APNIC Internet Resource Management (IRM) Tutorial
Agenda

• Introduction to APNIC
• Policy Development Process
• Internet Registry Policies
• Requesting IP Addresses
• APNIC Whois Database
• Using MyAPNIC
• Autonomous System Numbers
• Reverse DNS
• Resource Certification (RPKI)
Asia-Pacific Network Information Centre

One of five Regional Internet Registry (RIRs) charged with ensuring the fair **distribution and responsible management of IP addresses** and related resources

A membership-based, not-for-profit organization

Industry self-regulatory body
  - Open
  - Consensus-based
  - Transparent
Where is the APNIC Region?
What does APNIC do?

APNIC services

Members

Resource distribution
- IP addresses
- AS numbers

Registration services
- reverse DNS
- Internet routing registry
- resource certification
- whois registry
What does APNIC do?
APNIC supports the Asia Pacific region

Policy development

Capacity building
- training
- workshops
- conferences
- fellowships
- grants

Infrastructure
- root servers
- IXPs
- engineering assistance
What does APNIC do?

APNIC collaborates with the Internet community

Original research
Data collection and measurements
Publications
Local/regional/global events
Government outreach
Intergovernmental & technical organizations collaboration
Internet security
APNIC in the Internet Ecosystem

APNIC is one of five RIRs

Resource distribution
- IP addresses
- AS numbers

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- whois registry

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Publications
Local/regional/global events
Government outreach
Intergovernmental & technical organizations collaboration
Internet security
Internet Registry Structure
APNIC – Vision

A global, open, stable, and secure Internet that serves the entire Asia Pacific community.

How we achieve this:

• Serving Members
• Supporting the Asia Pacific Region
• Collaborating with the Internet Community
APNIC – Mission

• Function as the Regional Internet Registry for the Asia Pacific, in the service of the community of Members and others

• Provide Internet registry services to the highest possible standards of trust, neutrality, and accuracy

• Provide information, training, and supporting services to assist the community in building and managing the Internet

• Support critical Internet infrastructure to assist in creating and maintaining a robust Internet environment

• Provide leadership and advocacy in support of its vision and the community

• Facilitate regional Internet development as needed throughout the APNIC community
APNIC from a Global Perspective

Internet standards development
- IETF
- IAB

IP address management
- RIPE NCC
- AfriNIC
- NIRs
- LACNIC
- ARIN
- APNIC
- IANA

Technical operators
- Network Operators’ Groups
  - ISPs
  - Venders
  - IXPs

Regulation and law
- Governments
- Regulators

Internet technical coordination
- ICANN
- ISOC
- TLDs
- IPv6 Forums

Forums for high-level discussions on Internet governance
- OECD
- ITU
- IGF
APNIC in the Asia Pacific

National Internet Registries (NIRs)
- APJII
- CNNIC
- JPNIC
- KRNIC
- TWNIC
- VNNIC

Asia Pacific Internet organizations
- APRICOT
- APv6TF
- APTLD
- APNG
- APAN

ISP associations
- ISPAK
- ISPAB
- ISPAI
- ISPAN
- LSPA

Network Operators’ Groups
- NSP
- AusNOG
- PHNOG

Network Operators’ Groups
- PACNOG
- JANNOG
- NZNOG

IXPs
- AIT

APT

ISOC chapters
- ISOC-Chennai
- ISOC-AU
- PICISOC
Global Policy Coordination

The NRO is a coordinating body for the five regional Internet registries (RIRs)

https://www.nro.net
Global Policy Coordination

The purpose of the Address Supporting Organization (ASO) is to review and develop recommendations on Internet Protocol (IP) address policy and to advise the ICANN Board.

https://aso.icann.org/
Where do IP Addresses come from?

IETF Standards → iana Allocation → RIRs Allocation → LIR/ISP Assignment → End user
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Policy Development

• Creating a policy environment that supports the region’s Internet development

• Developed by the membership and broader Internet community
You are part of the APNIC community!

**Open** forum in the Asia Pacific

A voice in regional Internet operations through participation in APNIC
Policy Development Process

- Open
  - Anyone can participate
- Transparent
  - All decisions & policies documented & freely available to anyone
- Bottom up
  - Internet community proposes and approves policy
Policy Development Process

Before the meeting

• Submit proposed policy to the APNIC Secretariat
• SIG Chair posts the proposal to mailing list
• Community discusses proposal
**Policy Development Process**

**During the meeting**

- Proposed policies are presented at the Open Policy Meeting (OPM)
- Community comments on the proposal
- If it reaches consensus, SIG Chair reports the decision at the APNIC Member Meeting (AMM)
Policy Development Process

After the meeting

- Within a week, proposal is sent back to mailing list
- A comment period between 4-8 weeks is given
- If it reaches consensus, SIG Chair asks the Executive Council (EC) to endorse the proposal
- APNIC EC endorses proposal
- APNIC Secretariat implements the policy (minimum of 3 months)
Policy Development Process

