Operations Support System Solutions for IP Networks

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OVERVIEW: The rapidly emerging information and communication society affects the structures of related businesses. In particular, the rapidly growing Internet and IP-based network infrastructure requires carriers to deploy new services more efficiently with minimum cost. The operations support system (OSS) plays the central role in doing this. Hitachi's OSS solutions help carriers improve their competitive power by enabling them to quickly deploy new services at lower cost. The open platform nature of the middleware enables the integration of recently developed technologies, e.g., Hitachi's policy server, Hitachi's VPN server, and management software developed by other software vendors. Management software provided by Hewlett-Packard based on our alliance is an important component of Hitachi's OSS. The key concepts of Hitachi's OSS include "faster deployment of new services on a network infrastructure," "service level management by IP/service measurement for individual users," and "Usage- and QoS-based billing." Hitachi also fully utilizes its recent IP hardware technologies to supply solutions that integrate everything from network hardware to application software.

INTRODUCTION

THE rapidly expanding Internet provides a base for new communication services such as electronic commerce and Web hosting. To meet the resulting demands, communication carriers are providing IP (Internet protocol) networks as an information infrastructure for private enterprises and as a business portal for them. Demands from advanced business users are increasing the importance of such concepts as "enrichment of supported services," "lower operation cost," and "rapid deployment of new services." They are the key to business success in today's information society.

The operations support system (OSS) plays the central role in meeting these business requirements. It has to handle not only the network infrastructure but also related services, including integrated billing support and support of such functions as marketing and customer-relationship management.

In this paper, we explain the basic design and benefits of Hitachi's IP OSS solutions.

REQUIREMENTS AND RECENT PROGRESS

The rapid deployment of IP-based communication systems requires an OSS that can handle various new IP-based services[1)] such as VoIP (voice over IP), Diff-Serv, and IP-VPN (virtual private network). It also requires an OSS that can support the rapid deployment of new services.

Two concepts are important for the rapid deployment of new IP-based services: "process and data integration between applications"[2)] and "OSS development based on commercial off-the-shelf packages." The TeleManagement Forum has thus initiated several catalyst projects[3)] aimed at proving the concept of package-based OSS development.

The standardization of new IP services is also actively promoted. The IETF[1)] plays an important role in the standardization of various IP technologies such as policy-based network management for QoS (quality of service) and IP measurement to support service level agreements (SLAs). The IP Detailed Record (IPDR) Organization[4)] tries to standardize IPDR specifications as an IP-version call detail record.

These standardized processes are indispensable to achieving carrier-grade OSSs that support multi-vendor environments.

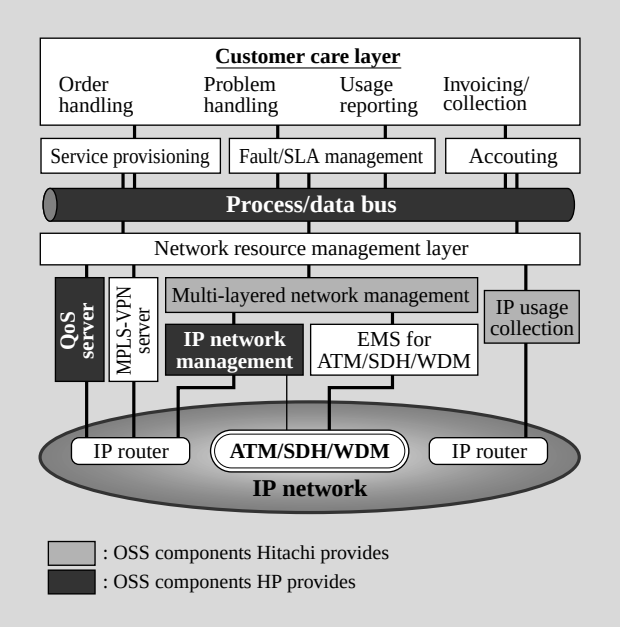

Fig. 1—Hitachi's IP OSS Concept and Architecture. Fundamental system is constructed on an open distributed object platform together with workflow technology to support cooperation between businesses and to support network resource management to combine front-end business with back-end business.

SYSTEM CONCEPT AND ARCHITECTURE

Concept

The architecture we use to achieve these system concepts has three key components (see Fig. 1).

Considering the requirements mentioned above, Hitachi's OSS is based on three system concepts.

(1) Customer care layer providing enterprise information portal

This concept means the provision of one-stop service for various customer service activities such as order/problem handling, usage reporting, and billing. It also means self-service by the customer making the best use of recent Web GUI, user authentication, and knowledge management techniques.

