



APAN Compendium Survey Report

May 23, 2007



Asia-Pacific Advanced Network

Overview of the Survey

Date of survey: Thursday, January 25, 2007 ~ Tuesday, March 6, 2007

Survey practices: The APAN secretariat sent the questionnaire by e-mail to NREN in each country -> The questionnaires were returned to the APAN secretariat and Nikkei Research.

Organizer: APAN

Conducted by: Nikkei Research Inc.

Planned by: Nikkei Media Marketing, Inc.

Fund: National Institute of Informatics

The Institutions Subject to the Survey and Status of Return

Institution	Country/Area	Answered
AARNet	Australia	Yes
BAERIN	Bangladesh	No
CERNET/CNGI-CERNET2	China	Yes
CSTNet	China	Yes
HARNET	HongKong	No
ERNET	India	No
ITB	Indonesia	No
NICT(APAN-JP)	Japan	Yes
NICT(JGN)	Japan	Yes
NII	Japan	Yes
KISTI	Korea	Yes
NIA	Korea	Yes
NREN	Nepal	Yes
REANNZ	New Zealand	Yes
HEC	Pakistan	Yes
ASTI	Philippines	Yes
SingAREN	Singapore	Yes
LEARN	Sri Lanka	No
NCHC	Taiwan	Yes
ThaiSARN	Thailand	No
UniNet	Thailand	No
NACESTI	Vietnam	Yes

The number of target : 22 institutions

The number of respondents: 15 institutions

The rate of cooperation: 68.2%

Executive Summary

Summary of APAN Compendium Survey

- ◆ The NRENs in APAN mainly connect to universities. In China (CSTNet) and Pakistan (HEC) mainly connect to research institutes. The expected infrastructure differs depending on the area.
- ◆ Most of the institutions connect at a speed of 1 Gb. They use 2 Mb/s for the research institutes, and primary and secondary schools in many cases even though the connections are not many. Most of the backbone band for the network is currently between 5 Gb/s and 10 Gb/s. In 2-year forecast, 10 Gb/s will increase.
- ◆ KISTI in Korea has distinctively high traffic.
- ◆ Not many institutions answered regarding budget. The average budget is 16.7 million dollars (in 2006). While the most institutions gain income from the government and public bodies, SingAREN and AARNet depend more on clients. Regarding expenditures, transmission capacity has the largest share, especially in Japan, Korea, Pakistan and Singapore, where it accounts for 70% or more.
- ◆ Regarding the services, 13 of 15 institutions currently support IPv6. IPv6 is supported mostly for universities and research institutes.
- ◆ Regarding other services, only four institutions provide information about Looking Glass on the Web. Three institutions provide information about the security incident response on the Web.
- ◆ 7 of 15 institutions are currently interested in the access for roaming end-users. Six institutions are looking to develop PKI service, Identity Management Systems., in the future. Five of 15 institutions are not interested in the billing system at all.

Result of the Survey

<Section 1. Clients>

1. Provision Scope of the NREN Services (1)

Institution	Country/Area	Universities		Institutes of higher/further education		Research institutes		Secondary schools		Primary schools		Libraries, Museums, National Archives		Hospitals		Government departments		Others	
		Served	%	Served	%	Served	%	Served	%	Served	%	Served	%	Served	%	Served	%	Served	%
AARNet	Australia	Yes	100.0	Yes	1.0	Yes	50.0	Yes	5.0	Yes		Yes	10.0	No		No			25.0
CERNET/ CNGI-CERNET2	China	Yes	90.0	Yes	60.0	Yes	30.0	Yes	8.0	Yes	2.0	Yes	6.0	Yes	3.0	Yes	1.0		
CSTNet	China	Yes	10.0	Yes	10.0	Yes	50.0	No		No		Yes	5.0	Yes	5.0	Yes	15.0	Yes	5.0
NICT(APAN-JP)	Japan	Yes	70.0	Yes	1.0	Yes	20.0	Yes	1.0	Yes	1.0	Yes	5.0	Yes	1.0	Yes	1.0	Yes	
NICT(JGN)	Japan	Yes	49.0	Yes	2.0	Yes	2.0	Yes	0.0	Yes	0.0	Yes	0.0	Yes	0.0	Yes	18.0	Yes	29.0
NII	Japan	Yes	67.6	Yes	6.4	Yes	11.0	No		No		Yes	1.0	Yes	0.1	No		Yes	13.8
KISTI	Korea	Yes	25.0	Yes	34.0	Yes	32.0	No		No		Yes	2.0	Yes	1.0	Yes	6.0	No	
NIA	Korea	Yes	27.0	Yes	5.0	Yes	20.0							Yes	5.0	Yes	2.0	Yes	41.0
REANNZ	New Zealand	Yes	40.0	Yes	10.0	Yes	40.0	Yes		Yes	10.0	Yes		Yes		Yes		Yes	
HEC	Pakistan	Yes	18.6	Yes	1.7	Yes	79.7	No		No		Yes		Yes		No		Yes	
ASTI	Philippines	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes			
SingAREN	Singapore	Yes	75.0	Yes	60.0	Yes	70.0	Yes	0.0	Yes	0.0	Yes	0.0		10.0	Yes	0.0		0.0
NCHC	Taiwan	Yes	100.0	Yes	100.0	Yes	50.0	Yes	100.0	Yes	100.0	Yes	1.0	Yes	0.0	Yes	1.0	No	
NACESTI	Vietnam	Yes	50.0		0.0	Yes	33.0		0.0		0.0		0.0	Yes	17.0		0.0	No	

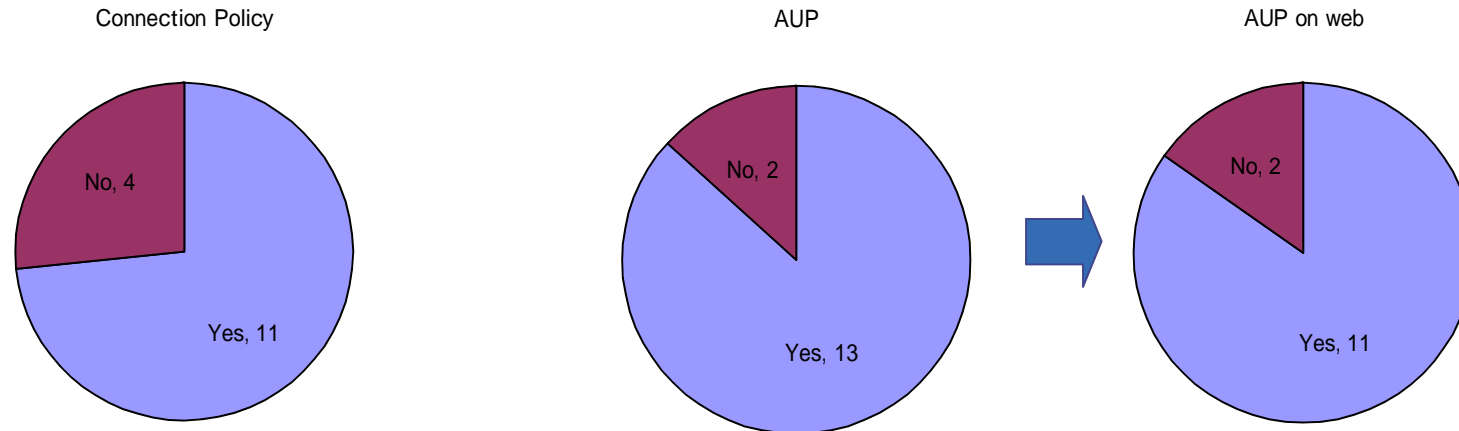
1. Provision Scope of the NREN Services (2) (Others)

- ◆ The NREN services are mainly connected to universities. In NREN in Japan, such as NICT and NII, their share is as great as 70%. In other areas, the share for research institutes are greater. The role of NREN seem to change depending on the status of infrastructure in each country.

Institution	Country/Area	Contents
AARNet	Australia	Organizations associated with Universities-Admission Centres, Universities Secretariat(AVCC)
NII	Japan	research partner companies
NICT(JGN)	Japan	companies, non-profit organizations, etc.
REANNZ	New Zealand	Research divisions of private companies, content and service providers to the research and education sector

2. Status of Connection Policy

11 out of 15 institutions have a connection policy. 13 institutions have AUP.