Before meeting:
- **Author** proposes policy or amendment

During meeting:
- **Community** discusses proposal on SIG mailing list
- **Community** discusses proposal face to face in SIG
- **SIG Chair** gauges consensus

After meeting:
- **Community** has chance to raise any final objections during final call
- **Executive Council (EC)** endorses policy
- **SIG Chair** confirms consensus
- **Secretariat** implements policy

Can policy be improved?
Policy Discussions

• Comment
  – Participants are encouraged to comment on the proposal

• Discuss
  – The Chair encourages discussion about the pros and cons of the proposal

• Show of hands
  – to broadly measure opinion – not a vote

• Consensus
  – declared if there are no objections
How to Participate

• Read the policy proposals currently under discussion
• Check out discussions on the Policy SIG mailing list
• Join the discussion at APNIC conferences
  – webcast (live streaming)
  – live transcripts
  – comment on Jabber chat
• Provide your feedback
  – Training or community outreach events
Questions
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How IP Addresses are Delegated

Registry Realm

- APNIC
  - delegates to APNIC member
  - Member (LIR)

Operators Realm

- LIR customer
  - delegates to customers
  - Customer / End User

- APNIC Allocation /8
- Member Allocation
- Sub Allocation /24
- Customer Assignments
  - /27
  - /26
  - /25
  - /26
  - /27
Portable and Non-Portable

- **Portable Address**
  - Provider-Independent (PI)
  - Assigned by RIR to end-user
  - Keeps addresses when changing ISP
  - Increases the size of routing tables

- **Non-portable Address**
  - Provider-aggregatable (PA)
  - End-user gets address space from LIR
  - Must renumber if changing upstream provider
  - Can be aggregated for improved routing efficiency
IPv6 Address Management Hierarchy

Describes “portability” of the address space
Aggregation and Portability

Aggregation

No Aggregation

(non-portable assignments)

(portable assignments)

ISP A

ISP B

ISP C

ISP D

ISP A

ISP B

ISP C

ISP D

INTERNET

INTERNET

(4 routes)

(21 routes)
IRM Objectives

Conservation
- Efficient use of resources
- Based on demonstrated need

Aggregation
- Limit routing table growth
- Support provider-based routing

Registration
- Ensure uniqueness
- Facilitate trouble shooting

Uniqueness, fairness and consistency
Growth of the Global Routing Table

- 1994: Introduction of CIDR
- 2001: The Great Internet Boom and Bust
- 2005: Broadband to the Masses
- 2009: The GFC hits the Internet
- 2011: Address Exhaustion

Projected growth of routing table before CIDR deployment

Dot-Com boom

CIDR deployment

Sustainable growth

As of 22 Jan 2015

534062 prefixes

http://www.cidr-report.org/as2.0/
APNIC Policy Environment

• Internet resources are delegated on a license basis
  – Limited duration (usually one year)
  – Renewable on the following conditions:
    • Original basis of delegation remains valid, and
    • Address space is properly registered at the time of renewal

• Security and confidentiality
  – APNIC to maintain systems and practices that protect the confidentiality of Members’ information and their customers
Allocation Policies

• Aggregation of allocation
  – Provider responsible for aggregation
  – Customer assignments /sub-allocations must be non-portable

• Allocations based on demonstrated need
  – Detailed documentation required

• All address space held to be declared
IPv4 Allocation Policies

• APNIC IPv4 allocation size per account holder
  – Minimum /24
  – Maximum /21
  /22 from final /8 block
  /22 from the recovered block

• According to current allocation from the final /8 block
  – Allocation is based on demonstrated need
IPv4 Sub-allocation

- No max or min size
  - Max 1 year requirement

- Assignment Window & 2nd Opinion
  - Applies to both sub-allocation & assignments
  - Sub-allocation holders don’t need to send in 2nd opinions
What is an Assignment Window?

“The amount of address space a member may assign without a ‘second opinion’”

• All members have an Assignment Window
  – Starts at zero, increases as member gains experience in address management

• Second opinion process
  – Customer assignments require a ‘second-opinion’ when proposed assignment size is larger than member’s Assignment Window
Assignment Window

• Size of Assignment Window
  – Evaluated after about three 2nd-opinion requests
  – Increased as member gains experience and demonstrates understanding of policies
    • Assignment Window may be reduced, in rare cases

• Why an Assignment Window?
  – Monitoring ongoing progress and adherence to policies
  – Mechanism for member education
2nd Opinion Request

IPv4 Sub-allocations
- IPs held by customer & customer’s customers
  - Customer assignments to end-sites
  - Sub-allocation infrastructure

IPv4/IPv6 Assignments
- IPs held by customer
  - Customer’s existing network
  - Additional information: Any additional info that may aid the evaluation
  - Confirm details

Applicant information
- Contact details, password
- IPv6 / IPv4, Assignment / Sub-allocation
- Network name, description, country
- Planned IP usage

