APNIC

Apster

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The Internet in Indonesia

Indonesia is a Southeast Asian archipelago consisting of 17,000 islands (6,000 inhabited), located on the equator. Long distances, far-flung populations and mountainous terrain have posed a challenge to Indonesia's Internet infrastructure development.

While satellite and wireless technology support television and voice services, these solutions are not ideal for Internet traffic. In addition to problems related to geography, the economy is still emerging from the crippling Asian economic crisis of the region in the mid 1990s.

The early days

The early development of the Internet in Indonesia mainly involved non-commercial research and hobby groups. Merlyna Lim, in her paper "Archipelago Online" notes that Joseph Luhukay established the first Indonesian connection to the 'Internet' of the time in 1983. He set up a UUCP link in the Department of Computer Science, University of Indonesia (UI), Jakarta, and connected to the UUNet in the United States.

Later, Luhukay built the UINET, a network within the campus, which formally joined the UUNet in 1984. The UINET linked to UUNet via a UUCP connection using a store and forward system, and it dialed in to UUNet in the United States using international long distance connections.

Store and forward technology was used for more than a decade and it was not until 1994 that government and ISPs had permanent Internet connections.

In 1986, Minister for Research and Technology Baharudin Jusuf Habibie promoted the idea for IPTEKNET, a research network modelled on NSFNET (National Science Foundation Network). IPTEKNET was finally launched in 1991, using local nodes. In 1994 IPTEKNET connected to the Internet for the first time, and a year later limited public use began. Running at 14.4 Kbps on a leased line, the Internet connection was made through Global One in the United States. The connection was slow and unstable.

IPTEKNET performance improved in 1996 when the Institute of Technology Bandung obtained 1.5 Mbps of bandwidth from the Japan Satellite Corporation (JSat) after being selected as a partner in the WIDE project.

The first ISPs

PT Indo Internet (Indonet), the first commercial ISP, was established in 1994 in Jakarta. Lim notes that by opening up the

▲ Bali, one of Indonesia's most well-known destinations, is the venue for the APNIC 23 meeting, being held from 26 February-2 March 2007.

Internet commercially, there were more than 20 ISPs operating in 1996. An ISP association, APJII, was formed that same year.

APJII started with 12 members. Their aim was to negotiate and consult with government policy-makers, and foster a healthy environment for ISPs to operate. Their first order of business was to set tariff guidelines for ISPs.

APJII joined APNIC in 1999 as a confederation member and achieved NIR status in 2002. The organisation now has over 250 members.

The slow connection speeds and expense associated with routing traffic internationally were two major issues faced by Indonesian ISPs. One of APJII's major achievements was to establish a local Internet Exchange Point in 1998. The ISPs can connect to two nodes at speeds of up to Gigabit Ethernet (though in practice, they use far lower bandwidth). The IIX has a 100 Mbps backbone. There are no port or traffic charges; ISPs simply pay the cost of their connection to the IIX. In addition, several of the larger ISPs maintain private peering arrangements.

APJII, working with APNIC, ISC and Autonomica, also played an important role in establishing two root servers in Indonesia. F and I root servers were installed in 2004 and 2005. The Pan Asia grants programme, of which APNIC is a partner, has funded a research project to measure the impact these root servers have had on DNS speed and stability.

In the interests of smaller ISPs, APJII in 2001 submitted a proposal to have the APNIC minimum IPv4 initial allocation lowered. Although the proposal was unsuccessful at the time, it raised awareness of the needs of smaller ISPs. A subsequent proposal

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initiated by the APNIC Secretariat was successful and the size was reduced from /20 to /21 in 2004.

Internet cafes

The emergence of 'Warnet' outlets (shortened from 'warung Internet') in 1996 marked a major milestone in Internet accessibility for Indonesians. Recent statistics provided by Digital Review of Asia Pacific indicated there were 2.3 million computers in Indonesia. 1.9 million of these computers were used in business and government, and 251,000 were used in households. At the same time, there were approximately four million Internet users and 600,000 Internet subscribers. It was estimated that 60% to 70% of Internet access was provided by approximately 1,500 Internet cafes.

Many Warnet proprietors have also become ISP operators.

Recent developments

Initially, Indonesia's Internet infrastructure development and expansion were hampered by a lack of good quality telephone lines, which were also expensive.

Advances in technology and infrastructure now enable several ISPs to offer broadband. An average medium-sized ISP now has a 200 Mbps connection.

◀ Indonesian Internet pioneer: APNIC Technical and Services Manager, Sanjaya, was heavily involved in establishing Indonesia's first commercial ISP, PT Indo Internet (Indonet) in 1994.

The table below shows how Internet usage has grown during the past decade:

Growth of subscribers and Internet users

Year	Subscribers	Users
1998	134,000	512,000
1999	256,000	1,000,000
2000	400,000	1,900,000
2001	581,000	4,200,000
2003	865,706	8,080,534
2004	1,087, 428	11,226,143
2005*	1,500,000	16,000,000

source: APJII
*estimate up to the end of 2005

The future

Despite the fact that it has faced a range of problems, the Indonesian Internet community continues to grow. As most ISPs are based in the cities, the current challenge for Indonesia is to take Internet accessibility to more remote, less-populated areas in this vast archipelago.

Sources

- Digital Review of Asia Pacific 2003/2004
- APJII - http://www.apjii.or.id
- Indonesian Internet Exchange - http://www.iix.net.id
- EU report – Status of Information and Communication Technology Development in Indonesia, 2003
- Archipelago online – Merlyna Lim, 2005

Many thanks to APJII for their assistance in writing this article.

APNIC 23 Open Policy Meeting

APNIC invites you to attend the 23rd APNIC Open Policy Meeting (APNIC 23) held in conjunction with APRICOT 2007.

26 February - 2 March 2007

Bali International Convention Centre

Bali, Indonesia

You can follow the events at APNIC policy meetings in real time whether you are onsite at the meeting, or watching remotely from anywhere in the world. The following live features are available online to enable you to participate in APNIC meetings in near real time.

◀ Bali will be the venue for APNIC 23 and APRICOT 2007.

Live transcripts

Live transcripts of selected sessions are available via chat clients and web browsers. Text files of the transcripts are available on the web site within a day of being transcribed.