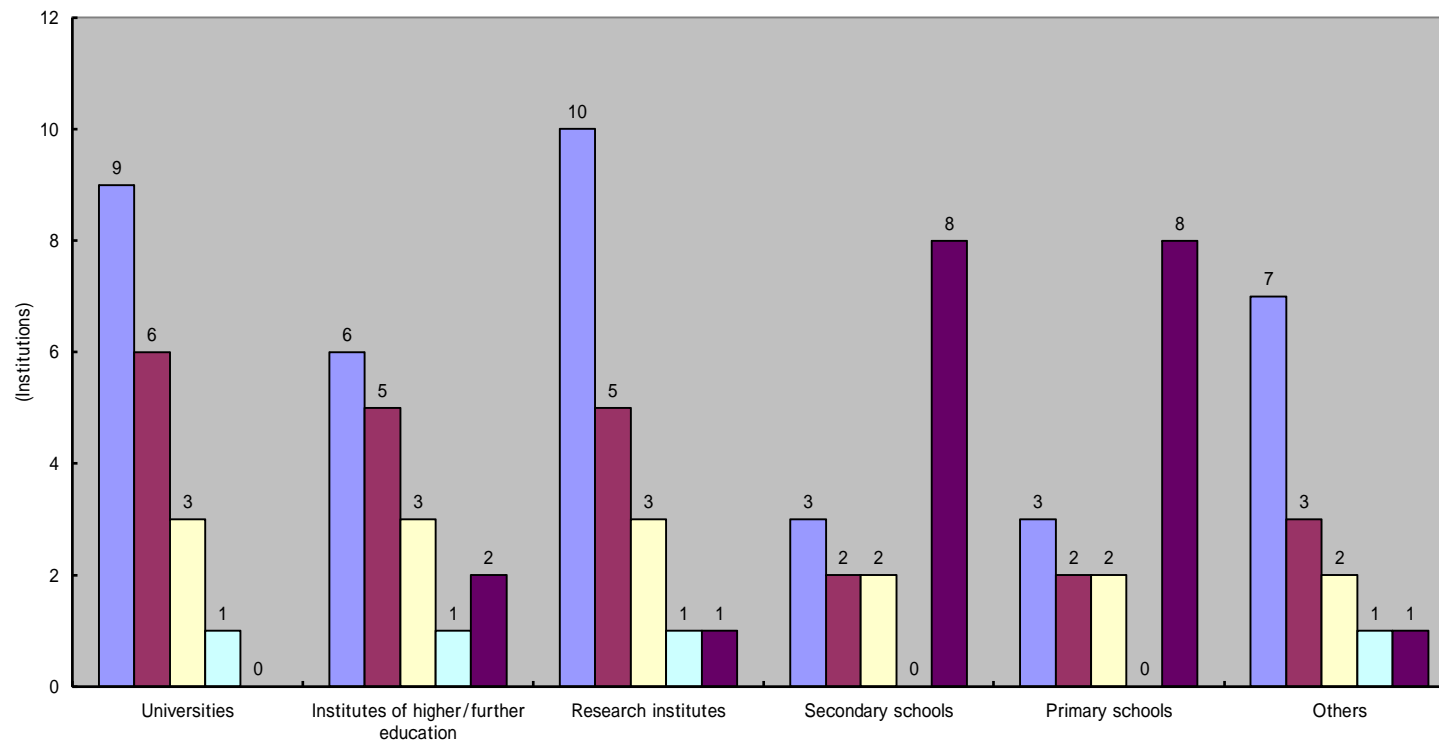
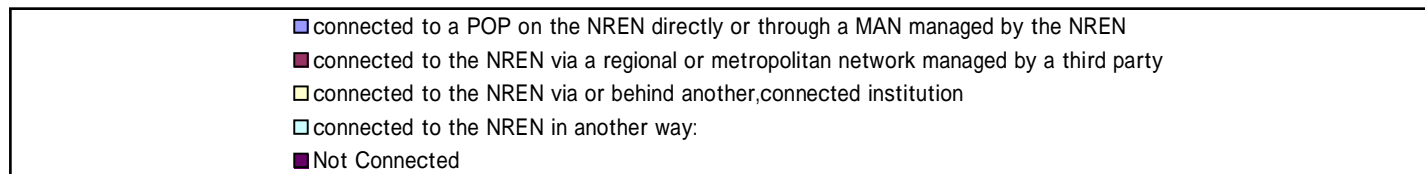


Institutions	Country/Area	Connection Policy
AARNet	Australia	www.aarnet.edu.au/services/accesspolicy.html
CSTNet	China	noc.cstnet.cn
CERNET/CNGI-CERNET2	China	www.edu.cn/laws_1404/index.shtml
NII	Japan	www.sinet.ad.jp/sinet/youshi/kanyuu-kitei.pdf (in Japanese) www.sinet.ad.jp/sinet/youshi/kanyuu-saisoku.pdf (in Japanese)
NICT(JGN)	Japan	http://www.jgn.nict.go.jp/e/03-+method/03-2/data/appendix1.pdf
NIA	Korea	www.koren2.net
KISTI	Korea	www.kreonet.net
REANNZ	New Zealand	www.reannz.co.nz/assets/Uploads/pdfnetworkaccess.PDF
ASTI	Philippines	www.pregi.net/index.php?option=com_content&task=view&id=36&Itemid=60
NCHC	Taiwan	www.twaren.net/index.php?option=com_content&task=view&id=60&Itemid=66 (In Chinese only)
NACESTI	Vietnam	www.vinaren.org.vn/vietnam/introductions/

Institutions	Country/Area	AUP
AARNet	Australia	www.aarnet.edu.au/services/accesspolicy.html
CERNET/CNGI-CERNET2	China	www.edu.cn/laws_1404/index.shtml
NICT(JGN)	Japan	www.jgn.nict.go.jp/e/03-method/03-2/data/appendix1.pdf
NII	Japan	www.sinet.ad.jp/sinet/youshi/kanyuu-kitei/pdf (in Japanese)
NIA	Korea	www.koren2.net
KISTI	Korea	www.kreonet.net
REANNZ	New Zealand	www.reannz.co.nz/assets/Uploads/pdfacceptableuse.PDF
HEC	Pakistan	www.pern.edu.pk/home/acceptable_uasge_policy.htm
SingAREN	Singapore	www.singaren.net.sg/singaren/aup.shtml
NCHC	Taiwan	www.twaren.net/images/stories/services/connection/twaren_aup.doc (In Chinese only)
NACESTI	Vietnam	www.vinaren.org.vn/vietnam/introductions/

3. Topology by Organization

While many universities and research institutes directly connect to NREN, primary and secondary schools in an Asian Area have not established the connection yet. But NCHC has more than 1000 connections to both secondary and primary schools.



4. The Number of Connections by NREN and Connection Speed

[The number of connections by NREN]

Institution	Country/Area	Universities	Institutes of higher/further education	Research institutes	Secondary schools	Primary schools	Libraries, Museums, National Archives	Hospitals	Government departments	Others
AARNet	Australia	48	6	14	1		5		1	12
CERNET/CNGI-CERNET2	China	1200	500	100	200	100	50	50		
CSTNet	China	>10	>10	>100			>20	>20	>50	
NICT(APAN-JP)	Japan	30		20	5		20	5	2	
NICT(JGN)	Japan	257	7	1	0	0	0	0	189	60
NII	Japan	547	52	89	0	0	8	1	0	112
KISTI	Korea	39	55	50			3	2	9	
NIA	Korea	22	4	17	0	0	0	4	2	34
REANNZ	New Zealand	20		15			1			
HEC	Pakistan	47	11	1						
NCHC	Taiwan	145	87	19	1046	2655	2	0	6	

[Connection speed by organizations]

(Institutions)

	connected through ISDN or lower	connected at up to 2Mb/s	connected at >2 Mb and <10Mb/s	connected at >10 and <100Mb/s	connected at >100 and <1000Mb/s	connected at 1Gb	connected at >1Gb and <10Gb/s	connected at 10Gb or above
Universities	2	5	5	5	3	9	4	2
Institutes of higher/further education	2	4	4	2	2	7	2	1
Research institutes	2	4	2	5	4	8	3	3
Secondary schools	2	3	2	2	3	1	0	0
Primary schools	2	3	2	2	1	1	0	0
Libraries, Museums, National Archives	1	2	2	2	3	4	2	1
Hospitals	1	3	1	2	4	2	1	0
Government departments	0	2	0	1	1	5	1	1
Others	1	2	1	2	1	3	1	1

<Section 2. Network>

1. The Number of PoPs, Managed Sites, and Links on the Network

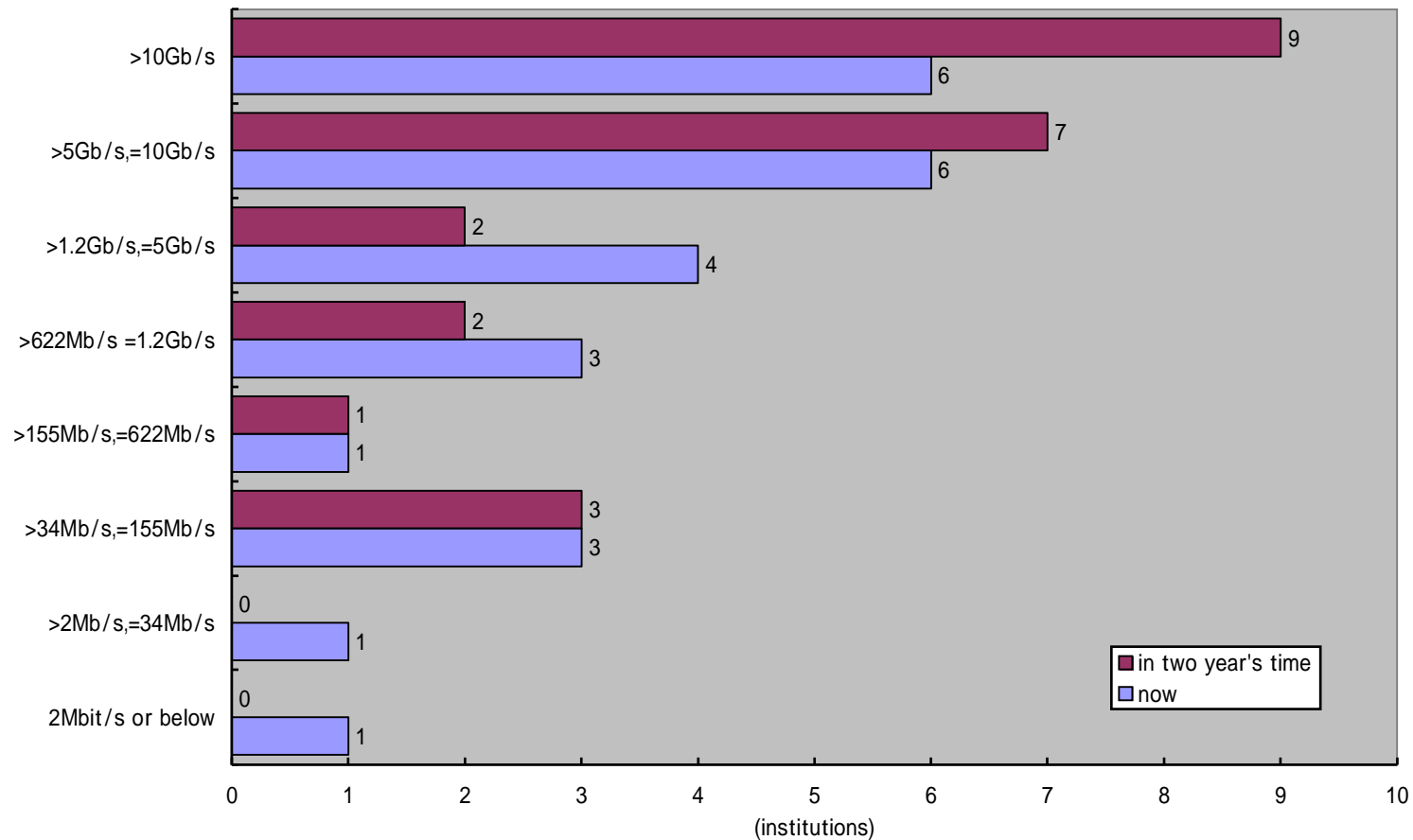
- Institutions in Japan have the distinctively large number of PoPs. The number of managed sites and links is larger in CSTNet in China, which are 100 and 200 respectively, than other institutions .