Type of request
- Network name
- Future network plan

Customer’s existing network
- Check your details
2nd Opinion Request Approval

Dear XXXXXXX,

APNIC has approved your "second opinion" request to make the following assignment:

[netname]
[address/prefix]

* Please ensure that you update the APNIC whois database to register this assignment before informing your customer or requesting reverse DNS delegation. Do this using the form at:

http://www.apnic.net/apnic-bin/inetnum.pl

Important:

Unregistered assignments are considered as "unused"
IPv6 Allocation Policies

• Initial allocation criteria
  – Minimum of /32 IPv6 block
  – Larger than /32 may be justified

• For APNIC members with existing IPv4 space
  – One-click Policy (through MyAPNIC)

• Without existing IPv4 space
  – Must meet initial allocation criteria

• Subsequent allocation
  – Based on HD ratio (0.94)
  – Doubles the allocated address space
## IPv6 Utilisation (HD = 0.94)

<table>
<thead>
<tr>
<th>IPv6 Prefix</th>
<th>Site Address Bits</th>
<th>Total site address in /56</th>
<th>Threshold (HD = 0.94)</th>
<th>Utilisation %</th>
</tr>
</thead>
<tbody>
<tr>
<td>/42</td>
<td>14</td>
<td>16,384</td>
<td>9,153</td>
<td>55.9%</td>
</tr>
<tr>
<td>/36</td>
<td>20</td>
<td>1,048,576</td>
<td>456,419</td>
<td>43.5%</td>
</tr>
<tr>
<td>/35</td>
<td>21</td>
<td>2,097,152</td>
<td>875,653</td>
<td>41.8%</td>
</tr>
<tr>
<td>/32</td>
<td>24</td>
<td>16,777,216</td>
<td>6,185,533</td>
<td>36.9%</td>
</tr>
<tr>
<td>/29</td>
<td>27</td>
<td>134,217,728</td>
<td>43,665,787</td>
<td>32.5%</td>
</tr>
<tr>
<td>/24</td>
<td>32</td>
<td>4,294,967,296</td>
<td>1,134,964,479</td>
<td>26.4%</td>
</tr>
<tr>
<td>/16</td>
<td>40</td>
<td>1,099,511,627,776</td>
<td>208,318,498,661</td>
<td>18.9%</td>
</tr>
</tbody>
</table>

RFC 3194 “In a hierarchical address plan, as the size of the allocation increases, the density of assignments will decrease.”
**IPv6 Sub-allocation**

- All /48 assignments to end sites must be registered.
- LIR must submit a second opinion request for assignments greater than /48.
IPv6 Assignment Policies

• Assignment address space size
  – Minimum of /64 (only 1 subnet)
  – Normal maximum of /48

• Assignment of multiple /48s to a single end site
  – Documentation must be provided
  – Will be reviewed at the RIR/NIR level

• Assignment to operator’s infrastructure
  – /48 per Point-of-Presence of an IPv6 service operator
Portable Assignments

• Small multi-homing assignment
  – For (small) organisations who require a portable assignment for multi-homing purposes

• Criteria
  – Currently multi-homed, or demonstrate a plan to multi-home within 1 month
  – Demonstrate need to use 25% of requested space immediately, and 50% within 1 year
IXP Assignments

• APNIC has a reserved block of space from which to make IXP assignments

• To be used exclusively to connect IXP participant devices to the exchange point

• Criteria:
  – 3 or more peers
  – Demonstrate “open peering policy”

• Assignment size:
  – IPv4: /24
  – IPv6: /48 minimum
Portable Critical Infrastructure

• What is Critical Internet Infrastructure?
  – Domain registry infrastructure
    • Root DNS operators, gTLD operators, ccTLD operators
  – Address Registry Infrastructure
    • RIRs & NIRs, IANA

• Why a specific policy?
  – To protect the stability of core Internet functions

• Assignment sizes:
  – IPv4: /24
  – IPv6: /32 (Maximum)
Sub-allocation Guidelines

• Sub-allocate cautiously
  – Seek APNIC advice if in doubt
  – If customer requirements meet min allocation criteria, customers can approach APNIC for portable allocation

• Efficient assignments
  – ISPs responsible for overall utilisation

• Database registration (WHOIS database)
  – Sub-allocations & assignments to be registered in the database
IPv4 Transfer Policies

• Between APNIC members
  – Minimum transfer size of /24
  – Source entity must be the currently registered holder of the IPv4 resources
  – Recipient entity will be subject to current APNIC policies

• Inter-RIR IPv4 Transfers
  – Minimum transfer size of /24
  – Conditions on the source and recipient RIR will apply
Historical Resources

- Internet resources registered under early registry policies without formal agreements and include:
  - Registrations transferred to APNIC as part of the AUNIC to APNIC migration
  - Registrations transferred as part of the Early Registration Transfer (ERX) project
  - Historical APNIC resources

https://www.apnic.net/policy/historical-resource-policies
Historical Resource Transfer

• Bring historical resource registrations into the current policy framework
  – Allow transfers of historical resources to APNIC members
  – The recipient of the transfer must be an APNIC member
  – No technical review or approval
  – Historical resource holder must be verified
  – Resources will then be considered "current"

• Address space subject to current policy framework
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How do I get addresses?

