第XVIII部

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. Various kinds of services are provided on the Internet and many people hasn't been able to imagine their daily life without the Internet. Since this penetration process has taken almost 5 years and more even for developed countries, it is quite natural for us to estimate that such penetration process in developing countries takes longer years than we experienced in developed countries. In fact, many developing countries are now struggle to develop the Internet infrastructure; however, still limited number of people in such countries can utilize the Internet without any difficulties. Their governments in many developing countries are now encouraging its industries as well as other domestic communities to cope with this issue called "digital divide" or "equal access," but few countries have improved this situation. As its results, this situation has caused stagnation in various kinds of activities.

In order to give solutions for this issue in the international context, many challenges have been conducted since mid 1990's. For example, Internet Society has been working actively on human resource development through organizing Networking Training Workshop (NTW)[112] since 1992. The workshop gathers people who are involved to the Internet development from various fields and provides in-depth training on how to develop the Internet. This workshop contributed the Internet development especially in Latin America and African countries. As another challenge, many international donor programs such as JICA of Japan have been working aggressively on the Internet development in various countries. Of course, there has been tremendous commercial investment for the Internet development.

With these activities, however, there is still big gap between developed and developing countries in terms of the Internet development. Especially for Asian countries, this penetration process has more difficulties because of broader diversity of economic development, existence of tremendous number of languages in Asia, geographical and climatic variety from small tropical islands in Pacific Ocean, monsoon region in South East Asia, desert in Central Asia, and to northern icy rural areas. In mid 1990's, leaders involved to the Internet development in Asia concluded that more active participation to the Internet development was highly required.

With this situation in mid 1990's, our project called Asian Internet Interconnection Initiatives, or AI^3 (*ei-tripl-ai*) in short, has been established in 1995, in order to work for the Internet development in Asian region[168, 167, 27]. 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 AI^3 project decided

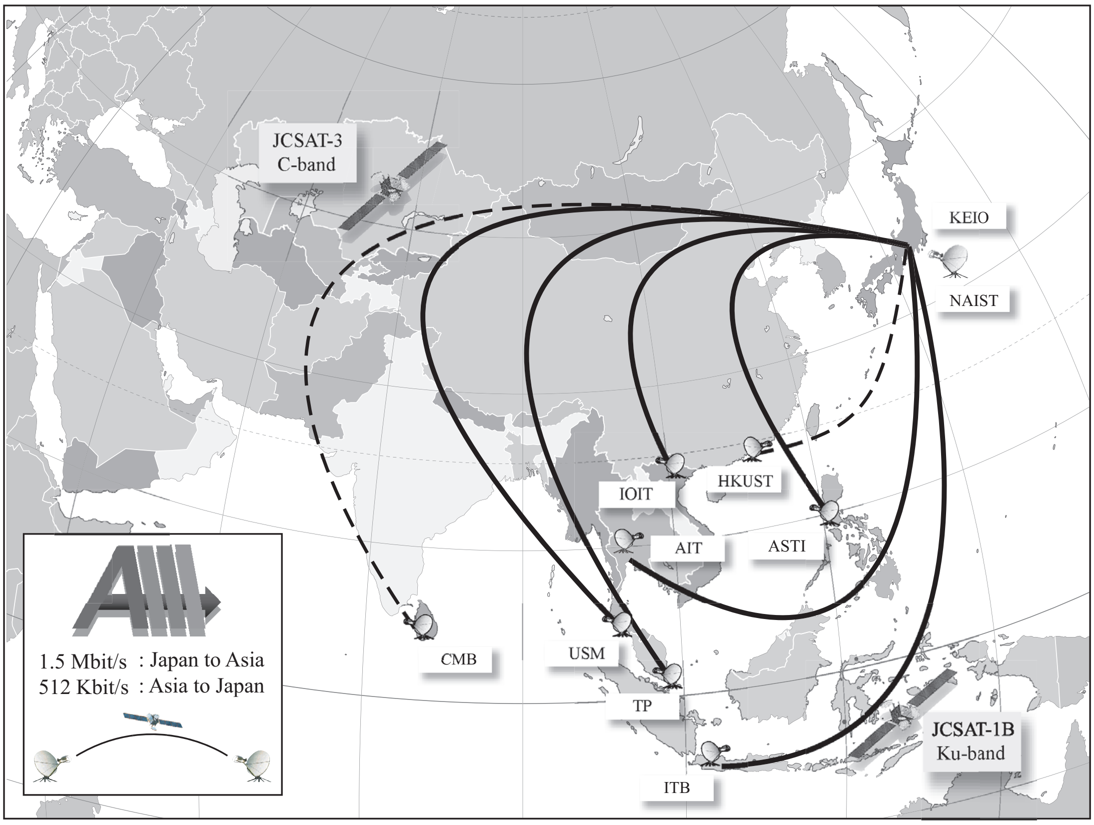

Fig. 1.1. The AI^3 testbed network

to start as a research consortium of leading research groups in universities in Asia. Because universities are in charge of human 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.

In our 7 years activities, AI^3 testbed network has been built to connect 16 universities in 10 countries in this region and still expanding. This network has been working on 24/7 basis and turned to be its communication infrastructure for members of this AI^3 project. In this report, we summarize the AI^3 project and its achievements in both Internet development and our R&D process using AI^3 satellite Internet infrastructure in Asia.

第 2 章　Infrastructure

2.1 L2 design

When we started the AI^3 project in mid 1990's, we could get fiber optical infrastructure in Japan, however, legacy PSTN was only a major infrastructure available in many Asian countries. Therefore, the biggest issue was to find out the way to install the Internet infrastructure for members in Asia even when there was few terrestrial communication infrastructures developed. The solution we delivered was to build up our international Internet testbed network using communication satellites.

The advantages on use of communication satellite as our L2 technology is trivial; we don't have to expect terrestrial infrastructure around project's members to hook up to the Internet. What we need for installation of the Internet is to construct satellite earth station; therefore, nothing but stable and enough electricity to activate equipments for the satellite earth station is required.

As technology transfer and equal partnership are important for international collaboration, the AI^3 project made a project framework about AI^3 partnership. This framework defines that purchasing VSAT earth station, obtaining appropriate licenses from the local authorities and anything coordinated locally must be completed by each parter in each country. On the other hand, the AI^3 project provides satellite circuits (bandwidth on transponders) and related technical information to all the partners. Within this framework, AI^3 partners were invited from Asian countries, and the groups who indeed needed the AI^3 project were selected.

In the preparation process of each earth station, the AI^3 project provides the minimum requirement concerning station equipment such as frequency and polarization, satellite modem, antenna and HPA (High Power Amplifier), and so on. Along with such minimum requirement, AI^3 partners set up their earth stations which were fitted for this requirement considering procurement, cost, maintenance and operation in their local circumstances.