Institution	Country/Area	The number of PoPs on your network	The number of managed sites on your network	The number of managed links between the managed sites on your network
AARNet	Australia	22	70	79
CSTNet	China	20	100	200
CERNET/CNGI-CERNET2	China	38(CERNET) 25(CERNET2)	38(CERNET) 25(CERNET2)	80+
NICT(APAN-JP)	Japan	4	2	5
NICT(JGN)	Japan	69	69	75
NII	Japan	62	65	102
NIA	Korea	6	36	36
KISTI	Korea	14	15	16
REANNZ	New Zealand	16	16	19
HEC	Pakistan	3		
ASTI	Philippines	3	11	11
SingAREN	Singapore	1	1	
NCHC	Taiwan	12	19	19
NACESTI	Vietnam	5	1	1

2. Major Band Classes on the Network (Comparison between Now and in Two Years)

- Currently, the major band classes on the network are between 5 Gb/s and 10 Gb/s, and many narrower band classes exist. It is expected that, in two years, the 10 Gb/s class will become the norm and the backbones be further improved in Asia.

The typical core usable backbone capacity on your network



3. A Map of Topology

Institution	Country/Area	A Map of topology
CSTNet	China	www.cstnet.cn/gloriad.jsp?Type=wltip
CERNET/CNGI-CERNET2	China	www.edu.cn/introduction_1378/20060323/t20060323_158657.shtml
NICT(APAN-JP)	Japan	www.jp.apan.net/NOC
NICT(JGN)	Japan	www.jgn.nict.go.jp/english/02-about_jgn2/nw/index.html
NII	Japan	www.sinet.ad.jp/engiish/japan_map_1.htm www.sinet.ad.jp/sinet/sinet_kaisen_kouseizu_1.html (in Japanese)
NIA	Korea	www.koren2.net
KISTI	Korea	www.kreonet.net
REANNZ	New Zealand	www.reannz.co.nz/topology/erg.wand.net.nz/weathermap/weathermap.php
HEC	Pakistan	www.pern.edu.pk/home/network_archeticture.htm
ASTI	Philippines	noc.pregi.net
SingAREN	Singapore	www.singaren.net.sg
NCHC	Taiwan	mrtg.twaren.net/mrtg/wmap/
NACESTI	Vietnam	www.vinaren.vn/

<Section 3. Traffic>

1. Traffic from the External Accesses and Clients

- KISTI has the highest traffic, and NII and AARNet follow.

(TB)

Institution	Country/Area	an estimate of the total amount in 2006				an estimate of the total amount in January 2007			
		A. T3	B. T4	A. T1	B. T2	A. T3	B. T4	C. T1	D. T2
AARNet	Australia	1159.0	85.0	1364.0	1996.0	92.0	9.0	119.0	166.0
CSTNet	China	300.0	200.0	100.0	150.0	25.0	10.0	20.0	12.0
NICT(APAN-JP)	Japan	483.9	483.9	483.9	483.9	40.3	40.3	40.3	40.3
NICT(JGN)	Japan	0.0	0.0	11.9	18.7	0.0	0.0	1.6	2.5
NII	Japan	4282.9	7285.7	8494.3	10489.2	410.1	759.5	740.8	964.7
KISTI	Korea	15619.0	16789.0	29629.0	44442.0	1301.0	1309.0	2470.0	3703.0
ASTI	Philippines	13.6	20.4			14.1	23.9		
SingAREN	Singapore	100.0	120.0	400.0	520.0	1.0	1.2	4.0	5.2
NCHC	Taiwan	435.7	966.6			30.7	63.0		
NACESTI	Vietnam	1.7	3.8						

<Section 4. Funding & Staffing>

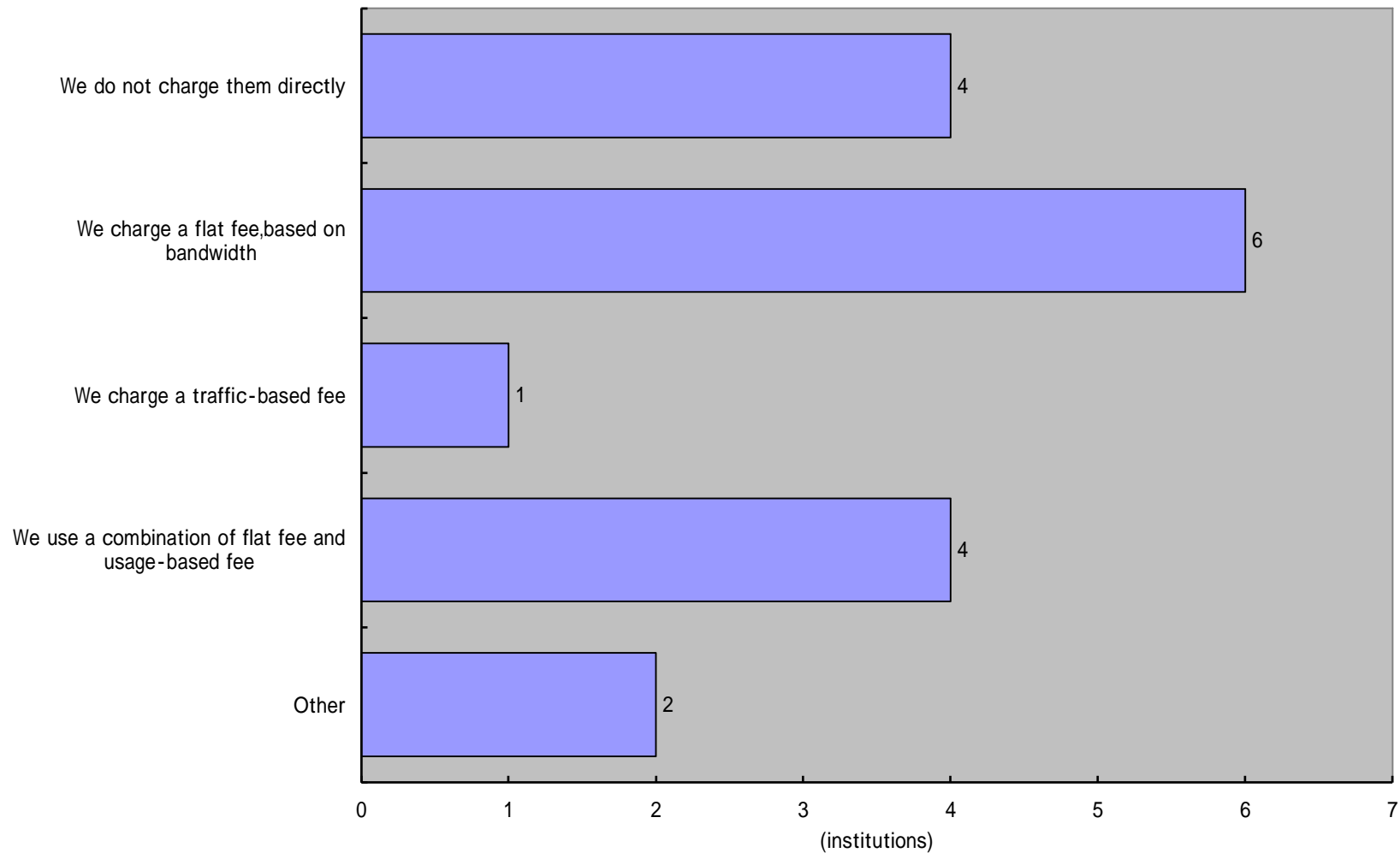
1. Budget for Total and NREN Activities, and Related Income

- ◆ Not many institutions answered regarding the budget. The average is 16.7 million dollars in 2006.
- ◆ AARNet and SingAREN mostly gain NREN-related income from the clients, and other institutions gain it from the government and public bodies.

Institution	Country/Area	(Million \$)				An estimate of the sources of your NREN-related income (%)		
		a. Total budget		b. Budget that was dedicated directly to NREN activities		Users/clients	Government/public bodies	Others sources
		2006	2007	2006	2007			
AARNet	Australia	36.5	35.0	36.5	35.0	73	25	2
CSTNet	China	15.0	20.0	10.0	10.0	20	70	10
NICT(JGN)	Japan					0	100	0
NII	Japan					0	100	0
NIA	Korea	5.4	5.2	2.6	3.6		100	
KISTI	Korea	10.0	10.0	8.0	8.0		100	
ASTI	Philippines					20	80	
SingAREN	Singapore					100		
NCHC	Taiwan					0	100	0
average		16.7	17.6	14.3	14.2			

