

第 XXIX 部

Asian Internet Interconnection Initiatives

第29部

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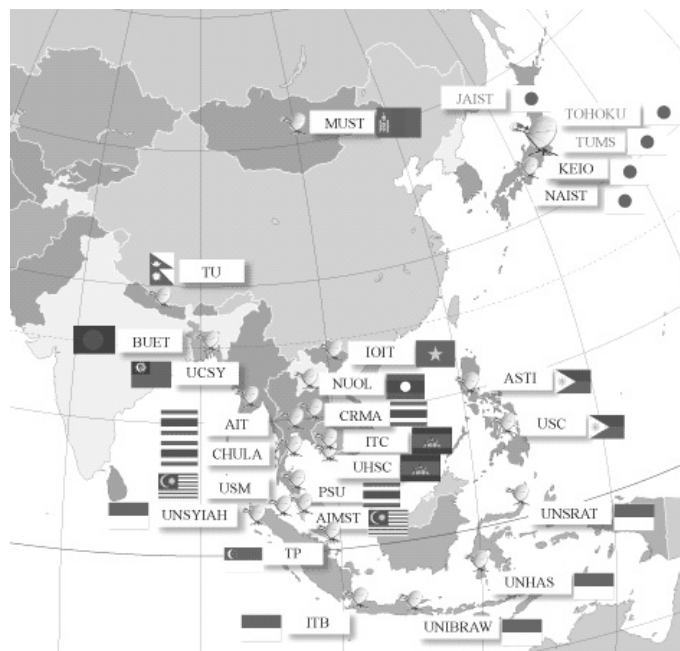
第1章 Introduction

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*)[3] 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

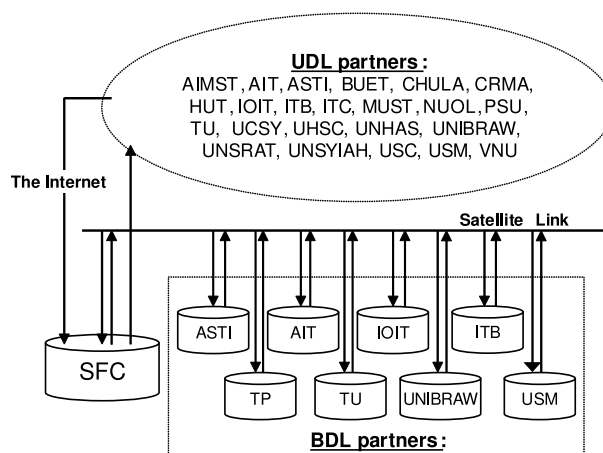


Fig. 1.2. AI³ satellite topology

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, 194].

Through our 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 2010.

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 UDLR technology[45] in this environment.

第2章 Operation

2.1 NAIST Operations

Recently, we are working on deployment of virtualization technology in NAIST NOC. Figure 2.1 shows the architecture of the virtualization deployment in NAIST NOC.

We combine three AI³ services, i.e., WWW, mail and DNS (ns1) server, and one router into one machine as shown in Fig. 2.2. These services run on top of the linux system as a virtual machine. We maintain redundancy by installing dual VM hosts. Here, we use a Kernel Virtual Machine (KVM) for virtualization platform. We also attached a iSCSI disk system to dual VM (vm1 and vm2) for backup the important configuration files.

So far, we have conducted a benchmarking (software and hardware) and created an imitation services (www, mail, dns) in a VM host for the testbed. We still have a problem with the attachment of iSCSI disk system to dual VM hosts. Once we finish the configuration of iSCSI disk system, we will migrate the imitation services runs on top of virtual machine to the real services and operation.