Consequently, each earth station has been set up using the different RF unit as shown in Figure 2.1. Through this process, we found that there were various regulations to start satellite communication in Asian countries. The required licenses from the local authorities were for wireless communication, location of earth station, import permissions of wireless devices and etc. Obtaining the licenses was much hard for AI^3 partners in some cases, however, they finally accomplished this task in every way. From the aspect of human resource development, AI^3 partners got a complete *know-how* at the initial stage.

Since the early stage of the AI^3 project, Ku

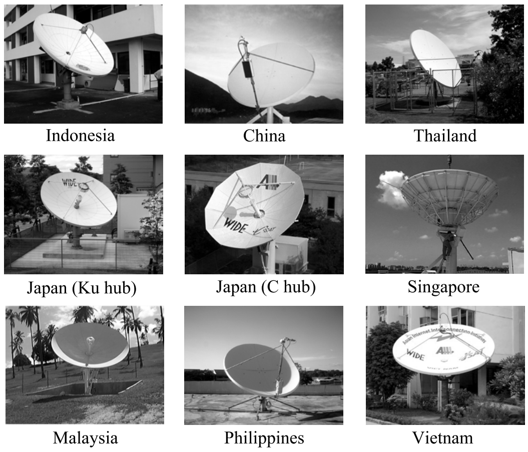

Fig. 2.1. The AI^3 earth stations using the different RF units

band transponder on the communication satellite JCSAT-3 operated by JSAT Inc. has been utilized and Ku band VSAT earth stations were installed at the member sites listed in the upper part of Table 2.1. These installations were done around 1996. At that moment, there were many hope and hype on usage of Ku band satellite communication channel for the Internet, because there were few experiments using Ku band so far and Ku band has bigger rain degradation effect than C band which is quite popular for digital communication in tropical region. Therefore, several experiments to confirm usability of Ku band satellite communication channel in tropical area, where heavy rain is quite popular, were conducted right after our installation. Furthermore, when we started this project, there was no other large scale satellite Internet infrastructure, we developed several tools and systems to operate our infrastructure to be merged to ordinary Internet environment.

In 1999, we had an opportunity to expand our activities to more countries in Asia. At the time, we started to use C band transponder on JCSAT-3 and added 5 more universities listed in the lower part of Table 2.1. These universities added to our C band infrastructure are relatively strong in terms of technology development in this region. In figure 1.1, our network is mapped into geographical location, though two of them are not in operation due to some operational difficulties

Table 2.1. AI^3 partners connected via bi-directional link on both Ku and C band

Members	Country	Abbrev.
Ku band		
Nara Institute of Sci. and Tech.	Japan	NAIST
Institute of Technology Bandung	Indonesia	ITB
Hong Kong Univ. of Sci. and Tech.	China	HKUST
Asian Institute of Technology	Thailand	AIT
C band		
Keio University	Japan	KEIO
Temasek Polytechnic	Singapore	TP
University Sains Malaysia	Malaysia	USM
Advanced Sci. and Tech. Institute	Philippines	ASTI
Institute of Information Technology	Vietnam	IOIT
University of Colombo School of Computing	Sri Lanka	CMB

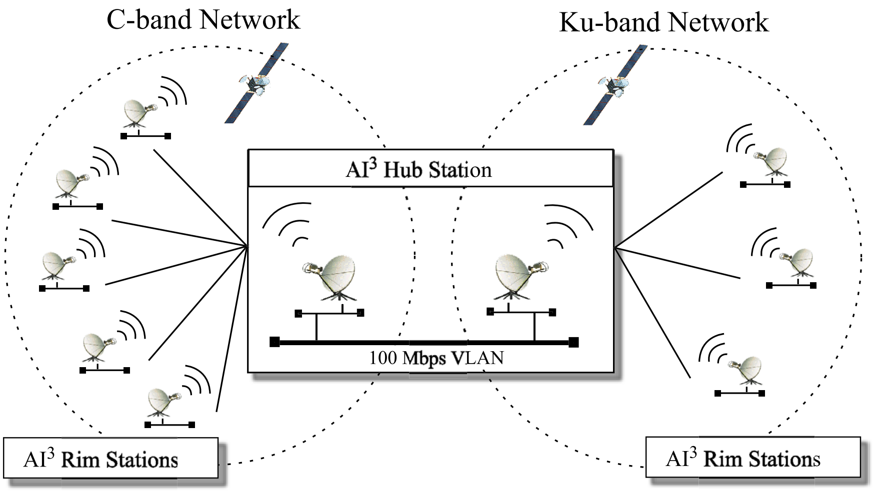

Fig. 2.2. Network junction between Ku and C bands

at HKUST station and our planning link to CMB before installation.

With two transponders, both Ku and C bands, we installed two hub stations in Japan to span our links to our member sites, and set up broadband transit link between these stations as illustrated in figure 2.2 using nation wide ATM network called JGN[89] in Japan.

2.2 L3 design

Our network can be considered a transit network connecting multiple AS resides on member sites. Figure 2.3 depicts Layer 3 logical map of our infrastructure. We operate our own AS for our project itself and our network exchanges traffic comes to/from our member AS. In this sense, our network can be considered a distributed L3 internet exchange scattered over South East Asian region.

For global Internet connectivity, APAN TRANSPAC link[38, 91] as well as WIDE Internet operated by WIDE Project can be used. This broadband backbone connectivity to the Internet can facilitate conducting several experiments with

