A Client Integration Solution

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Abstract

Thin Client refers to a system in which the terminals do not incorporate data or applications and perform processing by accessing a server. As requirements have recently been diversifying from the viewpoint of security enhancement, NEC has prepared three Thin Client systems, which include the "virtual PC system," "screen transfer system" and "network booting system" for selection according to environment and purpose.

This paper introduces the features of the connection systems and terminals of the three Thin Client systems provided by NEC.

Keywords

Thin Client, virtualization, screen transfer, network booting

1. Introduction

Thin Client refers to a system in which the terminals do not incorporate data or applications that performs processing by accessing a server. At NEC, we noticed the TCO reduction effect of the "screen transfer system," commenced development ahead of our competitors and have since achieved significant advances. To meet the needs that have recently been diversifying from the viewpoint of security enhancement, we now provide the following three Thin Client systems for selection according to the environment and purpose.

(1) Virtual PC System

This is a new Thin Client system based on NEC's original concept. It incorporates the client virtual machines in the server to execute applications and transfers the screen display information to the terminals. The possibilities of virtual machine concentration and dynamic resource distribution make it possible to build a system with a high TCO reduction effect.

(2) Screen Transfer System

The server executes applications and transfers the screen display information to the terminals.

(3) Network Booting System

The client disk images are concentrated on the server and the terminals are booted by means of network booting.

This paper is intended to introduce the Thin Client systems and the terminals for use with these systems.

2. Virtual PC System

As described above, the virtual PC system executes the Client OS on the server, and implements the operation console and screen display in Thin Clients.

The virtual PC system and the technology implemented with the Virtual PC Center has the following two special features, each of which will be described separately in the following sections.

- Feature (1): Load balance adjustment between client PCs
- Feature (2): Improved operability

2.1 Load Balance Adjustment between Client PCs

The virtual PC system is not only capable of running multiple virtualized client PCs on a single server but is also capable of adjusting the allocation of the actual CPU used by them, as well as of deciding the share rate (distribution rate) when the CPU is busy

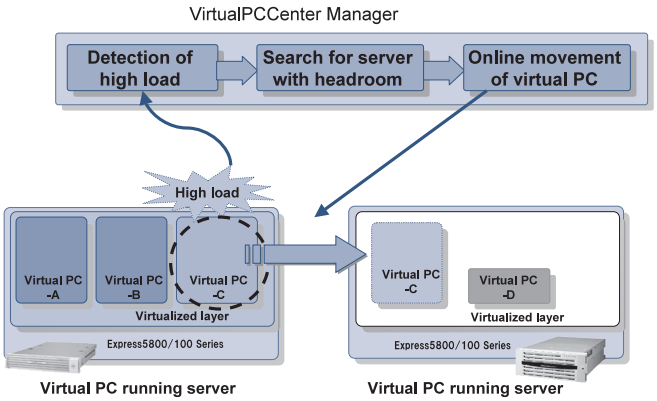

Fig. 1 Virtual PC movement and load balance adjustment.

or distributing the CPU power flexibly when it has headroom.

The load balance is not only adjustable on a single server but also across multiple servers. Since a virtual client PC is virtualized, it can be run on a different server (**Fig. 1**). It may also be moved across different servers provided that certain conditions are met. This technology makes it possible to distribute the load on the servers by moving a virtual PC running on a high-load server to another server with headroom.

2.2 Improved Operability

Improved operability is a critical point for client integration because all of the PCs used by end users are managed by a center. The Virtual PC Center has a management function for dealing with hardware status and faults including servers. This function is not unique because it is an application of the existing server surveillance and status notification technology. However, it does incorporate the autonomous recovery technology cultivated through VALUMO and it is capable of executing this process from fault detection through to automatic recovery. The automatic recovery function works according to the fault recovery method specified in advance. However, if the specified recovery method is too complicated a significant load is imposed on the operation administrator and designer. It is precisely in the context of this point that the virtualization technology of VALUMO can exert its effectiveness.

With the virtual PC system in which the client PCs are not dependent on the hardware type, uniform management is made possible using the technology for virtualization of operations as described below.

The client PC management operations can be categorized into the power operations including; startup and shutdown, the operating machine management including the creation or deletion of virtual PCs, and the software management including batch software installation, etc. Actual operations are very variable, for example, the installation execution procedures in software management are variable depending on the programs and the actually installed programs are also widely variable. In the creation of a virtual PC, too, the procedures for installing the applications to be used are widely variable depending on the individual tasks. These management operations can be unified using virtualization technology, including group management, resource management and scenario execution technologies.

(1) Group Management

The virtual PCs can be assigned into groups for reducing the numbers of management targets and operation types. For example, if the "response center" has specified applications and network setups that must be installed, changes in the number of PC operators can be dealt with by defining and managing the group under the job unit name of "response center" and controlling the number of the required virtual PCs. When it is necessary to install additional applications, all that is needed is to update the list of applications for the group and apply the updated list to the entire group. This can free the operation administrator from complicated client PC management procedures.

(2) Resource Management

The point of group management lies in its effect of reducing the operation and management targets by assigning multiple virtual PCs into groups. The resource management technology is indispensable in achieving this aim.

The resources refer to the components required for actual job execution, including the virtual PCs arranged in groups, the actually operating server hardware and other network support devices. The VirtualPCCenter uses the resource management technology to manage the resource list and the group assignment. The resource list is compiled based on close linkage with the functions for providing resources and detecting their status. For example, the server hardware status can be obtained from the server management function and the virtual PC information can be obtained from the virtualized machine function. The VirtualPCCenter provides uniform operations for the administrator by combining informations obtained from multiple sources, by managing these informations as simple "resources," and by isolating each Virtual PC's individual information as "properties" (**Fig. 2**).

