

## Rapid growth of Broad-Banded Telemedicine Network in Asia-Pacific Area

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## **Rapid growth of Broad-Banded Telemedicine Network in Asia-Pacific Area**

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*Abstract*— We have promoted the international telemedicine project with Digital Video Transfer System to transmit high quality moving images on TCP/IP in Asia-Pacific area since February 2003. We have used the canvas network in Kyushu University, domestic Giga-bit networks (JGN, JGN2, SuperSINET), and international Giga-bit networks (Korea Japan Cable Network, and lines of Asia-Pacific Advanced Network). We have three categories in the project, (1) regular teleconferences to exchange the opinion internationally, (2) live transmissions during operation procedure, (3) remote participation at international academic meetings. We have had total 46 telemedical events in Japan, Korea, China, Taiwan, Thailand, USA, and Australia until September, 2005. We are planning to extend the network to Singapore, Malaysia, and Philippine until 2007. The project can promote exchanges and standardizations of knowledge on the medical technique, social medical systems, medical ethics, new medical items, medical science, and medical education in Asia-Pacific Area.

*Keywords*—**Telemedicine, Broad Band, Internet Protocol, Asia-Pacific Area**

### I. INTRODUCTION

In the China-Japan-Korea Medical Informatics Meeting 2004 in Nagoya, we reported our experiences of international broad-banded telemedicine between Japan and Korea, and the first event between Japan and China (Beijing)<sup>1</sup>. From the beginning of 2005, we have grown the network to Taiwan and Thailand<sup>2</sup>. Furthermore, we are going to extend the network to Singapore, Malaysia, and Philippine until 2007. To achieve these, we need counter-partners (medical staffs and network engineers), broad-banded lines and equipments in both sides, and human network. In this report, we introduce our activities for three years to extend the network in Asia-Pacific area.

### II. ACTIVITIES

#### II -1. Mother Project

Our project has been one of subproject of Hyeonhae/Genkai consortium which was started since 2001 to use Korea Japan Cable Network (KJCN) for research purpose<sup>3</sup>.

#### II-2. Network

##### II -2-1. Domestic Network in Japan

We connect conference rooms and operation rooms in Kyushu University hospital (Fukuoka, Japan) to the main campus of Kyushu University (Fukuoka, Japan) by the campus network with 1 Gbps. We connect to domestic giga-class backbones, JGN (until 2003), JGN2 (since 2004)<sup>4</sup>, and super SINET<sup>5</sup> from Computing and Communications Center in the Kyushu University main campus.

##### II -2-2. Domestic Networks in other countries

We used research networks inside of other countries. We have used Korea Advanced Research Network (KOREN) in Korea<sup>6</sup>, China Education and Research Network (CERNET) in China<sup>7</sup>, Taiwan Advanced Research and Education Network (TWAREN) in Taiwan<sup>8</sup>, and Thai Social/Scientific, Academic and Research Network (Thaisarn) in Thailand<sup>9</sup>.

##### II -2-3. International optic cables

We have used KJCN for Japan-Korea transmission via the Kyushu Giga POP (QGPOP) network. We have used KJCN and a Korea-China optic submarine cable for Japan-China transmission. We have used Asia-Pacific Advanced Network line<sup>10</sup> for Taiwan and

Thailand from Japan.

### II-3. Moving Image Transmission System

We usually use the Digital Video Transfer System (DVTS)<sup>11)</sup>. We had chances to use Access Grid (AG)<sup>12)</sup>, and transmission of High Definition Television (HDTV) compressed by mpeg2. To transmit high definition static image, we have sometimes used Virtual Network Computing (VNC). PCS-1 (Sony) has been backup system for the events.

### II-4. Security system

We transmit patients' live image in operation room between Korea and Japan after we get the agreement letter from the patients. In these cases, we use C4S-VPN (Focus systems Co.)<sup>13)</sup> as a security system which was approved to use by the ethical committee in the graduate school of medicine, Kyushu University.