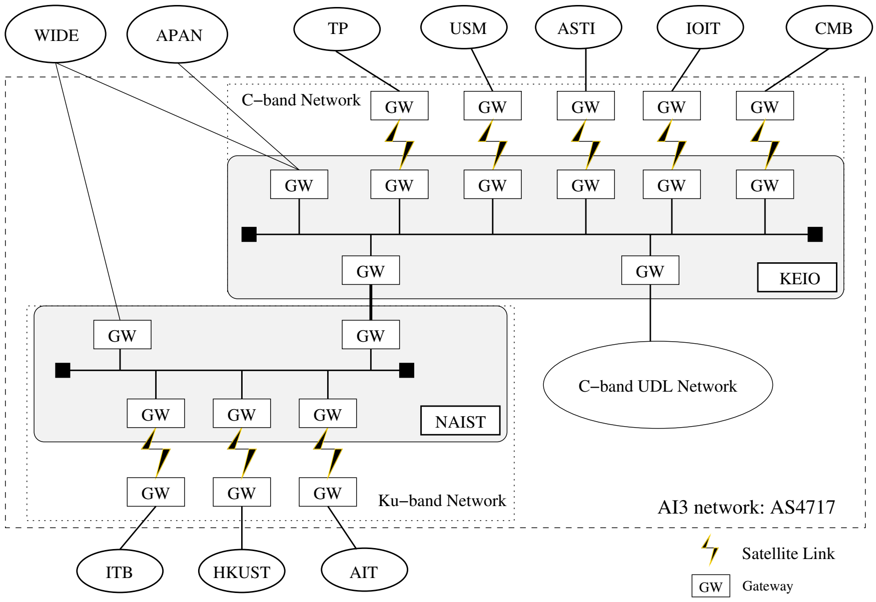

Fig. 2.3. Layer 3 logical map

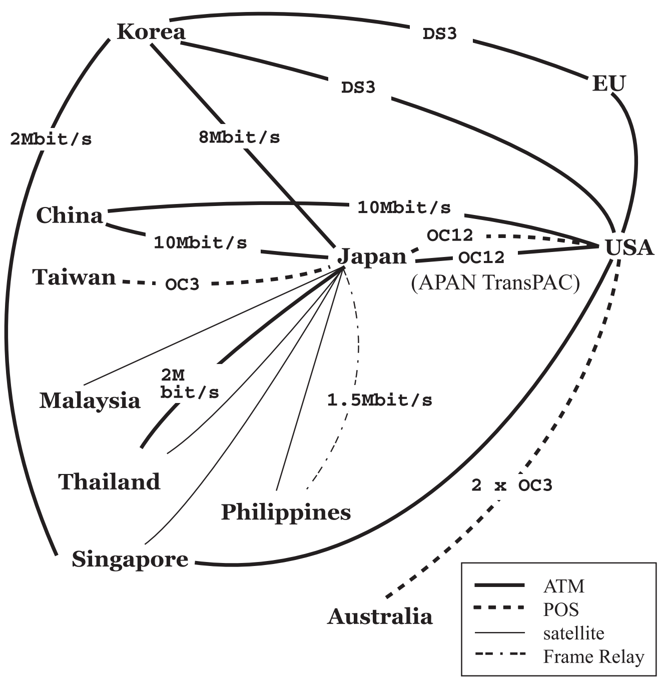

Fig. 2.4. AI^3 network fully integrated into APAN and other international R&D networks

other members in our AI^3 project as well as research groups in Internet2 and others. Especially for APAN, our network is fully integrated to their APAN infrastructure as shown in Figure 2.4.

2.3 UDL

Major achievement in our project is UDLR which stands for Uni-Directional Link Routing[73].

In our original design of VSAT earth station,

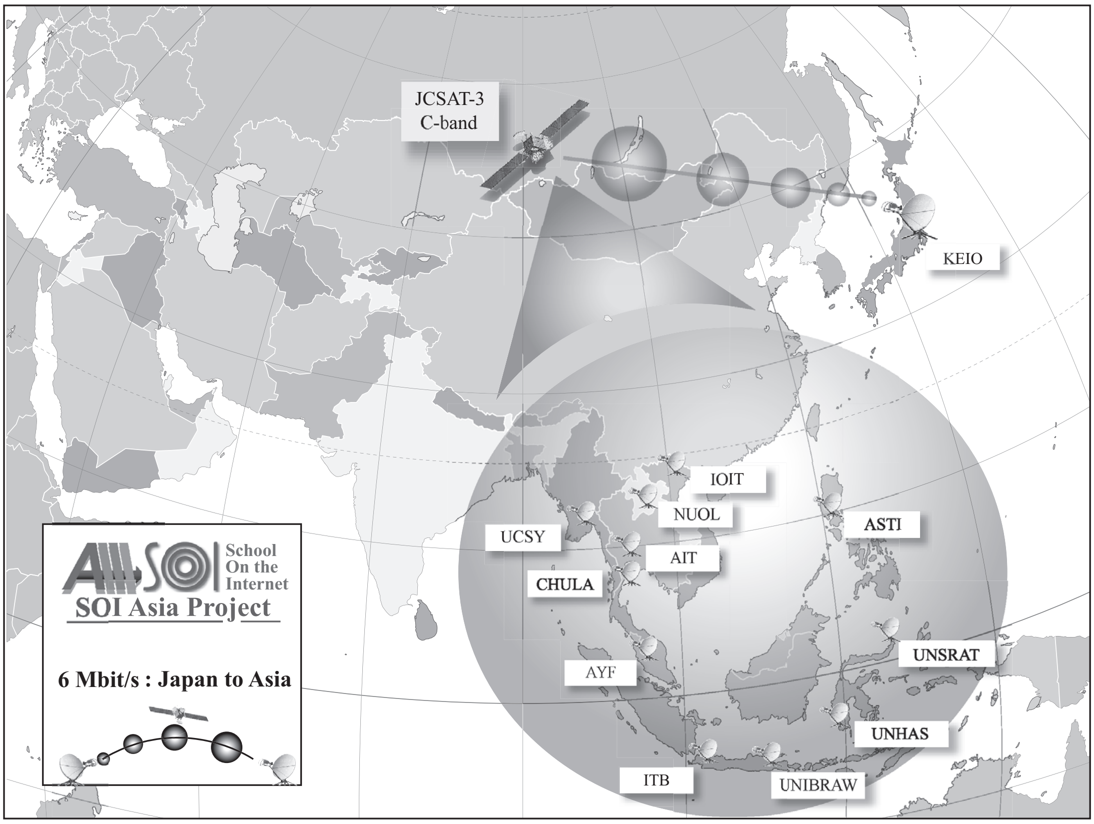

Fig. 2.5. UDL network in AI^3

each station had to obtain appropriate license from authorities to receive and transmit signals from/to the communication satellite, however, license for transmitting signal normally requires us to have long and complicated process as described earlier. Moreover, VSAT earth station with transmitting capability requires expensive equipment. These characteristics of VSAT earth station made our licensing process troublesome in many cases, so that we consider the licensing process as the hardest part for member site set up in our project.

On the other hand, receive only earth station is quite popular in Asian countries especially for TV broadcasting, and in many cases there is no requirement to obtain licenses for building receive-only earth stations. Furthermore, the receive-only station is inexpensive. If we can use receive-only station for Internet connectivity, installation of our gateway at our member site can be done more easily.

Around 1998, the bases of UDL routing technology was developed. As shown in Figure 2.5, a single satellite channel is shared among UDL receivers. The "feed" station transmits IP datagram to the satellite channel as L1 broadcast, and each UDL receiver selectively receives and forwards IP datagram bound for the network connected to the receiver. For uplink from UDL receiver sites to the Internet, terrestrial link from the site to the Internet is utilized. Of course, many Internet protocols have an assumption that each link in the Internet should be bidirectional, so that the UDL receivers and the "feed" station need to handle routing control to make UDL working consistently with other connected networks. Details of how UDL works are available in the literature[53].

This mechanism is well fit to both communication satellite and many usage of the Internet. Since a single communication satellite can be considered as an amplifier to receive signals from an earth station and retransmit to covered area of its transponder, the nature of the communication via

Table 2.2. AI^3 partners using UDL

Members	Country	Abbrev.
Keio University	Japan	KEIO
Chulalongkorn University	Thailand	CHULA
Asian Institute of Technology	Thailand	AIT
National University of Laos, Laos	Laos	NUOL
University of Computer Studies, Yangon	Myanmar	UCSY
Brawijaya University	Indonesia	UNIBRAW
Sam Ratulangi University	Indonesia	UNSRAT
Hasanuddin University	Indonesia	UNHAS
Institute of Technology Bandung	Indonesia	ITB
Asian Youth Fellowship	Malaysia	AFY
Institute of Information Technology	Vietnam	IOIT
Advanced Sci. and Tech. Institute	Philippines	ASTI

satellite is broadcast. With UDL routing technology, we have to share bandwidth available on the satellite with other members, but theoretically we can use the entire single transponder which can serve us up to 30 Mbps* bandwidth as one way link. Currently we are providing 6 Mbps for UDL sites, and it is quite enough for carrying multimedia traffic such as traffic for distance education using video conferencing mechanism and other ordinary Internet applications.

