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**Asian Internet Interconnection
Initiatives**

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第 1 章 Introduction

The Internet has become a critical and dependable infrastructure for today's society. This was clearly seen when an earthquake in Taiwan on 26 December 2006 knocked out several undersea cables off Taiwan. Some Asian countries, including Taiwan, Singapore, Thailand, Philippines, and Indonesia, were severely affected. However, satellite connectivities were not affected by this disaster. Thus we can see this as a role of satellite Internet today, in addition to providing connectivities where terrestrial links are still scarce.

Asian Internet Interconnection Initiatives, or AI³ (*ei-triple-ai*)[6] in short, was established in 1995, in order to work for the Internet development in Asian region. When we started

this project, we set some assumptions on what is required to accelerate the deployment process of the Internet: (1) a testbed network as a live demonstration and also as a technical showcase of the Internet technology is required because it always can persuade many people of the potential and possibility for the power of the Internet, (2) research for adapting and localizing the Internet to the region should be conducted simultaneously with the deployment, because the Internet is aiming to be an infrastructure for our society, and (3) human resource development locally in the region is vital for rapid deployment of the Internet because the human resource development process can reproduce more evangelists, supporters and participants for the Internet deployment.

With these assumptions, the AI³ project decided to start as a research consortium of leading research groups in universities in Asia. Because universities are in charge of human

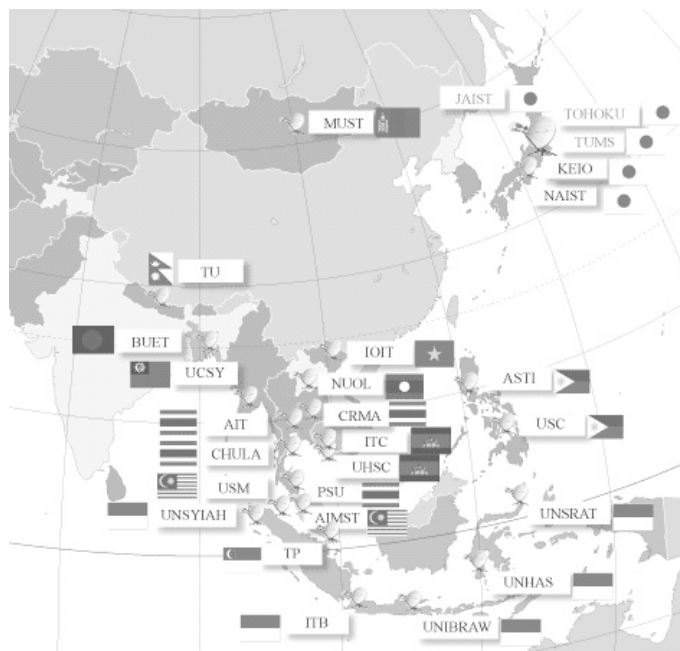
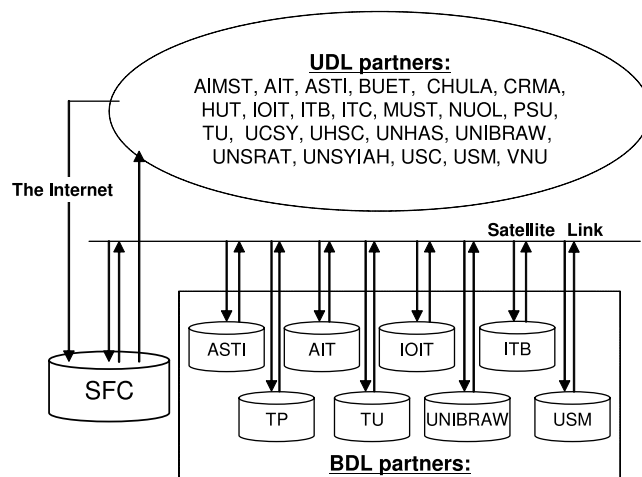


Fig. 1.1. AI³ partners

Fig. 1.2. AI³ satellite topology

resource development, less restricted to have a testbed network, and a base of research activities, we expect we can find out there many researchers who are working actively on the Internet technologies. Our decision and achievements are recorded on papers[193, 196].