• Decide what kind of number resources you need
  – IPv4, IPv6

• Check your eligibility
  – On the website www.apnic.net
  – Contact the helpdesk helpdesk@apnic.net

• Become familiar with the policies
  – www.apnic.net/policy

• Apply for membership and resources
IPv4 Address Space

STATUS OF 256 /8s IPv4 ADDRESS SPACE

TOTAL IPv4 SPACE

- CENTRAL REGISTRY 91
- RIRs 130
- IANA RESERVED 0
- NOT AVAILABLE 35

- EXPERIMENTAL 16
- LOCAL IDENTIFICATION 1
- LOOPBACK 1
- PRIVATE USE 1
- MULTICAST 16

Source: NRO Q3 2014
Available IPv4 /8s in Each RIR

Source: NRO Q3 2014
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Check for Eligibility – IPv4

• Initial LIR delegation:
  – Have used a /24 from their upstream provider or demonstrate an immediate need for a /24,
  – Have complied with applicable policies in managing all address space previously delegated to it (including historical delegations), and
  – Demonstrate a detailed plan for use of a /23 within a year

• Small multihoming delegation:
  – Currently multihomed with provider-based addresses, or demonstrates a plan to multihome within one month
  – Demonstrate that they are able to use 25% of the requested addresses immediately and 50% within one year
Check for Eligibility – IPv4

- **Internet Exchange Points:**
  - Eligible to receive a delegation from APNIC to be used exclusively to connect the IXP participant devices to the Exchange Point.

- **Critical Infrastructure:**
  - If operating in the Asia Pacific region, are eligible to receive a delegation
  - Available only to the actual operators of the network infrastructure performing such functions
Check for Eligibility – IPv6

• APNIC members with IPv4 but no IPv6 automatically qualify for an appropriately sized block of IPv6 addresses.
  – Members with an IPv4 allocation are eligible for a /32 of IPv6
  – Members with an IPv4 assignment are eligible for a /48 of IPv6

• Minimum initial allocation
  – Must be an LIR
  – Not be an end site
  – Plan to announce IPv6 within two years
  – Must meet one of these:
    • Have a plan for making at least 200 assignments to other organizations within two years
    • Be an existing LIR with IPv4 allocations from an APNIC or an NIR, which will make IPv6 assignments or sub-allocations within two years.
How do I get addresses?

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How do I get addresses?

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  – IPv4, IPv6

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• Become familiar with the policies
  – www.apnic.net/policy

• Apply for membership and resources
Initial IP Address Request

• You are required to be an APNIC member in order to initiate your IP address request.

• However, you can apply for membership and request an initial address allocation at the same time.

• [http://www.apnic.net/services/become-a-member](http://www.apnic.net/services/become-a-member)
Applicant Contact Details

Clear form and restart

Privacy Collection Statement

APNIC is collecting personal information from you in order to process your application for APNIC membership. Without this information, APNIC may not be able to process your application.

APNIC may publish your organisation name, phone number and Abuse Contact email address in the public APNIC Whois database.

APNIC has a privacy policy that contains information about:

- How you may complain about a breach of the Australian Privacy Principles by APNIC, and how APNIC will deal with such a complaint;
- How you may access and seek the correction of the personal information held by APNIC about you.

Please note, while it is unlikely your personal information will be disclosed to any overseas recipient, some of your personal information may be stored by APNIC using computer servers located outside Australia.

Name: *
Your name

Position: *
Your job position title

Email: *
Your email address

Confirm Email: *
Your email address

I am the Corporate Contact: What's this?
- Yes
- No

The billing contact is the same as the Corporate Contact:
- Yes
- No

Where did you hear about APNIC? *

Next
New Member Application Form

• More user-friendly, interactive, and informative
• Member receives quote after application. Invoice issued after approval
• Contacts Management
• Kickstart IPv6 integration
• Essential Whois objects will be created automatically
Applying for Resources - IP

Select IPv4 or IPv6 and the block size. Make sure you meet the criteria.
Applying for Resources - ASN

Provide details of two peering networks, and whether you require 2-byte or 4-byte ASN.
First Allocation

- APNIC IPv4 allocation size per account holder
  - Minimum of /24
  - Maximum of /21
    - /22 from final /8 block
    - /22 from the recovered block

- Initial IPv6 allocation criteria
  - Minimum of /32 IPv6 block
  - Larger than /32 may be justified
Requesting for Additional Resources

Resource management

Internet resources
- View and manage resources

Whois database updates
- Add/Update/Delete Whois objects

Resource request forms
- IPv4 addresses
- IPv6 addresses
- AS numbers

Resource transfer/return
- Transfer resources into another account
- Receive resources into my account
- Transfer pre-approval
- Return resources to APNIC

Resource certification
- Manage certification

More on how to use MyAPNIC in later sections
Questions
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What is the APNIC Database?