Chat rooms

Jabber chat rooms enable people around the world to participate in meeting sessions in near real time. In chat rooms, you can:

- Follow live transcripts of most meeting sessions
- Discuss issues with others in the chat room
- Have your questions or comments read out and discussed at the meeting
- Have your position (for or against) on policy proposals considered during the consensus process

Video and audio streaming

Selected sessions are also streamed live in full video and audio-only formats. Archives of this video footage will be available on the APNIC web site after the meeting.

http://www.apnic.net/meetings/remote

◀ In the policy development process, decisions are made by consensus. At the meetings, this is addressed by a show of hands, rather than a formal vote.

Proposals to be presented at APNIC 23

prop-037: Deprecation of email updates for APNIC Registry and whois data

This is a proposal to phase out email updates to APNIC registry data.

The APNIC Resource Management System Working Group requested that this second version of the proposal, containing a revised timeframe based on the Working Group's discussions, be submitted to the Policy SIG for consideration at APNIC 23.

prop-042: Proposal to change IPv6 initial allocation criteria

This is a proposal to remove the need to have a plan to make 200 /48 assignments in two years and replace it with a plan to make a reasonable number of assignments in two years.

prop-043: Proposal to remove reference to IPv6 policy document as an "interim" policy document

This is a proposal to remove the reference to the IPv6 policy document as an "interim" policy document from section 1.1 of APNIC-089, "IPv6 Address Allocation and Assignment Policy".

prop-044: Proposal to remove requirement to document need for multiple /48s assigned to a single end site

This is a proposal to remove the requirement for LIRs to document the need for multiple /48s assigned to a single end site.

prop-045: Proposal to modify "end site" definition and allow end sites to receive IPv6 allocations

This is a proposal to allow end sites that are not multihomed to receive portable IPv6 assignments.

prop-046: IPv4 countdown policy proposal

This proposal provides some ideas as well as concrete examples of policy that could help IPv4 allocations from RIRs and NIRs to ISPs come to an end with minimum confusion and in as fair a manner as possible.

The following policy proposal was submitted after the deadline for policy proposals to be discussed at APNIC 23. Therefore, this proposal will be presented as an informational proposal at APNIC 23. At APNIC 24, the community will decide whether to adopt, modify, or abandon the policy proposal.

prop-047: eGLOP multicast address assignments

This is a proposal for RIRs to begin the assigning mechanism set up in RFC 3180 for extended GLOP assignments, known as eGLOP, from the portion of the 233/8 space corresponding to the RFC 1930 Private-ASN GLOP mapped address space.

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An economic and social perspective on a future Internet

The National Science Foundation and the OECD recently held a workshop exploring possible futures for the Internet. **Geoff Huston** provides his view of the workshop.

Is Internet incrementalism a sufficient approach to answer tomorrow's needs for communications? Can we reach useful outcomes solely by allowing research and industry to make progressive marginal piecemeal changes to the Internet's operational model? That's a tough question to answer without understanding the alternatives to incrementalism. It's probably an equally hard question to attempt to phrase future needs outside of the scope of the known Internet's capabilities. It's hard to quantify a need for something that simply has no clear counterpart in today's Internet. But perhaps we can phrase the question in a way that does allow some forms of insight on the overall problem. One form of approach is to ask: What economic and social factors are shaping our future needs and expectations for communications systems?

This question was the theme of a joint National Science Foundation (NSF) and Organisation for Economic Co-Operation and Development (OECD) workshop, held on the 31st January of this year. The approach taken for this workshop was to assemble a group of technologists, economists, industry, regulatory, and political actors and ask each of them to consider a small set of specific questions related to a future Internet.

Thankfully, this exercise was not just another search for the next 'Killer App', nor a design exercise for IP version 7. It was a valuable opportunity to pause and reflect on some of the sins of omission in today's Internet and reflect on some of the unintended consequences of the Internet and ask if they were truly unavoidable consequences.

- Was spam a necessary outcome of the Internet's model of mail delivery?
- Why has multi-lingualism been so hard?
- Is it true that network manageability is a rather poor afterthought?
- Why has Quality of Service proved to be a commercial failure?
- Can real time applications sit comfortably on a packet switched network that is dominated by rate adaptive transport applications?
- Why are trust and identity such difficult concepts in this particular model of networking?
- How did we achieve this particular set of outcomes with this particular Internet framework?
- Can we conceive of a different Internet model where different outcomes would have happened as naturally?

These are more than technical questions. When we consider innovation and investment models, the regulatory framework, consumer choices, innovation in services, and the health of the value chain in the communications industry, we are considering issues that reach well beyond technical topics and are essentially economic and social in nature.

It was against this background that workshop participants were requested to consider particular questions and submit papers on these topics. The presentations and position papers from the Workshop are available online at:

http://www.oecd.org/sti/ict/futureinternet2007

A number of observations that I took away form the workshop struck me as interesting.

One of these was the view from the regulatory perspective that it takes some level of trust in the industry and confidence in the underlying dynamics of private equity in the public communications enterprise to continue a course of deregulation in the face of industry uncertainty. Direct regulatory involvement in the form of phrasing objectives and enforcing certain forms of behaviour in the market would be a more conventional form of expressing regulatory interest.

From a public policy perspective the question relates to the challenge of structuring an environment where market forces and competitive pressures lead towards outcomes that are desirable, or even essential, in terms of public policies and national and regional aspirations. Of course, even considering outcomes at a national level is challenging, given that the network and the economic activity it facilitates are ones that resist the creation of distinct outcomes at a national level. The degrees of freedom in setting public policies at a national level that relate to the communications enterprise, be they economic or social in nature, are highly constrained. Is this a desirable outcome? Are there other models of communications systems that admit greater levels of control? Is the Internet necessarily not only a child of deregulation in the industry, but an outcome that requires a deregulated environment, and one that relies on strong substitutability in terms of competitive supply in order to function efficiently as an open market? Can other regulatory frameworks support a similar outcome in terms of functionality and service portfolio? Is the Internet a unique outcome of a unique form of deregulation?

From an economic perspective I was exposed to the view that the Internet represents the Big Bang of Cosmology for many economists. The Internet's development over the past few decades leading to the boom and bust of the early years of this decade appear to have followed classic forms of economic and social theory. It has assumed the forms of a disruptive wave of technology, (with textbook phases of early adopters and high risk ventures lead by the research world); followed by initial broader impetus (through the definition of new carriage economics); and then, massive disruption as this technology and the associated dazzling range of services attained broad visibility to the entire market.