In our 12 years of activities, AI³ has been an international research consortium of 29 organizations in 13 Asian countries as shown in Figure 1.1. This network has been working on 24/7 basis and turned to be its communication infrastructure for members of this AI³ project. Recently, we are not only focus on conducting satellite research activity but also conducting IPv6 research activity. Our partners include Japan, Indonesia, the Philippines, Singapore, Vietnam, Malaysia, Thailand, Cambodia, Laos, Nepal, Myanmar, Bangladesh, and Mongolia. We aim to contribute to developing a communications infrastructure as well as human resources in these regions through the project. In this report, we describe all conducted activities in 2008.

Figure 1.2 shows the satellite-network topology. The earth station at SFC transmits signals between BDL partners and to UDL partners. The UDL frequency can simultaneously transmit aggregated traffic to many partners. Satellite links are shared by both BDL and UDL signal transmissions. We are developing UDRL technology[46] in this environment.

第 2 章 Achievements

In this chap., we describe our activities in this year.

2.1 Invited Papers in SFC Journal

AI3 and SOI Asia invited partners to submit papers to be published in a special issue of KEIO SFC JOURNAL, a publication by Keio SFC Academic Society. The special issue is titled Networking and Distance Education in Asia and will be published in February 2009 and four papers will be published in this special issue. The titles, authors, and abstracts of the papers (in no particular order) are as follows.

- Title: Performance Evaluation of ROust Header Compression (ROHC) over Unidirectional Links using DVB-S Testbed
Authors: Way-Chuang Ang (Universiti Sains Malaysia), Tat-Chee Wan (Universiti Sains Malaysia), Kotaro Kataoka (Keio University), and Chee-Hong Teh (Universiti Sains Malaysia)
Abstract: Unidirectional Lightweight Encapsulation (ULE) was introduced to carry IP data over Unidirectional Link (UDL)

using Digital Video Broadcasting via Satellite (DVB-S) system to overcome efficiency problems in satellite data communication. This paper introduces a method to further improve the efficiency of IP packets transmission over satellite communication system using RObust Header Compression (ROHC). ROHC is a framework to compress headers of IP packets. This paper presents a study of performance characteristics of ROHC over DVB-S via an actual satellite link. The analysis of results showed that header compression yields significant improvement in terms of data throughput when the payload sizes of IP packets are less than 512 bytes, typical of VOIP and other realtime traffic.

- Title: Real Time Communication and Collaboration

Authors: S. Kamolphiwong, S. Sea-Wong, and T. Kamolphiwong (Prince of Songkla University, Thailand)

Abstract: In this paper, we first present some proposed extensions based on SIP (Session Initiation Protocol) conference scenarios. We then show how to use such extensions to enhance interactive distance learning (IDL) applications as an example. Our work describes some enhancements of conference scenarios based on SIP. The system architecture to support such scenarios as well as signal flows are presented. Some flow parameters are given, to show real deployment possibility. We have proposed two additional components to enhance conference features: Conference Manager Server (CMS) and Conference Repository (CR). We have deployed these scenarios for SIP based e-learning applications. We have shown some e-learning scenarios when interactive communications are needed, for example, class scheduled learning, class mate group finding. In addition, other rich features can be added, e.g. sharing on-line objects and documents in real-time, virtual interactive white-board, and

multimedia recorder. We have proposed the implementation architecture, some main features are described. We discussed for some future challenging works: P2P based SIP may be adopted. Moreover, converging to UCC (Unified Communication and Collaboration), as well as working on multi-platform and multi-devices are concerned.

- Title: ANGKOR: a real-time remote classroom on research and education networks

Authors: Kanchana Kanchanasut (Asian Institute of Technology), Jean-Francois Bertholon (University of Pierre et Marie Curie, France), and Jean-Francois Vibert (University of Pierre et Marie Curie, France)

Abstract: In this paper, we describe our experiences from a collaborative project, called ANGKOR. We conducted real-life experiments on setting up remote teaching and learning in medical sciences, which comprises of rich media contents with mandatory interactive sessions. Remote teaching experiments were conducted from the School of Medicine, University of Pierre et Marie Curie (UPMC) in France to the University of Health Sciences in Cambodia (UHSC). The network being used for the project poses a real technical challenge, where a combination of very high speed connectivity from France to Japan with relatively low speed satellite Internet from Japan to Cambodia. Rich multimedia content for medical lessons is sent using digital video transport system, or DVTS, from UPMC. Three main technical contributions from this project include the use of IP multicast in heterogeneous environment; the real-time media stream frame reductions and the provisions for mobile classrooms. Based upon our experimental results from this project, we propose a framework for a remote classroom system over heterogeneous network environment.

