Integrated Network Management Architecture Based on EIP

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Abstract

The worldwide connectivity of the Internet and the explosion in its use has given rise to new companies , new business models and new applications. EIP(Enterprise Information Portal) technology enables network carriers to collect, filter and deliver just-in-time network management data directly to targeted network managers.
This paper describes EIP related technology briefly and then proposes the integrated network management architecture based on EIP technology. The proposed architecture makes it possible to aggregate value-added network management information from various kinds of network management systems and to deliver highly personalized content to network operators.

1. Introduction

As networks grow in size, speed and flexibility, the role of network management becomes more and more important. Most of the existing large telecom service providers has operated various kinds of network management systems for maintenance and control of its telecommunication network. These network management systems can be classified into 3 types according to their managed domain, i.e., ANMS(Access Network Management System), TNMS(Transmission Network Management System), SNMS(Switching Network Management System).

These network management systems provide their own functionalities to monitor their network status and performance in real-time . By using these network management systems, network status in each domain network can be monitored and controlled very easily.

But there are some difficulties in integrating the existing the network management systems because most of the existing NMSs are still are composed of the legacy systems and they have proprietary data interfaces.

The standard bodies envisioned the TMN concept as a promising approach to manage the Operations, Administration, Maintenance & Provisioning (OAM&P) functions in a multi-vendor telecommunication network.

The basic premise of the TMN is that it enables the interconnection between the OSs and the NEs or between OSs and OSs and the entire management framework is based upon standardized interfaces, protocols and messages.

Nevertheless, there are significant gaps between the proposed TMN concepts and reality. That is, there are still a number of NEs in the existing network that do not support Q3 interfaces and additional Q adapters are required. So, high initial development cost is needed to develop TMN-based network management system.

In the last four years, millions of people have begun using the Internet for sending e-mail and browsing innumerable Web sites. The worldwide connectivity of the Internet and the explosion in its use has given rise to new companies , new business models and new applications.

Perhaps no Internet technology has evolved more rapidly in the last year than "push technology", the name given to a broad new spectrum of technology that automate the delivery of information. The term was coined by contrast to the current "pull" model of the Web, where users must manually seek out the information in which they are interested. Push technology enables automated, intelligent communications relationships between information publishers and subscribers.

We believe real-time access to important network management data from all available resources empowers network operators to make better and more timely decisions.

Internet push technology can collect, filter and deliver just-in-time network management data directly to targeted network managers.

This paper describes EIP related technology briefly and then proposes the integrated network management architecture based on EIP technology. The proposed architecture makes it possible to aggregate value-added network management information from various kinds of network management systems and to deliver highly personalized content to network operators.

2. EIP(Enterprise Information Portal)

One of the most promising technologies today on the Internet would be the emerging push/pull technology. Push technology based applications have been a great success since its emergence in April 1996, the time PointCast announced its PointCast Network. PointCast Network is a virtual environment that combines content providers and information consumers together to deliver information directly onto the desktop. The delivered information includes daily headline news, financial news, weather and entertainment.

This rapid success is due to that the push technology introduced a completely new model to information distribution/retrieve applications on the Internet.

Traditional information distribution applications are based on the request/reply model, also known as the client/server model. The technology based on this model is called "pull". By this pull model, information retrieval is generally initiated by a client and data traffic flows on a point-to-point basis. While this model is appropriate for some applications, it also has some important limitations, among them:

- to initiate the connection to a server, a user should know a server's identifier, generally in form of site/port pair;
- for frequently updated information, a user should check the server periodically to get new or modified information;
- when there is a large number of users, there will be a lot of duplicate traffic in the network and the server may become over-loaded.

That's why there has been a growing interest for solutions allowing content providers to deliver information directly into client's desktops. A number of companies have endorsed the push concept, among them Pointcast(now EntryPoint), BackWeb, Marimba, Netscape, Microsoft and more.

