The Feasibility Study of The Application of Virtual Machine Technology in OPC of GDX1/2 Cigarette Packing Machine

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Abstract. OPC is the operation interface of GDX1/2 packaging machine. Its application software and related drivers are developed in Windows XP operating system. This paper introduces the virtualization of the OPC system and finally realizes the function of human-computer interaction of OPC in win7 operating system. It can improve the maintainability of GDX1/2 cigarette packaging machine.

1. Introduction

OPC is the operation interface of GDX1/2 cigarette packaging machine. It contains a Japanese PROFACE industrial computer and a com20020 communication card. It obtains data through communication with the CPU of packaging machine. Its software and driver are developed in Windows XP operating system. With the exit of Windows XP operating system, it is difficult to find the hardware that supports Windows XP operating system.

Because the old software and drivers can’t be used in win7 or later operating system, it has to upgrade OPC hardware and develop software and drivers. But the upgrade is expensive. It costs 180000 yuan. This paper mainly explores the installation and usage of OPC in virtual machine, and realizes the function of human-computer interaction in win7 or later operating system. It helps to improve the maintainability of OPC, reduce costs and increase benefits.[¹-²]

2. OPC introduction

OPC is a human-computer interactive workstation, which processes the equipment information of GDX1/2 cigarette packing machine, displays equipment fault information, statistics, parameters and functions setting. It consists of industrial computer, ARCNET communication card, encryption dog, communication card driver, encryption dog driver and OPC interface software. The OPC industrial computer and the MICRO-II CPU board card are both equipped with an ARCNET network card. The two network cards are connected by coaxial cables to form the ARCNET network of two nodes.

When the device is powered on, the two network cards are initialized. After the OPC industrial computer starts the Windows XP system, it starts the OPC interface software and enters the start screen. The software of the dongle starts to participate in the program and waits for the MICRO-II to initiate the communication. After the startup of MICRO-II, it holds the token, initiates the reconstruction frame, then adds one to the token address and sends the token to its neighbor. At the same time, it monitors the network status. If the neighbor doesn’t respond, it means that the neighbor...
doesn’t exist, and then adds one to the token address until the neighbor is found. If the OPC industrial computer receives the token, it also initiates the reconstruction frame, and sends the token to the next neighbor. After the reconstruction of the network, the network card records the address of its neighbor.

After the OPC interface software obtains the token again, it will send the data frame request to MICRO-II to ask the interface data, release the token to MICRO-II, and MICRO-II will get the token, send the data frame of the encapsulated interface data to OPC industrial computer, which will receive the data frame, unseal the data frame and enter the OPC operation interface.\textsuperscript{3,6}

3. OPC virtualization scheme

Now we will introduce our OPC virtualization scheme. First install the operating system, then install the virtual machine VMware software, and use VMware to create a virtual client. Virtual client is built on the basis of virtual machine management system supporting PCI devices, which can be used to add PCI devices. If the virtual system does not support PCI devices, it cannot be used in the virtual client. The PCI type ARCNET communication card of the original OPC cannot be recognized by the virtual system. When implementing OPC virtualization, PCI type communication card needs to be replaced with USB type communication card. As can be seen from the instructions for using the USB type ARCNET communication card, it is the same as the control chip of PCI type communication card, both of which are com20020. Installing a new driver can replace it.

4. OPC virtualization environment construction

4.1 Hardware platform test

The hardware platform test adopts the combination of industrial control host and display, using general industrial PC and industrial level flat panel display, with the brand of Advantech. The specific configuration is as follows: i7-3610qe processor; 4G memory; 256g solid-state hard disk, expandable 2 PCI interfaces, 2 Ethernet interfaces, 6 USB interfaces.

4.2 Virtual machine environment installation steps

(1) Install the windows 7 operating system of the ark3500 industrial computer;
(2) Install the ark3500 main board driver;
(3) Install the touch screen drive;
(4) Install virtual machine software;
(5) Open the virtual machine software, configure a virtual machine according to the performance of the original machine and install Windows XP SP3;
(6) Install VMware tool;
(7) Insert the communication card and install the communication card driver;
(8) Insert the dongle and install the dongle driver;
(9) Copy OPC software to virtual hard disk.

4.3 System settings

(1) Automatic startup setting of industrial computer after power on. When power on, press del key to enter BIOS setting, select "power management configuration" sub item in "advanced" option, and enter "power on" to confirm.
(2) Hardware self check quick start setting. When power on, press del key to enter BIOS setting, select "fast boot" sub item in "boot" option, and enter "enable" to confirm.
(3) Host system configuration settings of physical machine operating system. Enter "msconfig" in the command bar to enter the system configuration settings, select "general" option, select "selective startup"; select "boot" option, select "no GUI boot", and the timeout is set to 3 seconds; select "service" and "startup" options, and close the services and startup items unrelated to the project;
(4) OPC industrial personal computer starts and restores settings. OPC industrial personal computer is usually in the state of illegal shutdown. The operating system will automatically enter the startup
configuration screen when it is powered on again. In order to shorten the startup time, right-click "my computer" and select "properties". Under the "advanced" option, click "startup and fault recovery" and click "Settings". Remove the "time to display the operating system list" option and check "when displaying the recovery option when necessary", set to 0 seconds.

(5) Startup item setting. Add a virtual machine boot shortcut to the operating system boot entry. Open the properties of the VM virtual machine startup shortcut, and enter "C:\ program files (x86) \ VMware \ VMware Workstation \ vmware.exe" - X "D: \ Vm1 \ Windows XP Professional 1. VMX" in the target column. Or open the property of VirtualBox virtual machine startup shortcut, and enter "C:\ program files \ Oracle \ VirtualBox \ virtualbox.exe" vboxmanage startvm "D: \ VW \ vbxp \ vbxp. VBox" in the target column.

(6) The client operating system settings are the same as in step (3).

(7) Add OPC startup shortcut in the client operating system startup item.

5. Online test
After the completion of the above software and hardware environment, the OPC system and the packaging machine MICRO-II system under the virtual machine environment are tested online. The two systems have normal communication handshake, and the OPC system under the virtual machine environment can fully realize the function of the original machine. The success rate of on-off test communication is 100%, and there is no crash after 170 hours of operation. The test results show that all applications and drivers are working properly.

At the beginning of testing, it is often found that the communication fails. Then we find that the start-up time of virtual machine is occasionally longer, almost the same as that of MICRO-II. When MICRO-II is started to the 60th second or so, the network reconstruction frame will be sent out. At this time, if the OPC isn’t in the waiting state, the network reconstruction fails, and the communication will not be connected. The main reason is that the system configuration of physical machine and client machine and the time of system start-up and recovery project aren’t optimized well. This problem also exists in the original OPC. After optimization, the start-up time is stable.

![Figure 1 the bus signal diagram of network startup](image)

When using the parallel port encryption dog, it is easy to cause the poor contact of the encryption dog, which leads to the failure of communication. The main reason is that the parallel port is easy to oxidize, resulting in poor contact. The solution is to remove the parallel port encryption dog, clean it with electronic cleaning agent and then install it.
6. Summary
The research of this paper shows that it is feasible to transfer OPC human-machine interface to virtual machine system, and its operation effect is the same as that in the physical machine environment. It has important practical significance to improve the maintainability of OPC and reduce cost and increase efficiency.

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