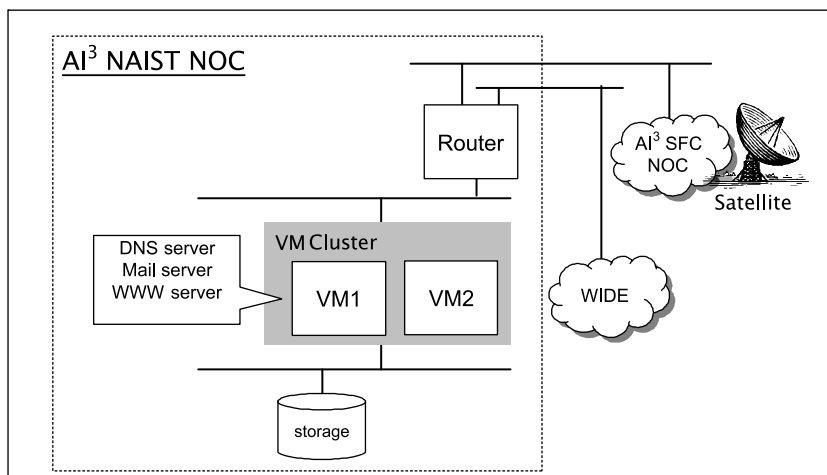


Fig. 2.1. Virtualization in NAIST NOC

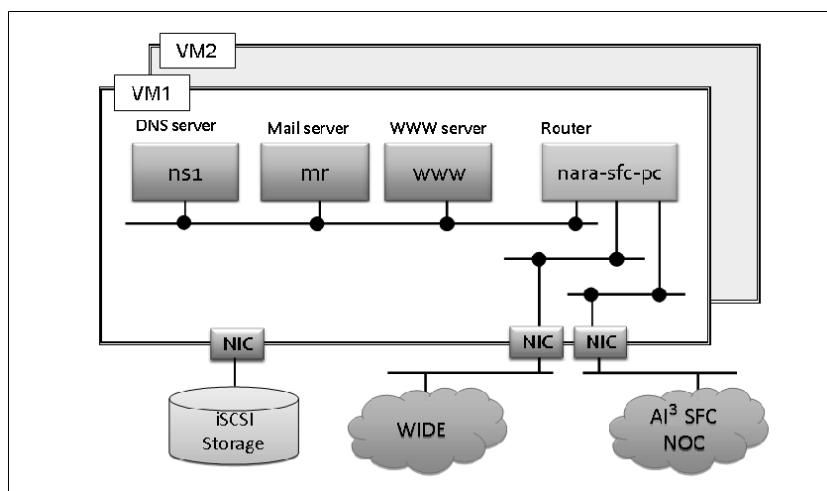


Fig. 2.2. Inside of VM

2.2 Keio SFC Operations

Keio SFC performed network upgrades in December 2010 to replace two Cisco Catalyst switches to the 2960 models. In addition to that, two new servers were installed as virtualization platforms: one is for SOI Asia workshops, and the other one is for AI³ and SOI Asia services.

Keio SFC released a new version of ULE software for the satellite unidirectional link receiver to fix the earlier problem when the signal reception is too low. This release allows partners at the receiving end of the satellite UDL to receive signal better. Besides that, Keio SFC also released a documentation to merge the ULE receiver and

router at the UDL receive only sites. This documentation instructs partners on how to operate receive only sites using a single machine, instead of the previous requirements of using two machines. The single machine configuration is now running at Keio SFC as well as at several partner sites.

2.2.1 Unidirectional link upgrade to 18 Mbps

The satellite unidirectional link was upgraded on 28 October 2010 after receiving the license from the Government of Japan. The instruction for partners were sent on 26 October 2010. Following the upgrades, partners sent reports on the success of the satellite receiver configuration changes; with Universitas Brawijaya sent the first