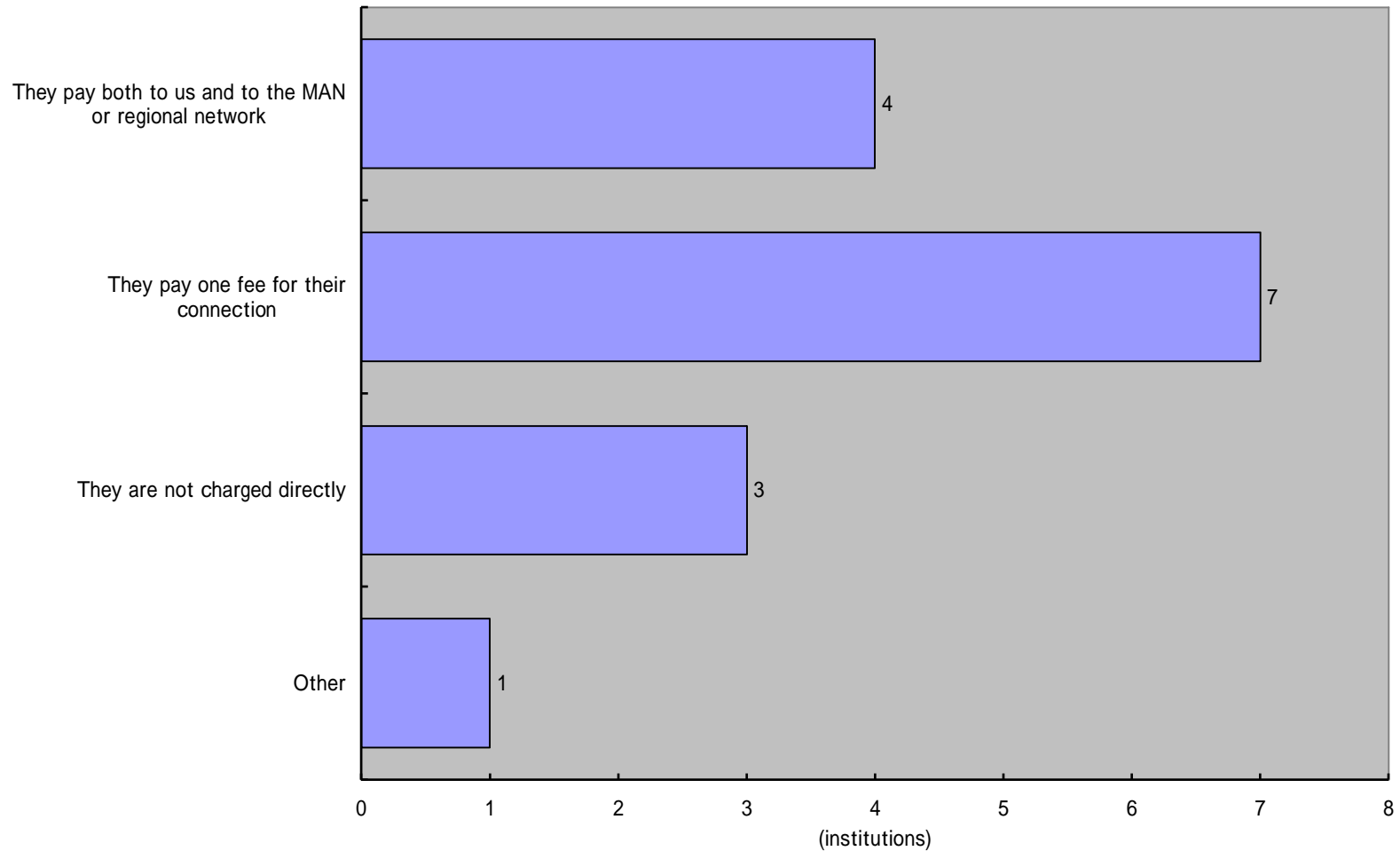
2. How to Charge the Clients

Most of the institutions charge the clients according to a flat fee based on the bandwidth.



3. Payment Method by Clients for WAN and RAN

Most of the clients make payments directly to WAN and RAN. Many clients also pay through NREN.



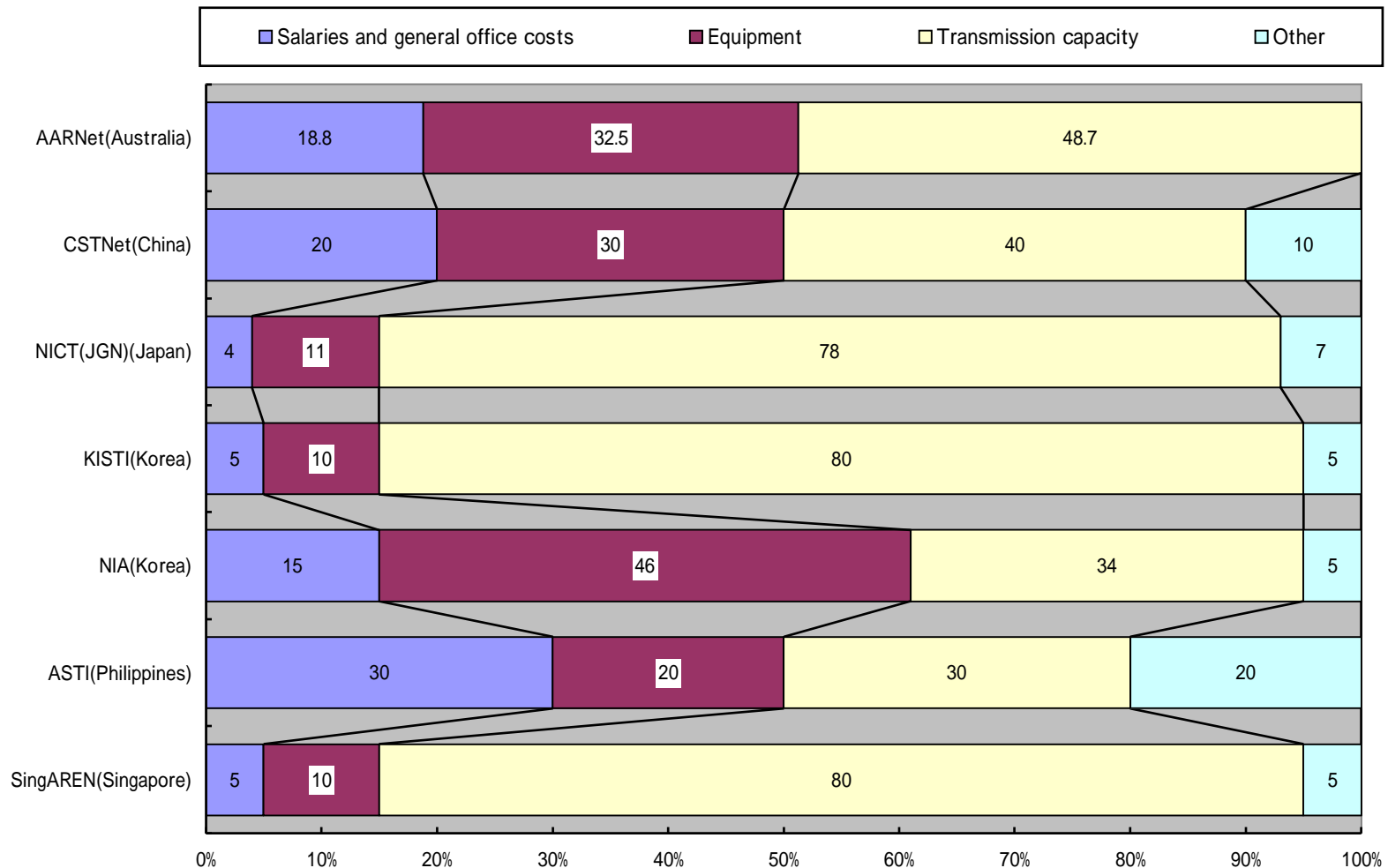
4. Work Force (Total, NREN Employees, and Subcontractors)

- ◆ NICT (JGN) holds the most work force, and then KISTI follows.

Institutions	Country/ Area	The total number of paid staff directly employed	Engaged in NREN activities	
			The number of staff	The number of subcontractors
AARNet	Australia	35		
CSTNet	China		100	0
NII	Japan	142		
NICT(APAN- JP)	Japan		7	5
NICT(JGN)	Japan	490	16	32
KISTI	Korea	330	20	10
NIA	Korea	300	10	25
REANNZ	New Zealand	8		
ASTI	Philippines	127	8	
SingAREN	Singapore		1.5	3
NCHC	Taiwan	268	30	5
NACESTI	Vietnam		6	5

5. Expenditure ratio (For the Institutions that Returned Answers)

- Transmission Capacity has the largest share in expenditure items. NIA, however, spends the most on Equipment.



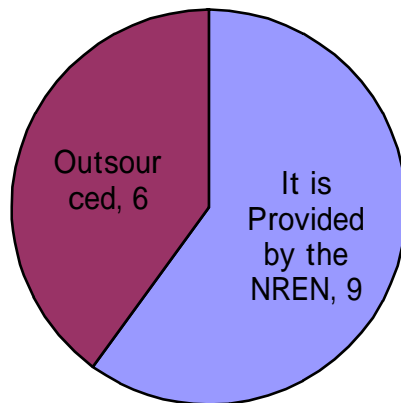
<Section 5. Services>

I. NOC

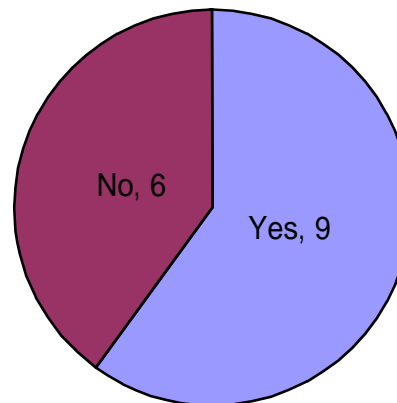
1. Method and Scope of the Provision of Customer Services

9 out of 15 institutions provide NOC. 14 institutions provide all users with the services.

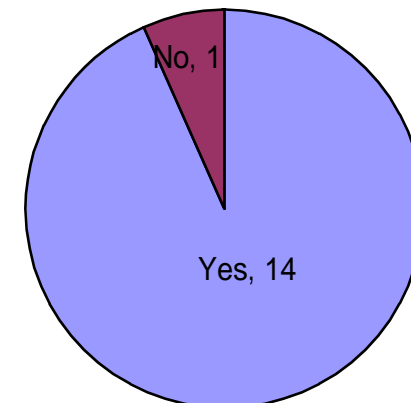
NOC provided by



NOC at the main NREN address

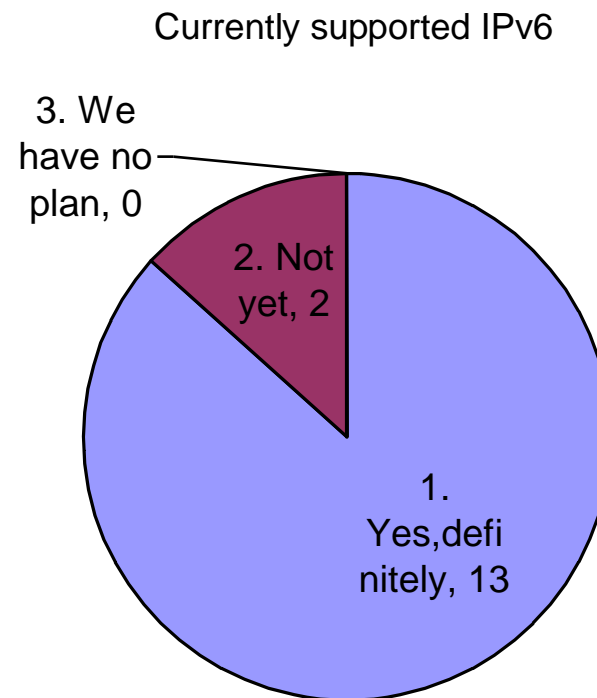


Serve for all your customers



2. Status of IPv6 Support

13 out of 15 institutions support IPv6. The remaining two institutions have plans to start the pilot service in late 2007 and establish the production network service in early 2008 at the latest.



