of it is completely database driven and browser based. However, it is a proprietary product and not integrate-able to many available Portal & CMS systems. We consider that it is an important to develop generic spatially aware Portal-CMS systems for future community needs

3 INTEGRATION OF SPATIAL DATA AND GIS FUNCTIONS INTO PORTAL AND CMS SYSTEMS

From our point of view, there are 2 levels of integration of GIS data and functionality in a portal application, namely;

3.1 External integration

Web GIS application is entirely independent from Portal application, it is displayed in Portal's view via a frame or iFrame control (equal to browsing 2 or more websites at the same time); user has the feeling of working with the GIS application inside the portal.

Figure 1 below shows example of such integration "Book Delivery System" which allows user to browse a book cart and library's OPAC screen at the same time and "borrow cart" before selecting the convenience store location on Web GIS for book delivery. Such "integration" offers quick solution, in terms of look and feel while in fact there is completely no functional integration or data exchange between these two or more web applications.

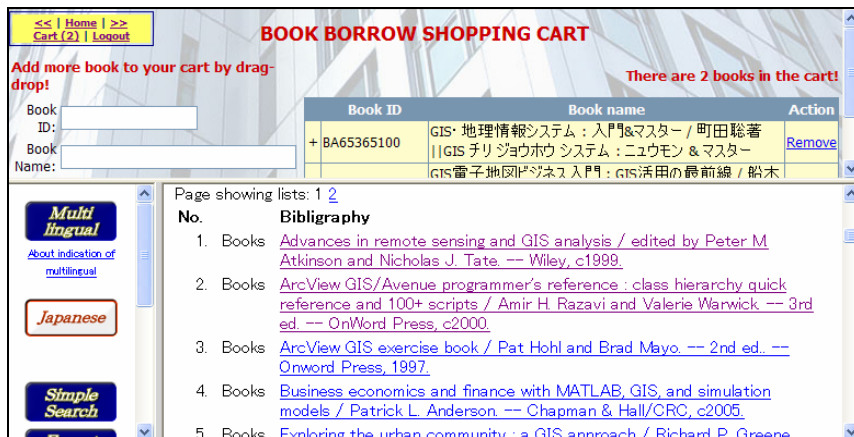


Figure 1. Example of “External Integration” in the Book Delivery System.

3.2 Internal integration

Internal integration using Portal’s API, allow access to web-GIS services within the portal framework via a functional module. This solution allows “global integration” in term of information and functionality, the web-GIS client can take all the advantages of the host Portal application.

In this paper, we focus on the internal integration where a Web-GIS module with the CMS can make use of readily available resources of the Portal application.

4. PLONE / PRIMA-GIS INTEGRATION

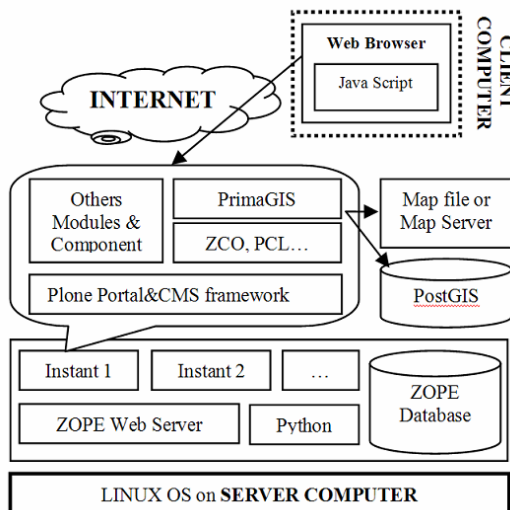


Figure 2. PrimaGIS / Plone Portal architecture.

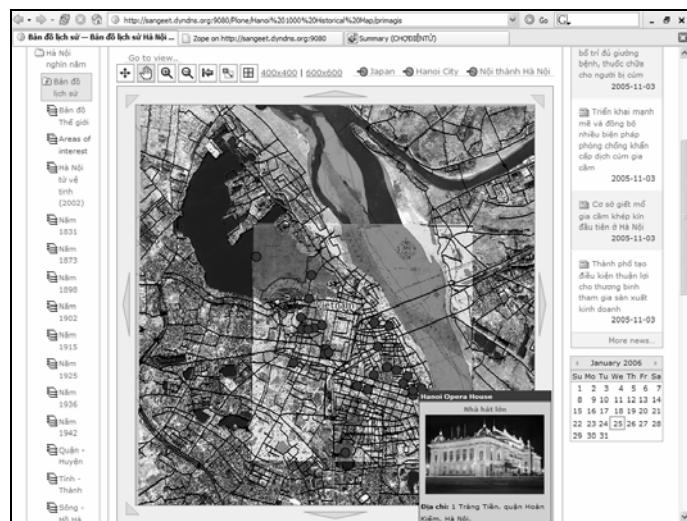


Figure 3. Map of Hanoi in 1902 overlaying on background layers, yellow circles are historical sites, red triangles are French architectures.