In UDL configuration, we have to use terrestrial link as its uplink to the Internet and available bandwidth on the terrestrial links are around 64 kbps in many cases in our AI^3 project. However, since many usage of the Internet is still along with client server model, clients reside in a UDL receiver site have to transmit data destined for application servers on the Internet but its bandwidth consumption is quite limited. In our experiments, 64 kbps uplink is enough for ordinary usage in many cases. With this UDL technology, we are now connecting 8 more universities in Malaysia, Indonesia, Laos, and Myanmar.

All the members in our project is listed in Table 2.2.

第3章 Site Update

In this chapter, we describe updated works for some AI3 partner sites.

3.1 NAIST

NAIST is an advanced institute in Japan[106]. Naist is one of the two AI3 sites located in Japan besides with SFC site. It plays some important roles such as transferring any traffic between partners and providing DNS and Web server functions.

3.1.1 Network

NAIST AI3 site has two satellite links with Indonesia (ID) and Thailand (TH) on Ku-band via JCSAT-1b[114]. It provides connectivity to the Internet for each foreign site. And it also has ground link to Keio Univ. (SFC). Sometimes our network is used for transmitting Remote Education

* Popular design of communication satellites in these days is that a single satellite has multiple transponders and a single transponder for Ku band and C band can provide the bandwidth of 30 Mbps around. Of course, in the other frequency band such as S or Ka, the bandwidth provided by a single transponder can be varied and not limited to 30 Mbps.

Program provided by WIDE SOI group[123] from SFC. At the time, our network is used for transferring the program from SFC site to partners in foreign country.

1. For ID link
   Ku-band on JCSAT-1b, 2 Mbps bandwidth is assigned as uplink from NAIST and 1.5 Mbps one as downlink.
2. For TH link
   Ku-band on JCSAT-1b, we use 1.5 Mbps bandwidth as uplink to AIT and 512 kbps one as downlink.
3. On the ground link
   The connection between NAIST and SFC use 100 Mbps Ethernet-VLAN.

3.1.2 Services

NAIST site provides Web, DNS, Mail and Mailing List services for AI3 network. Besides, we provide many functions for informing our project and sharing information each other as well as maintaining our network.

1. DNS server
   We provide AI3 primary DNS system. It contains many records not only for Japanese sites but also for foreign partner's. Therefore many partners refer it as their DNS server.
2. Web server
   The web server is named www.ai3.net. It is used for to inform our results and to share the operator's information. For example, We can check whether NAIST network system is going well or not on our Multi Router Traffic Grapher page.
3. Mail server(and ML service)
   We have mail and Mailing List server. We can easily share variuos of information about our activity such as operational topics, progress of our projects and so on.
4. Experiments host In this year, we also setup some experimental computers for partners.
   (a) MCS server
   This experimental computer was setup for the use of Malaysia partner. MCS server is Multimedia Conference System which provides a service as teleconference intermediate box.[151]
   (b) Cache-proxy
   This one is setup for Thailand partner. By using this experimental data, they published a couple of paper for International Conferrence.[30]

3.2 ITB

ITB [72] has been as First AI3 partner since 1996 until now. Many activities related to research, development and operational on Internet related have been produced by AI3 ITB and its partner. The Internet link through AI3 not only used by ITB itself, but also used by several universities and research institution in Bandung. Focusing on the annual report are on operation and research aspects. The operation aspect focusing on satellite operation, Web cache operation, and IPV6 operation on ITB's network environment. The research aspects focusing on IPV6, SMTP server experiment, and Network Monitoring.

3.2.1 Operation

Focus on this cooperation between Asia Countries are to development research and development on Internet infrastructure and its application. AI3 ITB focusing on reliability of Internet connection especially using VSAT on Ku-Band. The Link between Japan (NAIST) and Indonesia (ITB) are unique link for ITB because this is the only one Ku-Band VSAT station on Indonesia who operated for Internet gateway.

1. Satellite Router status
   The satellite router gateway configuration on ITB's are shown in Figure 3.2. The gateway is Gerbang.ITB.ac.id (ITB-NARA-SAT). This is FreeBSD 4.5-RELEASE box, running Zebra 0.92a (OSFPd+BGPd) which receives 19k BGP route. This router is very stable.
   Regarding Cisco bridge operation, ITB is cur-