3. Status of IPv6 Connections

IPv6 connection with native is high, especially for universities. No institution uses 6to4.

The main organizations connected via IPv6 are universities and research institutes especially in China, Japan, and Korea.

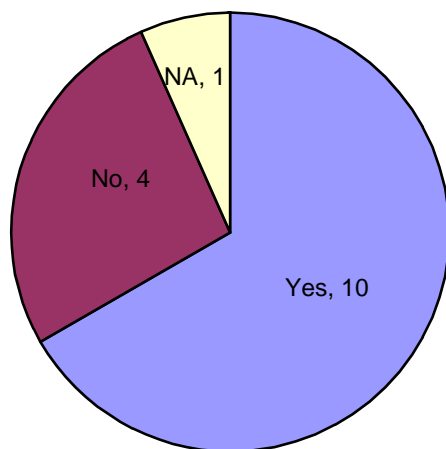
	(Institutions)			
	connected with native IPv6	connected via tunneled IPv6	connected using 6to4	connected using tunnel brokers
Universities	8	2	0	1
Institutes of higher/further education	2	1	0	0
Research institutes	7	2	0	0
Secondary schools	0	0	0	0
Primary schools	0	0	0	0
Libraries, Museums, National Archives	3	1	0	0
Hospitals	0	0	0	0
Government departments	3	1	0	0
Others	2	2	0	0

Institutions	Country/Area	Total number of IPv6 connections								
		Universities	Institutes of higher/further education	Research institutes	Secondary schools	Primary schools	Libraries, Museums, National Archives	Hospitals	Government departments	Others
AARNet	Australia	5								10
CSTNet	China			>20			<5		<5	
CERNET/CNGI-CERNET2	China	180	10	10						
NICT(APAN-JP)	Japan	30		20						
NICT(JGN)	Japan	26	0	0	0	0	0	0	17	13
NII	Japan	38	2	19						1
KISTI	Korea	6		5					4	
NIA	Korea	3	2	4						
REANNZ	New Zealand	8		8			1			
NCHC	Taiwan	43	0	19	0	0	1	0	0	
NACESTI	Vietnam	1								

4. Participation in the IPv6-Related Activities

10 out of 15 institutions participate in various activities promoting IPv6, such as workshops, seminars and e-learning.

Undertaken activities to promote IPv6



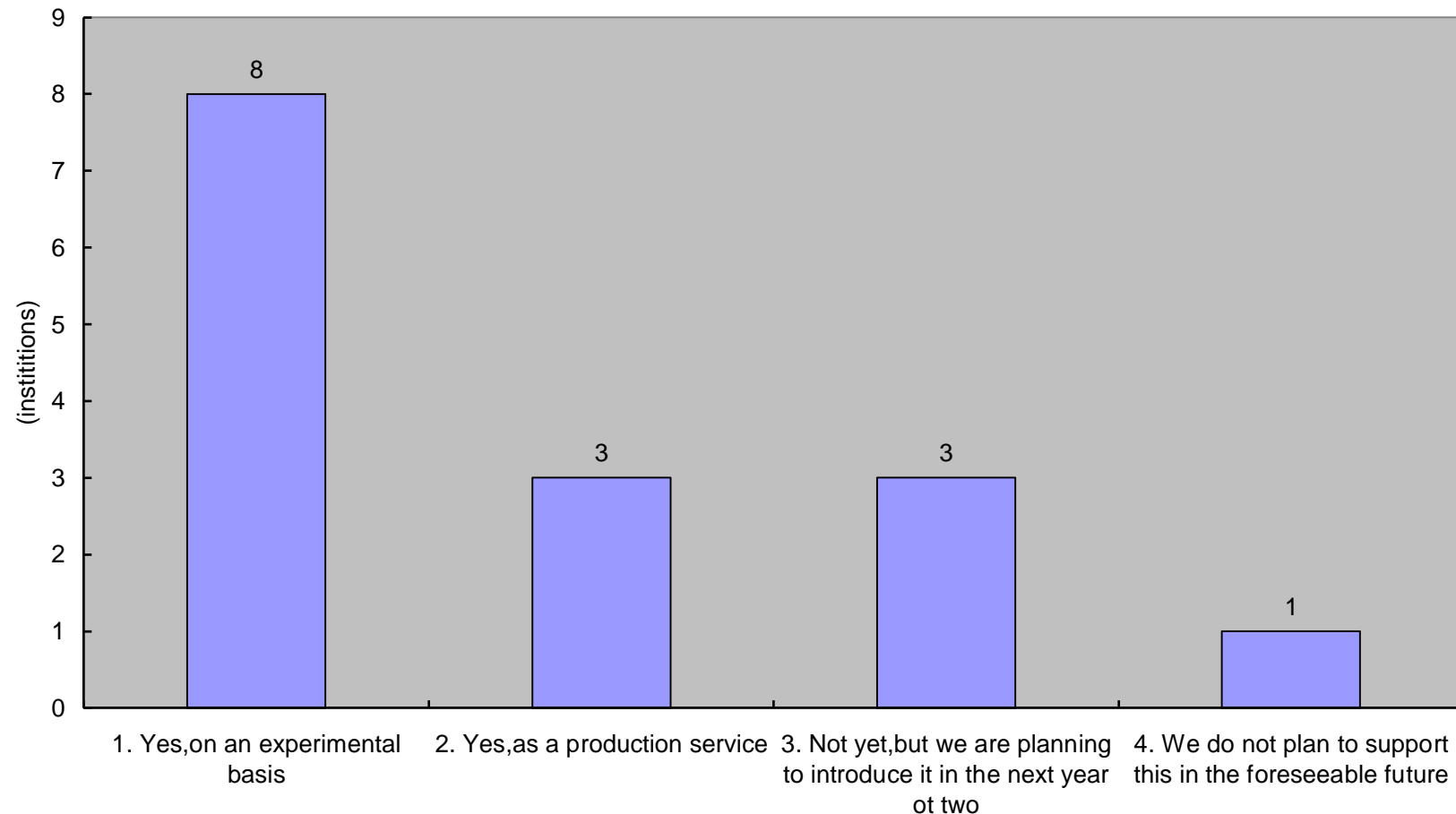
Institutions	Country/Area	Contents of activities related to promotion of IPv6
AARNet	Australia	support for workshops
CSTNet	China	GRID, Video Conference, VOIP, etc.
CERNET/CNGI-CERNET2	China	www.cernet2.edu.cn/metadot/index.pl
NICT(JGN)	Japan	NICT Chugoku Research Center conducts "JGNv6" project to promote IPv6 related experiments by forming user community for this purpose.
KISTI	Korea	We assign IPv6 address and give user guide to use IPv6.
REANNZ	New Zealand	Hands on workshops
ASTI	Philippines	www.phonenix.net
NCHC	Taiwan	Hosting IPv6 conferences, Supporting IPv6 research projects, Giving priority to IPv6 traffic.
NACESTI	Vietnam	e-learning

5. Support of IPv6 Multicasting

Eight out of 15 institutions support IPv6 multicasting.

The remaining institutions are also positively considering it, and there is only one institution that has no plans for it at all.

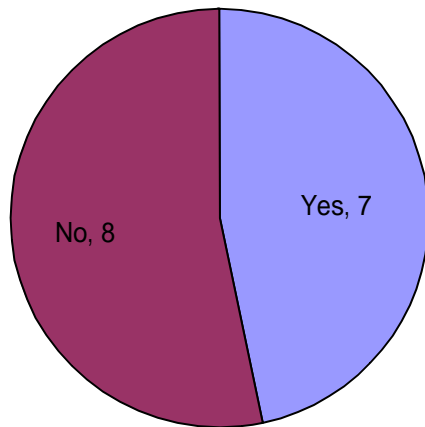
Your Network supported by IPv6 Multicasting



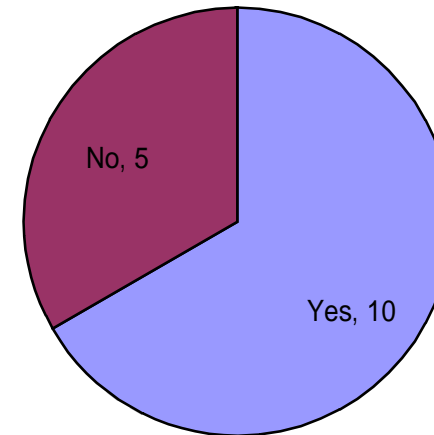
. Performance Monitoring and Management
1. Status of the System

7 out of 15 institutions have implemented PERT. Two-thirds of institutions have monitoring tools on the Web.

Having a PERT



Monitoring tools on Web

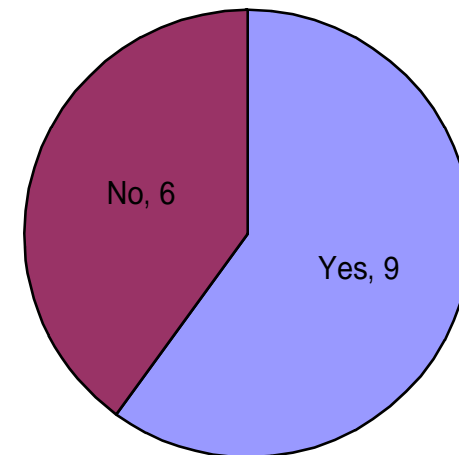


Institution	Country/Area	Monitoring tools on Web
CSTNet	China	mrtg.cstnet.cn/mrtgnew/mrtg/login.htm
NICT(APAN-JP)	Japan	www.jp.apan.net/NOC
NICT(JGN)	Japan	www.jgn2.jp/jp/traffic/weathermap/core2/w4rrd.php
KISTI	Korea	noc.kreonet.net
NIA	Korea	www.koren2.net
REANNZ	New Zealand	erg.wand.net.nz/weathermap/index.php
ASTI	Philippines	noc.pregi.net
NCHC	Taiwan	measurement.twaren.net/eng/

2. Provision of Traffic Statistics on the Web

Nine out of 15 institutions provide information about traffic statistics on the Web.

