International Telemedicine
Experiment between Japan and
Thailand

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Outline

- Background
  - Broadband Network in Japan
  - Next Generation Network
- A Telemedicine experiment between Japan and Thailand
  - Asia Broadband Network Experiment
  - Proposed Annotation function concept
  - Telementoring experiment using VR simulator and real tissue with annotation function
  - Telesurgery experiment
- Summary
Broadband access users in Japan

FTTH users are 9.6 million

Million lines

2000 2001 2002 2003 2004 2005 2006 2007

0 4 8 12 16 20 24 28

DSL CATV FTTH

Ministry of Internal Affairs and Communications
Comparison of Network Charge (per 100kbps)

ITU Internet Reports 2005: Internet Things Sep. 2005

Network Charge (per 100kbps) US$
Issues for Network Operators

Reductions in investment and operation costs and a revenue shift from POTS to broadband are needed.

- Promotion of Broadband Ubiquitous Service -> Revenue Shift from POTS
- Achievement of FMC and Triple Play -> Gain and Keep Market Share
- New Business Development -> Market Expansion
- Migration to IP-based Networks -> Reduction of CapEx/OpEx

*: Plain old Telephone Service
A Telemedicine Experiment between Japan and Thailand
Asia Broadband Experimental Network

Kyushu Univ.

JGN II

45Mbps International connectivity

Asia BB NW

Chulalongkorn Univ.

ThaiREN
(ThaiSARN or UniNET)

*JGN II <Japan Gigabit Network II>
Open test-bed network for research and development, sponsored by NICT
http://www.jgn.nict.go.jp/e/index.html
Proposed New technologies for telemedicine

- We have proposed
  - A secure network storage and distribution system using iSCSI
  - Tele-annotation system

- We have tested
  - MPEG4 scalable video CODEC in order to watch ROI part
    - Low latency MPEG2 video CODEC
    - Low latency H.264 video CODEC

- In this session, I will show you a detailed tele-annotation system.
Local Annotation System Configuration

- Custom Keyboard
- Tablet Display
- Microphone
- Matrix Switch
- Video Mixer
- PC
- Custom Keyboard
- Endoscope1
- Endoscope2
- Endoscope3
“Local” Annotation System Configuration

- 4x4 Matrix Switch
- Video Mixer
- Microphone
- Up Scan
- Down Scan
- RS-232C
- USB
- Custom keyboard
- Tablet Display
- Small Display
- Small Display
- Small Display
- Endoscope1
- Display1
- Speaker1
- Display2
- Speaker2
- Endoscope2
- Display3
- Speaker3
- Endoscope3
- Splitter
- Drawing Application
- Matrix Switch Control Application
- Annotation PC

Signals:
- VGA
- Audio
- NTSC
Tele-annotation System Concept

- Easy to use
- Draw simultaneously
- Simple control box

**Japan side**

- Tablet Display
  - AP Sharing (master)
  - DATA transmit

- MIXER

- CODEC

**Thailand side**

- Endoscopic camera

- MIXER

- CODEC

- AP Sharing (Slave)
  - DATA receive
Tele-annotation and Secure Storage Distribution System Configuration

Japan side

Thailand side

Secure Storage and Distribution System

Controller

Small Display

Down Scan

Client2

Down Scan

CODEC

CODEC

CODEC

JGNI

Down Scan

Storage Encoder1

Storage Encoder2

Storage Server

Client1

Down Scan

Display1

Endoscope1

Display2

Endoscope2

Up Scan

Video Mixer

Down Scan

Display3

(with Tablet)

Custom keyboard

Network

NTSC/PAL

VGA

USB/RS-232C

Annotation System

application sharing

Drawing Application

Transmitter

Matrix Switch

Annotation PC (Master)

Down Scan

Client1

Down Scan

Video Mixer

Down Scan

Display3

(custom tablet)

Secure Storage and Distribution System Configuration

Thailand side
Telementoring using VR Simulator
Result of Telementoring using Endoscopic VR Simulator

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Conclusion

Telementoring with virtual-reality-based training can be effective for the development of laparoscopic suturing skills.
A Scene of Tele-mentoring using a training box
A Scene of Tele-mentoring with real tissue
Chulalongkorn University side
A Scene of Tele-mentoring (Japan side)

Displaying an operating room at Thailand side

Custom keyboard

Tablet display

Stylus pen
A Scene of Tele-mentoring (Video)
Telesurgery System Configuration

Chulalongkorn University

Endoscopic image (reserved)
Endoscopic image (For Doctor)
Endoscopic image (For Residents)
Circumstances image of Chulalongkorn University (For Doctor)
Circumstances image of Chulalongkorn University (For Residents)
Circumstances Image of Kyushu University (For Doctor)
Camera (reserved)

MPEG4 Enc/Dec
MPEG2 Decoder
MPEG2 LL Decoder
MPEG2 Encoder
MPEG2 Encoder
MPEG2 LL Encoder

Operator (Master)
Robotic (Slave)

Kyushu University

Endoscopic Camera
Assistants Camera
Switcher

MPEG4 Decoder
MPEG4 Encoder
MPEG2 Encoder
MPEG2 Encoder
MPEG2 LL Encoder

Circumstances image of Chulalongkorn University
Back up (single channel) alternative

Doctor’s hands image at Chulalongkorn University

Endoscopic image

MPEG4 Scalable (3 - 10Mbps)

MPEG2 Encoder

MPEG2 Decoder

6Mbps
6 - 4Mbps
6Mbps

0.5 - 1Mbps

Video Phone (For Stuff Communication)

Asia BB NW and JGN II
Telesurgery Experiment between Japan and Thailand

Thailand Side

Animal Center in Medical Center of Kyushu University

Japan Side
Summary

- The telemedicine system enables a more effective medical and healthcare treatment over broadband network.
- We have developed the tele-annotation and secure storage system and also have tested some video CODECs.
- From the results of our subjective evaluation test, we have confirmed the most suitable video CODEC is H.264 and it’s bandwidth is about 3Mbps.
- We are carrying out an international experiment in telemedicine between Kyushu University in Japan and Chulalongkorn University in Thailand, and we have verified some functions.
- Our annotation system is effective not only in a telemedicine field but also in a tele-education field.
- We believe that ICT and NGN will contribute to the development and expansion telemedicine, tele-healthcare treatment.