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Research for distributed automatic test system

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Abstract

Along with the development of computer and network technology, a distributed automatic test system works in a local area network is on the date. There are very great significance to investigate the follow topics, how to manage the resource in the ATS, how to find and drive the instrument in the ATS. This article combines the technology of distributed component object model and active directory Service, realized an open test system architecture.

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1. Introduction

Computer technology and network technology have greatly promoted the development and innovation of automatic test system (ATS) and automatic test equipment (ATE) technology. The development of automatic test system has been tremendous impacted. Many of the first generation of automatic test systems was private systems. They were designed for a specific task. In the 70's, the problem of standardized general interface bus for automatic test systems was solved. Automated testing had come into the second generation of the most extensive. And now the third Generation Automatic Test System is composed of modular instruments. Since 1987, HP, TEK, and other major manufacturer of electronic measuring instruments jointly proposed a new program module that is VXI instrumentation bus system.

ATS	Automatic Test System
DCOM	Distributed Component Object Model
AD	Active Directory
ATE	Automatic Test Equipment

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2. The applications and the problems of the test system architecture

As shown in figure 1, the test structure is a hierarchical structure.

The top layer of the test structure is the implementation of test software, which manages services and provides the interface for users and include database connectivity, reports generation, equipment configuration management, and related testing processing control. The application in the top layer will call test module components in the next layer. These test module components in the second layer can be developed in a variety of ADE (application development environment, such as VC, Delphi, LabVIEW, VB, etc.). They can be used to obtain test data from the instrument, calculate data, and make a judge according to test results. The third layer is the instrument driver layer, which can follow the industry standards (such as IVI), or be made up by the traditional instrument components.

Next is the instrument input and output layer. In this layer application can communicate directly with the instrument which is achieved based on the standard VISA. The bottom layer is the instrument hardware, including a variety of instruments. These instruments have different communication bus structure, such as a common GPIB, VXI, PXI, USB, and IEEE 1349 and so on. For the entire test system, all layers are integral part of the system.

With the development of network technology, users need to perform testing tasks within a network. The structure described in Figure 1 Test System can not meet the needs of users:

First, test equipments are no longer just installed on a separate computer, but may be installed in any PC within a network, and the application can be executed in any other PC in the same network.

Secondly, the functions on the client are too concentrated to keep the efficiency of the test system. It is necessary to distribute the functions to many clients. Many clients provide services for one test system cooperatively.

Therefore, we need research out architecture of an open test system. And the architecture should have following characteristics:

1. The architecture must have a directory information base, in which to store the properties of various objects and components services that it provides, and to store equipment resource information.
2. The architecture must have a standard for component interface.
3. The architecture must define the way of interactive between of components and information model in a test environment.

In this paper, an actual automatic test system (Quality controlling system for tobacco materials) is architected. By the using of technology of distributed component and Active Directory, the hardware resources, software components and application services in this test system are managed in an open distributed test system

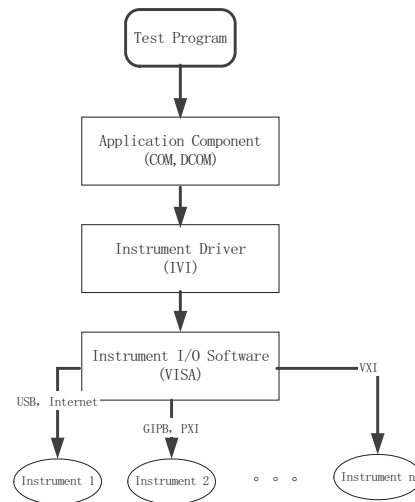


Fig.1 the Old Test System Architecture

3. DCOM and AD

3.1. Distributed component technologies(DCOM)

COM, the software object model (Component Object Model), is a binary-interface standard for software component introduced by Microsoft. COM provides both a standard interaction between components, but also provides the environment of interaction, because the interaction between the component objects is not dependent on any particular language, COM is a standard for collaborative development of different languages.