Traffic statistics on Web

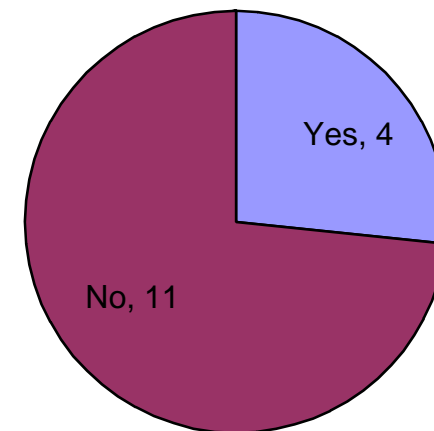


Institution	Country/Area	URL(traffic statistics on Web)
CSTNet	China	bill.cstnet.cn/
NICT(APAN-JP)	Japan	www.jp.apan.net/NOC
NICT(JGN)	Japan	www.jgn2.jp/jp/traffic/index.html(Japanese only)
KISTI	Korea	noc.kreonet.net
REANNZ	New Zealand	erg.wand.net.nz/weathermap/index.php
NCHC	Taiwan	mrtg.twaren.net/mrtg/

3. Provision of Information about Looking Glass on the Web

Only four out of 15 institutions provide information about a Looking Glass on the Web.

Looking glass on Web

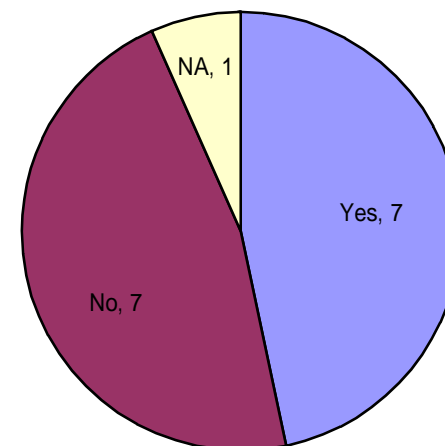


Institution	Country/Area	URL(Looking glass on Web)
NICT(APAN-JP)	Japan	www.jp.apan.net/NOC
KISTI	Korea	noc.kreonet.net

4. Holding of Special Troubleshooting Tools

Seven out of 15 institutions have special troubleshooting tools that are not provided officially.

Special troubleshooting Tools

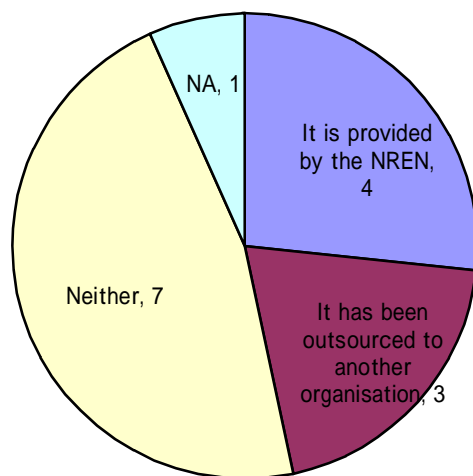


Institutions	Country/Area	Contents of Special troubleshooting Tools
CSTNet	China	Trouble Ticket;Syslog-ng;Flowscan
NICT(APAN-JP)	Japan	Peakflow SP
KISTI	Korea	Network measurement and monitoring tools such as MRTG, Weather Map, Flowscan, amp and so on. All are on KREONET Webpage.
ASTI	Philippines	iperf,smokeping,net flow,ip plan
SingAREN	Singapore	MRTG,iperf,nms
NCHC	Taiwan	Active Measurement Project, NDT, Multicast Beacon

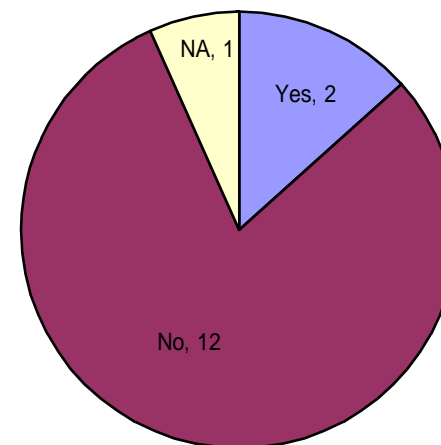
III. AA Infrastructure

The authentication infrastructure in a half of the institutions are neither provided by NREN nor outsourced. Only two institutions have joined an authentication federations.

Using AA Infrastructure



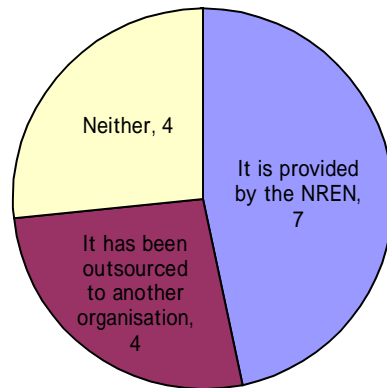
Running AA Federation



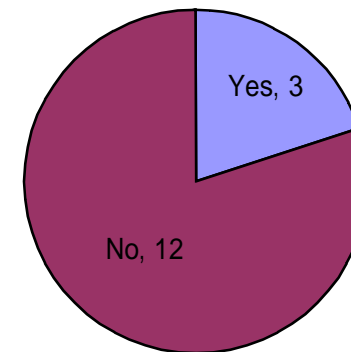
IV. Security Incident Response

In seven of 15 institutions, security incident response is supported by NREN. Four institutions outsource the support. Three institutions provide information about security incident response on the Web.

Institution providing Security Incident Response



Information about Security Incident Response on Web

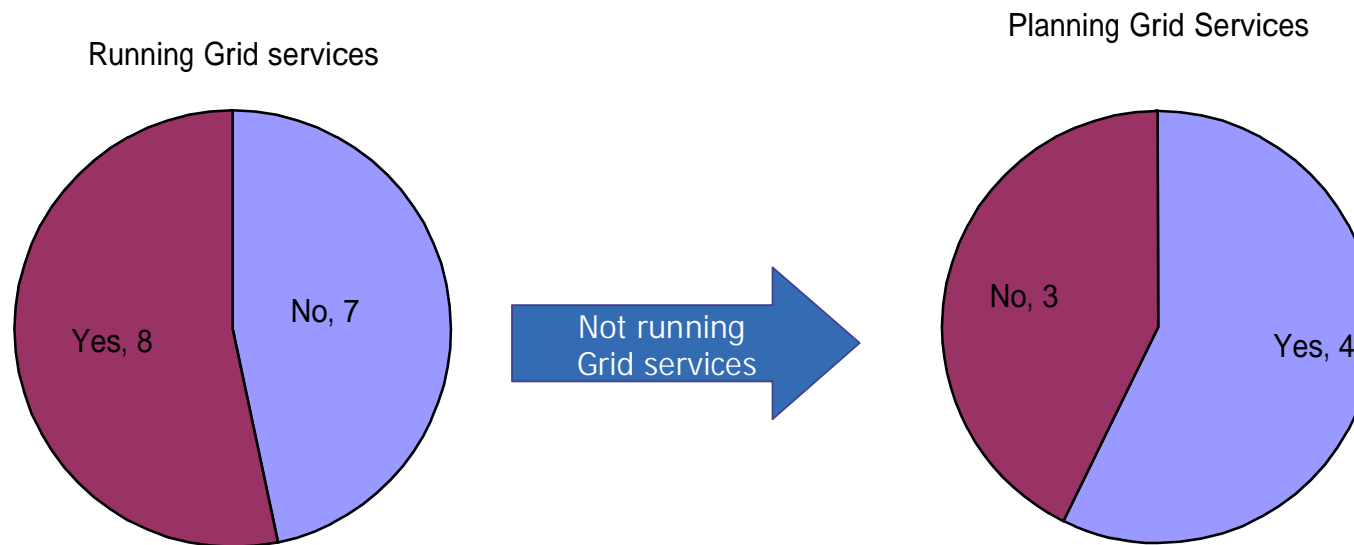


Institution	Country/Area	URL(Information of Security Incident Response on Web)
CSTNet	China	cert.cstnet.cn/
CERNET/CNGI-CERNET2	China	www.ccert.edu.cn/