• Public network management database
  – Operated by Internet Registries
  – APNIC maintains the database of resources for the AP region

• Tracks network resources
  – IP addresses, ASNs, Reverse DNS delegations, Routing policies

• Records administrative information
  – Contact information (persons/roles) of relevant resource holders
  – Authorization for updating these info
  – Network abuse handling (IRT)
Resource Registration

As part of the membership agreement with APNIC, all members are required to register their resources in the APNIC database.

- Members must keep records up to date
  - When ever there is a change in contacts
  - When new resources are received
  - When resources are sub-allocated or assigned
# Whois Object Types

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>person</td>
<td>Technical or administrative contacts responsible for an object</td>
</tr>
<tr>
<td>role</td>
<td>Technical or administrative contacts represented by a role, performed by one or more people</td>
</tr>
<tr>
<td>inetnum</td>
<td>Allocation or assignment of IPv4 address space</td>
</tr>
<tr>
<td>inet6num</td>
<td>Allocation or assignment of IPv6 address space</td>
</tr>
<tr>
<td>aut-num</td>
<td>Registered holder of an AS number and corresponding routing policy</td>
</tr>
<tr>
<td>domain</td>
<td>in-addr.arpa (IPv4) or ip6.arpa (IPv6) reverse DNS delegations</td>
</tr>
<tr>
<td>route / route6</td>
<td>Single IPv4/IPv6 route injected into the Internet routing mesh</td>
</tr>
<tr>
<td>mntner</td>
<td>Authorized agent to make changes to an object</td>
</tr>
<tr>
<td>irt</td>
<td>Dedicated abuse handling team</td>
</tr>
</tbody>
</table>
Objects for New Members

- If you are receiving your first allocation or assignment, APNIC will create the following objects for you:
  - role object
  - inetnum or inet6num object
  - maintainer object (to protect your data)
  - aut-num object (if you received an ASN)
  - irt object

- Information is taken from your application for resources and membership
How to Use APNIC Whois

• Using a web browser
  – http://www.apnic.net/whois

• Whois client or query tool
  – whois.apnic.net

• Identify network contacts from the registration records
  – IRT (Incident Response Team) if present
  – Contact persons: “tech-c” or “admin-c”
What if Whois information is invalid?

• Members (LIRs) are responsible for reporting changes to APNIC
  – Under formal membership agreement

• Report invalid ISP contacts to APNIC
  – http://www.apnic.net/invalidcontact
  – APNIC will contact member and update registration details
What if Whois information is invalid?

• Customer assignment information is the responsibility of the LIR
  – LIR must update their customer network registrations

• Tools such as traceroute, looking glass and RIS may be used to track the upstream provider if needed
Using the Whois – Step by Step

1. person: nic-hdl: KX17-AP
   Contact info

2. mntner:
   Data Protection

3. Allocation (Created by APNIC)

4. Customer Assignments (Created by Member)

inetnum: 3
Allocation (Created by APNIC)

person: nic-hdl: KX17-AP
mntner: mnt-by: KX17-AP

inetnum: ...

inetnum: ...

inetnum: ...

inetnum: ...

inetnum: ...

inetnum: ...

mint-by: ...

mint-by: ...

mint-by: ...

mint-by: ...
Inetnum / Inet6num Objects

• Contains IP delegation information

• APNIC creates an *inetnum* or *inet6num* object for each delegation they make to the Member

• All members must create *inetnum* or *inet6num* objects for each sub-allocation or assignment they make to customers
Inet6num Object

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>inet6num:</td>
<td>2406:6400::/32</td>
</tr>
<tr>
<td>netname:</td>
<td>APNIC-TRAININGIPv6-Lab-AP</td>
</tr>
<tr>
<td>descr:</td>
<td>APNIC TRAINING Lab</td>
</tr>
<tr>
<td>descr:</td>
<td>LEVEL 1, 33 PARK RD</td>
</tr>
<tr>
<td>country:</td>
<td>AU</td>
</tr>
<tr>
<td>admin-c:</td>
<td>AT480-AP</td>
</tr>
<tr>
<td>tech-c:</td>
<td>AT480-AP</td>
</tr>
<tr>
<td>mnt-by:</td>
<td>APNIC-HM</td>
</tr>
<tr>
<td>mnt-lower:</td>
<td>MAINT-AU-APNICTRAINING</td>
</tr>
<tr>
<td>mnt-routes:</td>
<td>MAINT-AU-APNICTRAINING</td>
</tr>
<tr>
<td>status:</td>
<td>ALLOCATED PORTABLE</td>
</tr>
<tr>
<td>remarks:</td>
<td>This object can only be updated by APNIC hostmasters.</td>
</tr>
<tr>
<td>remarks:</td>
<td>To update this object, please contact APNIC</td>
</tr>
<tr>
<td>remarks:</td>
<td>hostmasters and include your organisation's account</td>
</tr>
<tr>
<td>remarks:</td>
<td>name in the subject line.</td>
</tr>
<tr>
<td>changed:</td>
<td><a href="mailto:hm-changed@apnic.net">hm-changed@apnic.net</a> 20100216</td>
</tr>
<tr>
<td>changed:</td>
<td><a href="mailto:hm-changed@apnic.net">hm-changed@apnic.net</a> 20100818</td>
</tr>
<tr>
<td>source:</td>
<td>APNIC</td>
</tr>
</tbody>
</table>

