

A data seamless interaction scheme between electric power secondary business systems

Wenkai Ai¹, Feng Qian¹

¹NR Electric Co., LTD, Nanjing 211102, China

Email: aiwk@nrec.com

Abstract. At present, the data interaction of electric power secondary business systems is very high, and it is not universal to develop programs when data interaction is carried out by different manufacturers' electric power secondary business systems. There are different interaction schemes for electric power secondary business systems with different manufacturers, which lead to high development cost, low reusability and high maintenance difficulty. This paper introduces a new data seamless interaction scheme between electric power secondary business systems. The scheme adopts the international common Java message service protocol as the transmission protocol, adopts the common JavaScript object symbol format as the data interactive format, unified electric power secondary business systems data interactive way, improve reusability, reduce complexity, monitor the operation of the electric power secondary business systems construction has laid a solid foundation.

1. Introduction

With the improvement of the automation level of the electric power secondary business systems [1-4] and the frequent interaction of the data between the electric power secondary business systems, the realization of unified and efficient data interaction demand is becoming increasingly prominent. At present, the data interaction between power secondary business systems is divided into three categories, including through historical database interaction, through file interaction and interaction through power system-specific protocols. In these three forms of interaction, the data format of different manufacturers is different, and the difficulty of data interaction between the electric power secondary business systems is greatly increased, which greatly limits the development of data communication between the electric power secondary business systems.

In order to reduce the complexity of data interaction between the electric power secondary business systems and improve the data exchange, the JSON (JavaScript Object Notation) [5], [6] is used as the data interactive format, which is convenient and efficient to promote the development of data communication between the electric power secondary business systems. The use of JMS (Java Message Service) [7], [8] as a data exchange protocol program, which can shield the electric power secondary business systems data differences, to achieve the purpose of seamless data interaction, and has the reliability, efficiency, real-time And scalability and other advantages.

2. Technical work objective

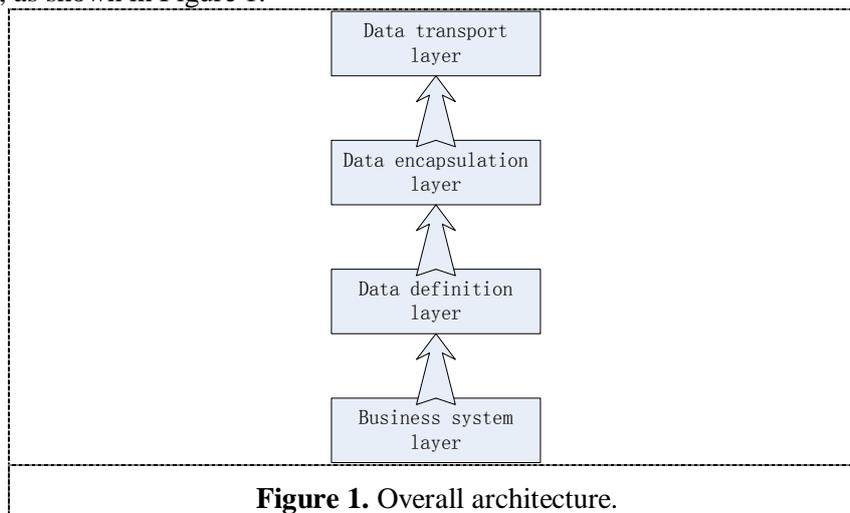
The purpose of this paper is to design a scheme to adapt to the complex data interaction between the electric power secondary business systems, to shield the complexity of the interactive data between the business systems, to format the interactive data, and to build the JMS protocol And JSON data format



data exchange framework, thus accelerating the development of electric power secondary business systems data interaction, for a variety of business system data can be easily shared to lay a solid foundation.

3. Overall architecture

The seamless data interaction framework of the electric power secondary business systems is to realize the separation and interaction between the data communication and the business system of the electric power secondary business system according to the design idea of the hierarchical architecture, and enhance the flexibility and expansibility of the framework. The framework is divided into four levels from bottom to top, namely: business system layer, data definition layer, data encapsulation layer, data transport layer, as shown in Figure 1.