- Title: AI3 Project Activities at SFC

Authors: Haruhito Watanabe (Keio University)

Abstract: This paper describes the activities of the AI3 Project in SFC. Using satellite links, this project gives contributions to the society by: developing Internet technologies using satellite links, operating an Internet infrastructure for southeast Asian region including a multicast network, and distance education.

2.1.1 Tokyo Meeting

AI3 and SOI Asia Project held a joint meeting from June 23 to June 25 2008 at Keio University, Shonan Fujisawa Campus and the AI3/SOI Asia Summit Conference on June 26 and June 27 in Tokyo. The joint meeting discussed the operation and research activities.

The heads of partner organizations attended the two-day Summit Conference and conducted a series of panel sessions and listened to keynote speeches. The keynote speakers were Prof. Hubert Gijzen, Director and Representative, UNESCO Office Jakarta; Mr. Koji Omi, Former Minister of Finance of Japan; and Prof. Aftab Seth, Keio University. This Summit Conference also witnessed two MoU signing ceremonies between Keio University and UNESCO as well as between Keio Research Institute at SFC and SEAMOLEC (Southeast Asian Ministers of Education Organization Regional Open Learning Centre). As a result of this Summit Conference, the participants agreed on the following Statement of Summit, which confirms the cooperations among AI3 and SOI Asia partners.

We are creating a commons for research and education among partner institutions; each of us strives for the future of our own nation by utilizing this commons; and we contribute to the world by collaborating with similar initiatives.

Tokyo, 27 June 2008 Representatives of AI3/SOI Asia partners

2.1.2 Manila Meeting

The fall meeting in 2008 was held from November 24 to 26, 2008 at the University of Philippines, Diliman, co-hosted by Advanced Science and Technology Institute (ASTI) and the University of Philippines, Diliman. The meeting discussed operation and research activities. Delegates from Keio SFC, Nara Institute of Science and Technologies (NAIST), ASTI, Universiti Sains Malaysia (USM), Institut Teknologi Bandung (ITB), Brawijaya University, and Tribhuvan University, as well as from SOI Asia partners attended the meetings. The meeting discussed the following items:

- bandwidth resource management,
- UDLR box development,
- Dokodemo SOI Asia,
- SOI Asia in High Definition,
- security, and
- relation and collaborations with other research and education networks in the region.

The following are the results of the discussions in the meeting.

Bandwidth Resource Management

The bandwidth of AI3 network testbed is now categorized into three:

1. Unidirectional Link bandwidth: this is the SFC-transmitted unidirectional link, which is currently operational
2. Research bandwidth: this is the bandwidth for research and other activities performed by AI3 partners
3. Lifeline bandwidth: this is the bandwidth that should be operational in 24/7 basis for the partners who need to use it for their daily operations.

The Research bandwidth will be operated on a request basis, where a partner who wants to use the bandwidth must apply to the AI3 Directors, which is the governing body of AI3, stating the purpose, duration, the contact point, and the bandwidth required. The AI3 Directors will decide within 48 hours whether to allocate the

bandwidth according to the following priority:

1. License: This is to prioritize some partners who may have to occasionally transmit to keep their satellite earth station licenses.
2. Research: This is for the research by partners
3. Class: This is bandwidth is for some partners who may want to increase their transmission bandwidth when hosting SOI Asia class lectures
4. Others: The priority of purposes of others than the mentioned above is subject to the lowest priority.

It was also agreed that AI3 Project should perform drills regularly to prepare for Internet disasters like the one affecting Asian Internet due to fiber cuts off Taiwan.

