Storage Centric Network System V1

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Abstract

This article outlines NTT's storage centric network system V1 (version 1), which offers a safe environment that prevents an enterprise's customer data from leaking and ensures rapid recovery and business continuity in the event of a disaster. This system reduces the total cost of ownership through on-demand use of the IT (information technology) resources and unifying PC terminal management.

1. Emergence of new businesses

With the expansion and evolution of corporate IT systems, there has been a rapid shift toward storage area networks (SANs). While the mainstream architecture today consists of an independent closed SAN using the fiber channel (FC) protocol, this may be about to change. The iSCSI (Internet small computer system interface) protocol drafted by the IETF (Internet Engineering Task Force) in February 2003 (defined in RFC 3720 in April 2004) effectively opens IP (Internet protocol) networks to storage traffic, thus enabling wider area storage networks between corporate branches rather than just within one corporate site. This development could lead to the emergence of a new type of business that seamlessly integrates network and storage technologies, which until now have been developed independently.

At the same time, there has been a growing demand for better ways to prevent the loss of information from corporate IT systems, more robust security measures, ways to reduce the total cost of ownership (TCO) through better control and management of PCs, and better disaster recovery solutions. Especially acute is the need for ways to prevent sensitive data from being stolen or otherwise lost from client PCs and ways to implement centralized control and management over client PCs.

The storage centric network system was conceived to address these needs by putting in place a new architecture that integrates high-speed high-quality network technology with high-performance high-quality storage technology to create safe and secure PC-based environments anywhere in the workplace. An overview of the architecture of a storage centric network system is schematically shown in **Fig. 1**. However, before we examine the new architecture, let us start by considering the drawbacks and needs of current systems.

Most current corporate IT systems consist of numerous PCs and each one has its own local hard disk that is highly susceptible to data loss in the event of disasters, viruses, worms, and many other problems. Therefore, developing an alternative approach that solves these problems has become an urgent concern [1]. In a related development, the "Personal Information Protection Law", which went into effect on April 1, 2005, will necessitate urgent changes in business practices. This is because corporate information and especially private data about individuals often leaks as a result of unauthorized copying or theft and this could have a major impact on a company's business.

2. NTT's storage centric network system V1

Our storage centric network system V1 (version 1) offers solutions to these problems and addresses cur-

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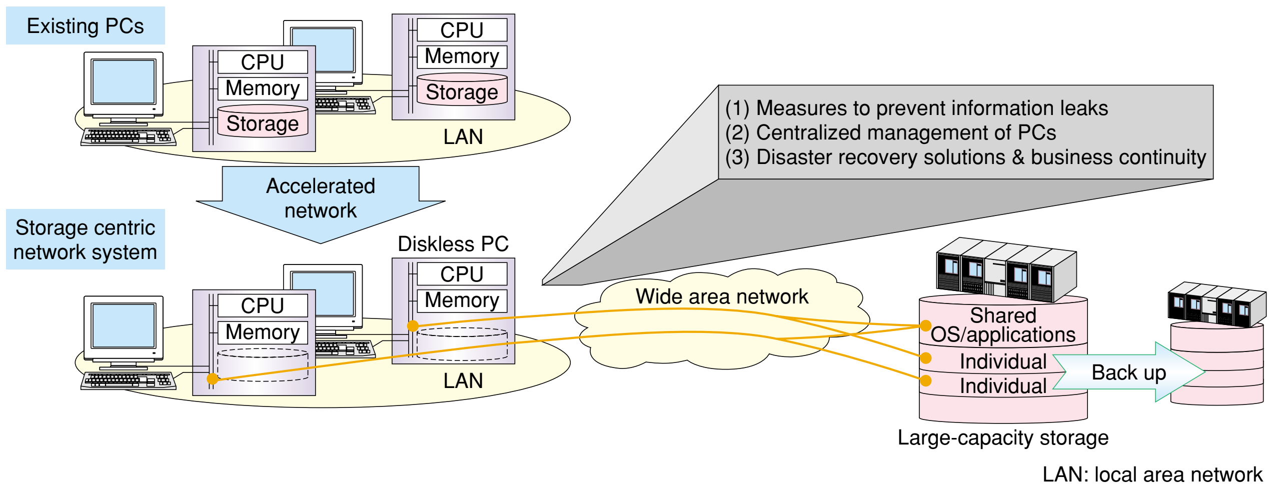

Fig. 1. Storage centric network system architecture.