V. Grid Services

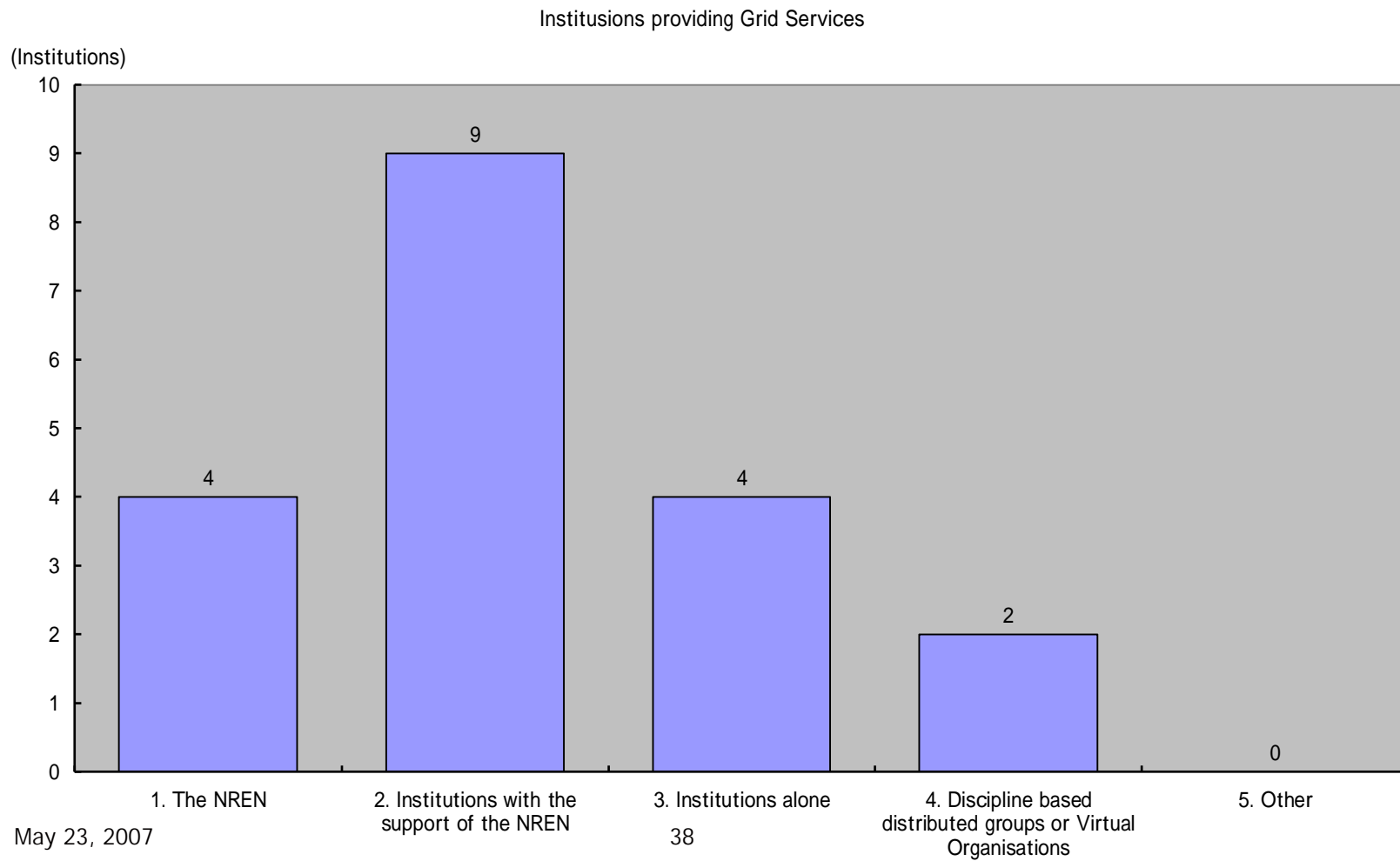
1. Activity Status and Future Plan for Grid Services

Eight out of 15 institutions provide Grid Services. Among the remaining half, four institutions plan to provide the service.



2. Institutions Providing Grid Services

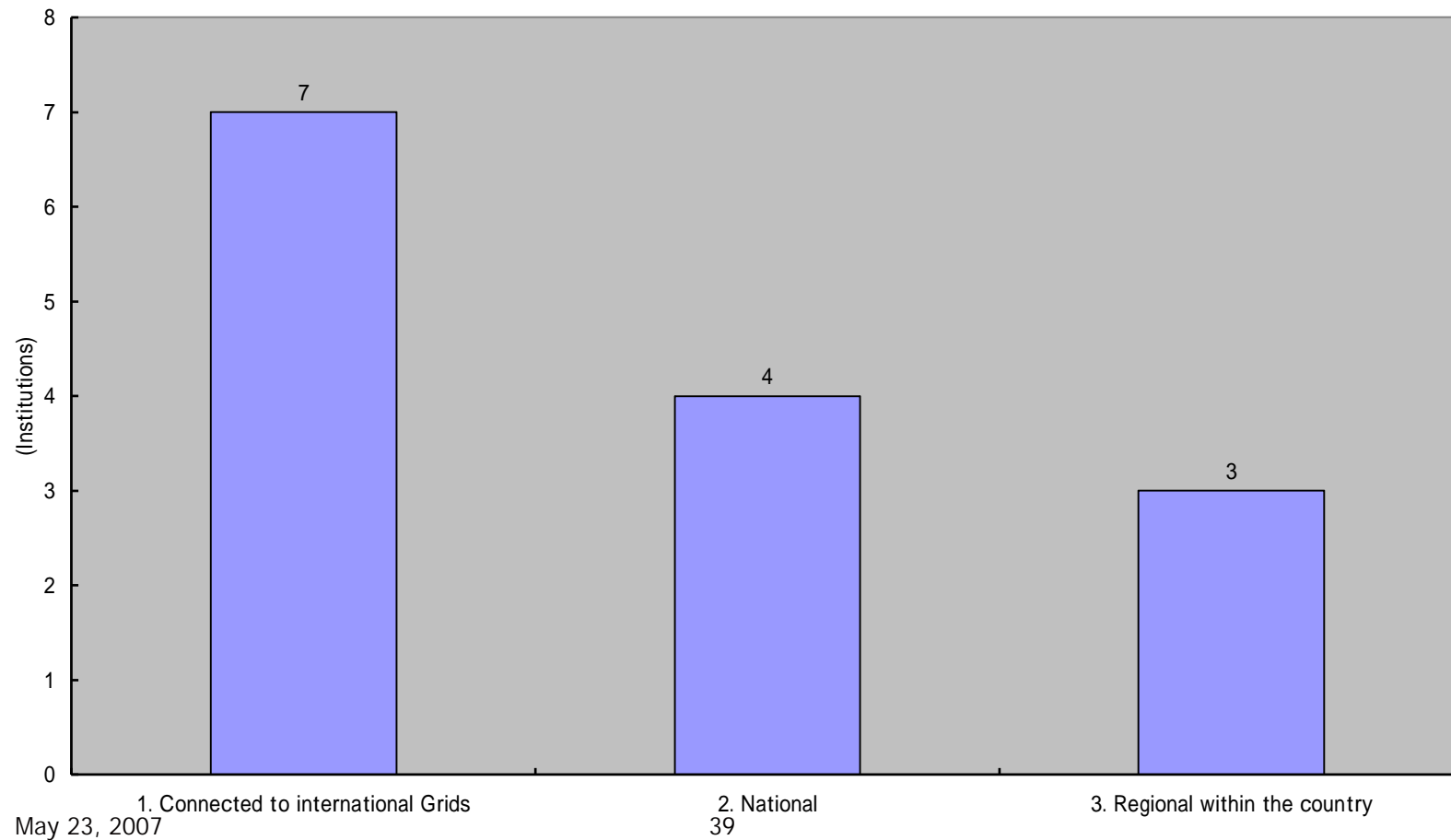
In nine of 15 institutions, Grid Services are provided by an institution supported by NREN. Four institutions provide the services by itself.



3. Provision of Grid Services

Seven out of 15 institutions connect to international Grid Services. Four institutions connect to national services, and another three institutions connect to regional services.

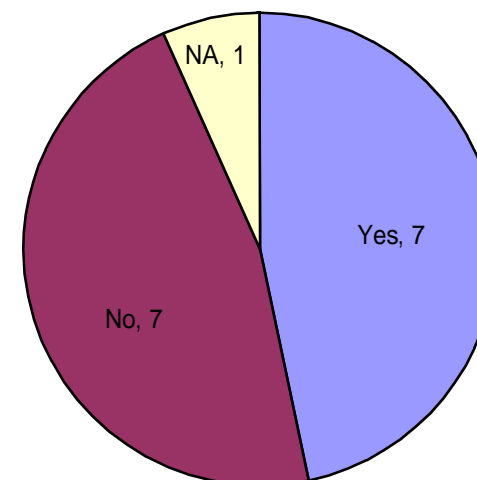
The global extent of Grid services



4. Provision of Information about Grid Services on the Web

Seven out of 15 institutions provide information about Grid Services on the Web.