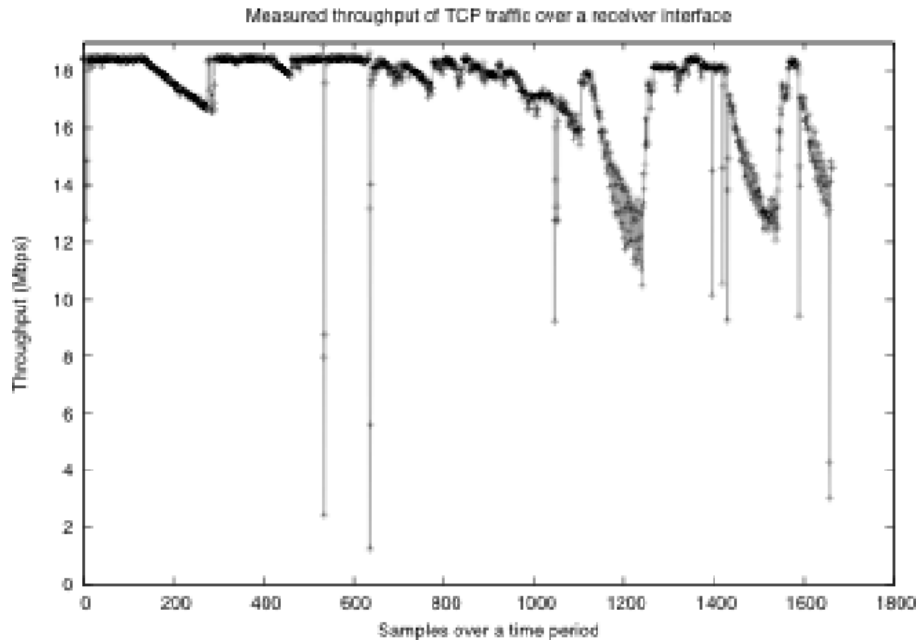


Fig. 2.3. Measurement results of TCP traffic on UDL link

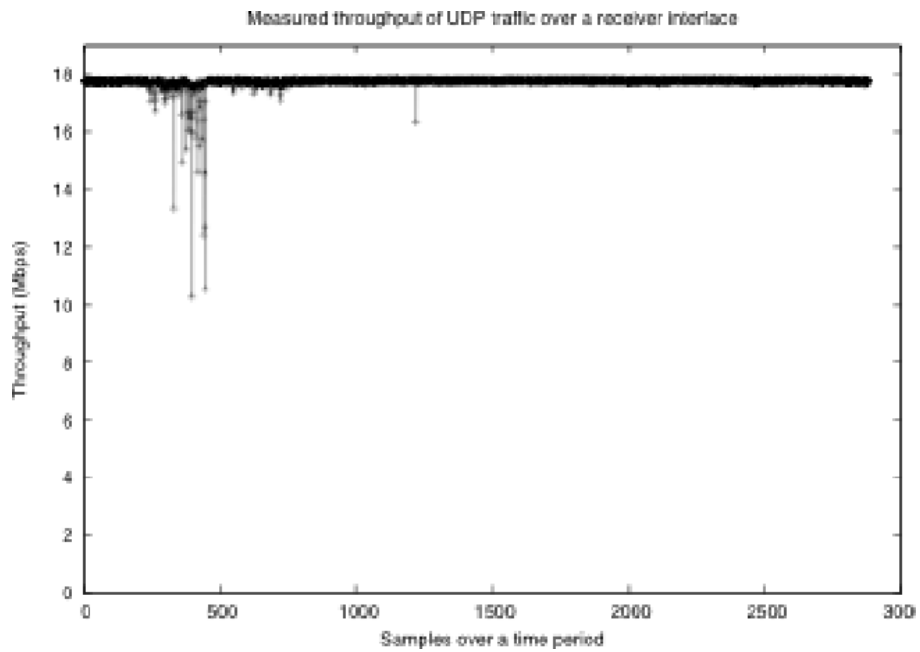


Fig. 2.4. Measurement results of UDP traffic on UDL link

report at around 15:30JST, some 30 minutes after SFC started the 18 Mbps transmission. Measurements showed that with this upgrade, the satellite unidirectional link can achieve traffic of around 17.7Mbps at fig. 2.3 and fig. 2.4.

第3章 Research

3.1 Network Virtualization

Currently, NAIST staffs are conducting some research on virtual machine and network security.

Cloud computing becomes a hot issue in recent days because it offers a low cost and flexible information technology services. Cloud computing is a natural evolution of information technology services adopting virtualization, distributed computing, and utility computing. Virtualization technology is one of technology that plays an important role in building a cloud computing. Virtualization allows an operating system (OS) or several OSes, called VM, run on top of an existing OS (host). It makes an efficient use of physical resource leading to provide a low cost technology.

Recently, we are conducting research on virtual machine. The theme of the research is FU-JIN: A Cloud Computing Environment Visualization System for Specifying Points of Failure. The

objective of this research is to develop a monitoring system for recognizing defective behaviors and specifying point of failure in virtual machine.

3.2 Terrestrial wireless network

A working group under AI³ is now researching and developing terrestrial wireless network technologies to deliver IPv6 multicast traffic. The WG, called TerWi, is focusing on two technologies: DVB-T (Digital Video Broadcast-Terrestrial) and Wi-Fi Mesh Network (WMN). The DVB-T development is handled by Universiti Sains Malaysia (USM), while the WMN development is handled by Keio SFC. USM is developing a protocol to compress the header of DVB-T packets, called RoHC (Robust Header Compression). Keio SFC is starting the work on WMN by first performing measurements of the current Wi-Fi situations within the campus. Preliminary implementation of WMN is on-going base on a scenario where multicast routers and Wi-Fi APs are installed statically as shown in Figure 3.1. The multicast routers are based on Ubuntu Linux. Quagga OSPF and XORP PIM-SM are installed for unicast and multicast routing respectively.