(3) Scenario Execution Management

The scenario is a resource which has the information about installing software list and execution procedure, and it is managed together with the result of executing. This is a complicated process that includes the installation and execution of programs and the management of the installation list. It is simplified by isolating the application installation data, execu-

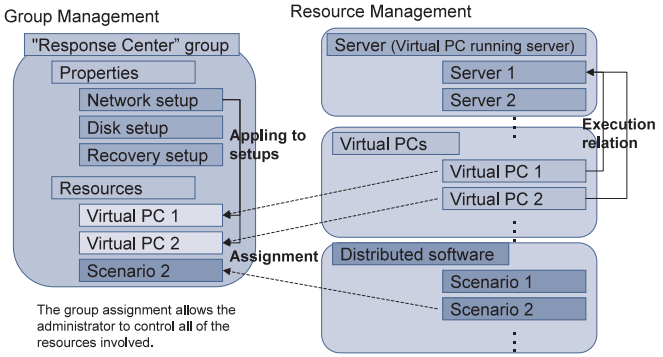

Fig. 2 Relationships between groups and resources.

tion procedures and the installed data storage server information and managing them as a single scenario. The administrator can sequentially execute the complicated processes required when creating a new virtual PC. These include the selection of procedures, software and the storage server, by simply assigning a scenario as one of the resources assigned to the group.

3. Screen Transfer System and Network Booting System

This section describes the Citrix Presentation Server screen transfer system and the Ardence network booting system.

3.1 Citrix Presentation Server

The Microsoft Windows Server 2003 incorporates a function named Terminal Server for use in implementing a server-centralized computer system. The Terminal Server executes multiple virtual Windows sessions on a Windows server, distributes screen display information to terminals and receives the keyboard and mouse input information from terminals. The Citrix Presentation Server (previously called MetaFrame) is a product complementing the Terminal Server to improve the performance, maintainability and availability of the system.

This product is offered by Citrix and is already the de facto standard of Windows-based server-centralized systems. NEC noticed this Citrix product at a very early stage, concluded a business alliance to start marketing it in April 2000 and later on concluded a technical alliance and is currently working on the preparation of the Japanese language version of the product.

3.2 Ardence

The Ardence system is a product of Ardence, Inc. that enables disk-less terminals by providing a Windows terminal network booting function. As the applications in this system run on the terminals, it can be used with high-load applications that are difficult to be used in other Thin Client systems, such as CAD programs. It also features less restriction on the user of peripheral devices such as IC card readers so it is able to use them easily. In addition, it also features a function for sharing client disk images used in network booting and manages any anomalies in caches in order to improve the system maintainability.

4. Thin Client Specific Terminals

This section describes the features of the terminals that are specific for the Thin Client systems.

4.1 Virtual PC/Screen Transfer System Terminals

We have also developed terminals that are compatible with the virtual PC and screen transfer systems for use according to purposes and design requirements. All of these terminals incorporate flash ROM in place of HDDs and are compatible with the RDP and ICA protocols.

(1) TC-Station

This is a desktop terminal featuring a light weight of 0.85kg (main body only) and low power consumption of 8W (**Photo 1, Left**). It is a low-cost terminal that incorporates an original UNIX-based OS as the booting OS for simple, quick booting.

(2) TC-Station <High-End Model>

This model is also a desktop terminal with a weight of about 2.05kg and power consumption of max. 24W (**Photo 1, Right**). It incorporates Microsoft Windows XP embedded as the booting OS and a contact-type IC card reader for the IC card authentication capability.

(3) VersaPro Thin Client (Virtual PC/Screen Transfer Type)

Featuring a light weight of about 1.83kg in spite of a large, 14-inch LCD panel, this terminal can be used in both desktop and mobile applications (**Photo 2**). It incorporates Microsoft

Photo 1 TC-Station (Left) and TC-Station High-End Model (Right).

Photo 2 VersaPro Thin Client (Virtual PC Type/Screen Transfer Type).

Windows XP embedded as the booting OS. A ROM customization service is available for providing it with compatibility with regard to individual needs such as IC card authentication and VPN client function.

4.2 Network Booting System Terminals

The following terminals featuring different functions and designs are provided as terminals that are specific for network booting systems.

(1) Express5800/51Lc and 53Xc

These terminals are designed mainly for designers and programmers. They are network booting terminals that maintain the architecture of PC workstations capable of high-speed CPU and advanced graphic processing (**Photo 3**). These terminals have been developed as a solution for the current Japanese 3D-CAD, CG and DTP design environments where regular employees, visiting specialist workers and associated company employees work together. They do not hold local data to help maintain the uniformity of the design environment regardless of the user types, which is an advantage of the network booting system, while ensuring data security.

(2) Mate Thin Client (Network Booting Type) and VersaPro Thin Client (Network Booting Type)

The Mate Thin Client features a thin, 66mm cabinet and the VersaPro Thin Client is an A4-size notebook terminal with a large 15-inch screen. In consideration of the need for prevention of data leakage, these terminals naturally do not incorporate HDD and the elimination of FDD and optical drives can also be selected optionally (**Photo 4**).

Photo 3 Express5800/51Lc (Left) and Express5800/53Xc (Right).

Photo 4 Mate Thin Client (Left) and VersaPro Thin Client (Right).

5. Conclusion

In the above, we described the features of the connection methods and terminals of the three Thin Client systems offered by NEC. It is expected that the dissemination of Thin Client will make the need for convenience, high speed and flexibility more demanding than ever. We intend to tackle further client integration and Thin Client systems development by detecting changes in customers needs and applying feedback to future product developments.

*Ardence is a trademark of Ardence, Inc.

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