3.1. Business system layer.

The business system layer refers to all systems in the electric power secondary business systems, which provide the source of the interactive data, including EMS system (Energy Manage System), DMIS system (Data Management Information System), WAMS system (Wide Area Measurement System), Secondary operation and maintenance system, Dynamic security assessment system.

3.2. Data definition layer

The data definition layer refers to the specific data required for data exchange, such as alarm data, index data, model object data, vulnerability record data, baseline verification record data, syslog log data (system log).

3.3. Data encapsulation layer

The data encapsulation layer encapsulates the data in the data definition layer and is encapsulated in the JSON format to provide a uniform data format to facilitate encapsulation and parsing of data..

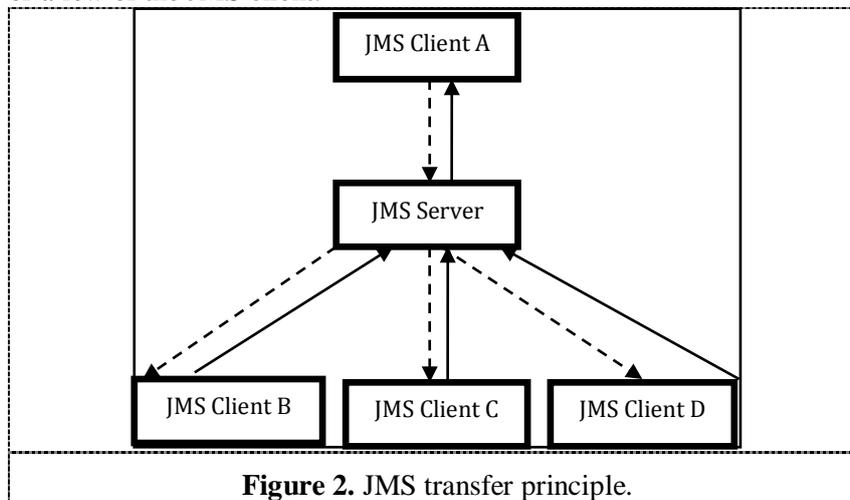
3.4. Data transport layer

The data transport layer is the focus of the framework, which includes the JMS client and the server, the encapsulated data through the source JMS client to the JMS server, and then forwarded by the JMS server JMS client to complete the data transmission, Refer to the data exchange process in Section V for a specific procedure.