PrimaGIS (www.primagis.fi) is an internal mapping solution meant primarily as a spatial extension to the powerful Plone Portal and CMS framework. PrimaGIS is built on top of Mapserver, Python Cartographic Library (PCL) and Cartographic Objects for Zope (ZCO). The combination of such tools has been used to build the first prototype system (Raghavan, V. and others, 2006).

Spatial data available for the PrimaGIS include: Vietnam's province and district border, Hanoi's transportation network and water boundary (provided by Vietnam Institute of Geography), Ikonos satellite image at 2 meters resolution representing inner of Hanoi in 2002, Eight raster image files representing Hanoi's historical map in 1831, 1873, 1898, 1902, 1915, 1925, 1936 and 1942 comes from Vietnam Historical Science Association.

Input data for the Portal includes information and pictures on 30 famous places and 150 French architectures of Hanoi (Terunobu, F. and others, 1997).

Open PrimaGIS's view in the Portal, we see a map with all basic elements of a web-GIS application: layers list, legend, a set of zoom-pan-view functions. Each POI is displayed as a colored small circle or triangle on the map, its brief introduction and thumbnail picture will be shown while mouse is dragged over, clicking inside will bring full information or documents to download.

5. INTEGRATION OF MAPSERVER CLIENT IN PHP-BASED PORTALS

Plone Portal and PrimaGIS base on Zope web application server and developed using Python programming language. Plone-based systems require knowledge of Python, Zope and are difficult to implement without learning additional new skills thus limits the popularity to the common users and further features development capability.

Nowadays, Portal systems built on PHP scripting language, Apache web server and MySQL database server are most used to develop multi-functional and scalable Portal and Content Management Systems. Finding out a standard process to make an independent Web-GIS application available in such kind of Portal systems will bring much benefit in both making geographic content more accessible and Portal to be richer in functionalities.

We have chosen 2 popular and powerful PHP-based Portal systems to experiment with the integration, which are Joomla (www.joomla.org) and Drupal (www.drupal.org). The G-Map Web-GIS client has been chosen for its fullness of basic features but its code-base is still simple enough to be modified and put into Portal-dependent run-time environment.

The integration process has been carried out by the following main steps:

5.1 Pre-Integration

- Modify the HTML code of G-Map to compact Graphic User Interface into a smaller layout that is fit-able to the widest row (usually the middle one) of Portal's view.

- Rewrite some part of G-Map's PHP code from PHP4 to PHP5 for compatibility with Portal's run-time environment and more security.

- Restructure G-Map's PHP and HTML code base.

5.2 Integration steps

- Started by making a new blank functional module following Portal's rule, named it as G-Map. Copy G-Map application's files system to the appropriate module folders of the new module in Portal's code directory and change path of all Java Applets and images in the code;

- Replace some functions of G-Map by common functions of Portal's kernel (e.g. database access, string processing, user management, security check); change environment variables and some code paragraphs of G-Map from running inside an independent environment to a dependent one.
- Develop new functions for the integrated G-Map module, e.g. distance measurement, page for creating connections between spatial object and Portal's content.
- Create an administration area for G-Map module in Portal's back-end, this will manage critical parameters of the module like: Title, Path to the map file, Output map size.
- Create an installation file bases on XML following Portal's rule and package all module's files into an installation package.

5.3 Post-Integration

- Remove the current module and install it using the installation package to perform some final tests.
- Use appropriate functions to create connections between spatial objects and Portal's content like: News, Survey, Pictures.