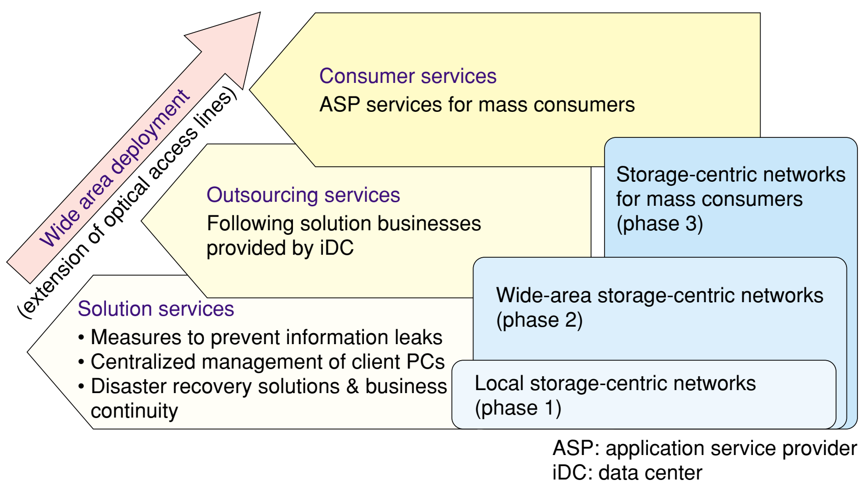

Fig. 2. Envisioned services.

rent needs by removing hard disks from PCs, concentrating storage in a data center subject to centralized management, and administering PC resources (operating systems, applications, and data) from behind the data center's locked doors. The basic architecture supports the following services.

(1) Measures to prevent information leaks: Because storage (i.e., local disks) is removed from the PCs, no information is left on the individual PCs. Thus, unauthorized accesses to it, either from within the organization or from outside, is prevented. This combination of safeguards provides an environment that structurally prevents information leaks.

(2) Centralized management of client PCs: Setting up the client environment (an operating system (OS) and applications), upgrading software, and running virus scans are all done under centralized control from the data center. This ensures that OS maintenance patches are kept up to date and also has the effect of reducing the TCO.

(3) Disaster recovery solutions and business continuity: Since the OS and applications are backed up together with the data, this architecture ensures that users can rapidly recover from the effects of a disaster and continue their business from other terminals at a different location.

3. Envisioned services

The range of services that we envision being supported by the storage-centric network system architecture is shown in **Fig. 2**. Initially, we are planning to

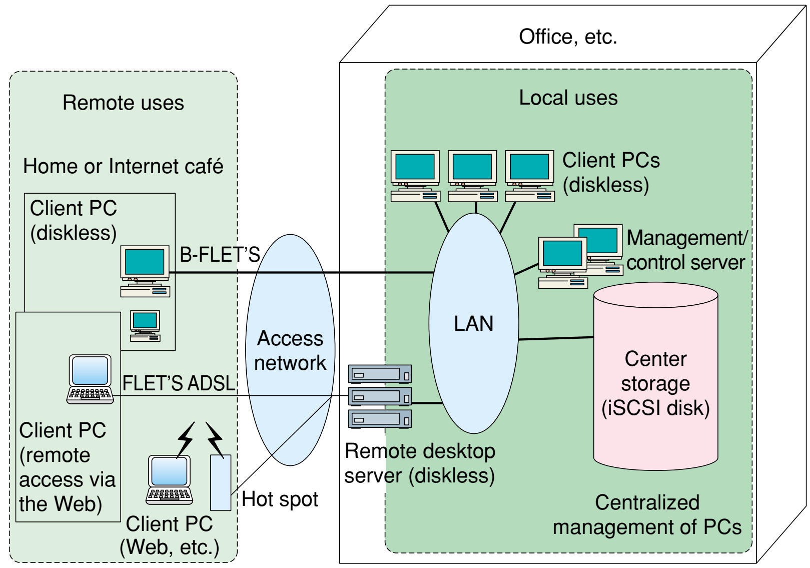

Fig. 3. Service application examples (local storage-centric network system).