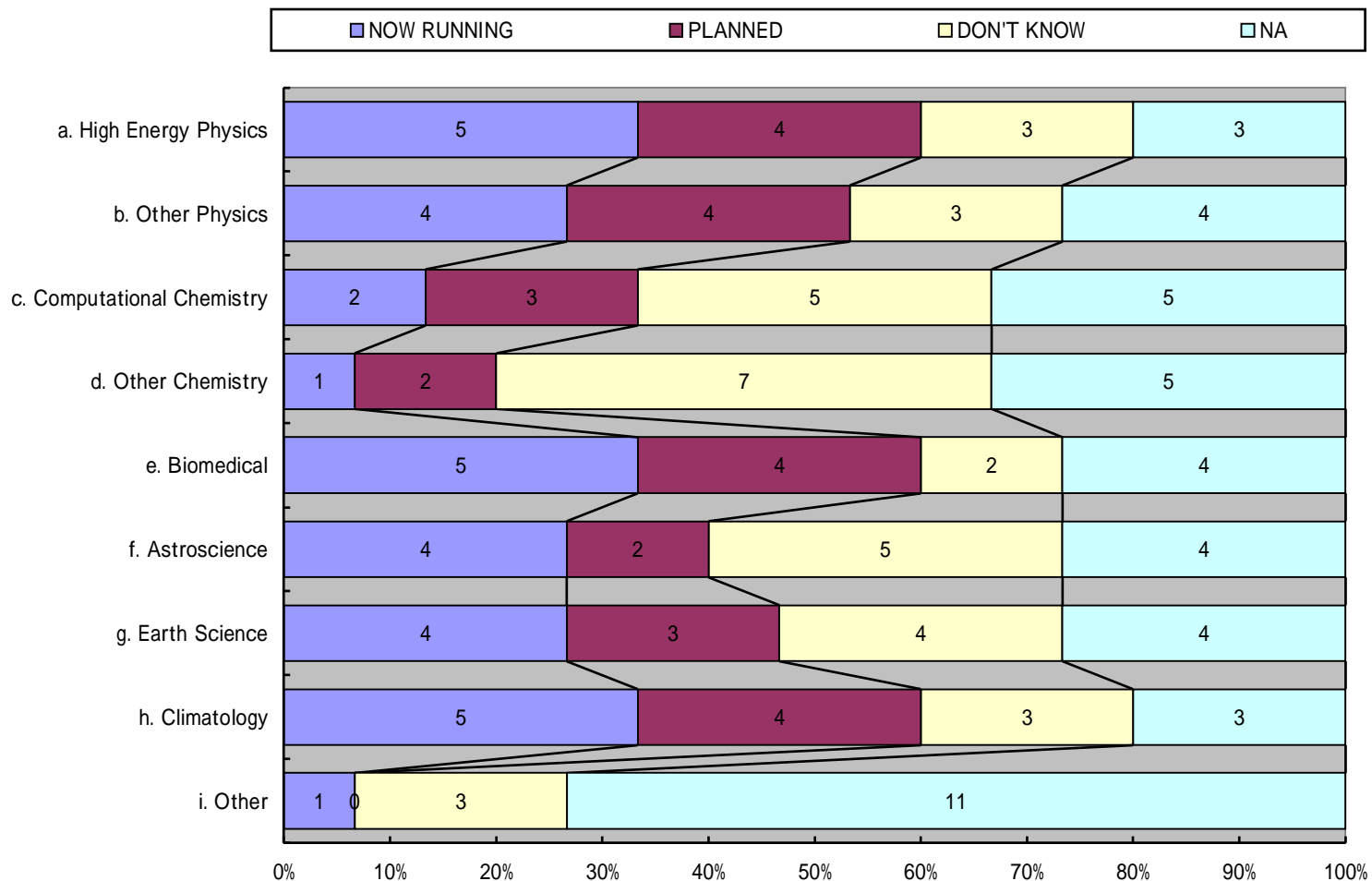
Grid Services information on web



Institution	Country/Area	URL(Grid services information on Web)
CSTNet	China	www.scgrid.cn/page/home.htm
KISTI	Korea	www.ksc.re.kr
REANNZ	New Zealand	www.bestgrid.org/index.php/Main_Page
ASTI	Philippines	philgrid.asti.dost.gov.ph
SingAREN	Singapore	www.ngp.org.sg
NCHC	Taiwan	www.nchc.org.tw/en/

5. The Fields Providing Grid Services

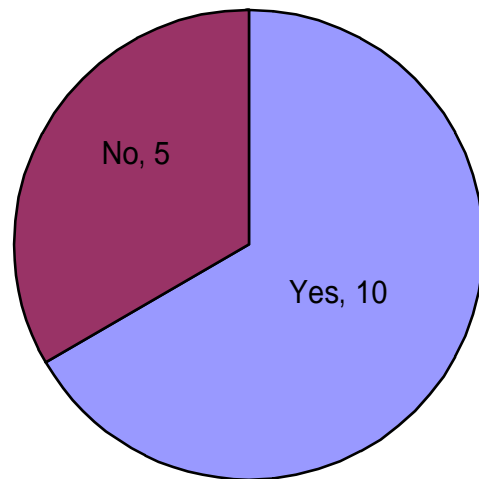
Currently, Grid Services are used the most in the high energy physics, biomedical and climatology field, followed by other physics, astrosience and earth science fields. The service is not provided in most chemistry fields, which have no plans to provide it in the future in many cases.



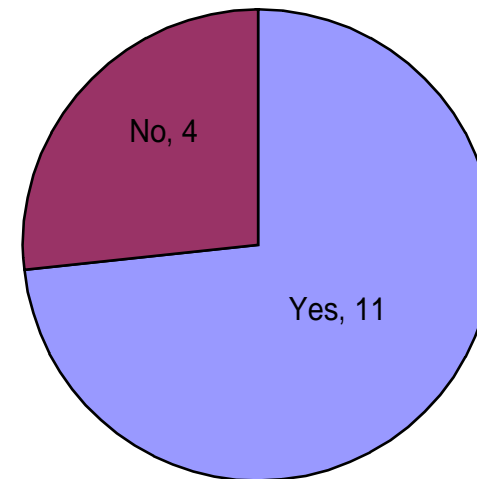
VI. IP Telephony and Video Conferencing

Two-thirds of institutions provide IP telephony services. 11 institutions provide video conferencing. The rate of institutions providing these services are high.

Running IP telephony



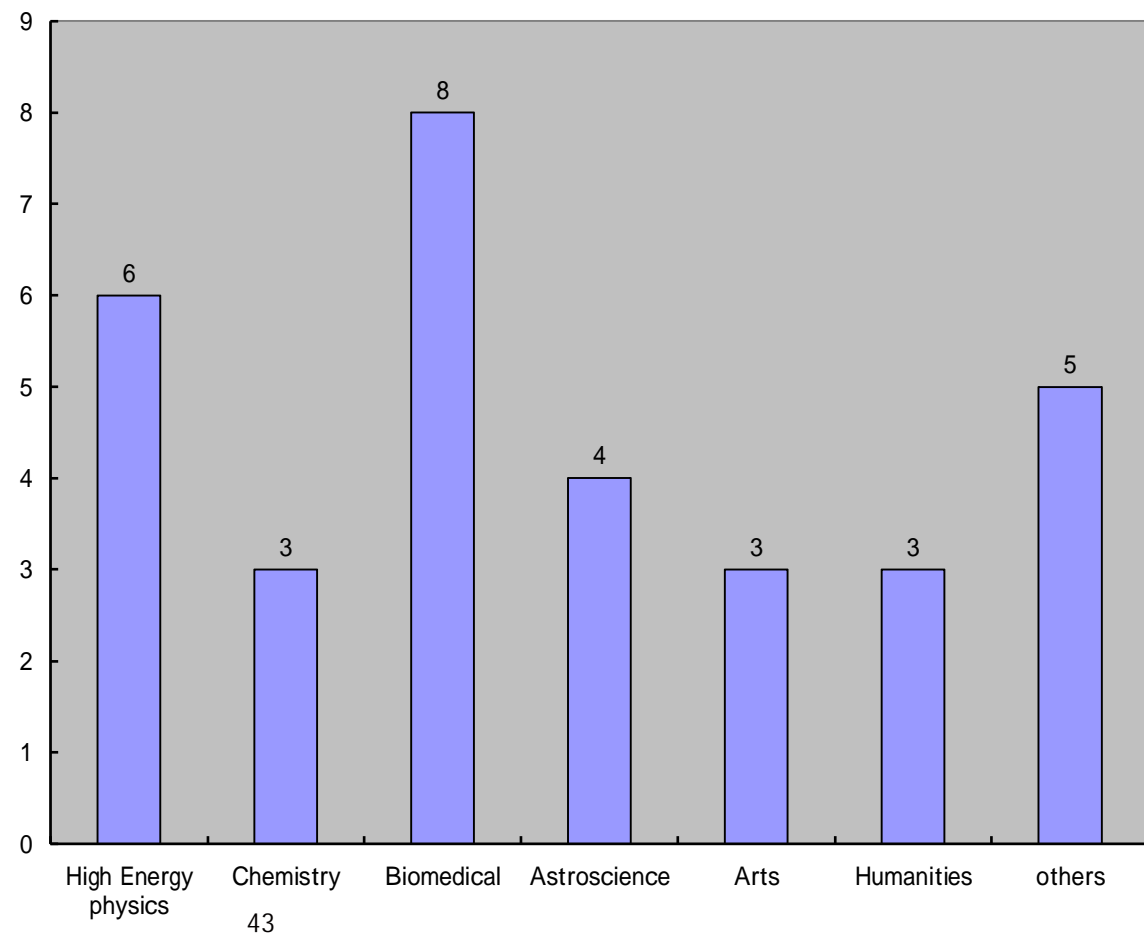
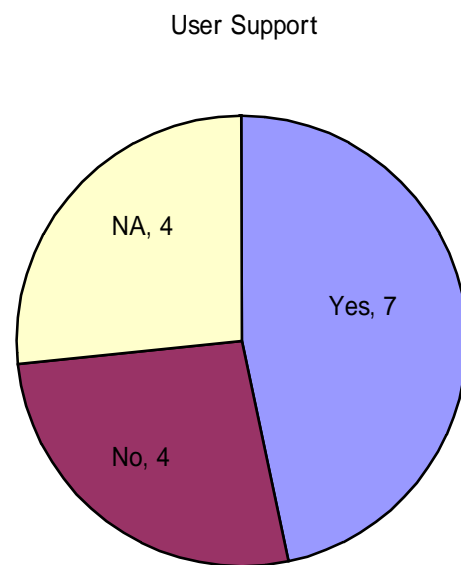
Offering Video Conferencing



VII. User Support

Seven institutions provide user support. Biomedical and high energy physics fields have a high ratio of providing such support .

The categories of User Support



VIII. Attitudes Regarding the Services

Twelve institutions currently provide gigabit Ethernet, video conferencing, and traffic monitoring. Eleven institutions provide SDH/SONET. PKI services and ID management system are planned for the future.

	Now running	Current interested	Essential future	Potential future development	Will follow other NREs	No interest
SDH/SONET	11	1	1	0	1	1
Gigabit Ethernet	12	3	0	0	0	0
Wavelength Testbed access	4	2	3	3	1	1
Wavelength Service Deployment	5	2	2	5	0	1
Wireless LAN	8	1	1	3	1	1
802.1x authentication	4	3	0	5	2	1
Mobile IP	1	3	0	5	2	2
eduroam	6	3	1	1	0	3
Diffserv/QoS	7	4	1	0	2	2
Multi-domain PIP	1	4	1	1	3	4
MPLS Service Deployment	4	5	1	2	3	1
GMPLS Service Deployment	2	6	3	1	1	1
Multicast	8	6	1	0	0	0
Light paths for high-end users	4	3	3	3	2	1
Access for roaming end-users	2	7	1	2	0	3
Directory Services	4	5	1	3	2	1
PKI services	1	6	1	6	2	0
Identity Management Systems	2	5	1	6	2	0
Grid support infrastructures	6	6	0	4	0	0
Teaching and learning applications	8	4	0	2	0	0
Video Conferencing	12	2	0	2	0	0
Streaming Media	5	8	1	0	0	0
Instant messaging	5	3	1	3	1	2
VoIP(internal)	9	4	1	0	0	1
VoIP(across the WAN)	7	6	1	0	0	1
Traffic Monitoring	12	2	1	1	0	0
Charging / billing systems	5	2	2	1	0	5
Web Server content management	8	4	1	2	0	0
Web Server usage analysis	6	5	1	2	0	0
Information Content indexing	3	2	3	4	1	1
Disaster preparedness	5	6	2	1	2	0
Performance Enhancement and Response Team	6	5	1	3	1	0
Others	1	0	0	0	0	0