

Web Service AJAX Intelligent Engine Based on XFire and DWR Framework

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Abstract. In order to solve process technology and application problems of real-time data interface in power monitoring system, this paper studies scalable vector graphics, XFire and DWR framework, and designs new power automation monitoring web service ajax intelligent engine based on XFire and DWR framework. Using proxool database connection pool to improve process sequence of tele-signal, tele-metering, tele-control of supervisory control and data acquisition system. This paper has completed a new system architecture, and achieves real-time data communication from communication component to SVG graphic elements based on web service ajax intelligent monitoring engine.

Keywords: intelligent monitoring engine ; real-time process ; scalable vector graphics ; web service ; AJAX

1. Introduction

Real-time database is an important component in automated monitoring system. At present, realization of Web monitoring interfaces and functions are very different, and some systems use ASP and ASP.net, et al; some other systems use applet to show graph of real-time database; still some others build web service interface.

At present, web service interface is a sharing interface, which can contain web-based interface, improve current difficulties in openness of graphics information and real-time database.

Most of power automation monitoring system use C/S (client/server) model to interact between real-time database and monitoring system interface. [References 1-5] studies how to use computer technology(such as XML, SVG, et al.) to solve data problems and user visual interface problems in automation systems. With development of some technologies of Web service and AJAX[6-7], intelligent interface problem may be solved using some frameworks, such as XFire framework and DWR framework, which can be inserted into architecture between real-time database and monitoring graphic system in power control system. In this paper, a new design is presented to help implement intelligent process engine, and to facilitate designer to conduct exchange of real-time data.

2. Key Technologies

2.1. SVG Technology

SVG is an expansion of two-dimensional vector graphics format based on XML (eXtensible Marker Language), SVG is designed to meet growing web application for the dynamic, scalable complexity of content, and realizes interactive and flexible demands. In this paper, SVG will be used in human machine interface power automation system to upgrade graphics performance and operation ability of web-based power

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application system, SVG provides a network standard for electric power automated monitoring system [7-10], and is bound to make new changes of traditional human machine interface in graphics format, Now SVG can be embed in firefox 3.0 browser.

2.2. Web Service

Web Service is loosely coupled, reusable software modules; it encapsulates discrete functionality, after the release of the Internet, through a standard Internet protocol to access in the program. Web Services is a middleware that can be applied in internet about different operating systems, Web services enable us to build distributed systems where application components on a network can be accessed in a platform-neutral, language-agnostic, and implementation-independent way. How applications are developed, what language they use, or what OS platform they run on, which are not matter. Web services have some mainly concepts:

1) XML: Default data format used across all layers of Web services environment.

2) SOAP (Simple Object Access Protocol): The default protocol for packaging and exchanging messages, which is not really for accessing objects, and it is not simple any more.

3) WSDL (Web Services Description Language): The language that describes Web services. Although based on XML and understandable by humans, WSDL is mainly for machine consumption, to be read and understood by client programs.

2.3. XFire

POJOs (Pure Old Java Objects or Plain Ordinary Java Objects), that can be deployed on any Servlet compliant servlet container such as Tomcat. XFire supports other lightweight application container technologies, including Spring and Hibernate. XFire can be easily embedded inside a Java application providing web service client or server functionality.

2.4. DWR Framework

DWR(Direct Web Remoting) is a web framework for remote calls, this framework allows AJAX development simply, which is a Java library that enables java on the server and java script in a browser to interact and call each other as simply as possible. DWR can generate java script to allow web browsers to securely call into java code almost as if it was running locally, and it can marshal virtually any data including collections, POJOs, XML and binary data.

3. Web service Ajax Intelligent Engine Model

Power automated monitoring system includes tele-signal, tele-metering, tele-control, real-time curve, alarm, all requests, query of records, query of reports, and so on, which need to build some web service interfaces, Figure 2 shows interface collaboration of the SOA(Service-Objected Architecture) architecture, which is following as "find, bind, and invoke" model, and browsers use dynamic service location to find services that match their criteria through the query service registry, and if the service exists, registry will provide users interface contract and service endpoint address, then interfaces will be invoked, when data return, they will enter DWR, this AJAX engine can intelligent filter many data that have not change. In power automated monitoring system, changed data are only a small number of all data, so intelligent engine can greatly improve the efficiency of real-time data call.