Economically the technology evolution process can be seen almost as a bipolar process, with a tendency to flip states between incrementalism/piecemeal adoption, and intervals of acute disruption as the industry is confronted with change that is neither backward compatible with existing deployment or existing infrastructure technologies. The disruptive waves allow for large leaps forward in technology, while imposing a considerable cost in terms of stability and surety of investment.

Incrementalism sends out more reassuring signals in terms of overall stability, while at the same time constraining innovation into relatively tightly constrained areas.

The market approach also admits considerable efficiencies, and the Internet's peering and settlement framework, (based as it is on a market approach to interconnection), is often touted as a poster child of the benefits of transition from regulation to markets. The difference in terms of overall cost and efficiency from the call minute regulated accounting and settlement regime to the flat rate market-based approach of the Internet is one market-based economists can look upon smugly!

Of course not every topic is one where market-based approaches yield superior outcomes. The considerations of the longer term interests, the issue of routing (which is akin to the problem of the tragedy of the commons), and equitable service provision prices across domains (where the incremental costs of service provision differ markedly) are topics of considerable interest from

an economic perspective. Economic failures do exist, and the euphoria and ease of access to capital at the height of a boom can be rapidly replaced by scepticism, panic and high cost of capital in the subsequent bust. This transition can occur in a matter of days.

Are there 'property rights' in this environment? Is 'network neutrality' an expression of the network operator asserting some form of property right over the use of the network? Or are networks best operated in an open fashion with open-end devices and open services, where substitutability and competition feature at each and every level in the value chain?

Just constructing an 'open network' where the fundamental network interactions are based on an open and freely available specification is one thing, but we commonly see 'openness' as more than this, and assume that devices are general purpose programmable devices that are open to the user to load service applications upon. We also assume that these service applications are based on an open specification and that there are multiple sources of supply. We tend to view closed devices and closed applications with some scepticism. What interests are we protecting when we load features into software? Should third party software enforce some form of digital rights in content? Should networks allow for complete anonymity of use, or should networks be configured as active systems?

In looking at the range of scenarios that relate to a future Internet we are presented with an array of choices. Some of these represent what appear to be clear choices with clear technical aspects, but others ultimately represent choices between various social values and various forms of control and freedoms. How should we look at this array of economic and social outcomes and then consider what form of technical design decision makes 'sense' for a future Internet?

Whatever way we chose to undertake this examination, it appears that a sensible approach is to undertake such study in a deliberate fashion, understanding that a choice in technology often represents a choice in related economic and social realms. It is also sensible to consider the economic and social perspectives of a future Internet at the same time we ponder the set of technology choices open to us.

Undersea earthquake disrupts Asian Internet

▲ Gaurab Raj Upadhaya: "the scale of the outage was pretty massive".

In December 2006, an undersea earthquake south of Taiwan caused serious damage to several of the submarine cables which provide Internet connectivity in Asia. The damage caused immediate and severe disruptions to Internet service in Taiwan, Singapore, Hong Kong, Korea, and Japan, and problems were observed to 'cascade' through to many other places.

At the time of writing, the damage had still not been repaired and some experts have warned that the deep water and harsh conditions mean that a full repair may take many more weeks, if not months, to complete.

Gaurab Raj Upadhaya, an Internet Analyst with PCH, describes the scale of the outage as "pretty massive".

However, he also notes that "the whole beauty of the thing was that in less than 24 hours, most systems were running again at some level, which showed the resiliency of the network. But it will still force sub-sea cable operators to go back to the drawing table and see how they can avoid similar situations again."

Gaurab is coordinating a special session on the cable outage to be held at APNIC 23 in Bali. The session, to be moderated by Akinori Maemura, will feature Sylvie Laperriere (VSNL International/Teleglobe), Hong-Ren Lo (CHT), Kitamura Yasuichi (APAN NOC), Wilfred Kwan (ANC), and Todd Underwood (Renesys), each presenting their perspective on the event.

This promises to be a fascinating session, and a detailed analysis will be published in *Apster* 22.

2007 ICANN NomCom calls for statements of interest

ICANN has started the process of selecting individuals to serve on the ICANN Board of Directors, two Supporting Organizations, and the At Large Advisory Committee.

On 1 February 2007, ICANN's Nominating Committee (NomCom) made an open call for statements of interest from the Internet community. The NomCom seeks qualified people to assist in ICANN's technical and policy coordination role.

The positions available are:

- Three seats on the ICANN Board of Directors
- Two seats on the Council of the Generic Names Supporting Organization (GNSO)
- One seat on the Council of the Country-Code Names Supporting Organization (ccNSO)
- Three seats on the At Large Advisory Committee (ALAC)

Selection to these positions is considered to be an opportunity to make a valuable public service contribution towards the continued function and evolution of the Internet.

Current Board members who have been selected by the Nominating Committee include: Vint Cerf (Chairman), Susan Crawford, Joichi Ito, Njeri Rionge, Vanda Scartezini, Rajasekhar Ramaraj, Steven Goldstein and Roberto Gaetano.

The NomCom is an independent committee which selects a majority of the members of ICANN's Board of Directors and other positions within the Supporting Organizations. NomCom members are to act only in the interests of the global Internet community and within the scope of the ICANN Bylaws.

Anyone who wishes to lodge a Statement of Interest may do so by emailing <nomcom2007@icann.org>. The deadline is 1 May 2007 and selections will be announced by 2 October 2007. All applications are confidential.

Individuals selected will take up their positions following ICANN's Annual Meeting in November 2007.

More information regarding the Nominating Committee is available at:

http://nomcom.icann.org

AAAA in the roots - IPv6 and the DNS

The DNS Root Server System Advisory Committee (RSSAC) and ICANN Security and Stability Advisory Committee (SSAC) are jointly studying the addition of type AAAA resource records for the IPv6 addresses of the root name servers to the 'root hints file' and the DNS root zone.