Actually, almost all so-called "push" applications are still based on the client/server model: basically they just replaced human queries by automatic software queries in order to get up-to-date information. The distribution scheme they implement is "multiple one-to-one" connections. That results in that they have the same limitations as the traditional information retrieval systems. In other words, these applications are not true push applications; instead they are called "smart pull".

Although the service provided by "true push" applications may look rather similar to "smart pull" from the user point of view, the underlying model is significantly different: information consumers (or agents located on their desktops) have no need to fetch information by themselves. They just send the information once, data is replicated in the network when necessary to get to no matter how many receivers.

Following <Table 1> summarizes the current commercial push products and their features [6,7,9,8,10,11].

<Table 1> Commercial Push Products and Features

Provider	Products	Features	Information Media
EntryPoint	I-Server	Smart pull, channel viewer, SmartScreens	HTML, Screen Saver File Format
Netscape	NetCaster	Smart pull	HTML
Marimba	Castanet	Smart pull, Java-Based, OSD	Java, S/W package
BackWeb	BackWeb Foundation	Smart pull, Flash Notification, Polite Communication	HTML, S/W package, Infopaks
DataChannel	DCS WEBView	real-time information push using XML, EIP	HTML, XML, Any Documents (MS word, Excel etc)
TIBCO	TIB/ ActiveEnterprise	Real-time information push, EAI Solution, EIP	HTML,XML

In November of 1998, a new "investment space" called Enterprise Information Portal (EIPs), was declared by Christopher Shilakes and Julie Tylman of Merrill Lynch's Enterprise Software Team. Enterprise Information Portals are applications that enable companies to unlock internally and externally stored information, and provide users a

single gateway to personalized information needed to make informed business decisions. That is, a corporate portal brings together a wide variety of information and applications available to an enterprise and its employees, all in one well-organized personalized Web page or Web site. Employees, partners, and customers browse a corporate portal to access a logical directory of information from documents, databases, data warehouses, and groupware systems, as well as from the Internet. A corporate portal simplifies access to information and applications, and highlights important news. Therefore, the portal frees users from searching complex networks and disparate on-line data sources. This new technology enables users to effectively leverage vast information resources in less time.

Here are the essential characteristics of EIP's according to Shilakes and Tylman[1].

- EIPs use both "push" and "pull" technologies to transmit information to users through a standardized web-based interface;
- EIPs provide "interactivity" – the ability to " 'question' and share information on" user desktops;
- EIPs integrate disparate applications including Content Management, Business Intelligence, Data Warehouse/Data Mart, Data Management, and other data external to these applications into a single system that can "share, manage and maintain information from one central user interface." An EIP is able to access both external and internal sources of data and information. It is able to support a bi-directional exchange of information with these sources. And it is able to use the data and information it acquires for further processing and analysis;
- EIPs exhibit the trend toward "verticalization" in application software. That is, they are often "packaged applications" providing "targeted content to specific industries or corporate functions."

3. Integrated Network Management Architecture based on EIP

3.1. Network Management in Korea Telecom

Korea Telecomhas operated various network management systems for maintenance and control of its telecommunication network, which can be categorized into 3 groups. ANMS(Access Network Management System) manages telephone installation, telephone outside plant and subscriber line facilities. TNMS(Transmission Network Management System) manages digital transmission facilitates(SDH/PDH network) and administrates facilities related to the trunk and dedicated lines. SNMS(Switching Network Management System) manages switching telephone network. Following <Table 2> summarizes Korea Telecom's Network management system [4,5].