4. Deployment architecture

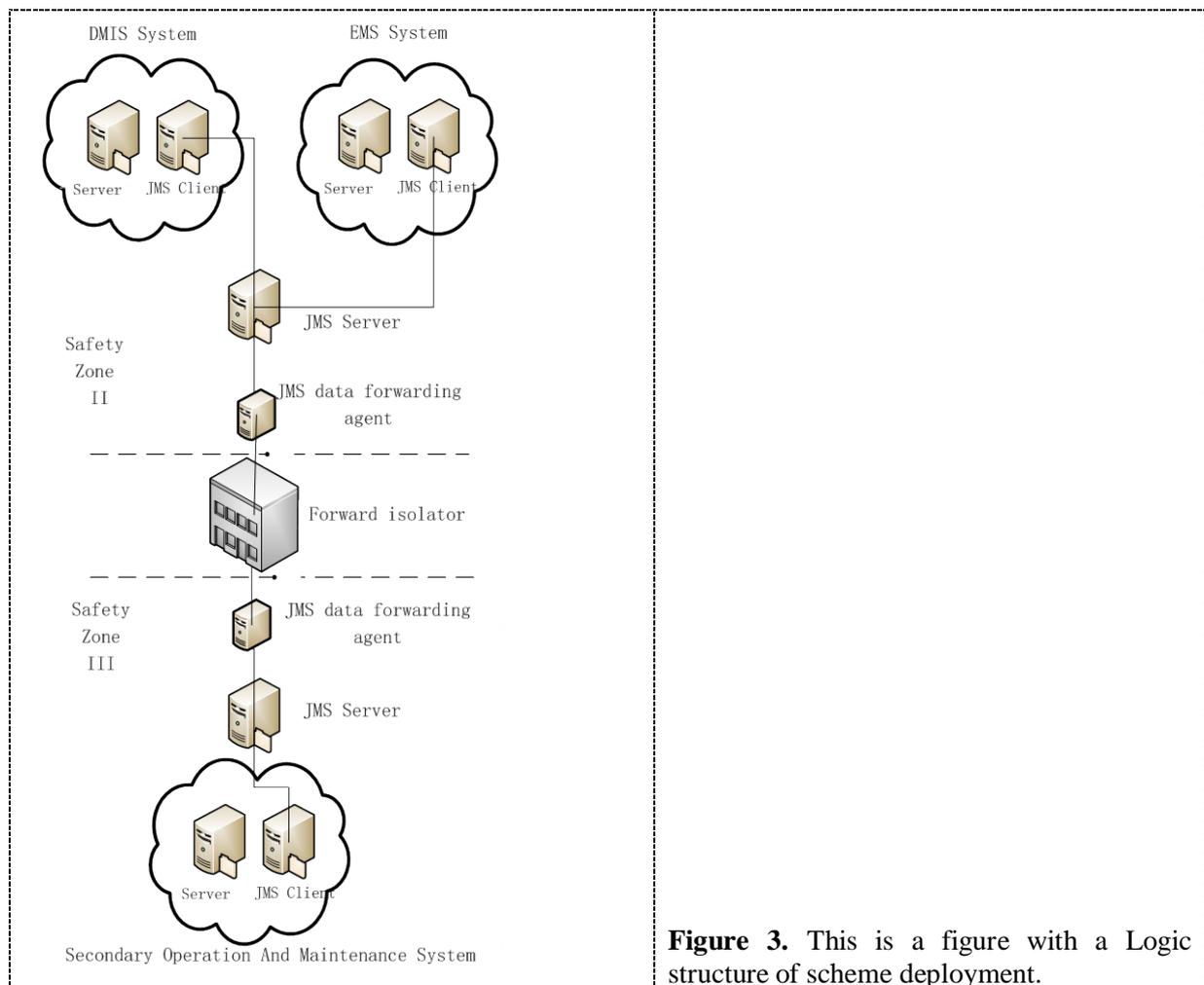
First introduced the principle of JMS transmission, as shown in Figure 2; data sender and receiver are collectively referred to as JMS client, and are deployed JMS client dynamic library, JMS server is the deployment of Apache ActiveMQ (Active Message Queue) [8] server. Data from the JMS client A

through a channel to send data to the JMS server, JMS server and then send the data to monitor the channel of one or a few of the JMS client.



According to the "China Electric Power Secondary System Security Protection Overall Plan" standard, completed the electric power secondary business systems seamless data exchange program deployment diagram, as shown in Figure 3.

In the Security Zone II and Security Zone III, select a server to deploy the JMS server, which is responsible for receiving and forwarding JMS data for this security zone. In each of the electric power secondary business systems in the secure zone II, the JMS client is deployed on the server of the one electric power secondary business system as the sender. In the security system of the security zone III, the JMS client is also deployed on the server of the one electric power secondary business system as the receiving end. The JMS client of the secure II zone sends the JMS data to the JMS client of the secure zone III, which needs to pass through the forward isolation device. The JMS data itself can't pass through the forward isolator, The JMS data forwarding agent of the security zone II forwards the JMS data of the security zone II to the JMS data forwarding agent in the security zone III and sends the JMS data to JMS server by the JMS data forwarding agent of the security zone III, and then the JMS server in the security zone III is sent to the JMS client of the security zone III, where the specific implementation of the JMS data forwarding agent will vary from vendor to vendor, but the function is the same.



5. Data exchange process

The data interaction process includes the same security zone data interaction and cross-safe zone data interaction, as described below.

5.1. The same security zone data interaction.

The process of data interaction between electric power secondary business systems in the same security zone is divided into three steps. For example, the EMS system of the security zone II needs to send its alarm data to the DMIS system of the same security zone as follows.