Most recursive name servers perform a bootstrap process called 'priming' to determine the current list of root name servers. To prime, a recursive name server sends a DNS query of type 'NS' for the root (".") to one of the root name servers listed in the local root hints file. The response is the current set of root servers and their IPv4 IP addresses

Here is an example of a priming query for the DNS root name-servers, and the current response:

```
$ dig NS . @192.5.5.241
; <<>> DiG 9.3.2 <<>> NS . @192.5.5.241
; (1 server found)
;; global options:  printcmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR,
id: 45507
;; flags: qr aa rd; QUERY: 1, ANSWER: 13,
AUTHORITY: 0, ADDITIONAL: 13
;; QUESTION SECTION:
;.        IN  NS
;; ANSWER SECTION:
. 518400  IN  NS  E.ROOT-SERVERS.NET.
. 518400  IN  NS  F.ROOT-SERVERS.NET.
. 518400  IN  NS  G.ROOT-SERVERS.NET.
. 518400  IN  NS  H.ROOT-SERVERS.NET.
. 518400  IN  NS  I.ROOT-SERVERS.NET.
. 518400  IN  NS  J.ROOT-SERVERS.NET.
. 518400  IN  NS  K.ROOT-SERVERS.NET.
. 518400  IN  NS  L.ROOT-SERVERS.NET.
. 518400  IN  NS  M.ROOT-SERVERS.NET.
. 518400  IN  NS  A.ROOT-SERVERS.NET.
. 518400  IN  NS  B.ROOT-SERVERS.NET.
. 518400  IN  NS  C.ROOT-SERVERS.NET.
. 518400  IN  NS  D.ROOT-SERVERS.NET.
;; ADDITIONAL SECTION:
A.ROOT-SERVERS.NET. 3600000  IN  A  198.41.0.4
B.ROOT-SERVERS.NET. 3600000  IN  A  192.228.79.201
C.ROOT-SERVERS.NET. 3600000  IN  A  192.33.4.12
D.ROOT-SERVERS.NET. 3600000  IN  A  128.8.10.90
E.ROOT-SERVERS.NET. 3600000  IN  A  192.203.230.10
F.ROOT-SERVERS.NET. 3600000  IN  A  192.5.5.241
G.ROOT-SERVERS.NET. 3600000  IN  A  192.112.36.4
H.ROOT-SERVERS.NET. 3600000  IN  A  128.63.2.53
I.ROOT-SERVERS.NET. 3600000  IN  A  192.36.148.17
J.ROOT-SERVERS.NET. 3600000  IN  A  192.58.128.30
K.ROOT-SERVERS.NET. 3600000  IN  A  193.0.14.129
L.ROOT-SERVERS.NET. 3600000  IN  A  198.32.64.12
M.ROOT-SERVERS.NET. 3600000  IN  A  202.12.27.33
;; Query time: 22 msec
;; SERVER: 192.5.5.241#53(192.5.5.241)
;; WHEN: Sun Feb 11 14:54:50 2007
;; MSG SIZE  rcvd: 436
```

Priming ensures that a recursive name server always starts operation with the most up-to-date list of root name servers.

This query was performed over an IPv4 transport, and the response was a set of IPv4 address (A) records. The response message size was 436 bytes in length, which is well under the datagram reassembly maximum size of 512 bytes of DNS payload that is specified in RFC 1035.

But what about IPv6? If we were to consider an all IPv6 world the query would be passed over an IPv6 transport and the query would be about IPv6 address records (AAAA records).

The operators of five root name servers, namely B, F, H, K, and M, have assigned IPv6 addresses to their systems, which are capable of responding to queries over an IPv6 transport. These IPv6 addresses are not included in the DNS root hints file at this time, nor are they present in the root zone. So IPv6 information is not returned in response to DNS priming queries sent by recursive name servers.

The issue here is that adding AAAA records to the root hints file and to the root zone will increase the size of the priming response message. If the five IPv6 addresses were added to the "Additional Section" of the DNS type NS response message of the priming exchange, the size of the response message would increase from the current 436 bytes to 587 bytes. Ultimately, when all 13 root name servers assign IPv6 addresses, the priming response will increase in size to 800 bytes. This message size inflation imposes additional conditions for completing a priming exchange that do not exist today:

- Resolvers and any intermediate systems situated between recursive name servers and root name servers must be able to process DNS messages containing type AAAA resource records.
- Resolvers must use DNS Extensions (EDNS0, RFC 2671) to notify root name servers that they are able to process DNS response messages larger than the 512 byte maximum UDP-encapsulated DNS message size specified in RFC 1035.
- Intermediate systems must be configured to forward UDP-encapsulated DNS response messages larger than the 512 byte maximum DNS message size specified in RFC 1035 to resolvers that issued the priming request.

The ICANN DNS Root Server System Advisory Committee and the ICANN Security and Stability Advisory Committee are seeking feedback from the Internet community on whether commercial firewalls that organisations use to protect resolvers will block these larger priming responses that contain IPv6 AAAA records because they do not satisfy current constraints. The objective is to establish whether there is a substantive issue with this proposed larger priming response when AAAA resource records are added to the root hints file and root zone.

Test your recursive name server

To test whether your recursive name server will operate correctly, perform the following:

1. Determine whether your firewall supports AAAA and EDNS0 by performing the tests described in SAC016:

http://www.icann.org/committees/security/sac016.htm

2. Install a copy of the test hints file, aaaa-test-root-hints on the system that provides a recursive name service. The contents of aaaa-test-root-hints appear below:

IMPORTANT NOTE: This root hints file is for TESTING ONLY. Use this file to test your recursive name server's support of AAAA records for the root name servers. Details of this experiment are available at:

http://www.icann.org/committees/security/sac017.htm

```
. 3600000  IN  NS  aaaa.verisignlabs.com.
aaaa.verisignlabs.com.  3600000 A  65.201.175.33
aaaa.verisignlabs.com.  3600000 AAAA
2001:503:39c1::2:26

. 3600000  IN  NS  aaaa.dns.br.
aaaa.dns.br.   3600000  A     200.160.7.135
aaaa.dns.br.   3600000  AAAA  2001:12ff:0:7::135

. 3600000  IN  NS  roto.nlnetlabs.nl.
roto.nlnetlabs.nl.  3600000  A 213.154.224.153
roto.nlnetlabs.nl.  3600000  AAAA
2001:7b8:206:1::153
```

```
. 3600000  IN  NS  rs-net.isc.org.
rs-net.isc.org.3600000  A    204.152.186.62
rs-net.isc.org. 3600000    AAAA 2001:4f8:3:ba::62
```

3. Configure your recursive name server to use the test root hints file, either by specifying the new file in its configuration or by copying the test file over the current root hints file. (We of course suggest making a backup of your current root hints file, though the official file is easily obtained using the URL at the beginning of this document.) Each recursive name server configuration is different, so you may need to consult your server's documentation, a local expert, or resources on the Internet if you're not sure how to specify an alternate root hints file.