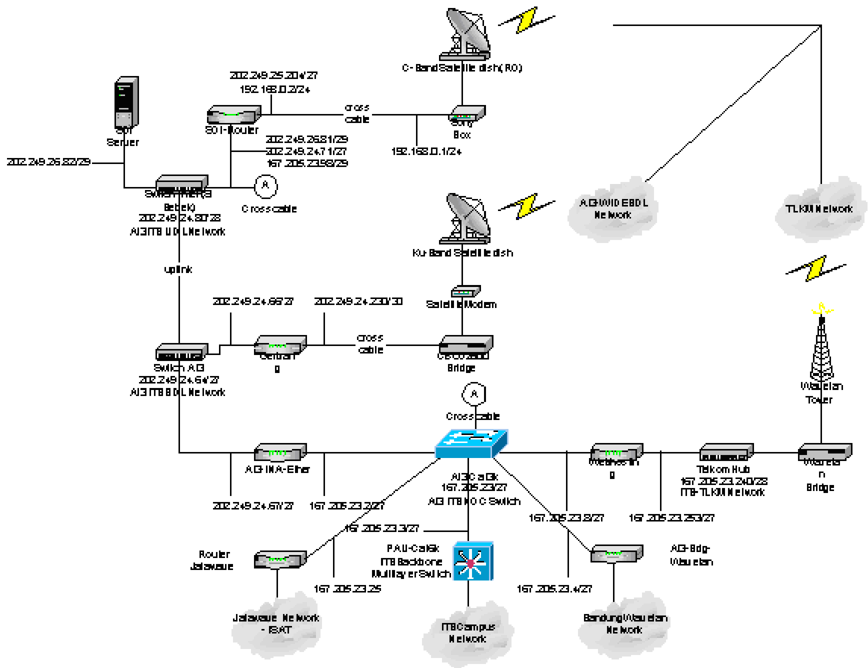

Fig. 3.1. The AI^3 ITB Networks

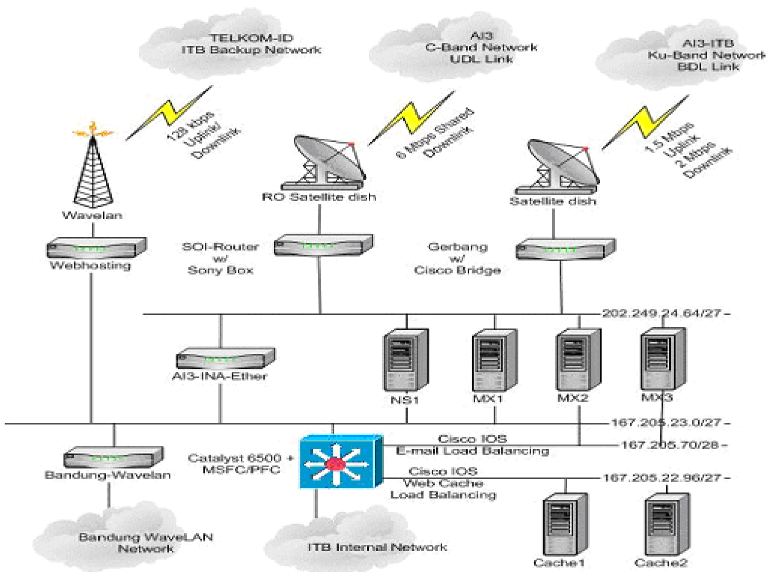

Fig. 3.2. ITB's Network around the Satellite Router

rently using Cisco bridge to find alternatives to Riscom card. The Cisco Bridge specs are Cisco 2621 with 2 Serial (Sync) and 2 Ethernet.

From ITB's point of view, (almost) no performance degradation was found, thanks to queuing configuration at NAIST.

2. Satellite Operation

The Internet satellite communication between Japan (NAIST) and Indonesia (ITB) has been using Ku-Band for 5 years. This is the only one ground station on Indonesia using Ku-band for Internet connection. The Main weakness using Ku-Band on Tropical

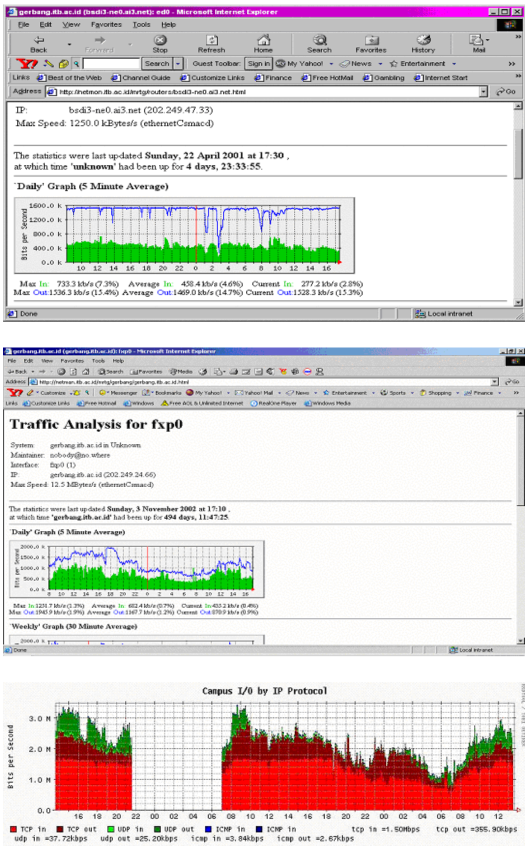

Fig. 3.3. Performance Before and After Upgrade Bandwidth at ITB

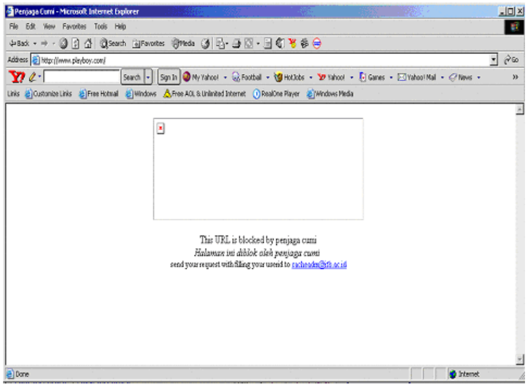

Fig. 3.4. ITB's Squid Guard

country like Indonesia is the high attenuation effect when the rain comes. Our experience showed that the link down when rain is come and the link up again 5 to 15 minutes later. We need to do some experiment on effect of rain on Ku-Band. The Bandwidth for ITB are 512 Kbps for uplink (ID-JP) and 1.5 Mbps for downlink (JP-ID). The link was saturated. Both of uplink and downlink. On first semester meeting, we proposed to upgrade the bandwidth to ITB.

In the second semester, our bandwidth was upgraded with 1.5 Mbps for uplink and 2 Mbps for downlink. The performance before and after upgrade were as follows.

In the top of Figure 3.3, we could see that incoming traffic from NAIST (JP-ID) was saturated on 1.5 Mbps. Outgoing traffic was almost the same condition with incoming traffic.

Performance after bandwidth has been upgraded was not saturated as shown in the middle part of Figure 3.3. We have strictly policy according to use bandwidth consumption on ITB's Network. We used the bandwidth limiter for several application especially for Web (http) application.

On the bottom part of the Figure 3.3, we could see the bandwidth consumption from the aspect of TCP and UDP after the link bandwidth was upgraded.

3. Cache Server Operation

   We have several objectives related to Cache server operations (CacheBone). One of our experiment and operation are using the Cache server which is to manage the resource (link to Internet). We installed application squid tweak and log cache analyzer on our system. We made policy on our network not to access to sex sites like www.playboy.com.

   (a) Squid Tweak

       We install the squid tweak on our cache server. The objective to install squid tweak are: (1) to reject URL that contains sex material base on Squid Guard (2) to remove banner.

       On figure 3.4, we could see that if any network on ITB wants to access the porn and sex site, they will redirect by squid guard. For example, if we accessed to http://www.playboy.com and then the

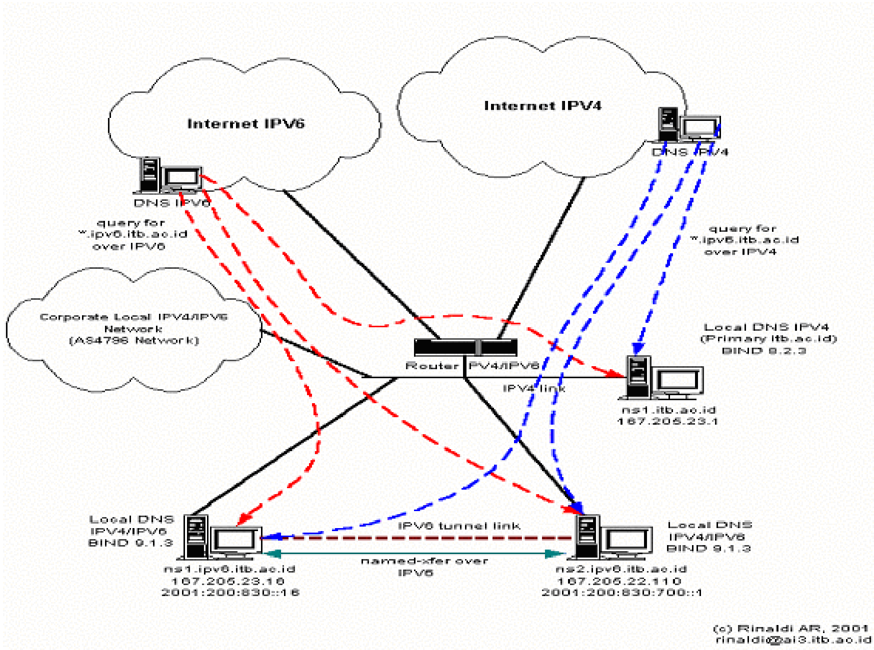

Fig. 3.5. The DNS IPv6 Network at ITB

squid guard would redirect that url to we called it "Penjaga Cumi" or Squid Guard.