<Table 2> Network Management System in KT

Area	NMS	Function	TMN Support
ANMS	TIMS	Telephone Installation Management	No
	RIMS	Repair and Installation Management	No
	TOPS	Telephone Outside Plant design	No
	SLMOS	Subscriber Line Maintenance & Operations	No
TNMS	DTMS	Digital Transmission network Management	No
	MOST	Maintenance and Operation System for Synchronous Transmission network	Yes
	DMAS	DCS Management	No
	DELMONS	Dedicated Line Maintenance & Operations	No
	TRUMAN	Trunk Management	No
SNMS	MOVE	Maintenance and Operation for Various ESS	No
	NetSolver-L	Local Switching Network Management	No
	NetSolver-T	Toll Switching Network Management	Yes
	NetSolver-I	International Switching Network Management	Yes

Korea Telecom is organized into the 10 regional business groups by its territorial area. Each regional business group has its own regional network management center. Also there are toll and international network management centers. In each network management center, various network management systems did not share the important network status information since they are operated independently.

Although each database system in these network management system can demonstrate effectiveness to some degree, network management information still resides in these silos, which are disconnected from each other.

So, we have some difficulties in sharing the network

management data among various network management systems in network management center because most of the network management systems can not support TMN Q interface and provide only propriety data interface.

In recent years, Korea Telecom undergoes a lot of critical changes. One is the deregulation. New competitors start to provide telephone services in local, toll and international telephone market. To survive in these competitive markets, we are striving to differentiate ourselves from others either on price or the quality of the services. One of the keys to this differentiation among service providers is an effective and efficient network management system, which guarantees seamless network service maximizes network utilization.

Internet push and portal technology can make network management system more effective and efficient by providing a scheme which give us the power and flexibility of the Internet without having to change our existing network management systems.

Internet push and portal technology can provide customized, personal, and secure access to all the network management information in network management centers for network operators to provide integrated network view.

3.2 Requirements for Integrated Network Management

Under the current network management environment in Korea Telecom, it is hard to control traffic congestion efficiently in a disaster or an abnormal condition. Most of the network management systems in Korea Telecom have propriety data interface, operates independently and do not share the important network status information among them. Therefore, it is necessary to have the inter-working architecture among those NMSs, which satisfies the following requirements:

- exchange network performance data among switching network management systems(that is, NetSolver-L, NetSolver-T, NetSolver-I);
- exchange performed control activity information among switching network management systems in a disaster or an abnormal situation;
- exchange the critical alarm information between transmission network management system and switching network management system;
- exchange planed outage information between transmission network management system and switching network management system or among

switching network management systems;

To meet the above-mentioned requirements, and to use EIP technology for inter-working architecture, candidate EIP technology must meet the following features.

- **User profiles Management capability:** Not all users are created equal: Different users have different needs for network management information;
- **Both Push and Pull capability:** An EIP should pull information to publish to the appropriate receiver, based on the profiles, and also "push" information on a regular basis;
- **Capability of publishing all types of information:** data, word processing files, spreadsheets, audio, video, images, HTML, e-mail;
- **News broadcast and aggregation capability**: information publishers can instantly reach their base of network operators to announce fresh breaking news and aggregates a wide variety of commercial and public news source focused on specific event which influences on telecommunication services;
- **Real-time data broadcast capability:** information publishers with real-time constraints such as alarm notifications can instantly and continuously update network operators base with new fresh data ;
- **Collaborative work capability:** collaborative applications such as whiteboard applications, multimedia conferencing, collaborative document editing and collaborative software development can take advantage of real-time data broadcast;
- **Automatic DB replication capability:** distributed organizations can make their access-critical database information automatically replicated over multiple locations, seamlessly ensuring real-time databases consistency;

To implement integrated network management, which enables end-to-end management and provides unified access scheme for management information about our total network, it is also necessary to interconnect our network management systems via a high-speed dedicated data communication network.

We are constructing MIH (Management Information

Highway) to interconnect these network management systems. MIH is a high-speed dedicated data communication network, which is based on the frame relay and ATM technology. All our network management systems are organized in this MIH based on TCP/IP.