4. Stop and restart the name server process or service. This should cause your name server to "prime". (In some cases, your operating system or DNS appliance may require a system level restart.)

5. Perform the following DNS lookup using the popular 'dig' program to obtain the set of type A and AAAA resource records your recursive name server now has:

```
dig +norec +bufsize=1024 @IP-of-your-recursive-
server . NS
```

To create a file of the dig output, use

```
dig +norec +bufsize=1024 @IP-of-your-recursive-
server  . NS >
testAAAA.txt
```

If you are able to run dig on the recursive server itself, you can send queries to the server's loopback (localhost) address by using an IP address of 127.0.0.1 in the dig command above.

6. Compare the output of your dig query against the information below (note that this query is performed at a recursive name server's localhost IPv4 address, 127.0.0.1, and that the TTLs and order of resource records returned in response to your request may be different):

```
$ dig +norec +bufsize=1024 @127.0.0.1 . ns

; <<>> DiG 9.3.2 <<>> +norec +bufsize=1024 @IP-
of-your-recursive-server . NS
; (1 server found)
;; global options:  printcmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR,
id: 48730
;; flags: qr ra; QUERY: 1, ANSWER: 13, AUTHORITY:
13, ADDITIONAL: 19
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;.    IN  ANY
;; ANSWER SECTION:
. 514104  IN  NS  A.ROOT-SERVERS.NET.
. 514104  IN  NS  B.ROOT-SERVERS.NET.
. 514104  IN  NS  C.ROOT-SERVERS.NET.
. 514104  IN  NS  D.ROOT-SERVERS.NET.
. 514104  IN  NS  E.ROOT-SERVERS.NET.
. 514104  IN  NS  F.ROOT-SERVERS.NET.
. 514104  IN  NS  G.ROOT-SERVERS.NET.
. 514104  IN  NS  H.ROOT-SERVERS.NET.
. 514104  IN  NS  I.ROOT-SERVERS.NET.
. 514104  IN  NS  J.ROOT-SERVERS.NET.
. 514104  IN  NS  K.ROOT-SERVERS.NET.
. 514104  IN  NS  L.ROOT-SERVERS.NET.
. 514104  IN  NS  M.ROOT-SERVERS.NET.
;; AUTHORITY SECTION:
. 514104  IN  NS  M.ROOT-SERVERS.NET.
. 514104  IN  NS  A.ROOT-SERVERS.NET.
. 514104  IN  NS  B.ROOT-SERVERS.NET.
. 514104  IN  NS  C.ROOT-SERVERS.NET.
. 514104  IN  NS  D.ROOT-SERVERS.NET.
. 514104  IN  NS  E.ROOT-SERVERS.NET.
. 514104  IN  NS  F.ROOT-SERVERS.NET.
. 514104  IN  NS  G.ROOT-SERVERS.NET.
. 514104  IN  NS  H.ROOT-SERVERS.NET.
. 514104  IN  NS  I.ROOT-SERVERS.NET.
. 514104  IN  NS  J.ROOT-SERVERS.NET.
. 514104  IN  NS  K.ROOT-SERVERS.NET.
. 514104  IN  NS  L.ROOT-SERVERS.NET.
;; ADDITIONAL SECTION:
A.ROOT-SERVERS.NET. 600504  IN A 198.41.0.4
B.ROOT-SERVERS.NET. 600504  IN A 192.228.79.201
B.ROOT-SERVERS.NET. 600504  IN AAAA
2001:478:65::53
C.ROOT-SERVERS.NET. 600504  IN A 192.33.4.12
D.ROOT-SERVERS.NET. 600504  IN A 128.8.10.90
E.ROOT-SERVERS.NET. 600504  IN A 192.203.230.10
F.ROOT-SERVERS.NET. 600504  IN A 192.5.5.241
F.ROOT-SERVERS.NET. 600504  IN AAAA
2001:500::1035
G.ROOT-SERVERS.NET. 600504  IN A 192.112.36.4
H.ROOT-SERVERS.NET. 600504  IN A 128.63.2.53
H.ROOT-SERVERS.NET. 600504  IN AAAA
2001:500:1::803f:235
I.ROOT-SERVERS.NET. 600504  IN A 192.36.148.17
J.ROOT-SERVERS.NET. 600504  IN A 192.58.128.30
K.ROOT-SERVERS.NET. 600504  IN A 193.0.14.129
K.ROOT-SERVERS.NET. 600504  IN AAAA
2001:7fd::1
L.ROOT-SERVERS.NET. 600504  IN A 198.32.64.12
M.ROOT-SERVERS.NET. 600504  IN A 202.12.27.33
M.ROOT-SERVERS.NET. 600504  IN AAAA
2001:dc3::35
     ;; Query time: 2 msec
     ;; SERVER: 127.0.0.1#53(127.0.0.1)
     ;; WHEN: Tue Jan 30 08:50:55 2007
     ;; MSG SIZE  rcvd: 756
```

If your recursive server successfully used the test root hints file and processed a priming response from one of the test name servers, you may see AAAA resource records for some of the root name servers in the dig output as in the example above. Note, however, that the absence of these records doesn't necessarily mean something is wrong: Your server may have received the proper response, but does not return the records when queried for them. (You may be able to confirm this by examining DNS server or system event logs.)

7. The final step in the test is to use your name server. Does it resolve queries and operate normally?

Your recursive name server passes the test if it starts normally, continues to run and resolves queries as usual when configured to use the test root hints file.

We are most interested to find servers that fail the test by refusing to start when presented with the test root hints file containing AAAA resource records, or that don't operate normally or resolve queries properly after receiving AAAA resource records in the priming response from the test root name servers. The scope of this test is not limited to resolvers that have IPv6 transport. We are also interested in results for resolvers that have IPv4 transport only.

Share Your Results with the Internet Community

The SSAC and RSSAC committees encourage you to share your test results with the community by sending an email to the ICANN SSAC Fellow (dave.piscatello@icann.org) containing the following information:

- DNS Name Server (hardware or software) product & manufacturer
- Hardware model (if applicable)

- Operating System and DNS server versions (for BIND version,

  "dig@nameserver version.bind txt chaos"

- Did the name server implementation succeed or fail to bootstrap when configured with a hints file containing type AAAA resource records? Did your name server issue an error and/or stop running after being restarted with the test root hints file in place?

