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Medical Internet Exchange Project in JAPAN

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Abstract

The Internet has been widely used by medical institutes and hospitals around the world, however ; its use for telemedicine is still low. The main reason for this is the availability of bandwidth and poor security through the net. Meanwhile, we have established and have been operating 'Cancer Information Network' among 11 Cancer Centers in Japan, mainly for Multipoint TV Conference using HDTV image. There are also similar projects among 9 cardiovascular centers in Japan. By March, all 240 national hospitals will have been connected by an IP network using an ATM backbone. The above network projects are operated independently, and have an 'Intranet' characteristic within them. There are also many hospitals and clinics connected to the Internet by commercial internet providers.

To make a secure and efficient network between these medical networks and medical sites, we started the Medical Internet eXchange project (MDX project) constructing a Medical Network Operation Center to create a link between them. To provide the administrative policy of this project, we established the Medical Internet eXchange Association.

We are planning to expand this project to Asian-Pacific countries using the Asian-Pacific Advanced Network (APAN), and also expand it to worldwide connections in the future. For this purpose, we are currently asking other countries to form a structure similar to MDX-Japan.

The concept, hardware system, software system, firewall configuration, and routing policy will be also discussed.

Keywords

Internet; Intranet; Internet Exchange, Medical Network

Introduction

Communication between medical institutes is very useful for many reasons. However, there are some issues to be resolved when using the Internet for medical information.

Medical usage of Internet

E-mail can send patient information when introducing a patient to other doctors. E-mail can also be used for consultation with images attached..Mailing lists and newsgroups can be used for group discussion and announcements, including closed ones. WWW can be used for information searching. Super-computers can be used through the Internet. Recently, there are numerous kinds of TV-conference system available using the Internet.

Issues

There are several special issuses to be concerned for the medical use of the Internet. a) High security for patients information such as encryption. b) Access control for security. c) High bandwidth for effective large image transfer. d) Relation mechanism with Hospital Information Systems with secure connections. e) How to get all hospitals and clinics on the net. f) Accessible User Policy (AUP) regulations in the case of Academic or research network.

Current status of the internet connection of medical institutes.

All University Hospitals are connected to the Inter-University Network operated under SINET which is supported by the ministry of education. Cancer Center Network has been made among 11 institutes nationwide [1]. There is also the Cardiovascular Center Network among 9 institutes [2]. Both of these national center networks is connected to the Inter-Ministry Network (IMnet) which is supported by the Science and Technology Agency. All National Hospitals are connected with each other by the Information Network for National Hospitals (INNH) supported by the Ministry of Health and Welfare [3,4]. There are many hospitals and clinics, medical sites connecting to commercial internet providers, a public network. There are many narrow connection between these network providers through public internet projects.

Encryption router system

One way to solve these issues is to install an encryption router at the connection point of each medical site or medical network connection to the internet (Fig.1). However, there still remains the AUP problem.

Medical Internet Exchange Project.

Another way is to make an Internet eXchange point to provide an alternate way to communicate each other (Fig.2). In this way, medical sites can communicate via a secure network which matches its AUP for medical use.

For an experimental setup of this Internet eXchange, we made ëMeDical internet eXchange (MDX) Projectí.

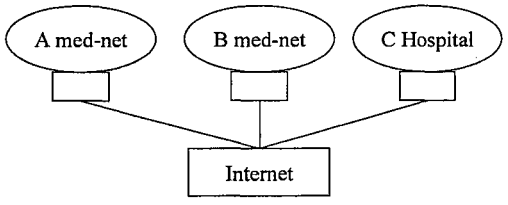

Figure 1 - Encryption Router Connection

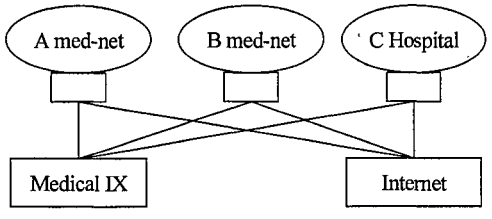

Figure 2 - Internet eXchange Connection

Methods, Systems, and Results.

Current network connection map.

Fig 3 shows an actual network connection map from the National Cancer Center (www.ncc.go.jp) using the UNIX 'traceroute' command. Host names such as www.xxx.xx.jp are well-used medical www servers in Japan. Other names are the temporay name of the router.