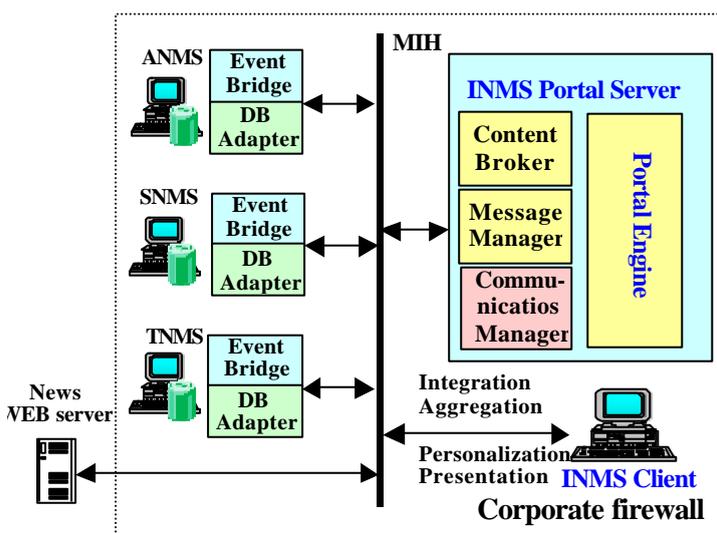3.3 Integrated Network Management Architecture based on EIP

The proposed integrated network management architecture has two major sections: adapter section and portal server section.

Adapter section consists of
- event bridge,
- DB adapter

Portal server section includes
- content broker,
- message manager,
- communication manager
- portal engine

(Figure 1) Integrated Network Management Architecture

The portal server and client elements combine to an information distribution mechanism capable of targeted, high-speed message delivery in real-time.

Event bridge in adapter section provides well defined APIs for application to dispatch critical alarm information to content broker.

DB adapter simplifies accessing and filtering the NMS's network management data in database.

DB adapter enables each NMS's database to act as peers in Internet integration infrastructure receiving content from content broker through the publish/subscribe-messaging

interface. The result is a substantial increase in the ease of integration and real-time event-to-action capabilities of our existing database applications throughout the organization Content broker in portal server monitors and aggregates key information and events from each network management system, delivering notifications and the latest information directly to users.

That is, content broker provides integration between users and each network management system to organize, filter time-critical information and deliver it to the right people at right time.

In order to easily let network operators create their own messages, portal server includes message manager component. Network operators can fill out a few browser fields to write and send a message for immediate delivery to the groups or individuals they have permission to address.

The communication manger is responsible for client connections and channel management.

Portal engine is the infrastructure to package the content broker and other module in portal server in order to integrate and aggregate the information sources. It also provides user registration, administration and access control functions to generate for true one-to-one pages for each individual user.

Unlike the traditional smart pull model, portal server uses a dual connection methodology allowing continuous, real-time updating of individual clients as the portal server receives new messages.

This approach provides real-time updating and content synchronization without the wasteful polling and late delivery.

4. Conclusion

In the context of end-to-end network management, there is a urgent need for integrated network management.

However, most of the major telecommunication carriers have the difficulties in implementing the integrated network management because most of the their network management systems are still based on legacy system design and propriety data interface. That is, each network management system's database resides in isolated "silos" which are disconnected from each other. Each one of these

"information silos" carries its own registry of authorized users. The administrative burden to aggregate information and events from each network management system is overwhelming and very difficult.

The EIPs provides good solution to implement integrated network management in the following aspects.

- Integrating access in a wider variety of data formats(comprehensive);
- Organizing access to information for users to browse(organized);
- Assembling personalized views of key information and notifying users of the availability of urgent events in real-time(personalized)
- Organizing access to data, but not storing the data itself(location transparent);
- Automatically identifying and organizing access to new content(automated delivery);
- Selectively brokering access to various network management system (secure);

In this paper, we proposed the integrated network management architecture using based on EIP features.

In the future, we have plan to exchange network management information with other carriers extending this architecture.

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