DCOM is an extension of COM technology. It enhances the function of remote call COM components.

In addition, DCOM combines the original ActiveX COM technology, so variety of ActiveX components can be call remotely in DCOM.

The interactive between the components in different clients is supported in DCOM, even if these clients are located in LAN or in WAN.

The components of DCOM have many important features such as scalability, configurability, security, protocol-independent, platform independent and so on.

3.2. Active Directory(AD)

The directory is similar to a database. It usually contains some descriptive information of the property. Because it is more frequency to read the information than to write, the directory does not need to be as complex as database, such as transaction, or rollback mechanism. The directory service is a combine of directory information source and a service which provide directory information for user. A typical directory service has the following characteristics: security, distribution, reproduction.

The Active Directory is a kind of directory service provided by Win OS. It is a major innovation and an important technology of Win OS. Based on LDAP protocol in the network, Active Directory organizes effectively all resources, such as: users, computers, shared folders, etc.

4. An instance of distributed automatic test system

In this paper, Quality controlling system for tobacco materials is an instance for distributed automatic test system. The test system is used for tobacco materials, such as filter rod, pull tape, etc. The materials which pass the test can be used for cigarette.

In the automatic test system, many characteristics of tobacco materials will be test, such as tensile strength, roundness, length, appearance, water and so on. There are many measuring instruments in the automatic test system. So the automatic test system requires a network environment. The solution of this automatic test system for tobacco materials is following:

(1) The drivers of measuring instruments are developed in DCOM. And these drivers are distributed in the network.

(2) All of measuring instruments and function components in the network are managed by AD. All information is classified into many types.

The architecture of the automatic test system is shown in Figure 2 structure.

In the figure 2, the instruments can be installed in different computers in the network. The drivers of instruments and function components can also be distributed in different computers too.

The workflow in the test system is following:

① Equipments are installed in Active Directory.

The instrument-related information and drivers are registered in Active Directory service. System administrators can manage these information in the AD.

② Start the test.

The application looks up in the AD, and gets information of special measuring instruments and drivers or function components.

③ Get the test data.

The application interacts with measuring instruments and gets test data. Then it interacts with function components installed in other client and gets statistic data.

In this automatic test system, there is an instrument resource management system.

It mainly achieves the following functions:

- Equipment maintenance
- Instrument object searching
- Enable or disable an instrument object
- Function component maintenance
- Function component searching
- Access permissions management for Instruments and components

Instrument resources management system is an interactive tool which can be use for equipment install or uninstall in the automatic test system. All information will be saved in AD as objects.

A whole testing process is as follows:

1. Users execute the test program in a client. The program list out all of available instruments selected form AD. Users specify some of them no matter what them are installed in this client or not.
2. Users start drivers provided by AD and control these remote instruments. Then test data are generated
3. Users start function components provided by AD and then statistics and reports may be generated in some clients else in the network.

5. Summary

Based on the instance of an automatic test system, author has an in-depth study on technology of distributed automatic test system. not only the technology of DCOM is applied in this automated test system, but also the one of AD is applied too for resources management. The benefit of DCOM and AD Services can make the automatic test system more efficient and easier to construct.

6. References

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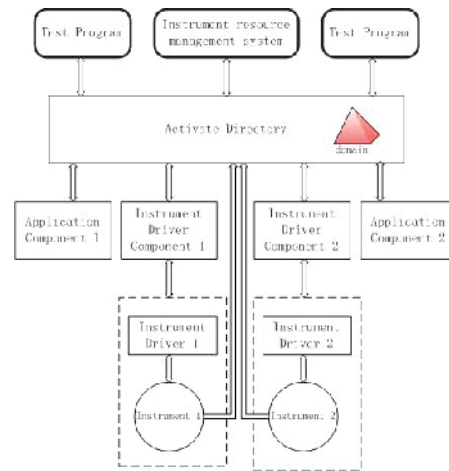


Fig.2. AD based distributed test system architecture