

Study on Rainfall Information Integration System based on Java Web Start

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Abstract—To avoid the shortcomings of traditional methods of software deploy, this paper analyzed the principles and advantages of adopting Java Web Start (JavaWS) to deploy the applications of client, put emphasis on transforming applications to jar file, digitally signed the file and created Java Networking Language Protocol (JNLP) file, and the applications were finally accessed by web server. Application of rainfall information integration system based on the WebGIS in Shaanxi province indicates the convenience and security of the system when using JavaWS, which allows users to deploy and use the system offline, and thus it has a good prospect.

Keywords- Java Web Start (JavaWS); Digital Signature; Java Networking Language Protocol (JNLP); WebGIS

I. INTRODUCTION

Water conservancy informatization is an important infrastructure of the national economy, and it is also an important material foundation for sustainable social and economic development. Real time rainfall information is the basis of national water conservancy informatization. It is hard to deal with the large amount of real time hydrological data all over the country because there has a vast territory with different weather conditions. Thus it is necessary to provide temporal and spatial properties for certain applications to offer strong support of rainfall information for flood prevention and the water regime monitoring. The rapid development of information technologies provides technical support for rainfall information integration, such as modern network, database technologies and geographic information system, to provide basic information for scientific rainfall forecast and decision-making.

Nowadays, the rainfall information integration is usually developed based on WebGIS. The basic function of GIS is the server or client depending on different WebGIS technologies, then to deploy the application. Both of gateway interface mode and server application programming interface mode put most of the functionality on the server side, which overload the server and cannot keep the balance between server and client. ActiveX technology makes full use of the processing capacity in server, but it is slow and difficult to deploy and keep security. Java applet mode is more secure but it is limited in functionality^[1]. Java Web

Start used in this paper is released by Sun to develop a WebGIS client application, which can effectively avoid disadvantages of traditional patterns and be upgraded automatically. Also, it is secure when the system is used offline or without browser.

II. KEY TECHNOLOGIES AND PROTOCOLS

Java Web Start (JavaWS) is an application releasing technology based on Java technology by Sun. It connects computers and Internet, and allows users to run and manage Java applications offline^[2]. JavaWS is installed in the client when the system is deployed, which needs to run as *.jar file and has a digital signature. In addition, a Java Networking Language Protocol (JNLP) should be created for JavaWS deploy.

A. JavaWS technology

JavaWS is an application associated with the browser. When the user clicks a specific link, web browser launches the JavaWS. Then JavaWS downloads and runs the JNLP file of certain application automatically, and provides local high speed caching service at the same time.

The advantages of JavaWS are as follows^[1-3]:

- JavaWS is a method to solve application deploy based on Java platform. Therefore, it extends the feature of independent, good property of cross-platform and robustness of Java platform, and can be deployed in multiple platforms.
- JavaWS can implement the distribution and maintenance of web server automatically, and it is easy to download, install and configure for software server. It has advantage of once download with many times execution. After the program start, users can use the same application with local cache offline.
- JavaWS inherits the security feature of the Java platform. JavaWS runs the application with digital signature, which allows user to run applications safely from entrusted application. Users do not need to worry about the security of local environment and integrity of the data and files being destroyed.

- JavaWS does not depend on the browser, and it is not restricted by markup-language user interface, which allows users to start the application without browser. Users can run the application offline or use desktop shortcut, which makes the application localization.
- JavaWS is used to start the application developed by J2SE. The applications can be digital signed if JRE is included in the installation file path of J2SE.

B. Digital signature

Digital signature exists in the data in electronic form, and it can be used to identify data signer, which also contains the signer approval of the data^[3]. It is an important technology to determine identity in networked virtual environment, which is similar to the fingerprint identification in reality. Convert the password data into unit, make recipients of corresponding data and transform data unit to identify data sources. It can be used to protect data and to prevent the data from being altered or forged. Application of digital signature contains sender and receiver of data source. Data source sender uses its own private key to check data and then encrypt other variables associated with data content, to complete the "digital signature" of data. Data receiver use public key provided by data source sender to interpretate received digital signature, and verify the data integrity to conform whether the signature is valid. This paper uses keytool.exe and jarsigner.exe of J2SE to digital signature for Jar file of client application.