- If your name server failed to bootstrap over IPv4 transport:
  - Can you provide a description of the failure or an error code?
  - Were you able to resolve the failure condition by making a configuration change? If yes, please describe any changes to your name server configuration that resolved the failure condition.

- If your name server successfully bootstraps over IPv4 transport:
  - Does it support EDNS0?
  - Is it able to parse AAAA resource records?
  - Does your name server retain a local copy of the type AAAA records for the root name servers?

Please provide a copy of the dig input and output (as illustrated above, this can be obtained by directing the output to a file, e.g., "dig +norec @IP-of-your-recursive-server . NS > testAAAA.txt"); alternatively, indicate success or failure. If failure, please provide the Domain System Response Code reported.

- Does the name server continue to function correctly following a priming exchange with a test root name server? (The root and root servers.net zones used for testing purposes will contain the IPv4 and IPv6 addresses of operational, authoritative root name servers.)

This article is based on the Joint RSSAC and SSAC announcement of the 12th February:

http://www.icann.org/committees/security/sac016.htm

- Geoff Huston

Apstats

In February 2007 APNIC launched Apstats, its statistics report generator. Apstats enables users to easily access membership and resource statistics. It was developed using Ideasoft 03 software in response to the popularity of a similar system launched by LACNIC in 2003.

Apstats was developed to give accessibility for the broader Internet community to obtain answers to queries that previously relied on response requests from APNIC staff. Frank Salantri, APNIC Senior Project Manager, said “Apstats meets a need in today’s self-service society where people demand instantaneous information. Currently APNIC only publish resource statistics. The introduction of Apstats will also include membership statistics. ”

Apstats provides a tool for interactive analysis of APNIC membership and resource statistics. It also stores historical data as far back as 1985 for resources and 1995 for memberships. Information can be displayed in a number of ways including graphs, charts and spreadsheets, and can be downloaded for local use.

Use is simple with the inclusion of features, such as self-documenting menus, live chart updates and an intuitive interface. The user can manipulate data to generate reports that will be useful for members, other Registries, researchers and market analysts.

Its primary fields enable users to identify:

* dates resources were allocated/assigned

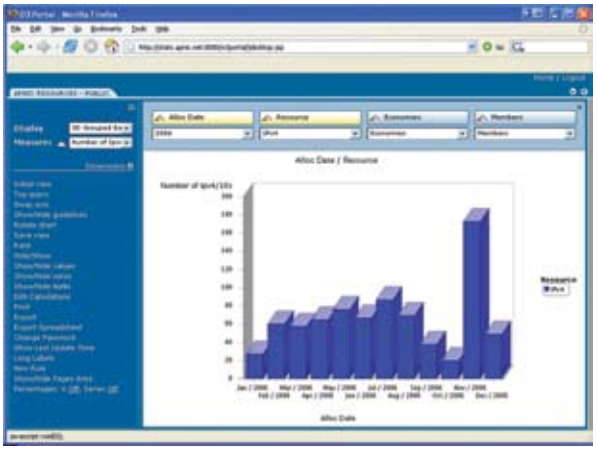
* resource types

* statistics for APNIC region economies

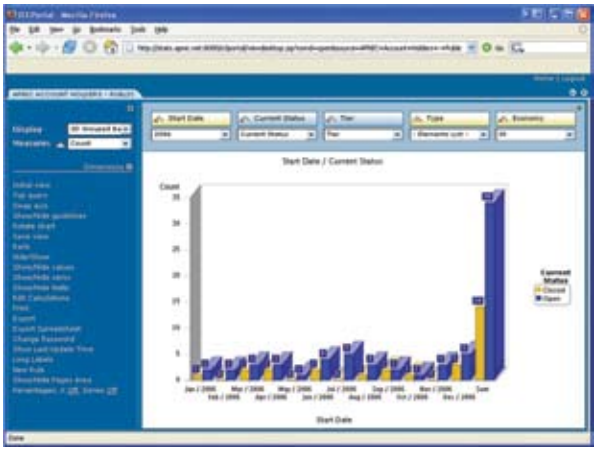
* membership types

Apstats can be accessed at:

http://www.apnic.net/apstats



▲ Number of IPv4 /16 assignments for the whole APNIC region in 2006.



▲ Membership growth for India in 2006.

Results of the fourth APNIC member survey

Since 1999, the APNIC Executive Council has commissioned a regular survey of the APNIC community. The survey collects feedback from members in a variety of areas, and APNIC uses the information to set organisational priorities and goals. The fourth APNIC members and stakeholders survey started in late 2006, and the results were finalised in early 2007. The survey produced 316 responses – more than in any of the previous surveys.

To ensure the survey was neutral and objective, it was conducted independently from the APNIC secretariat by the international organisation KPMG. Dr John Earls of KPMG developed the survey format and questions in consultation with APNIC staff members. However, the survey responses went directly to Dr Earls, who made sure that any data returned to APNIC was anonymous.

Dr Earls compiled and analysed the data, and his report will be presented at the APNIC Annual Members meeting in March 2007.

"APNIC can consider this survey to be very satisfactory", Dr Earls said.

"In many instances members of individual economies have provided a number of responses. This will allow the Secretariat to build needs profiles targeting such individual economies, especially when considering comments in conjunction with the numeric response data."

The survey was divided into three parts: examining opinions about current services, guidance for APNIC in allocating future resources, and invitations to participate in mini surveys on specific topics. Following is a brief summary of the survey results (but the full report will be available on the APNIC web site after it has been officially presented at the APNIC 23 meeting).

Section 1: Assessment of present services

This section of the survey reviewed APNIC Services, including training, resource services, member services, online services, and communication (general communication, web site, policy, meeting and community, technical services).

Dr Earls noted that overall comments on APNIC services were generally positive. Individual respondents identified particular problems that they had experienced and constructively suggested solutions. The support from individual members of the APNIC Secretariat was acknowledged. In general, respondents agreed that "the services provided by APNIC are above the average and that the value received justified the cost of membership."

Dr Earls made specific mention of feedback praising timely and appropriate helpdesk responses, and the usefulness of helpdesk email and online chat services.

However, there were criticisms of some aspects of APNIC's services, with some respondents noting that APNIC's processes are too complex and that the web site navigation was not as effective as it could be. The level of awareness of some other services, such as ICONS and *Apster* was also relatively low.