UDLR Box Development

The AI3 UDL has been using UDLR feed and receiver products from UDCast for about five years. We expect to have more broken products in the future considering the age of the current ones, thus increasing the maintenance costs as well as the time as replacing broken receivers take a long time. AI3 plans to develop its own UDLR feed and receiver products using Linux and off-the-shelf DVB cards with the cooperation from a partner organization: Universiti Sains Malaysia. This development is expected to minimize the maintenance costs and time, as well as to conform with the ULE encapsulation standard.

The development is already ongoing up to the preliminary testings. The next steps of the development are command-line user interface implementations and field testings. The field testings will evaluate the performance and the user-friendliness of these products, and will use the research bandwidth and will start in late February or early March. Several AI3 and SOI Asia partners will participate in these testings: Bangladesh University of Engineering and Technology, Syiah Kuala University, Sam Ratulangi University, Advanced Science and Technology Institute, and Institute of Technology Cambodia.

The development is expected to finish within the first half of 2009 and the deployment is expected to be executed by the first half of 2010.

Dokodemo SOI Asia

Dokodemo SOI Asia is an implementation to enable users that are not directly connected to the AI3 network testbed to join to SOI Asia classes. Dokodemo SOI Asia consists of several components, with the Dokodemo SOI Asia Terminal as the component placed closest to the users. The Dokodemo SOI Asia Terminal is basically a Fedora Linux with all software required to send and receive SOI Asia classes that are installed on a USB flash disk. To join SOI Asia classes, users boot their computers using the USB flash disk and connect to the AI3 network testbed using VPN. The details of Dokodemo SOI Asia can be read in the SOI Asia report.

SOI Asia in High Definition

SOI Asia successfully broadcasted an event on October 13, 2008 using a 720p MPEG4 stream over IPv6 multicast. This is SOI Asia's first broadcast in high definition quality. Figure 2.1 depicts the workflow of the event. The 720p MPEG4 stream requires almost 5 Mbps. Additional multicast traffic is the sum of multicast streams that the participating partners were sending during the event. For this event, we policed the unicast traffic to about 2.5 Mbps in order to prevent packet losses in multicast traffic.

Security

The major security issues faced in AI3 network testbed is email related issues: spam and virus outbreak. AI3 plans to implement the DKIM and TLS for its email operations, and DNSSEC for the DNS operations. AI3 is also considering to monitor IPv6 traffic for security purposes.

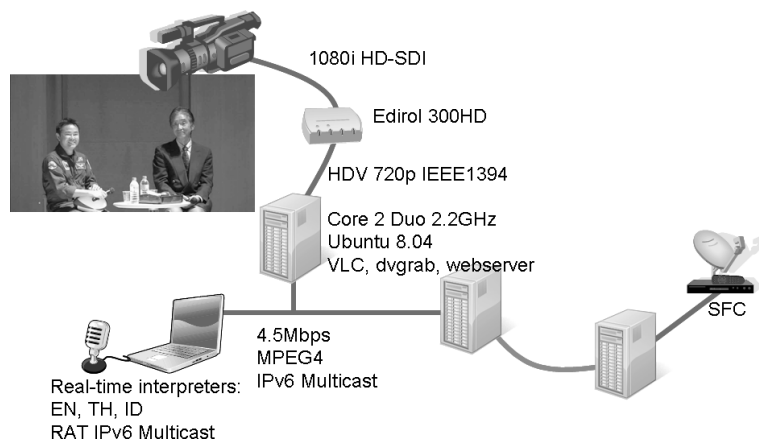


Fig. 2.1. SOI Asia broadcast in high-definition quality

Relation with other Research and Education Networks

The deployment of TEIN2 (<http://www.tein2.net>) and the planned TEIN3 as the successor of TEIN2 create a more complex research and education network environment in Asia from the point of view of network operations, activities, and relationships. Some of AI3 and SOI Asia partners are also members of TEIN2 (and the planned TEIN3), but AI3 and SOI Asia do not have any formal ties with TEIN2 (and TEIN3). Therefore AI3 and SOI Asia agreed to appoint Institut Teknologi Bandung, Indonesia as the representative of both groups to TEIN2 (and TEIN3).