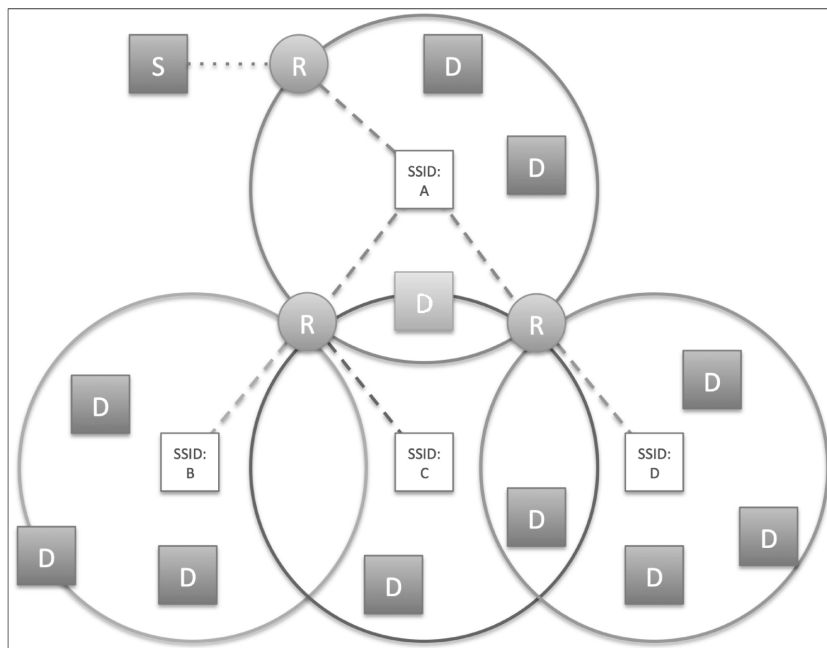


Fig. 3.1. WMN Deployment Scenario

Keio SFC will run a small test-bed and measure the performance. Several partners have expressed their interest to participate in this development by becoming testing sites.

3.3 Mtrace2 looking-glass

Mtrace2 is a protocol under standardization process to provide IP multicast capability to trace from a multicast receiver to a source. Since the mtrace2 must be implemented in routers to work, hence it may take several years before any implementation is available in routers, we propose a looking glass. Mtrace2 looking glass is a web application that provides the tracing from a receiver to a source by accessing routers one by one and returning the results. A looking glass may ask another looking glass to continue the trace. Figure 3.2 depict the architecture. This looking glass is under implementation and we expect to finish the first prototype by March 2011. We expect the looking glass to be installed on research and education networks to support IP multicast operations.

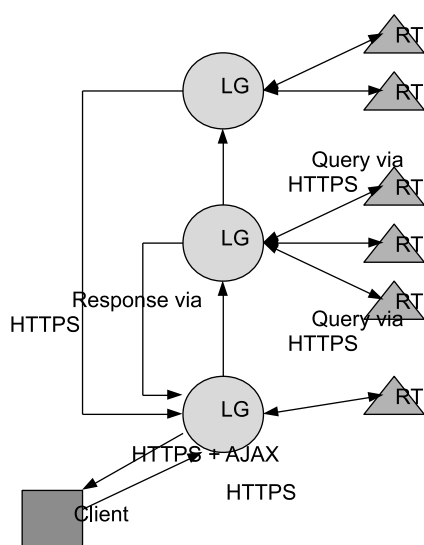


Fig. 3.2. Mtrace2 Looking Glass architecture.

第4章 information

4.1 Partners

This part lists the status updates of several partners.

Advanced Science and Technology Institute (ASTI) requested to use the old UDBOX for the ULE box instead of preparing a new machine.

Universiti Sains Malaysia (USM) is doing research and development in wireless terrestrial network and HD video conferencing. USM wants to use DokoDemo SOI Asia and gets MYREN involved.

Institut Teknologi Bandung (ITB): is doing research on content filtering and DNS. ITB is also working with other universities in the Indonesian Higher Education and Research Network (INHERENT), which is funded by the government.

Brawijaya University (UB): moved the UDL RO antenna; had difficulties in implementing IPv6 multicast for the campus.

Thribuvan University (TU): has a rolling blackout problem especially during dry seasons, which may last 12 hours a day. No skilled technical staff as the knowledge transfer at the time a staff left was not smooth.

Asian Institute of Technology (AIT): focuses on the CanalAVIST, a distance education platform developed by AIT team.