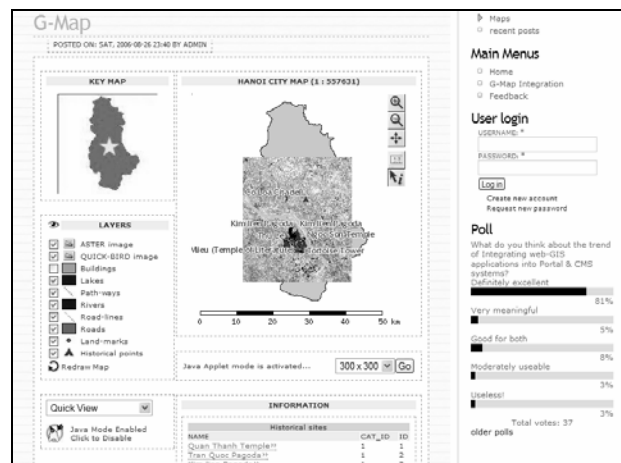
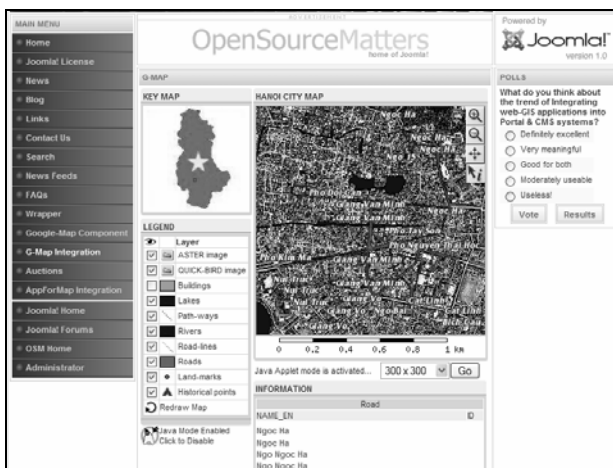


Figure 4. G-Map as a module of Joomla Portal, <http://160.193.95.170/joomla/>

Figure 5. G-Map as a module of Drupal Portal, <http://160.193.95.170/drupal/>

Spatial data available for the integrated systems includes: Hanoi's district border, Hanoi's roads network and water boundary at 1:2000 scale (provided by Kyoto University), Quick-Bird satellite image at 0.6 meter resolution for inner of Hanoi; point objects representing historical places are put onto the map in using Quantum GIS software (www.qgis.org).

G-Map module has now become a dependent and integrated module of the Portal that professionally support spatial data (vector, raster) and geographical functions like: layers list, legend, a set of zoom, pan, view, distance measurement, information query. Especially, each object of the map (point, line) can be associated to one or more Portal's content of any type.

Information about 150 historical points of interests of Hanoi and more will be entered to the system after the development phase by the authors and community using the ready Content Management functions of the Portal framework.

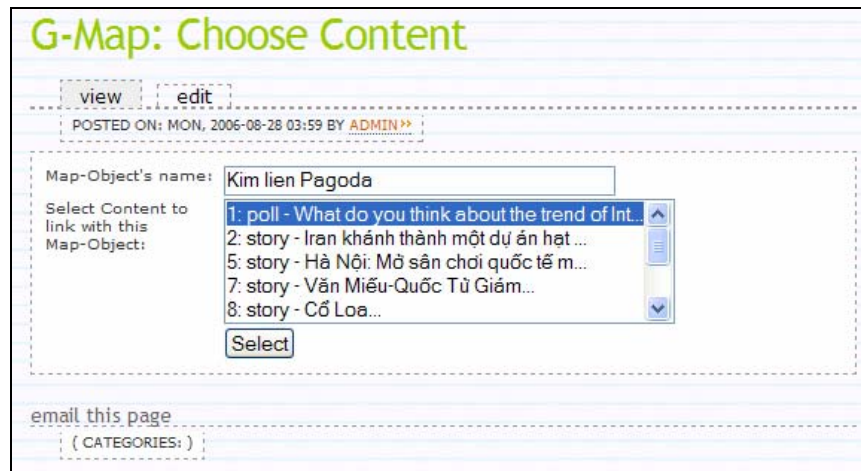


Figure 6. Select some contents to link with a map object in Drupal Portal.

6. CONCLUSIONS

In this research, we have integrated GIS content and functions into some FOSS Portal & CMS framework utilizing all system's resources (working environment, technical background, content). The prototypes show that this method of integration could not only make GIS technology more popular to community but also enhance Portal frameworks in term of functionality and GIS-aware contents, and is usable in many other types of application. This functionality could promote the widespread of geo-spatial information and GIS technologies and help in improving location-based content availability for a wide variety of user needs and applications.

Future development for this research includes; Develop WMS-support capability for G-Map module, Develop Traveling Salesman Problem and PG-Routing functions to support Location-based Services using CMS, Integrate into Moodle e-Learning portal to support geography learning courses. The source code of all above prototypes is to be released under OSI compliant license (www.opensource.org) by the end of 2006.

7. REFERENCES

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