

## The Research and Application of the Web Map Issuing Technology

Yan Huiwu<sup>1,2</sup> Wu Tao<sup>2</sup> Fei Lifan<sup>2</sup>

(1. Research Center for Environmental Engineering & Management, Shenzhen Graduate School of Tsinghua University, Shenzhen 518055, [yhwmc@263.net](mailto:yhwmc@263.net);

2. School of Resource & Environmental Science, Wuhan University, Wuhan 430079, [wt1118wc1118@263.net](mailto:wt1118wc1118@263.net).)

**Abstract:** Starting from the features and functions of the web maps, the authors of this paper reviewed the full development history of the web maps, and furthermore, compared the issuing technologies of the web maps at home and abroad which are relatively mature, and analyzed their advantages and shortcomings. On the basis of the above mentioned research issues, the authors introduced their own way for an issuing system of the web maps which has really fulfilled the concept of “thin client” associated with the actual need of the issuance of the information about “Saving and Comprehensive Utilization of Resources of the Shenzhen City” from the Internet for an enterprise combined with the Flash technology which is relatively popular today.

**Key Words:** Web Maps; Internet; Map-issuing Technology; Flash Technology

Nowadays, with the quick development of the technology of the computer and the communication, the world has entered into the era of the informational network. Just as the other traditional subjects, cartography also faces the tremendous impact of the informational network. Giving the users a quick and new approach of all kinds of the maps, the Internet makes the application of the maps a new definition and gives birth to new products of cartography — web maps: Web maps belong to a new kind of maps which are browsed, produced and used in the network. They use the Internet as the medium of transmission. They offer the users with continuous and multi-scaled description of space. They also offer the users with exact geographical coordinates and functions of spatial searching, query and analysis, whose key features are object-oriented, distributive and mutual operational. With the popularization of the Internet, web maps which serve the visualization and transmission of the spatial information will win more recognition by the people.

To date, web maps have changed a lot in the system framework, and in the methods of creating and storing the map data. In order to be used commonly, easily and universally, more and more web maps are nowadays based on the method of the “thin client” in their creation. Through comparison and research of these web maps, the authors have discovered that they are not so ideal, as far as the ease of creation, the convenience in updating of the cartographic data and the effectiveness of mutual operation to and from the users are concerned. In order to realize the effective organization of various kinds of web maps’ data with an easier way and to satisfy the basic needs of ordinary people for spatial information as much as possible, the authors have built and realized the real “thin client” of the web map issuing system, using the contemporary prevalent technology — the Flash technology, combined with the professional knowledge of the web maps and the data of the most advanced one hundred enterprises in Shenzhen City.

## **1. The analysis of today’s issuing technology for the web maps**

Nowadays, with the improvement of the network technology, the web maps have been developing continuously. They have changed a lot in the system framework, exploiting way and the way to deal with the cartographic data. As regard to their system structure, web maps have already been developed from the original C/S structure to present B/S structure. The way of their creation was based on the programming languages for the web page such as CGI Common Gateway Interface or JavaScript a technology of dynamic web page programming in the early stage. But at the present the object-oriented programming languages are being used just like Java and so on, which are based on the API programming. In the processing of the map data, the use of raster maps has been expanded to the use of the vector maps as well. Through the renovation of the crucial technologies mentioned above, the functions that web maps can realize are more powerful. The information that can be integrated is more abundant, and the operations for the users, easier. The web maps are being satisfying the needs of the users in various fields with their spatial information.

Through the research of many current web maps issuing systems, the authors have found that these systems tend to be consistent in the aspect of the system framework and the creating method. The affairs that the server deals with are clearly departed from the things that the client does. Thereby it is beneficial for the web maps to become greater in size, more specialized and more integrated. However, this popular method of creating the issuing system for the web maps has some defects inevitably: the building of the system is difficult, which needs not only a lot of developers, but also much time. The cartographic data of the issuing system are embedded in API plotting functions instead of being managed by a database system. So it makes the updating of the cartographic data be tedious and complicated. When the bandwidth of the network is not large enough, the users have to wait for the results of their operations for so long a time that exceeds beyond their patience. The web maps are transmitted through the network, whose receivers should be the ordinary people who do not necessarily have the professional knowledge about the web maps. But the defects which we have just discussed make the

issuing system of the web maps have a bottle-neck effect, namely, the information that the users receive is much less than the information that the server can supply. The ratio between the performance and the cost of this kind of systems is very low. So it is not beneficial to popularize the web maps for the ordinary people.

According to the above mentioned analysis, we have to use different technologies of the web map issuing systems for different web map users. For the specialized users, we can continue the creating method of the web map issuing systems. But for the ordinary people, we should use a new method that utilizes the technologies as simply as possible, in order to promote the popularization of the web maps.