- In the first step, the topic-ems channel is established between the JMS client and the JMS server on the EMS system for sending data. The JMS client on the DMIS system also establishes the topic-ems channel between the JMS client and the JMS server, Used to receive data.
- The second step, JMS client program on EMS system reads the alarm data, and then formatted with JSON interface to transfer alarm data into JSON format.
- In the third step, the JMS client on the EMS system sends the JSON format data to the JMS server through the topic-ems channel. After receiving the data on the topic-ems channel, the JMS server sends the data to the topic-ems channel for listening The JMS client of the DMIS system, and then it continues the data processing, analysis and other operations.

5.2. Cross-safe zone data interaction.

The process of data interaction between electric power secondary business systems in different security zones can be divided into five steps. For example, the DMIS system in the secure zone II

needs to send the indicator data to the Secondary operation and maintenance system of the safety zone III as follows.

- In the first step, the topic-dmis2 channel is established between the JMS client and the JMS server in the same security zone on the DMIS system of the security zone II for sending data. The topic-dmis2 channel is also established between the JMS data forwarding agent for the security zone II and the JMS server in the same security zone and is monitored on the channel for receiving data while establishing a send link with the forward isolation device software of the security zone II.
- The second step is to establish the topic-dmis3 channel between the JMS client and the JMS server in the same security zone on the secondary operation and maintenance system of the security zone III and listen on the channel for receiving data. The JMS data forwarding agent for the security zone III establishes an topic-dmis3 channel between the JMS server and the same secure zone for sending data while establishing a receive link with the forward isolation device software of the security zone III.
- The third step, JMS client program on DMIS system of the security zone II reads the indicator data, and formatted with JSON interface to transfer alarm data into JSON format, and then JSON format data through the topic-dmis2 channel sent to the security II JMS server, which receives the data in the topic-dmis2 channel and forwards the data to the JMS data forwarding agent that is listening on the topic II-dmis2 channel in the security zone II.
- In the fourth step, the JMS forwarding agent of the security zone II receives the data on the topic-dmis2 channel and sends the data to the forward isolation device software of the security zone II, which then transmits the data from the security zone II to the security zone III, and then sends the data to JMS data forwarding agent of the security zone III.
- In the fifth step, the JMS data forwarding agent of the security zone III sends the data to the JMS server of the same security zone through the topic-dmis3 channel after receiving the data. After receiving the data on the topic-dmis3 channel, the JMS data forwarding agent sends the data to the JMS server In the security zone III topic_dmis3 channel on the monitor of the secondary operation and maintenance system JMS client, and then continue to carry out data processing, analysis and other operations.

6. Applications

The scheme has been implemented in the electric power project, which solves the complicated data interaction between the electric power secondary operation systems and realizes the interaction between the model data of the Secondary operation and maintenance system and the Network management system and the Security control system.

In the implementation of the power project, the first Network management system for network equipment discovery and data collection, and then the results of the collected JSON format to form a model, and sent to the Secondary operation and maintenance system and the Security system with JMS, which the two business systems are each modeled and stored in their respective databases. The Secondary operation and maintenance system to the model of the data in a unified code, and then sent to the Network management system and Security system through JMS, so that the three systems on the entire network equipment is unified. After the Network management system collects the relevant real-time data of the network, the unified coding format and data are combined to form JSON format, and then sent to the Secondary operation and maintenance system through JMS. The Secondary operation and maintenance system receives and stores in database. Then, the Secondary operation and maintenance system displays the data of the electric power system in the form of a picture.

The scheme gives full play to the Network management system, the strength of the Security system, the rational integration of their data into the Secondary operation and maintenance system for display, and JSON for the interactive data format, JMS protocol for data interaction, reducing the complexity and dependency of the respective system development, but the definition of JSON format is currently a private definition, with some limitations, only in the definition of a unified JSON format standard, the scheme can be widely used in the electric power secondary business systems.

7. Conclusions

The seamless interaction scheme between the electric power secondary business systems is based on the more mature and common JMS technology and widely used JSON format in the IT industry, and the advantages of both are applied to the electric power system data transmission, which reduces the complexity and dependency of the common data interaction, a good solution to the data heterogeneity between the system, the electric power secondary business system data exchange construction has important guiding significance. However, in the practical application of the electric power system, the interactive JSON format is privatized, there is no official unified standard, a great impact on the promotion of the scheme, the latter will be through the practice of the project, and actively promote the standardization of JSON format work.

8. References

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