Role and mntner object reference

Status shows the type of delegation

---

APNIC
Person Object

• Represents a contact person for an organization
  – Every Member must have at least one contact person registered
  – Large organizations often have several contacts for different purposes

• Is referenced in other objects

• Has a **nic-hdl** – a unique identifier for a person or role object
  – Format: [A-Z][0-9]-AP
**Person Object**

<table>
<thead>
<tr>
<th>person:</th>
<th>Nurul Islam Roman</th>
</tr>
</thead>
<tbody>
<tr>
<td>nic-hdl:</td>
<td>NR97-AP</td>
</tr>
<tr>
<td>e-mail:</td>
<td><a href="mailto:nurul@apnic.net">nurul@apnic.net</a></td>
</tr>
<tr>
<td>address:</td>
<td>6 Cordelia Street</td>
</tr>
<tr>
<td>address:</td>
<td>South Brisbane</td>
</tr>
<tr>
<td>address:</td>
<td>QLD 4101</td>
</tr>
<tr>
<td>phone:</td>
<td>+61 7 3858 3100</td>
</tr>
<tr>
<td>fax-no:</td>
<td>+61 7 3858 3199</td>
</tr>
<tr>
<td>country:</td>
<td>AU</td>
</tr>
<tr>
<td>changed:</td>
<td><a href="mailto:nurul@apnic.net">nurul@apnic.net</a> 20061128</td>
</tr>
<tr>
<td>mnt-by:</td>
<td>MAINT-AU-APNICTRAINING</td>
</tr>
<tr>
<td>changed:</td>
<td><a href="mailto:hm-changed@apnic.net">hm-changed@apnic.net</a> 20100818</td>
</tr>
<tr>
<td>changed:</td>
<td><a href="mailto:hm-changed@apnic.net">hm-changed@apnic.net</a> 20110624</td>
</tr>
<tr>
<td>source:</td>
<td>APNIC</td>
</tr>
</tbody>
</table>
Role Object

• Contains details of technical or administrative contacts as represented by a role performed by one or more people within an organization

• Also has a nic-hdl

• Preferred over person object as reference in other objects
  – Eases administration
## Role Object

<table>
<thead>
<tr>
<th>role:</th>
<th>APNIC Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>address:</td>
<td>6 Cordelia Street</td>
</tr>
<tr>
<td>address:</td>
<td>South Brisbane</td>
</tr>
<tr>
<td>address:</td>
<td>QLD 4101</td>
</tr>
<tr>
<td>country:</td>
<td>AU</td>
</tr>
<tr>
<td>phone:</td>
<td>+61 7 3858 3100</td>
</tr>
<tr>
<td>fax-no:</td>
<td>+61 7 3858 3199</td>
</tr>
<tr>
<td>e-mail:</td>
<td><a href="mailto:training@apnic.net">training@apnic.net</a></td>
</tr>
<tr>
<td>admin-c:</td>
<td>NR97-AP</td>
</tr>
<tr>
<td>tech-c:</td>
<td>NR97-AP</td>
</tr>
<tr>
<td>nic-hdl:</td>
<td>AT480-AP</td>
</tr>
<tr>
<td>mnt-by:</td>
<td>MAINT-AU-APNICTRAINING</td>
</tr>
<tr>
<td>changed:</td>
<td><a href="mailto:hm-changed@apnic.net">hm-changed@apnic.net</a> 20080424</td>
</tr>
<tr>
<td>changed:</td>
<td><a href="mailto:hm-changed@apnic.net">hm-changed@apnic.net</a> 20100818</td>
</tr>
<tr>
<td>changed:</td>
<td><a href="mailto:hm-changed@apnic.net">hm-changed@apnic.net</a> 20110624</td>
</tr>
<tr>
<td>source:</td>
<td>APNIC</td>
</tr>
</tbody>
</table>

Points to a person object
Replacing Contacts – Person Object

KX17-AP is the original contact
Referenced by three (or more) objects

BW117-AP is replacing him
Update all three (or more) objects with new contact one by one

Delete old contact KX17-AP

Customer Assignments
(Created by Member)
Replacing Contacts – Role Object

Replace old contact with new contact in Role object

1
person: nic-hdl: KX17-AP
Contact info

2
person: nic-hdl: BW101-AP
Contact info

3
role: nic-hdl: AT480-AP
... tech-c: BW101-AP
Contact info

No change in inetnum objects
Customer Assignments
(Created by Member)
## APNIC Whois Web Query