With regard to the APNIC policy development process, Dr Earls noted that:

"Respondents agreed that the APNIC policy development process is fair and is an effective way of developing IP addressing policies in this region… In general, respondents indicated that APNIC Open Policy Meetings are useful and that the use of multimedia has made them more accessible for those who cannot attend."

The survey revealed that members saw APNIC participation in DNS root server operations in the Asia Pacific region as "crucial", and the highest rated priority for future action.

▶ APNIC Director General, Paul Wilson, was pleased with the high number of survey responses and valuable feedback. "We are very committed to implementing these suggested changes and improvements wherever possible".

Section 2: APNIC future resource allocating

In this section respondents indicated their preferences for the level of priority for future action. The highest rated areas were:

Services:

- Streamline resource requests and allocation processes
- Expand training activities in scope, geographical coverage and online options
- Support ISP education in the Asia Pacific region

Communication:

- Increase accessibility of APNIC meetings and policy processes
- Represent the needs of the ISP community to governments and regulators
- Improve APNIC web site

Technical:

- Research and development activities (for example, DNS measurements, routability testing, 4-byte ASN tests)
- Deploy more DNS root servers in the Asia Pacific region
- Develop resource certification to support better routing security

Section 3: Future mini surveys

Dr Earls noted that there was an excellent response to the questions inviting participation in mini surveys. 157 people indicated they were willing to participate in the Training Needs Analysis, and 135 were willing to participate in the mini survey dealing with the APNIC Website. "This would demonstrate a positive view towards APNIC and a desire to collaborate in constructive service development," he said.

Looking forward

In his report Dr Earls observed that in past years the APNIC Secretariat has worked hard to find cost effective ways to implement suggestions and remedy issues raised by survey participants.

APNIC Director General, Paul Wilson, noted that 'following through' on the survey report was critical.

"While we are pleased with the overall positive response to our survey, we noted that many respondents also highlighted the work that APNIC needs to do in some areas. We are very committed to implementing these suggested changes and improvements wherever possible. We are very grateful to our membership for taking time to respond to our survey in such large numbers, and for providing us with the opportunity to gain a better understanding of their needs."

For details of this and all previous surveys, please visit:

http://www.apnic.net/survey

Neutral IX and root server launched at first PHNOG meeting in Manila

APNIC is pleased to be involved with two exciting milestones in the Philippines' Internet history, which coincided with the first PHNOG (Philippines Network Operators Group) meeting, held in Manila in January, 2007.

The meeting, hosted by the Philippines Advanced Science Technology Institute, was the venue for the launch of a neutral Internet Exchange, and an I root server.

Philippine OpenIX

The Philippine OpenIX is the economy's first local common exchange point. Prior to its establishment in January, the four local telcos all operated their own Internet exchanges. The associated peering problems meant that most local Internet traffic was still routed internationally. A cooperative effort involving the Philippines government, PHNOG, local telcos and private enterprise has resulted in the establishment of a neutral Internet Exchange in Makati City. Amante Alvaran, APNIC Training Officer and founding member of PHNOG, had a large involvement with this project.

"This exchange solves many problems faced by Philippines ISPs, such as connectivity issues, high costs, difficulty in obtaining statistics, and restricted access to bandwidth and infrastructure," said Amante.

The concept of a neutral IX was first raised by PHNOG in June 2005. The idea was supported by the Advanced Science Technology Institute (the research arm of the Philippines government Department of Science and Technology - DOST), and the Commission on Information and Communications Technology (CICT). The exchange is co-located with Innove Communications, and is managed and operated by ASTI/DOST. Packet Clearing House, Cisco, and Consulintel have also assisted the project by providing infrastructure.

The Philippine OpenIX is a non-profit, membership-based organisation that is open to all. It is a layer 2 exchange, supporting 10/100/1000Base T, with BGP peering. The membership fee will be waived until December 31, 2007 and the cost will be determined by member consensus.

Root server

APNIC, working with ASTI/DOST and Autonomica, provided funding and technical support to enable the installation of the Philippines' first root server. The I root server will improve DNS stability and response time for Internet users in the region. The server was launched on 26 January, and APNIC and ASTI/DOST exchanged Memorandums of Understanding for the server's management.

▲ APNIC's Amante Alvaran, who was instrumental in informing PHNOG.

PHNOG

Philippines Network Operators Group (PHNOG) is a non-profit organisation established to promote cooperation between network operators in the Philippines.

Similar to other Network Operators Groups (NOGs), PHNOG's main objective is to provide a common forum for Internet technology information dissemination.

PHNOG aims is to enhance the Philippines' participation in the Internet community by enabling and encouraging its members to learn more about policies, network and system issues, and latest technology trends. The organisation also intends to heavily promote the use of IPv6.

In addition to holding two meetings each year, PHNOG's future plans include installing looking glass, network time protocol, and route servers; measuring network traffic and collecting/reporting statistics; conducting training; and providing IPv6 transit services.

Philippine OpenIX: http://www.phopenix.net

PHNOG: http://www.phnog.org

APNIC to deploy remote training lab

The APNIC Training team has recently completed the installation of a network training and development lab that will support the delivery of hands-on workshops for member courses and also provide opportunities for in-house professional development.

The lab consists of 10 Cisco 2600 and 3600 routers, as well as a number of switches, and has been configured with a terminal server to enable remote console access to all of the devices. In addition, APNIC will soon be adding two Juniper routers, making the lab a multi-vendor interoperable environment.

By using VLANs, workshop participants will be able to build, configure, examine, and troubleshoot a variety of different topologies replicating real Internet structures such as IXs, ISP networks, peering, and multihoming. It will also be possible to practice and examine operational security issues such as filtering and network attack analysis.

The lab will be IPv6 capable, so both native IPv6 and dual stack configurations will be available. Course participants will be able to understand and experience the processes involved in IPv6 deployment and dual mode mechanisms, such as tunnelling.

By setting up the lab to provide remote access, APNIC will be able to conduct workshops throughout the region without having to depend on a suitable local training lab environment. This will provide more opportunities to offer this training experience to a wider audience in APNIC member economies. Remote access will simply require web access.

An important function of this facility will be to enable the Training team to plan and develop appropriate practical exercises for workshops. The lab will also offer training and technical staff at APNIC a safe platform for testing and examining new technologies, and to develop their own skills and expertise.