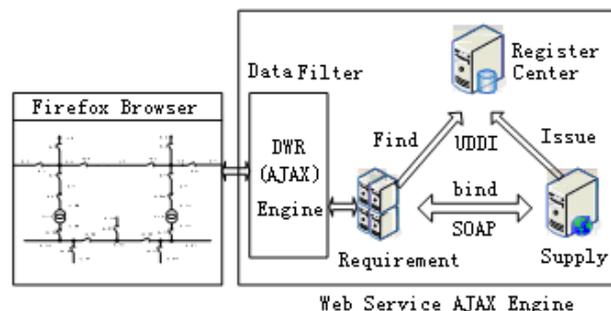


Fig.2. Web service AJAX intelligent engine structure

4. Container configuration and process flow

4.1. Configuration of DWR Container

In DWR framework, web.xml of Web-INF directory for graphics published system platform can set Servlet container, and set container properties of DWR Servlet, browser is used to implement request receiver, and the results return to browser, and configuration code is as follows:

```
<servlet>
    <servlet-name>dwr-invoker</servlet-name>
    <servlet-class>org.directwebremoting.servlet.DwrServlet</servlet-class>
    <init-param><param-name>debug</param-name><param-value>>true</param-value></init-param>
</servlet>
<servlet-mapping><servlet-name>dwr-invoker</servlet-name>
<url-pattern>/dwr/*</url-pattern>
</servlet-mapping>
```

4.2. JavaScript and SVG Data Access

SVG canvas embeds in browser, which visits data through DWR Ajax engine and web service contains, and then web service component accesses database server using JDBC database connection pool.

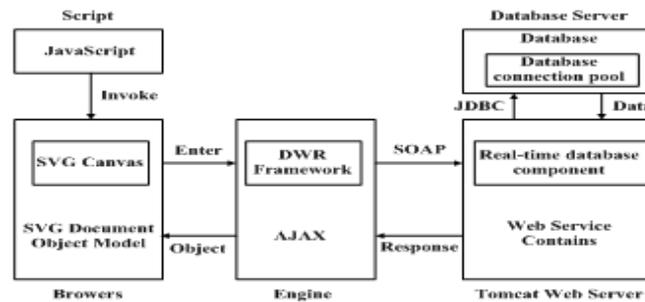


Fig.3. JavaScript and SVG data access

Database connection pool is a cache of database connections so that the connections can be reused when required, and connection pooling is a technique used to avoid the overhead of making a new database connection every time an application or server object requires access to a database. Proxool database connection pool component is used to build many logical connections for web service ajax monitoring engine.

4.3. SVG Equipment Display Flow

As the operation of private complicated image format, SVG vector graphics format is considered in power system monitoring, SVG uses XML to describe vector graphics, which can be smooth zooming. Therefore, it is easy to implement graphic display, operation and transformation using JavaScript scripts and DOM (Document Object Model).

For example, description a two-winding transformer with SVG is as follows:

1) Two-winding transformer definition

```
<defs>
    <symbol id="#Two_Transformer" viewBox="0 0 50 50">
        <circle cx="20" cy="20" r="10"/>
        <circle cx="20" cy="30" r="10"/>
    </symbol>
</defs>
```

2) Two-winding transformer reference

```
<use xlink:href = "# Two_Transformer" id = "#B2" class = "on"
    x="100" y="100" width="50%" height="50%"/>
```

3) SVG Elements operate process flow

Class attribute in graph element reference is a style of display, and when class value is equal "on", which defines a statement in the style sheet. For example, the transformer style can be defined as (stroke: red; fill: none;), it means the red edges, and do not fill the middle part.

Then JavaScript can read and write SVG elements by document object model and a typical tele-signal operate model is as Figure 4.

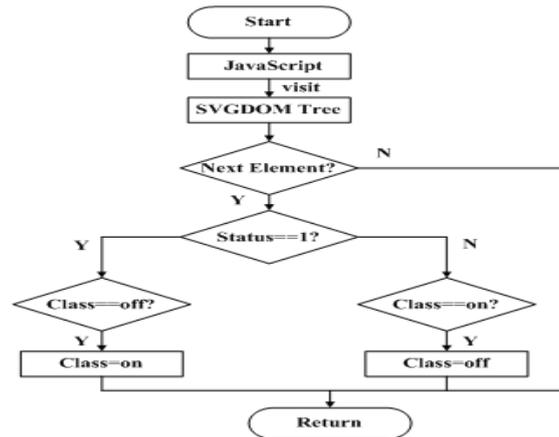


Fig.4. JavaScript operate process flow of tele-signal SVG elements

5. Run and Test

Real-time remote monitoring system must achieve connection with each other between long-range communication sub-system and real-time database sub-system. This connection can be achieved by soap protocol and web service component interface.

6. Acknowledgements

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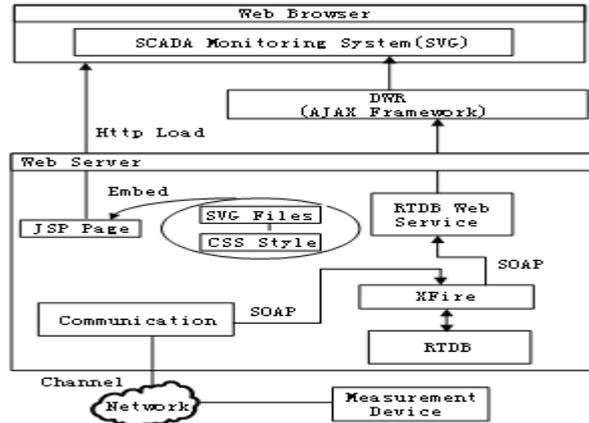


Fig.1. System architecture