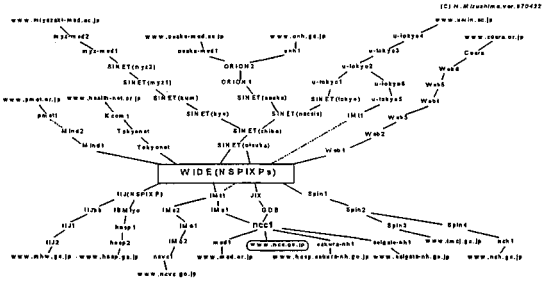

Figure 3 - Network Connection Map

As can be seen from Fig.3, most of the connection goes through the Network Service Provider Internet eXchange Point (NSPIXP), which is the central point of Japanese Internet. However, it is very slow to go to NSPIXP from an academic network, and NSPIXP itself is overloaded.

Construction of MDX project.

To overcome the issues in section 1.2, we established the MDX Project as a reseach network which will be an Internet Exchange Point amongst existing Medical Networks. The Network Operation Center is placed at a housing service with 24-hr maintenance, where most of the Japanese internet providers gathers.

The connection diagram is shown in Fig.4. Existing medical networks (such as H-Net) or internet connected hospitals can connect to MDX by making a second internet link to MDX. If the network is far from Tokyo-NOC (such as in case of C-Hosp), aframe-relay network can be used for the nearest Access Point. If some hospitals prefer an intranet connection, they can connect to the network within the firewall at MDX. If there is a new hospital which wants to connect to the Internet, they can use MDX as an internet provider, as in the case of A-Hosp.

Systems on MDX

We are installing the following functions in the MDX project Communication between medical networks and medical sites.

1. Firewall from Internet
2. WWW-server for medical content.
3. WWW-server for intranet sites.
4. DeleGate server for multimedia communication
5. Administration of Closed Medical Newsgroups
6. Nationwide Access Point (Internet / Intranet)
7. Proxy and cache server for effective retrieval of the www servers.

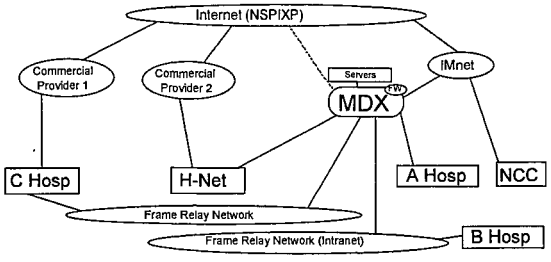

Figure 4 - Diagram of Medical Internet Exchange Project

Administration of MDX

For the organization of this project, we formed the 'Medical Internet Exchange Association' to develop the administrative policy of this project. Anyone who is interested in this project can be a member.

The following members form the headquarters.

President:

Dr. Hiroshi Mizushima (National Cancer Center)

Vice-president:

Dr. Masanori Akiyama (International Medical. Center of Japan)

Prof. Hiroyuki Tatsumi (Sapporo Medical College)

Secretary General:

Ms. Eiko Uchiyama (National Cancer Center)

Prof. Shigekoto Kaihara at Okura National Hospital and Prof. Takashi Takahashi at Kyoto Univ. kindly accepted positions as advisors for this project.

Policy of MDX

We decided that the following institutes can connect to the MDX project. a) Medical Institutes. b) National institutes handling medical information. c) Medical Network Project. d) MDX association approved sites.

Discussion

Advantage of MDX from other Internet provider.

The advantage of creating such a medical exchange point is as follows: a) High speed connection among MDX members as a short hop. b) Secure communication among MDX members as an intranet connection. c) Stable communication among MDX members as a backup line. d) AUP is not research or academic but Medical e) Access restriction by firewall. f) WWW-server placed at the NOC is stable, high-performance, and high-accessibility. g) Rental www-server for intranet server. h) Effective cache for medical purpose. i) Multimedia trans-communication using DeleGate server. j) Closed newsgroups. k) Nationwide access point both for internet and intranet.

Future system of MDX

We are planning to install following function to MDX project in future. a) Satellite backup system. b) Authorization system. c) Encrypted communication through the Internet using secure routers d) Connection to other MDX projects using the Asia-Pacific Advanced Network (APAN, see http://www.apan.net) and other international network projects.

Acknowledgments

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