### IP address lookups
- **-l**: 1st level less specific
- **-L**: All less specific
- **-m**: 1st level more specific
- **-M**: All more specific
- **-x**: Exact match only
- **-d**: Associated reverse domain

### Miscellaneous queries
- **-i**: Inverse attributes
  - Options: None
- **-T**: Object types
  - Options: as-block, as-set

### Query hints
- Include "AS" in front of an AS number. Example: AS4808
- Include "-t" (template only) or "-v" (template and description) in front of an object name to view the template. Example: -t inetnum
Whois Database Queries

- Flags used for inetnum queries

None one level less specific matches

- L  find all less specific matches
- m  find first level more specific matches
- M  find all More specific matches
- x  find exact match (if no match, nothing)
- d  enables use of flags for reverse domains
- r  turn off recursive lookups
Whois Database Query - inetnum

whois-L 202.64.0.0 /20
Less specific
(≠ bigger block)

inetnum:
202.0.0.0 - 202.255.255.255

202.0.0.0/8

whois 202.64.0.0 /20

inetnum:
202.64.0.0 - 202.64.15.255

202.64.0.0/20

whois-m 202.64.0.0 /20
More specific
(= smaller blocks)

inetnum:
202.64.10.0/24

inetnum:
202.64.12.128/25

inetnum:
202.64.15.192/26
Recursive Lookups

whois 202.12.29.0

whois -r 202.12.29.0

whois -T inetnum 202.12.29.0

whois -r -T inetnum 202.12.29.0

recursion enabled by default

recursion turned off

‘type’ of object specified

‘type’ of object specified & recursion turned off
Inverse Queries

Inverse queries are performed on inverse keys
  - *See object template (whois –t)*

Returns all public objects that reference the object with the key specified as a query argument
  - Practical when searching for objects in which a particular value is referenced, such as your nic-hdl

Syntax: whois -i <attribute> <value>
Customer Privacy

• Public data
  – Includes portable addresses (inetnum objects), and other objects e.g. route objects
  – Public data: must be visible

• Private data
  – Can include non-portable addresses (inetnum objects)
  – Members have the option to make private data visible

• Customer assignments
  – Can be changed to be public data (public data is an optional choice)
What needs to be visible?

IANA range

Non-APNIC range

APNIC range

APNIC allocations & assignments

NIR range

NIR allocations & assignments

LIR/ISP

PORTABLE addresses

Customer assignments

Infrastructure

Sub-allocations

NON-PORTABLE addresses

must be visible

visibility optional
What is a Maintainer?

• Protects objects in the APNIC Whois Database
• Applied to any object created directly below that maintainer object
• Why do we need Maintainer?
  – To prevent unauthorized persons from changing the details in the Whois DB
  – As parts of a block are sub-allocated or assigned, another layer of maintainers is often created to allow the new users to protect their (sub)set of addresses
• Authentication options: CRYPT-PW, MD5, PGPKEY
Maintainer Object

mntner: MAINT-AU-APNICTRAINING
descr: APNIC Training
country: AU
admin-c: NR97-AP
tech-c: NR97-AP
auth: # Filtered
mnt-by: MAINT-AU-APNICTRAINING
upd-to: nurul@apnic.net
referral-by: APNIC-HM
changed: hm-changed@apnic.net 20091111
changed: hm-changed@apnic.net 20091217
changed: hm-changed@apnic.net 20100528
changed: hm-changed@apnic.net 20110124
changed: hm-changed@apnic.net 20131129
source: APNIC
Mnt-by and Mnt-Lower Attributes

• Mnt-by
  – Can be used to protect any object
  – Changes to protected object must satisfy authentication rules of \textit{mntner} object

• Mnt-lower
  – Also references \textit{mnt-by} object
  – Hierarchical authorization for \textit{inetnum} \& \textit{domain} objects
  – The creation of child objects must satisfy this maintainer
  – Protects against unauthorized updates to an allocated range - highly recommended!