## **2. The feasibility of realizing the web map issuing system using the Flash technology**

Flash is an animation designing software developed in June 1999 by an American company named MACROMEDIA. Its technological features are listed below:

(1) Vector graphics and stream-play technology: vector graphics can be magnified at will

without the loss of the graphic quality; stream-play technology allows the animation be played and downloaded at the same time

(2) Using the key frames and the graphic symbols, the file of animation is very small. No sooner the users open the web page than it is played smoothly

(3) Combined with the means of pictures, music, videos and sound, its powerful functions

for editing allow the designer to create excellent works freely

(4) Relying on ActionScript programming language and the component which lies in the background of the system, we can realize the interoperability between the user and the animation itself

As a product integrated with science, art and technology, web map itself has the commonness as all other media do. Flash has the advantages in the facture and the issuance of multimedia through the Internet. Combined with geographic and thematic information, we can fully exploit Flash to produce the web maps, full of interoperability, intellectuality, interest and easthetics. Using such web maps through the network, the users can enjoy the professional map service with a higher level of visualization. The following is the feasibility of issuing the web maps using the Flash technology:

(1) Cartographic data: Flash supports the widespread graphics of vector format such as .ai and .dxf files. We can produce the cartographic data with software which are often used as tools for map drawing such as CorelDraw, Illustrator, FreeHand, and so on. Then we can export the map data in the vector format that is acceptable by Flash. Using the powerful Flash's capability in organizing various data, we can integrate the various cartographic data and related multimedia information and offer the users with vivid effect of visualization

(2) Map visualization: any technology for visualization with Flash is based on the graphic technology. The technology of Flash itself has a good foundation for graphic visualization: it pre-defines the basic graphic operation functions such as zooming in, zooming out, print and refresh, etc. Combining with the ActionScript, a programming language, lying on the background of Flash and the component which is embedded in Flash, we can realize better graphic visualization. We can also combine the Flash technology with the map elements to realize the professional functions of map display such as roaming, bird's-eye view, and the controlling of the map layers

(3) Interactive query about the attributive information: all of the attribute data related with the web maps can be saved in text files or in one of the relational databases. We can

use the ActionScript to handle the input and output of attribute data for the web map issuing system. Thus we can satisfy the users' needs for attribute data. The security, the management and updating of the data are also ensured

(4) Data updating: the data administrator of the system can update and correct the sources of the cartographic data. The sources for updating data are composed of two sides: one from the map issuer, another through the feedback from the map browsers

From the discussion above, we can say that Flash is a powerful tool for creating and issuing the maps through the Internet. Combined with other means of multimedia, it is capable to offer the users with map information quickly, interactively and satisfactorily.

### **3. The creation of the web map issuing system**

The creation of the web map issuing system is composed of three parts: the designing of the user interface, the integration of cartographic data and the management of the programs. For the user interface, emphasis is put on the novel expression of the map information; for the format of the web map data, we use the vector data instead of the raster data in order to facilitate the zooming in/out functions smoothly and to alleviate the burden of data transferring; for the management of the background programs, we make full use of the script language — actionscript, which is embedded in the software — Flash MX 2004.

#### **3.1 The design of the user interface**

The user interface includes five blocks:

(1) The title block which introduces the whole system

(2) The auxiliary information block which facilitates the use of “help”, “map legend”, “the

description of the copyright” and “feedback of the incorrect information”

(3) The block for cartographic data manipulation

(4) The block for cartographic display

(5) The block for query attribute data

#### **3.2 The integration of the data of the system**

##### **3.2.1 The integration of the map data**

Although maps can be drawn with the software CorelDraw, Flash MX does not support the .cdr format. Fortunately, both CorelDraw and Flash MX can import and export the .ai files. Therefore, the following transformation is necessary:

(1) Dealing with the cartographic data of the .cdr file

Regarding the restriction of the bandwidth of the Internet and of the display area, geographic elements of cartographic data need to be simplified and abstracted before they are displayed. After technical processing, the .cdr files are exported as the .ai files in order to integrate data into Flash MX.

(2) Inputting the .ai files to the Flash MX software

The most basic element of Flash MX is the MovieClip. The cartographic data layers with the format .ai are firstly transformed as the MovieClips, then they are imported into the Movieclip library of Flash MX and are given specific names in order to be managed by the ActionScript programs.

##### **3.2.2 Integration of non-geometric data**

In addition to the geometrical data, non-geometric data also need to be integrated into the system. They include navigational entries, information about the areas, information about the enterprises, etc.

### 3.3 Realization of the system functions

In order to realize the aim of “offering the users with the combination of various enterprise’s information and the spatial information in a more direct way”, the system contains the following functions:

(1) Display of maps: bird’s-eye view, controlling of the coverages, zooming out, zooming in, roaming, showing a whole map, displaying the map scale, printing

(2) Query for information: retrieving the information of the enterprises by regions, by types, or by key words

(3) Display of non-geometric information: including the names, the addresses, the types, the telephone numbers, the fax numbers, the homepages and other information of the enterprises

(4) Other functions: for help information, map legend, declaration of the copyright, joining our team, correcting the errors of the map, sound effect

### 3.4 Issuing the Information through Internet

While the cartographic data were integrated into the system and all of functions were implemented by the actionsript which functions in the background of the system, the information of all the enterprises are transformed into .swf files to facilitate the transmission of the vector stream for issuing the information through Internet. The client can use anyone of the following browsers: IE, Netscape, or Flash Player, if he downloaded the plug-in Flash Player beforehand.

Figure2. the snapshot of the web map issuing system



## 4. Conclusion

“The Web Map Issuing System of the Main Enterprises of the Shezhen City” allows the users to conveniently find the position of the enterprises in many ways and they can get important information of these units. The system can perform the operation of display the maps; can open the enterprises’ homepages when the users click their point positions; can print the current content on the screen; can also receive the feedback from the users for updating or correcting the cartographic information of this system. Under the current network conditions, the system satisfies ordinary people’s needs for the cartographic information through the Internet. The system also promotes the popularization of the web maps and has fulfilled the task of this project.