(2) Process/data bus providing enterprise application integration

Hitachi's CORBA*1 middleware techniques are the key to integrating various applications. They also enable the rapid integration of legacy systems and commercial software. The application management function and related wrapper parts of Hitachi's CORBA middleware play a central role in achieving this integration, enabling the rapid tuning of the OSS for future IP services.

(3) Network resource management layer integrating management over various network infrastructures

The network resource management layer defines management object specifications over the network nodes, interfaces, logical/physical paths, bandwidths, etc. in a unified way. It also provides a common API for the higher level management information data such as inventory data, fault status data, performance data, and usage data.

Architecture

(1) Middleware for application integration

Hitachi's application server is the key component in integrating the application software. Its conformity with CORBA/J2EE standards enables the integration of software, including packages on the market and legacy systems. Hitachi's work management server provides the workflow management capability needed to control various types of management software.

(2) Policy-based network management for carrier-grade large networks

Hitachi's policy server enables the deployment of Diff-Serv service. Hitachi's VPN server enables the deployment of MPLS-based IP-VPN service. Both systems are suitable for carrier-class multi-vendor large networks.

(3) Integrated Hewlett-Packard (HP) management packages

Based on the alliance between Hitachi and HP Japan, Hitachi will integrate some of HP's management applications into its OSS. They include the Smart Internet Usage IP mediation package*2, the OpenView Communications/Service Assurance integrated network management middleware*3, and the OpenView Communications/Event Correlation Services package*4.

HITACHI'S IP OSS SOLUTIONS

Three of the solutions supported by Hitachi's OSS are illustrated in Fig. 2. They help carriers cope with various business needs and system requirements when providing IP services.

*1: The CORBA (common object request broker architecture) specification provides interoperability between objects in a heterogeneous, distributed environment and was standardized by the Object Management Group.

*2–4: Smart Internet Usage (SIU), OpenView Communications/Service Assurance (OVC/SA), and OpenView Communications/Event Correlation Services (OVC/ECS) are trademarks of Hewlett-Packard Company.

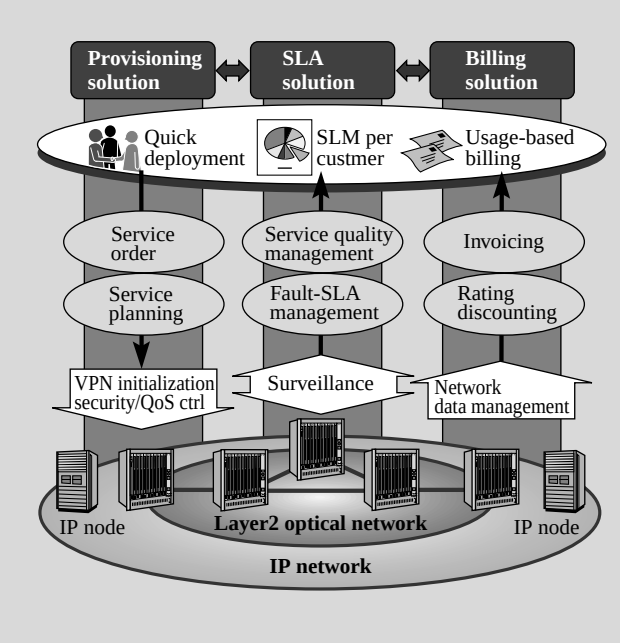

Fig. 2—Hitachi's IP OSS Solutions.
Hitachi's solutions cover provisioning, SLA, and billing and help carriers cope with various business needs and system requirements when providing IP services.

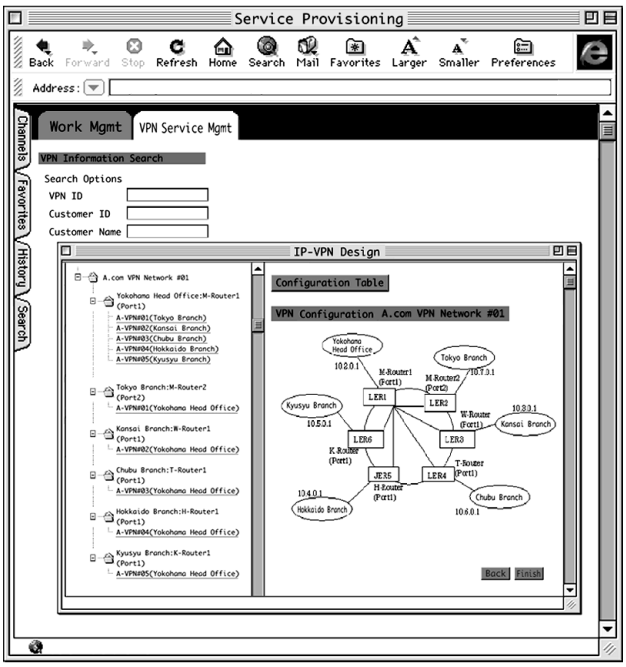

Fig. 3—Snapshot of Hitachi's IP-VPN Provisioning System.
The IP-VPN provisioning system achieves business flow-through for a series of VPN settings such as order management, service designing, and usage reporting.