Institute of Information Technology (IOIT): has not attended meetings in the past few years due to the transfer of administration of research and education networks in Vietnam.

4.2 Meetings

We regularly held meeting twice in a year with partners for exchanging information and discussing research issues.

4.2.1 Jakarta meeting

Jakarta meeting was held at the Directorate General of Higher Education, Ministry of Education office on June 1–3, 2010 hosted by UNESCO Jakarta Office, in conjunction with the CONNECT Asia meeting. The meeting was attended by delegates from partners organizations: Keio SFC, NAIIST, AIT, ITB, ASTI, USM, UNHAS, UNSYIAH, UB, BUET, TU, UCSY, UCSM, NUOL, and ITC. The meeting was consisted of the following program:

1. Operators meeting
2. Joint meeting
3. Research presentations and Working Group sessions
4. Directors meeting.

The operator meeting discussed issues such as network traffic, DNS and its usage in the AI³ network, security issues, satellite link bandwidth spectrum as well as the SOI Asia class operation issues. In the site updates, partners mainly reported about the migration from the UDBoxes that have been in operation for several years to ULE box, which is a new receiver bridge unit for the satellite unidirectional link. The ULE box is co-developed by Keio SFC and USM for AI³ Project. The research presentations were by participants from USM and Keio SFC in the topics of applications for disaster management and wireless communications. The working group sessions discussed the wireless mesh network and DokoDemo status and next steps in the research and development. The directors meeting listed the following items as the agenda and the corresponding consensus:

- operation direction

The satellite unidirectional link is to be upgraded from 13 Mbps to 18 Mbps.

- research direction

Keio SFC is to focus on the development of wireless mesh networks and USM is to focus on the development of DVB-T technology; deployments in other partners site are being considered.

- new partner

The National University of Timor Leste (UNTL) in East Timor is considered as a new partner. The UNTL Receive Only site setup is supported by UNESCO and UB.

- REN relations.

AI³ and SOI Asia will actively attend APAN meetings, and TEIN3 meetings.

4.2.2 Dhaka meeting

Dhaka meeting was held at the Bangladesh University of Engineering Technology (BUET) on November 2–4 hosted by BUET. The following partners attended this meeting: NAIIST, Keio SFC, BUET, USM, UNSYIAH, UNSRAT, TU, ITB, UCSY, UCSM, and UNTL. Several partners did not participate due to visa issues as there are no Bangladesh embassies in their countries so that they should apply for a visa in a third country. The meeting program basically follows the same format as the Jakarta meeting. The operator meeting discussed the following issues:

1. a single box operation for Receive Only sites, which means merging the functionality of the ULE box and the router in a Receive Only site into a single box;
2. the status of UDL upgrade to 18 Mbps and discussing the issues arisen in the upgrade;
3. how to allocate two 512 kbps satellite bandwidth;
4. the development of the next version of DokoDemo SOI Asia terminal and server based on Fedora 14;
5. SOI Asia classes in High-Definition should become the standard for future classes;
6. solving the noise and echo issues in audio;
7. the usage of WIDE cloud for partners;
8. resuming online operators meeting.

The directors meeting discussed the following research directions:

1. terrestrial wireless

Keio SFC applies for funding for wi-fi mesh network development while USM works for higher bandwidth DVB-T and ROHC

(Robust Header Compression) for DVB-T.

2. HD video conferencing

USM developed a video conferencing application on Windows 7, and AI³ will develop an application on Linux to replace VIC-RAT.

3. SOI Asia channel

BUET, USM, ITB, and KMD will team up to develop a streaming channel in IPv6 multicast featuring contents developed by students.

4. Multicast monitoring and evaluation

AI³ will push IPv6 multicast deployment in TEIN3 and APAN; support by providing monitoring tools: mtrace2 looking glass.

5. Real-time multilingual translation

AI³ and SOI Asia will develop mechanisms to provide real-time multilingual translations of SOI Asia lectures in order to increase the participants understanding of the classes.

In this meeting we also received an interest by KUET (Khulna University of Engineering and Technology), located in Khulna, some 200 km away from Dhaka. KUET representative presented an overview of the university in front of the meeting. BUET as the only partner in Bangladesh expressed the willingness to assist in the process of considering KUET as a new partner.

In terms of REN relations, the meeting appointed Husni Thamrin as the interface to APAN and TEIN3, Keiko Okawa and Husni Thamrin to CONNECT Asia, and Jun Murai to liase with India.

The next meeting is expected to take place in Thailand in May 2011.