We still have problem with banner removal, perl based URL blocking and we cannot moving the "die hard" banner.

(b) Log analyzer

The objectives are using log analyzer are: (1) To Display user utilization (monthly) (2) To analyze user account (3) To analyze utilization time (4) To analyze bytes utilization (5) To recognize user behavior (6) To display user utilization based on time and bytes.

As our methodology, Perl are used for data parsing and script when converting raw data (access.log) into SQL database. PostgreSQL and Web base interface are used. Our results about time consumption are almost 200 MB raw data each day, parsing/inserting/indexing take 6 hours respectively, and for 4 log files the process needs 24 hours per day.

4. IPv6 Status

The IPV6 status of ITB's network is NTLA WIDE/AI3-JP to AI3-INA (2001:200:830::/48). ITB is advertising aggregate routing (2001:200:830::/48 and 2001:200:830::/48) to AI3-JP.

As IPv6 DNS Status, there are 2 DNS Server in ITB. They are ns1.ipv6.itb.ac.id, ns2.ipv6.itb.ac.id using BIND 9.1.3. They are operated on both IPv4 and IPv6 network as shown in Figure 3.5. ITB has created 1 domain specialized for hosts running IPv6, ipv6.itb.ac.id. The IPv6 router on satellite gateway router keeps RIPng and OSPF6 daemons running, but OSPF6 cannot establish adjacency with neighbor. Currently zebra on gerbang is running with ospf6d, but it has not received IPv6 routing recently. Our IPv6 community for the late 2 years have been ceased (because lack of organization, activities, and coordination).

In the next year, we have future research on IPv6. The future research are: (1) to rebuilding IPv6 internal network based on BSD-router as end-point deployment; (2) Redesign

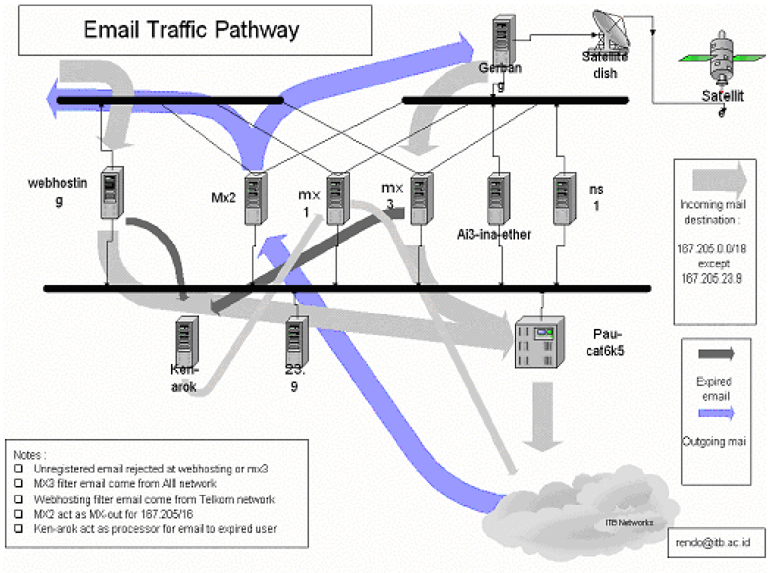

Fig. 3.6. Email Traffic on ITB's Network

IPv6 topology from tunneling solution and change with VLAN trunking solution; (3) To preparing IPv6 DNS to migrate from AAAA address to A6 RR; (4) To socialize IPv6 community by providing as many as possible services with IPv6 abilities and encourage people starting to use them (making the killer application such messenger on IPv6 environment);

5. ITB SOI class report

   ITB participated the following events.

   (a) Special Lecture on IT & Social Studies by Keio University SFC June 18th-July 18th 2002

   ITB began to watch it passively by WMT which available via multicast on their C-Band UDL link. On that time ITB didn't register their participant because when ITB know about the class, the 1st lecture has already begun. ITB only relayed it to their backbone-campus with Cisco PIMD, and announced it to their mailing-list community and encouraged them to watch them.

   (b) Advanced Internet Technology by WIDE Project, November 11th–January 23rd 2003

   The first event ITB prepared to join the whole class actively. ITB began by announcing to their mailing-list to participate in the class. After examining the setup guide, ITB decided using vic/rat instead of polycom, and starting to set class.

ITB has managed to follow the whole class in November 2002 and January 2003, and truthly speaking, it seems only a few student which has been registered, attending class continuously, the rest just decreased and didn't show up. Their reason for not attending the class various, because the topics too advanced for them, they've another academic schedule who can't be missed by etc. ITB think if ITB includes this lecture into some academic credit should attract them to follow the class more diligently.

For the upcoming season/class, ITB-AI3 team promises to hold better class than the previous one. They hopes more class with the same/co-relative topics in the future. ITB-AI3 team expresses their thanks very much to Japan's side who has provided ITB such interesting topics and knowledgeful lecturer.

6. ITB's SMTP Service Status

In The first semester, ITB initiated to do some research related to SMTP services (email). ITB have at least fifty thousand (15,000) students, (one thousand and three hundred) 1300 lecturers and at least (one thousand) 1300 employees. At least ten thousand students have email address (@itb.ac.id).

The Objectives for those research are:

(a) To Measure Incoming email statistics
(b) To Collect email user data
(c) To Supporting AI3-ITB user administration policy
(d) To Blocking email virus
(e) To Analyze and manage the email traffic

Basically the email traffic at ITB is routed as shown in Figure 3.6. Currently ITB has three main email server, MX1.itb.ac.id, MX2.itb.ac.id, and MX3.itb.ac.id. ITB has three main mail server running on FreeBSD. The role of MX1 is to serve 167.205/16 incoming MX, Mailing list server @itb.ac.id + alias, and 167.205/16 outgoing MX. The role of MX2 is to serve 167.205/16 incoming MX. The role of MX3 is to serve 167.205/16 incoming MX and Email filtering.

The MX2 and MX3 are heavy load machine. All traffic coming and outside ITB's network are through those mail server. The MX3 is becoming an email filtering especially for viruses filter. One of the filter is Nimda viruses. The workstation on ITB mostly using Microsoft product and the email client application using Microsoft outlook or outlook express. The Nimda Viruses attack the outlook and he sends many many address in outlook's address book (email) to many email address. The MX3 filter the Nimda outgoing and incoming ITB's Network.