Provisioning Solution

A service snapshot of Hitachi's IP-VPN provisioning system is shown in Fig. 3. A key component of Hitachi's IP provisioning solution, it covers various businesse processes, from order handling to network provisioning. The key features of this solution are:

(1) Integrated customer, order, service, and network-resource management to support provisioning work. Flow-through operation made possible by Hitachi's work management server is the key technique to integrating related applications and achieving quick service deployment.

(2) Multi-vendor support network resource management layer. A vendor-independent logical API (application programming interface) for various network resources enables integrated network management and its expandability.

(3) Policy-based QoS management. Hitachi and HP collaboration resulted in a policy server that enables integrated management of network QoS based on the operator's policy. Its automated configuration ability helps reduce operation costs.

(4) IP-VPN management. Hitachi's VPN server fully utilizes the hardware of the Hitachi router to support its QoS-and MPLS-based VPN functions.

SLA Solution

This solution supports in various ways the service quality management and fault/performance management tasks required to maintain the service level agreements between a carrier and its customers. The key features of this solution are:

(1) Customer, trouble, and service quality management and network surveillance to support service quality assurance. Individual attention to each customer's data insures quality service from network operators.

(2) Integrated management over multi-layered network. Hitachi's integrated system management system manages multi-vendor IP equipment by using the simple network management protocol standard. The HP OVC/SA and OVC/ECS protocols integrate IP layer management with vendor-specific optical-layer equipment management systems. Automated trouble ticketing and a closer connection between SLAs and the billing solution reduce the operation costs.

(3) IP measurement for surveillance of real-time IP traffic and service quality. Its real-time feature enables rapid response to network problems and improves network stability.

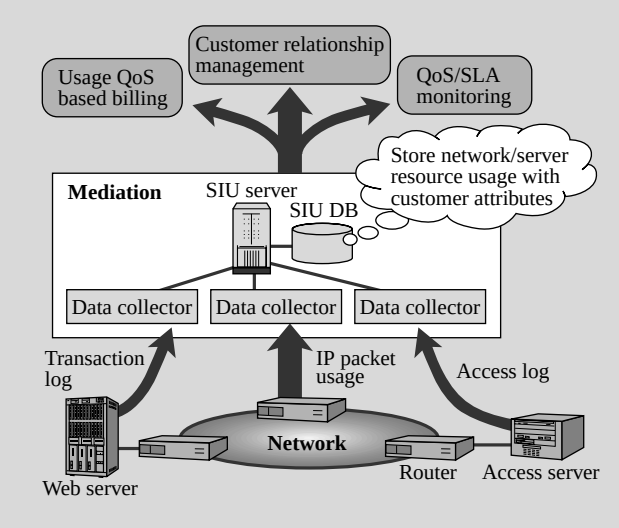

Fig. 4—Example of IP Usage Management. "Smart Internet Usage" mediation function [HP's (SIU)] enables carriers to use usage data of IP networks for billing, analysis of customer usage trends, and QoS/SLA monitoring.

Billing Solution

The billing solution supports usage-and QoS-based billing. Its input data is provided by the SLA solution. Fig. 4 shows the functions of SLA monitoring and the billing solution together. The billing solution also supports the customer-relationship management functions. The key features of this solution are:

(1) IPDR conformity, resulting in a multi-vendor-support billing infrastructure. To implement a vendor-independent billing infrastructure, Hitachi uses the IPDR conformity of HP's SIU package. IPDR also enables easy integration of third-party billing applications.

(2) Customer-relationship management function supporting sales and planning. Hitachi's data mining packages provide an infrastructure for the high-level data analysis needed to support sales and planning.

CONCLUSIONS

Hitachi's IP OSS solutions support the IT infrastructure needed for the upcoming network society. They will help carriers improve their competitive power by enabling them to quickly deploy new services at lower cost. Hitachi has a long history of providing OSS solutions to carriers and plans to continue its efforts. The alliance between Hewlett-Packard Japan and Hitachi will make it easier to meet carrier requirements.

REFERENCES

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