### II-6. On-line events

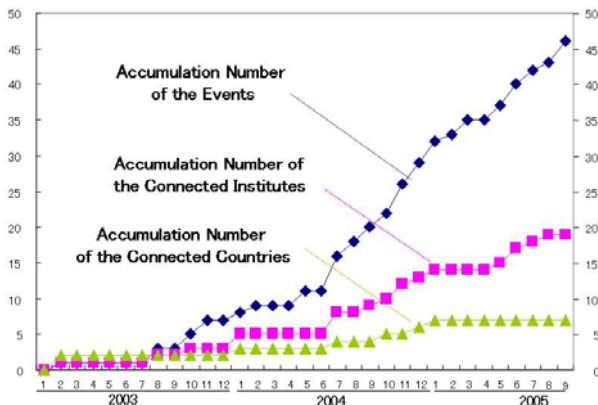


Fig. 1. The events numbers in our project for 2.5 years. We had connected total 7 countries.

We have conducted 46 events until September 2005, since we had the first telemedicine event with Hanyang University in Seoul in February 2003<sup>14)</sup>. We have three categories in our project. The first is regular medical teleconference between two countries: 20 events. The regular teleconference is powerful to exchange the medical knowledge and opinion internationally. The second is transmission of live image during procedure in operation, 12 events. We have introduced our procedures of endoscopic surgery in gastrointestinal tract and thyroid gland, microscopic surgery in brain, and endoscopic retrograde cholangio pancreatography examinations, so far. The third is remote participation at international academic meetings, 14 events. We can make presentations with slides and with microscopic images remotely. The first event in this category was APAMI & CJKMI-KOSMI conference 2003<sup>15)</sup>. We

started to participate to the APAN meeting in January 2004, and have continued having demonstration sessions by medical teleconference in total 4 series APAN meetings (Honolulu, Cairns, Bangkok, and Taipei). In Taipei meeting, the medical BoF became a formal working group in APAN by the vote.



Fig. 2. APAN-Taipei on 25<sup>th</sup> Aug. 2005. The screen shows images from 4 stations, left upper: Taipei, right upper: Fukuoka, left lower: Beijing, and right lower: Seoul.

In these events and activities, we have achieved the connection including Japan (Fukuoka, Tokyo, Iwate, and Sapporo), Korea (Seoul, Daejeon, and Daegu), China (Beijing, Shanghai), Taiwan (Taipei), Thailand (Bangkok), USA (Honolulu), and Australia (Cairns).

### II-5. Offline events

Hyeonhae/Genkai consortium has regular meetings, 4 times a year, since it was established in 2001. The medical team has participated from 2002, the 8<sup>th</sup> meeting.

We have also attended at Core University program "Development and Operation of the Next Generation Internet Technologies" in Kyushu University and Chungnam National University, Korea since 2003<sup>15)</sup>. This program has medical group and we have had 4 meetings so far.

### II-6. Web site

We opened a web site in June, 2005. In the site, we call our project "AQUA (Asia-Kyushu-Advanced Medical Network)"<sup>16)</sup>. In this site, we mention about purpose of the project, organization, staffs, network we use, equipments we need, event list, papers, media reports about our project (TV and papers).



Fig. 3. The Web site shows how to set up the end station, etc.

### III. DISCUSSION

This project has started to have two functions with satisfactory growth of the network.

The first function is the role of a hub for the telemedical network in Asia-Pacific countries. This project promoted the exchange medical knowledge only between Japan and Korea in the first one year. However, after our activities in several APAN meetings, many participants from Asia-Pacific countries have joined the project. As shown in Fig. 1, we had connected 7 countries so far, and we are planning to connect Singapore, Malaysia, Philippine, Indonesia, Vietnam and New Zealand, along with servicing of optic fiber cable in these areas. We already have a name list of the contact person in each country (medical staffs and/or engineer specialists).

The second function is as the communication place of medical knowledge and network technology. We need information communication technology of multimedia and high speed transmission of high quality moving image, to exchange medical knowledge with remote place. However, the contact between two fields has been very sparse so far. The on-line and off-line activities in this project are functioning to bury the notch between the two fields.

In addition to extension of the network, we would like to use IPv6 for multicasting. With Korea, we will transmit higher quality moving image by High Definition TeleVision (HDTV) without compression, which needs 1.5 Gbps or more. We also want to have telemedical events for paramedical staffs including nurses, pharmacist, radiological engineer, etc, and for citizens.

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