The current condition on three mail server are described as follows.

(a) 257 Mailing lists

There are 257 mailing list (@itb.ac.id). The Mailing list not only for civitas academica of ITB but for anybody who need mailing list. Before user in Indonesia using yahooegroups (largest mailing list server), they are using mailing list on ITB's server.

(b) 125,000 incoming email to ITB (+/−10%)

There are 125,000 incoming email to ITB everyday.

(c) 50,000 incoming email from Yahoogroups (+/−10%)

Everyday ITB receives 50,000 email from Yahoogroups (The favourite and the most popular mailing list).

(d) 1,500 incoming email to @itb.ac.id (mailing list+alias)

15,000 incoming email coming to ITB's mailing list everyday.

(e) 17,000 outgoing email from ITB (+/−10%) from MX.itb.ac.id user

At least 17,000 email coming from ITB's user to Internet everyday. The MX recorded al the data especially from host to any host, how much the size of the email.

(f) 20,000 rejected incoming email (+/−10%)

Almost 20,000 incomong email were rejecting to ITB's user because they contain viruses (Nimda and its derivate).

7. Network Monitoring

We developed and use our network monitoring system to monitor all activities on Internet application. The Main Internet gateway on ITB through JP-ID Ku-Band VSAT ground station. All ITB traffic outgoing and incoming via this gateway. We have 2,000 computer connected to our Campus Backbone and some institutions on Bandung were connected too via wireless LAN to ITB.

The objective of network monitoring research are as follows.

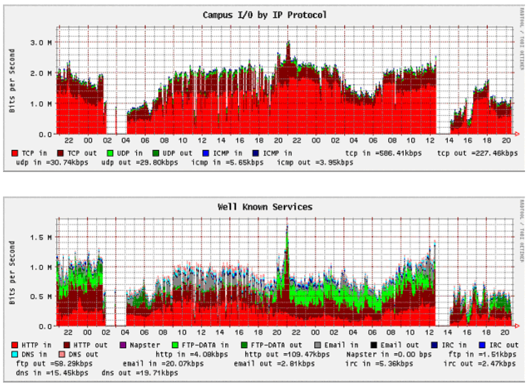

Fig. 3.7. Tele Tapper Traffic (ttt) Graphics running at ITB

(a) To watch our network activities

(b) To measure how much resources have been utilized

(c) To maintain and apply our internal policies

(d) To prevent unknown traffic burst

(e) To predict the future step in fulfilling our needs

ITB has two type of network monitoring system, one is using RRDtools & MRTG and the other using live remote monitoring by Tele trapper traffic (ttt) view. ITB implemented Altq software on ITB router gateway to NAIST (ID-JP).

The principle of the network traffic graph distribution is running Tcpdump on ITB main-router ai3-indonesia-ether.itb.ac.id as illustrated in Figure 3.1 and backup-router itb-bgp-2.itb.ac.id to collect data based on packets header. The results could be seen at http://netman.itb.ac.id/ as front-end draws network traffic distribution graphs every 5 minutes periodically.

ITB has been implementing network monitoring using tele tapper traffic (ttt) for real time traffic monitoring system on satellite gateway routers (Ku-Band and C-band). tttview draws 2 separated graphs which shows main contributors of the traffic, tttprobe invoked on our router and send to

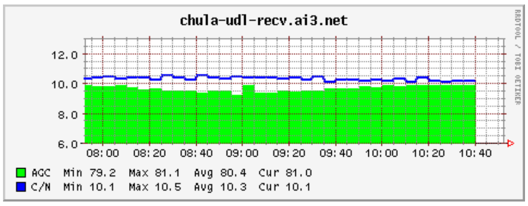

Fig. 3.8. examaple for MWD

remote host. Tttview runs on X workstation to view the graphs sent by router(s) on particular port(s). For example, on satellite gateway (Satellite router), ITB installed the tttview as shown in Figure 3.7. The upper side in this figure shows the result for Ku-band link, while the lower side means the result for C-band link connecting at ITB C-band router, itb-udl-recv.ai3.net.

3.3 SFC

SFC is the hub-station for AI3 C-band network. Since the number of C-band UDL partners has increased nowadays, SFC network operation has became an important part in AI3 network. In this year, there were some activities conducted in SFC. Here there are:

1. Start monitoring the traffic between SFC and NAIST

   We set up Aguri (display aggregation-based traffic profile) to monitor the traffic between AI3 and WIDE in SFC network. By using Aguri,we can monitor the trend of traffic and some burst traffic (ex. Denial of Service). The Aguri web page can be access via "http://sfc-aguri.ai3.net/log/aguri.cgi"
2. Implementation and development the MWD for C-band UDL partners

   We implement and develop the MWD for C-band UDL partners. [82] This tool uses rrdtools and MySQL database,and visualize the some values of the satellite modem status. 3.8 So we can monitor the satellite modem status easily.
3. Installing looking glass

   We set up Stripes Looking Glass in BGP

router to monitor the status of BGP 4 and BGP 4+ routes. Looking Glass page can be access via "http://sfc-serv.ai3.net/cgi-bin/lg.cgi".

4. IPv6 routing
   AI3 network use OSPFv3 for IGP. And some routers in SFC has begun to use BGP4+. Now the BGP4+ connections is established in the satellite link between SFC and MY, as well the link between AI3 and WIDE in SFC network. We begin to get sTLA address for the development of Asia IPv6 infrastructure.
5. Aggregate the satellite routers
   Before, we had satellite routers for each partners. Since operation cost was high, we aggregate the satellite routers to one router. And we set up back-up router for the aggregated satellite router. We are using Cisco bridge for Layer 2 connection between all satellite modems and satellite router.
6. Change the link between SFC and NAIST
   Previously, we used ATM link for the Layer 2 between SFC and NAIST. Now we are using wide area ethernet for the Layer 2 between SFC and NAIST. It goes throughout the WIDE Internet backbone. And we set up the back-up line between SFC and NAIST,using Tunneling-VPN technology.
7. Set up contact server
   The number of AI3 network operators has increased. We can't get some operator information now. So we set up contact server for the operators to get operator information each others.
   The contact server must be secure. So we uses PKI(Public Key Infrastructure) system. Now we set up AI3 CA ,which WIDE Root CA certifies. We will certify the client to access the contact servers and some AI3 servers.