C. JNLP protocol

JNLP protocol is an application or service which launches applications on a local client system from remote web server and allows an application to be run from codebase accessed over the network. It provides the file of standard structure and syntax format, which could launch application of file with JNLP as a file suffix. The file structure defined by the JNLP protocol is given below, which following XML markup language specification^[4].

```
<?xml version="1.0" encoding="UTF-8"?>
<jnlp spec="1.0+" codebase="" href="">
  <information>
    <title>Demo</title>
    <vendor>Demo Team</vendor>
    <homepage href=""/>
    <icon href="icon.jpg"/>
    <offline-allowed/>
  </information>
  <security>
    <all-permissions/>
  </security>
  <resources>
    <j2se
      version="1.6+"
      href="http://java.sun.com/products/autodl/j2se"/>
    <jar href="Demo.jar" main="true" />
  </resources>
</jnlp>
```

```
</resources>
<application-desc main-class="DemoApplication" />
<update check="background"/>
</jnlp>
```

III. APPLICATION DEVELOPMENT USING JAVAWS

JavaWS is used to deploy the rainfall information integration system based on WebGIS. The system is firstly packaged and digital signed, and jnlp file is created by JavaWS. The system can be used directly from the web browser and be started offline by user.

A. WebGIS architecture

WebGIS architecture is shown in Figure 1^[5]. It consists of four layers including data layer, service layer, application layer and client layer. Data layer includes WMS and GIS and other data files, which provide basic rainfall information for application layer. Service layer gets rainfall information by web application server, which is then submitted to the application layer. Application layer includes map services and application models. System submits the request of users by web and return results. Client layer provides man-machine interfaces for users.

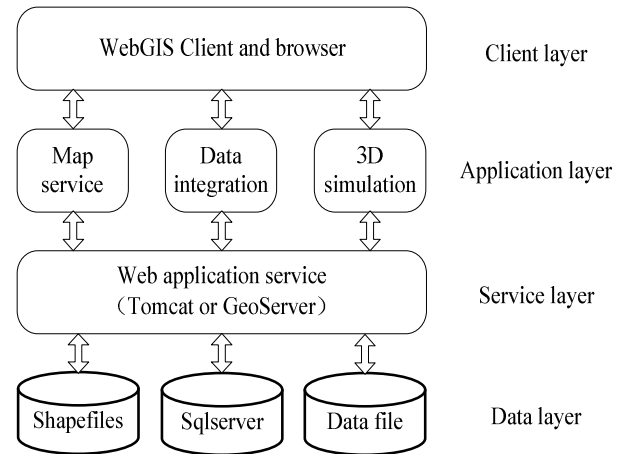


Figure 1. Four-layer architecture of WebGIS

B. Client package and digital signature

The system client should be packaged into Jar file before the deployment of system. Several methods can be used to package Jar file, and this paper generates WebGIS client file based on Eclipse. The process of client generation is shown as follows. User enters the directory of WebGIS client in DOS mode, and identifies signature information including the password, name, province, etc, by signature tool named Keystore. A file named DSKeystore is generated in the directory of WebGIS, which is the digital signature certificate of WebGIS client. All the signature information can be queried by keytool -list -keystore DSKeystore in the directory of the WebGIS deploy. The digital signature of WebGIS client in this paper is given below:

```
<?xml version="1.0" encoding="utf-8"?>
```


REFERENCES

- [1] Zhaohua Huan, Qiang Liu, Ling Tong. Research and Implementation: WEB GIS Based on JAVA Web Start Technology [J]. Geo-Information Science, 2006, 8(3): 29-31.
- [2] Java Web Start Technology [DB/OL]. <http://www.oracle.com/technetwork/java/javase/tech/index-jsp-136112.html>.
- [3] Bin Liu. Study of Railway Bureau Dispatch Query System Based on Java Web Start [J]. Journal of Lanzhou Jiaotong University, 2009, 28(3):130-132.
- [4] JNLP File Syntax [DB/OL]. <http://download.oracle.com/javase/1.5.0/docs/guide/javaws/developmentguide/syntax.html>.
- [5] Rengui Jiang, Jiancang Xie, Jianxun Li, et al. Analysis and 3D Visualization of Flood Inundation Based on WebGIS[C]//E-Business and E-Government (ICEE), 2010 International Conference on. IEEE, 2010: 1638-1641.