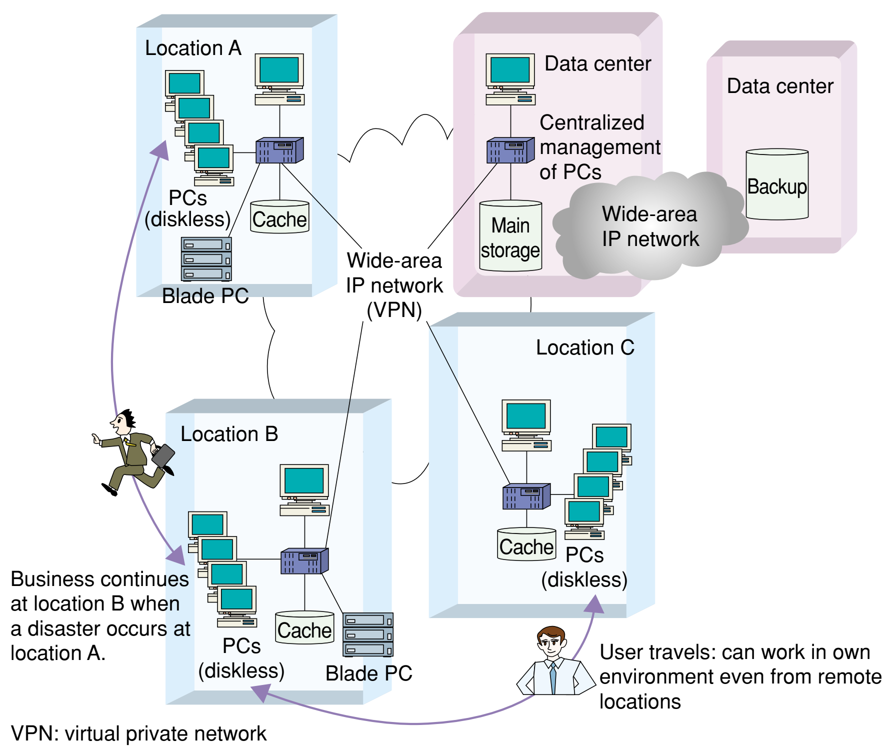

Fig. 4. Service applications examples (wide-area storage-centric network system).

provide in-house services, so we must develop the basic functions for implementing the services outlined in the previous section and then develop the solution services themselves (local storage-centric network system). The next phase (version 2) will be to extend the architecture to wider-area applications including services that can be outsourced (wide-area storage-centric network system). Considering how quickly the market is continuing to expand and how copper lines are being replaced by optical-fiber lines, we also envision consumer-oriented storage-centric network services for mass users (version 3), and we plan to investigate how such services might be implemented in the future.

Some examples of services that could be supported by the architecture at the local level are shown in **Fig. 3**. In 2005, we plan to use this architecture in-house to achieve centralized control over 100 client PCs. The system will also support remote access from business locations or from homes. Since there is great demand to access work environments from remote sites, connectivity is made possible through a remote desktop server (blade PC). The blade PC is diskless, which means that the PC's OS, applications, and data are centrally managed on the storage hardware of the data center. An individual can start up and access his or her own computer work environment on the blade PC from a remote terminal. Actual processing is done by the blade PC; all the remote PC does is to display information on the screen and handle input and output operations. This arrangement allows communication using relatively little bandwidth, yet greatly improves accessibility and convenience for employees.

Some services that could be supported by the architecture over a wide-area network system are shown in **Fig. 4**. By implementing a wide-area storage-centric network system (version 2) that can be extended between different office sites, we can apply the architecture to outsourced services. The range of services includes centralized storage in a data center (iDC) and outsourcing of services (1)-(3) described above. Deploying services over a wide area encompassing different office sites would require measures to eliminate the delays associated with the wide area network (WAN). We are now investigating how to implement a network cache technology as one possible solution.

4. Further extension to support consumer services

The next phase (version 3) will be to extend the architecture to support consumer services targeting mass users, as shown in **Fig. 5**. For example, we envision an application service provider (ASP) providing security management and backup support for people who either cannot perform these tasks or find them troublesome to perform such as elderly users or inexperienced PC users. We might expect to see all sorts of new circuit-switched ASP service offerings combined with centralized storage such as ones that (1) provide an easy-to-navigate safe secure PC environment, (2) take care of maintenance and licensing management (handled through centralized management at the data center), (3) take care of backups (handled through centralized backup at the data center), (4) support more comfortable or better quality operability and network performance, and (5) guarantee fast help desk response. Indeed, with further penetration of optical fiber, the day may come when PCs are considered so commonplace that they are as familiar to the elderly and other users as the old black rotary-dial telephones of yore.

5. Functional requirements to support services

Here, we highlight the main functional requirements that need to be satisfied in order for services to be supported by the storage-centric network V1. When booting up an OS from a PC, the prototype initially supported only Linux (Red Hat9), so we also enabled the selection of Windows XP. Remote access also needs to be supported via a blade PC. In implementing centralized management over many PCs