3.4 Temasek Poly

1. QoS over Demand-Assigned TDMA Satellite Network
   This is a funded project from our government agency (Singaren) to carry out the following work, together with our AI3 partner, USM:
   - To provide QoS over Demand-Assigned TDMA-based satellite networks and the understanding in the impact of channel errors over demand-assigned TDMA satellite networks.
   - To provide a framework through the provision of Demand-Assigned TDMA satellite network infrastructure for possible future collaboration with research institutes and the industry.
2. Telemedicine over Satellite
   This is a collaboration project with Nanyang Technological University (NTU) in Singapore to conduct experiment on telemedicine over satellite. Presently, the focus is on ensuring the security of the transmission.
3. Mitigation of Satellite Rainfade
   This is also a collaboration project with NTU, to study the mitigation method of satellite rainfade. Specifically, a rain sensor is designed and built, so that when there is rainfall, the rain sensor will activate a air blower to help to dry the water collected on the feedhorn. Data will be collected to analyse if this method will assist in mitigating the effect of rainfade.
4. Chairmanship of the Satellite-Internet WG in APAN
   TP chaired the Satellite-Internet WG in APAN in the year 2002, and will be doing so in the year 2003.

3.5 USM

1. Installing new Satellite Dish at New Computer Science School Building
   We have moved to a new computer Science school building and installed a new 4.5 meter C-band dish on top of our new 7-storey building. We decided left the old antenna for some other purpose since the wireless link between the old antenna and the computer sci-

ence school proved to be error prone and does not gives a good throughput. Below is our new topology map:

2. Installing Modem Watch Dog
   Modem Watch Dog software was installed to monitored the satellite modem. MWD web page can be access via link below.
   http://www.usm.ai3.net/mwd/index.html
3. Restoring MRTG
   Multi Router Traffic Grapher (MRTG) was up again after a long down due to the insufficient of manpower at the lab. MRTG web page can be access via
   http://www.usm.ai3.net/mrtg.html
4. Installing Stripes Looking Glass
   Stripes Looking Glass was installed to give a visual presentation to non-admin personnel on the status of BGP 4 and BGP 4+ routes. Stripes Looking Glass page can be access via
   http://www.usm.ai3.net
5. Reconfigure BGP 4+ for ipv6 routing
   BGP 4+ from Zebra was down for quite sometime due to some unknown bugs in the softwareK@ju10o itself. With the help of Japan AI3 staff, the problem was finally solved and the routing is back to normal.
6. Installing BGP 4 for Ipv4 routing (in the process)
   We are now starting on configuring BGP4 for IPv4 routing. It is still in the progress, below is our configuration: our AS is 17815, and remote AS is 4717. IPv4 Block to be advertises is 192.207.198.0/27.

3.6 ASTI

ASTI is an Advanced Science and Technology Institute in Philippines.[21] We have The Philippine Research, Education, and Government Information Network (PREGINET) connected to AI3 network.

3.6.1 Infrastructure Update

17 Access Points all over the Philippines

3 Points acting as Exchange Points-Access Points

At least 1 access point per region

Partner Institutions of PREGINET:

- University of the Philippines System
- Mariano Marcos State University
- Don Mariano Marcos Memorial State University
- Benguet State University
- Philippine Rice Research Institute (PhilRice) in Munoz, Nueva Ecija
- Philippine Science High School System
- Mindanao State University? Iligan Institute of Technology
- University of Southern Mindanao
- Mindanao Polytechnic State College
- Leyte State University
- Central Visayas Polytechnic College
- Ateneo de Zamboanga University
- Department of Science and Technology agencies and regional offices
- Department of Transportation and Communications — Telecommunications Office
- Bureau of Agricultural Research, Department of Agriculture
- Central Visayas Information Sharing Network (CVISNET)
- Peering with BITSTOP Inc.

3.6.2 Applications Update

Working Group/Research Meetings:

April 02, 2002

Videoconferencing session of the Agriculture Working Group composed of representatives from University of the Philippines Los Banos, Department of Agriculture, PHNet, Philippine Council for Agriculture, Forestry and Natural Resources and Development and Department of Environment and Natural Resources with APAN/MAFFIN (Dr. Ninomiya and Dr. Eguchi)

April 26, 2002

Second Agriculture Working Group Meeting

ASTI, Diliman, Quezon City

November 19, 2002
Meeting between Philippine Rice Research Institute (PhilRice), Ohio State University, Pennsylvania State University, and Virginia Institute of Technology through videoconference

Paper Submissions/Presentations:

April 12, 2002
Presentation of IPv6 Research during the Networking and Integration for Professionals (NIPS) Conference
Asian Institute of Management (AIM), Makati City

April 30, 2002
Submission of IPv6 Paper entitled "Performance Profiling of Flowlabel-based Packet Classification Using ALTQ on FreeBSD" to INET 2002

May 24, 2002
Presentation of the Paper entitled "IPv6 Deployment" to International Symposium on Parallel Architectures, Algorithms, and Networks (ISPAN) 2002
Ateneo Professional Schools, Rockwell Center Makati City

May 2002
Submission of a Paper entitled "A Management Information Base (MIB) Module Implementation for the EFDATA SDM-300A Satellite Modem" to the Philippine Journal of ICT and Microelectronics

June 08, 2002
Submission of a Paper entitled "A Proposed Network Measurements Architecture for the Philippine Research, Education, and Government Information Network (PREGINET)" to AsiaPacific Advanced Network (APAN)

July 11, 2002
Presentation of the papers on PREGINET and the "Perspectives on Interconnection Networks in the Philippines" during the NAST Symposium
Manila Hotel

August 2, 2002
Presentation of the paper entitled "Experiences in E-Learning over PREGINET" during the 1st National Conference on E-Learning Fiesta Pavillion, Manila Hotel

August 26–28, 2002
Presentation of the Paper entitled "A Proposed Network Measurements Architecture for the Philippine Research, Education, and Government Information Network (PREGINET)" during the Asia-Pacific Advanced Network (APAN) Conference Shanghai, China

November 11–15, 2002
Presentation of the paper entitled "H.323 Implementation over PREGINET" during the 28th Asia Info-Communications Council (AIC) Conference at the Discovery Suites, Manila, Philippines

November 18–19, 2002
Presentation of the paper entitled "Use of Satellite-based Network Infrastructure for Education and Government in the Philippines" during the 4th International Forum on Advanced Satellite Communications in the Asia-Pacific Region held in Tokyo, Japan

January 27, 2003
Presentation of the paper entitled "Characterization, Analysis and Visualization of Traffic in the Asia Internet Interconnection Initiatives (AI3) Satellite-based Research Network Testbed" in the 2003 International Symposium on Applications and the Internet (SAINT 2003) [160]

Others:

January 29, 2002
H.323 Interoperability Event
ASTI, Diliman, Quezon City

August 10, 2002–September 7, 2002
University of the Philippines — Open University (UPOU) videoconference classes with Cebu Students ASTI Conference Room Diliman, Quezon City and CVISNET, Cebu City

November 2002
The IDRC-Pan Asia Networking Programme granted funding to ASTI's "Building a Philippine IPv6 Network" Project

November 11–15, 2002
IPv6 NAT-PT Demonstration during the 28th Asia Info-Communications Council (AIC) Conference at the Discovery Suites, Manila, Philippines

November 27, 2002
IPv6 and Network Simulation Tutorial at the National ECE Conference Department of Electrical and Electronics Engineering
U.P. Diliman, Quezon City