APNIC Training Manager, Cecil Goldstein, said: "We would like to express our thanks and appreciation to Philip Smith from Cisco, and Damien Holloway from Juniper for their invaluable and generous support in helping us establish this resource."

For more information please contact training@apnic.net

Staff updates

Documentation

Donna McLaren, Documentation Manager

Donna joined APNIC in January 2007. She has qualifications in education and writing.

She has worked in a variety of areas, including business analysis, technical writing, management, and education development. Her responsibilities at APNIC include managing the Documentation team and its systems.

Business

Shannon Wells, Services / Business Administrator

Shannon joined APNIC in January 2007. She previously worked for RIPE NCC in the Netherlands for one year as a Training Co-ordinator. Her responsibilities at APNIC include arranging staff travel and providing support to the Training unit.

EcoAPNIC at APNIC 23

EcoAPNIC will make its second appearance at an APNIC meeting, after debuting at APNIC 22 in Kaohsiung in 2006.

An overview of the group's 2006 achievements, and an outline of the plan for 2007 will be presented in the AMM at APNIC 23. Many of the measures implemented at APNIC 22, such as a reduction in paper materials produced, will also feature in Bali.

As well as focusing on individual and collective eco initiatives, the presentation will also show how an environmentally conscious staff culture has steadily evolved since ecoAPNIC's creation.

In the interests of good corporate citizenship, ecoAPNIC is now an official APNIC project. This will allow staff to devote time and resources to their eco activities in a more structured way.

In order to set ecoAPNIC's direction for 2007, the first major action slated for 2007 is to conduct a waste audit. The audit will identify areas of concern, and potential cost and resource savings for the organisation.

New *Apster* subscription policy

You may recall that issue 19 of *Apster* included a comprehensive article about the EcoAPNIC initiative. This staff-driven project aims to reduce our impact on the environment by doing many things, including reducing our paper usage.

So, from now on, *Apster* will now be mainly published in an electronic format. If you'd like to be notified when the next issue is published, you can subscribe to the *Apster* mailing list here:

mailman.apnic.net/mailman/listinfo/apster-subscribers

If you prefer to use RSS, then you can subscribe to this feed:

www.apnic.net/docs/apster/news.rss

We will still be printing some copies of *Apster*, which we will give away at meetings and other events. If you would like to keep receiving hard copies, then please subscribe using this form:

www.apnic.net/docs/apster

Training schedule

2007

February

26-27 Bali, Indonesia (with APRICOT/APNIC23)

March

7-9 Brisbane, Australia

15-18 Kuala Lumpur, Malaysia (with IPv6 Summit)

19 Kuala Lumpur, Malaysia

April

2-6 Singapore

8-12 Dhaka, Bangladesh

17-19 Kathmandu, Nepal

23-27 Cebu, Philippines

May

1-5 Pakistan (tba)

7 India (tba)

9 Bangalore, India (with IPv6 Summit)

15-19 Vietnam (tba)

28-2 June China (tba)

June

4-7 Bangkok, Thailand

11-14 Ulaanbaatar, Mongolia

16-22 Cook Islands (In conjunction with PACNOG)

The APNIC training schedule is subject to change. Please check the web site for regular updates at:

www.apnic.net/training

If your organisation is interested in sponsoring APNIC training sessions, please contact us at:

training@apnic.net

Calendar

APRICOT 2007/APNIC 23

21 February - 2 March 2007
Bali, Indonesia
http://www.apnic.net/meetings/23

68th IETF

18-23 March 2007
Prague, Czech Republic
http://www.ietf.org/meetings/meetings.html

ICANN Meeting

26-30 March 2007
Europe (venue TBA)
http://www.icann.org/meetings

ARIN XIX

22-25 April 2007
San Juan, Puerto Rico
http://arin.net/meetings

AfriNIC 6

23 April - 4 May 2007
Abuja, Nigeria
http://afrinic.net/meeting

CeBIT Australia 2007

1-3 May 2007
Sydney, Australia
http://www.cebit.com.au/main/about

RIPE 54

7-11 May 2007
Tallinn, Estonia
http://www.ripe.net/meetings/current.html

LACNIC X

21-25 May 2007
Isla Margarita, Venezuela
http://www.lacnic.net/en/eventos

Interop Tokyo 2007

13-15 June 2007
Tokyo, Japan
http://www.interop.jp

ICANN Meeting

25-29 June 2007
San Juan, Puerto Rico
http://www.icann.org/meetings

69th IETF

22-27 July 2007
Chicago, USA
http://www.ietf.org/meetings/meetings.html

PACIPv6 2007

15-21 August 2007
Pacific Islands
http://www.ipv6forumpacific.org

APNIC 24/SANOG 10

3-7 September 2007
New Delhi, India
http://www.apnic.net/meetings

RIPE 55

22-26 October 2007
Amsterdam, Netherlands
http://ripe.net/ripe/meetings/current.html

ICANN Meeting

29 October - 2 November 2007
Asia Pacific (venue TBA)
http://www.icann.org/meetings

How to contact APNIC

Street address	Level 1, 33 Park Road, Milton, Brisbane, QLD 4064, Australia
Postal address	PO Box 2131, Milton QLD 4064, Australia
Phone	+61-7-3858-3100
SIP	info@voip.apnic.net
Fax	+61-7-3858-3199
Web site	www.apnic.net
General enquiries	info@apnic.net
Hostmaster (filtered)	hostmaster@apnic.net
Helpdesk	helpdesk@apnic.net
Training	training@apnic.net
Webmaster	webmaster@apnic.net
Apster	apster@apnic.net

Member Services Helpdesk

The Member Services Helpdesk provides APNIC members and clients with direct access to APNIC Hostmasters.

www.apnic.net/helpdesk

helpdesk@voip.apnic.net

helpdesk@apnic.net

+61 7 3858 3188

Helpdesk Hours: 9:00 am to 7:00 pm (UTC + 10 hours) Monday - Friday

Communicate with APNIC via MyAPNIC

APNIC members can use MyAPNIC to:

- view APNIC resources held by their organisation
- monitor the amount of address space assigned to customers
- view current and past membership payments
- view current tickets open in the APNIC email ticketing system
- view staff attendance at APNIC training and meetings
- vote online

For more information on MyAPNIC's features, see:

www.apnic.net/services/myapnic

eco APNIC
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