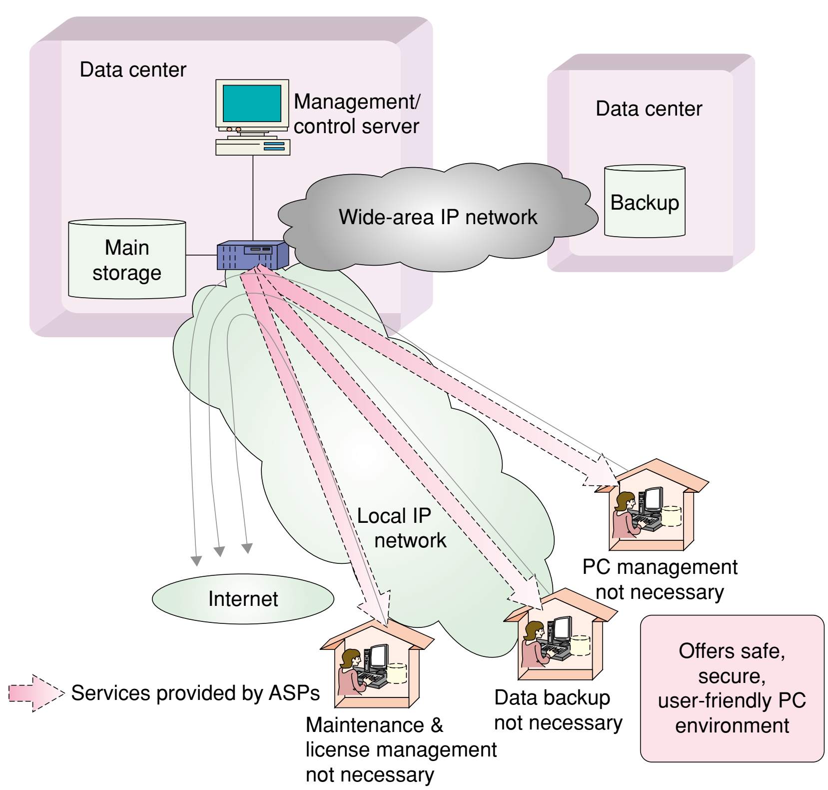

Fig. 5. Service application examples (storage centric network system for mass consumers).

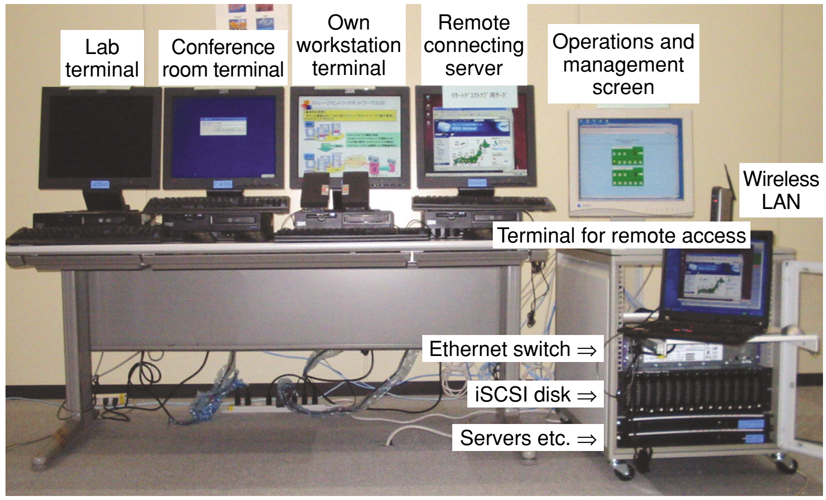

Fig. 6. Demonstration system.

from a data center, it would be extremely inefficient if virus scans had to be run or maintenance patches installed for all the operating systems and applications, so this must be implemented as a shared capability. In other words, it is important to implement a scheme that will perform a virus scan on a large number of OSs when run just once.

Figure 6 shows a photograph of a demonstration system incorporating these required functions that enabled us to try out some of the services described in this article. The demo system includes three terminals that we assume are located in different rooms: the user's own desktop terminal, a terminal in the conference room, and a terminal in the laboratory. This setup lets the user access his own work environment any time from any of these locations. For example, it lets you start up your own environment on the conference room terminal and display material that you previously created on your own workstation or start up your own environment on a terminal in the lab and modify and save material on your own desktop computer based on new experimental results just obtained in the lab. An environment could also be configured enabling you to access your computer from a remote location over a wireless LAN.

6. Service benefits and future development

The storage-centric network system can essentially be thought of as "an architecture capable of providing safe and secure individual or corporate IT environments anytime from different locations". Rather than offering this architecture as a standalone service, we believe it should be offered as part of a total solution in combination with other products or existing solutions. To put it differently, we think that one approach would be to incorporate the storage-centric network system V1 into a security-related total solution offered by service providers. It is essential to somehow link the four key benefits of the storage-centric network—prevention of information leaks, centralized management of PCs, disaster recovery and business continuity, and the convenience of being able to access your own work environment from anywhere anytime—with viable business offerings.

Reference

[1] T. Miei, M. Washisaka, N. Shigematsu, K. Kobayashi, and S. Yoshida, "Storage Centric Network Architecture," NTT Technical Review, Vol. 2, No. 7, pp. 57-60, 2004.

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