The Design and Implementation of an Automatic Detection Mode

Chen Liu, Qiaochu Han and Haitao Wang

ABSTRACT

This paper proposes a method of how to improve the Measurement Service Management Platform from standalone version to full automatic version by adopting the COM (Component Object Model) modularization technology. This method could realize the full automation testing from censorship to occupational certificate and data sharing, exchanging.

INTRODUCTION

As we enter into the age of information, the high-speed development of computer science and internet technology, information technology already infiltrates our life everywhere, influencing us, changing us and promoting the development of society continuously. The informationalized level of a country is one of important factors that indicate its degree of modernization and comprehensive strength\[1\]. The combination of information technology and measurement testing technical could re-organize the process of measurement testing, promoting the technology of automatic measurement service and make the information technology and automatic technology applied widely through the area of measurement testing.

In recent years, as the development of measurement testing area, the number of customer group that needs the measurement testing service keeps increasing and the testing requests becomes more professional and complicated. Because of this, the testing costs increased quickly, the accuracy of testing results and the quality of

Chen Liu, Qiaochu Han, Haitao Wang. Liaoning Provincial Institute of Measurement Shenyang, China
certificates could not be guaranteed due to the large amount of testing missions. The traditional manual work testing mode could not get rid of the sophisticated data calculation and processing under the pressure of the huge amounts of work. The error rate of the data would be increased. Although the automatic testing system mode from standalone version could reduce the error rate partly, due to the unconnection with the Measurement Service Management Platform, the automatic testing results still need to generate the certificates manually which may increase the probability of error made by a person. From the description above, one could see that the standalone version is not the best way to manage the Measurement Testing Service.

In order to reduce the interference factor and error in person, realize the testing service electronically, non-paper processing and enhance the efficiency of testing work effectively, this paper proposes a full automation testing mode based on Measurement Service Management Platform. This mode provides unified data interface function relying on the Measurement Service Management Platform to satisfy the full automation testing process of the tested instruments from censorship-transitional procedures-testing-generate and verify certificates to dispense instruments and certificates.

**SYSTEM DESIGN AND STRUCTURE**

Full automation testing mode uses the technology of MVC three layer architectures and COM modularization to provide integrated data DLL connector mode. In this way, all different kinds of standalone testing systems could exchange and share data through Service Management Platform as shown in Fig. 1.
In order to get better research results of the full automation testing mode, this paper provides a design of automatic thermal resistance verification system with multi-channel scanning switch. And based on this design, the functions and structure of the full automation testing mode would be analysis detailed. Automatic thermal resistance verification system, firstly, sends order code to the next place machine to let the thermal resistance do the data records at different temperature points through serial server module. Secondly, the testing results would be returned to the superordination machine to be packaging and processing. By calling the interface of COM modularization, original records and certificates module would be auto loaded and generated. Finally, the testing data would be passed to Measurement Service Management Platform to archive the goal of effectively connecting automation testing system and Measurement Service Management Platform.

The thermal resistance auto-testing system is act as a carrier of the full automation testing mode to connect the data interface and the Measurement Service Management Platform, thus, the full automation testing mode is realized. In this paper, the design of thermal resistance auto-testing system is developed based on Automated Rental Management (ARM), with both software and hardware. The program of the next place machine controls the multi-channel scanning switch, digital multimeter, constant temperature oven and other related equipments to accomplish the temperature control of industrial platinum (Pt) thermal resistance verification, data recording, data processing and data saving. Based on the structure of the thermal resistance auto-testing system, this system is mainly has three gradation of modulars, i.e. verification management of superordination machine, data communication and the data record of the next place machine. This system also
has 9 function modulars which includes system set-up, data processing, command sending, command receiving and data recording.

FULL AUTOMATION TESTING MODE PROCESSING DESIGN

The full automation testing mode processing is mainly concern service management processing as the main line, including customers come and censorship equipments, enter the information of the equipments that need to be testing, equipments handing over procedure, equipments testing provide certificates with data records, certificates printing, give out equipments and certificates. The whole system procedure, as describes above, achieves the goal of full automation testing, electrically, non-paper work during the service management and equipments testing.

The main profession process of Measurement Service Management Platform does not include equipments testing section, which means the equipments testing section is divorced from the electronic process of business management. And also, the information of equipments will be recorded again by testing staff, which may increase the artificial error rate and go against the management of measurement testing business. The full automation testing modes bring the automatic thermal resistance verification system into the Measurement Service Management Platform to make the equipments testing section as a part of the main business process. In this way, the full automation testing process from customers come and censorship equipments, enter the information of the equipments that need to be testing, equipments handing over procedure, equipments testing provide certificates with data records, certificates printing to give out equipments and certificates is realized.

KEY TECHNOLOGY AND DIFFICULTY

A. C/S Three-tier Architecture

COM is a binary-interface standard for software components introduced by Microsoft in 1993. The essence of COM is a language-neutral way of implementing objects that can be used in environments different from the one in which they were created, even across machine boundaries. It is also the basis for several other Microsoft technologies and frameworks[2]. COM application is mainly divided into two parts: COM server and COM client. COM server is mainly provides components mode and COM client uses the application provided by COM server and must apply the standard interface to get the service from COM server[3].

The full automation testing mode is developed by C# language, Model-View-Controller (MVC) three layer architecture is applied as inside structure and published in Dynamic Link Library (DLL) form. By providing the uniform data interface, standardized the interface mode based on the Measurement Service
Management Platform’s full automation testing system and enhanced the system application’s expansibility.

B. Customize Original Records and Certificates Templates

C/S three-tier architecture mode is deployed according to the functional partitions, which mainly includes Presentation Tier, Application Tier and Data Tier. Presentation Tier occupies the top level and displays information related to services available on a website[4]. Application Tier is also called Logic Tier, it controls application functionality by performing detailed processing. Data Tier houses database servers where information is stored and retrieved, data in this tier is kept independent of application servers or business logic. Comparing with C/S two-tier architecture mode, C/S three-tier architecture mode allows the Data Tier maintained as an independent module on a separate platform to increase expansibility, flexibility, security and reusability. C/S three-tier architecture mode allows any one of the three tiers to be upgraded and replaced independently and each tier can do the data exchange through the set-up of the object mode interface.

![Diagram of C/S three-tier architecture mode](image_url)

Figure 2. Different Set-ups of C/S three-tier architecture mode.

C/S three-tier architecture mode has three different kinds of set-ups as shown in Fig.2. In this paper, the second C/S three-tier architecture mode is applied for the design of the COM modulization interface. From the figure above, one can see that different tiers lay on different platforms. In this way, the Logic Tier of the software connects closely with the hardware to speed up the performance of the database.
CONCLUSION AND FUTURE STUDY

The full automation testing mode is designed based on the Measurement Service Management Platform and the thermal resistance auto-testing system is brought into the measurement testing service management process to auto-load the customize original records and certificates templates. The combination of these two systems make the hope of electrical, non-paper work during the measurement technical institute service management and equipments testing progress comes true. This mode standardized the interface mode of full automation testing based on the Measurement Service Management Platform to effectively connect with systems of different automation levels and it also has powerful application expansibility. As mentioned in this paper, this system is also good for reducing key data transfer and record times, reducing the interference factor and error in person, decreasing data error rate and enhancing the efficiency of testing work effectively. However, the full automation testing mode is still not mature on the data record and human-computer interaction aspect. And how to add on App program, Wechat or other functions to enrich the aspect of data record and human-computer interaction will be the research direction in the future.

REFERENCES