• Mnt-routes
**Maintainer Hierarchy Diagram**

**Allocated to APNIC:**
Maint-by can only be changed by IANA

**Allocated to Member:**
Maint-by can only be changed by APNIC

**Sub-allocated to Customer:**
Maint-by can only be changed by Member
## Authentication / Authorization

<table>
<thead>
<tr>
<th><strong>inetnum:</strong></th>
<th>203.176.189.0 - 203.176.189.255</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>netname:</strong></td>
<td>APNIC-TRAINING-IPv4-DATA-CENTRE</td>
</tr>
<tr>
<td><strong>descr:</strong></td>
<td>APNIC Training IPv4 Address for data centre</td>
</tr>
<tr>
<td><strong>country:</strong></td>
<td>AU</td>
</tr>
<tr>
<td><strong>admin-c:</strong></td>
<td>AT480-AP</td>
</tr>
<tr>
<td><strong>tech-c:</strong></td>
<td>AT480-AP</td>
</tr>
<tr>
<td><strong>status:</strong></td>
<td>ASSIGNED PORTABLE</td>
</tr>
<tr>
<td><strong>mnt-by:</strong></td>
<td>MAINT-AU-APNICTRAINING</td>
</tr>
<tr>
<td><strong>mnt-routes:</strong></td>
<td>MAINT-AU-APNICTRAINING</td>
</tr>
<tr>
<td><strong>remarks:</strong></td>
<td>This object can only be updated by APNIC hostmasters.</td>
</tr>
<tr>
<td><strong>changed:</strong></td>
<td><a href="mailto:hm-changed@apnic.net">hm-changed@apnic.net</a> 20080424</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:hm-changed@apnic.net">hm-changed@apnic.net</a> 20100818</td>
</tr>
<tr>
<td><strong>source:</strong></td>
<td>APNIC</td>
</tr>
</tbody>
</table>

Only APNICTRAINING-AU can create assignments within this allocation

Only APNIC can change this object
Whois IRT Contact

• Incident Response Team (IRT)
  – Dedicated abuse handling teams (not netops)
• IRT objects are mandatory when creating *inetnum*, *inet6num* and *aut-num* objects
• Provide an abuse contact email
  – Dedicated team to resolve incidents
  – Efficient and accurate response
  – Stops the tech-c and admin-c from getting abuse reports
IRT Object

**irt:**  IRT-MYAPNIC-TEST-AP  
**address:**  6 Cordelia Street test  
**address:**  South Brisbane  
**address:**  QLD 4101  
**e-mail:**  helpdesk@apnic.net  
**e-mail:**  tamya@apnic.net  
**abuse-mailbox:**  helpdesk@apnic.net  
**admin-c:**  VN61-AP  
**tech-c:**  VN61-AP  
**auth:**  # Filtered  
**mnt-by:**  MAINT-AU-VIVEK  
**changed:**  helpdesk@apnic.net 20101108  
**changed:**  hm-changed@apnic.net 20110624  
**source:**  APNIC
Whois Database Geolocation

- A latitude/longitude coordinate indicating where users of this network are located. Provides a hint to content and geolocation service providers.
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>inetnum</td>
<td>61.45.248.0 - 61.45.255.255</td>
</tr>
<tr>
<td>netname</td>
<td>APNIC-SERVICES-V4</td>
</tr>
<tr>
<td>descr</td>
<td>APNIC Pty Ltd</td>
</tr>
<tr>
<td>country</td>
<td>AU</td>
</tr>
<tr>
<td>geoloc</td>
<td>-27.473057 153.014199</td>
</tr>
<tr>
<td>language</td>
<td>en</td>
</tr>
<tr>
<td>admin-c</td>
<td>AMS11-AP</td>
</tr>
<tr>
<td>tech-c</td>
<td>AH256-AP</td>
</tr>
<tr>
<td>status</td>
<td>ALLOCATED PORTABLE</td>
</tr>
<tr>
<td>notify</td>
<td><a href="mailto:helpdesk@apnic.net">helpdesk@apnic.net</a></td>
</tr>
<tr>
<td>mnt-by</td>
<td>APNIC-HM</td>
</tr>
<tr>
<td>mnt-lower</td>
<td>MAINT-MYAPNIC-AP</td>
</tr>
<tr>
<td>mnt-lower</td>
<td>MAINT-AU-VIVEK</td>
</tr>
<tr>
<td>mnt-lower</td>
<td>MAINT-MYAPNIC-AP</td>
</tr>
<tr>
<td>mnt-lower</td>
<td>MAINT-MYAPNIC-AP</td>
</tr>
<tr>
<td>mnt-lower</td>
<td>MAINT-MYAPNIC-AP</td>
</tr>
<tr>
<td>mnt-irt</td>
<td>IRT-MYAPNIC-TEST-AP</td>
</tr>
<tr>
<td>remarks</td>
<td>+++++++++++++++++++++++++++++++++++</td>
</tr>
<tr>
<td>changed</td>
<td><a href="mailto:hm-changed@apnic.net">hm-changed@apnic.net</a> 20140114</td>
</tr>
<tr>
<td>changed</td>
<td><a href="mailto:hm-changed@apnic.net">hm-changed@apnic.net</a> 20150106</td>
</tr>
<tr>
<td>source</td>
<td>APNIC</td>
</tr>
</tbody>
</table>
Questions
Agenda

• Introduction to APNIC
• Policy Development Process
• Internet Registry Policies
• Requesting IP Addresses
• Whois Database

• **Using MyAPNIC**

• Autonomous System Numbers
• Reverse DNS
• Resource Certification (RPKI)
What is MyAPNIC?

• A secure website that enables Members to manage Internet resources and account interactions with APNIC online
• https://myapnic.net
How it Works

**APNIC internal system**
- Finance system
- Membership & resource system
- Whois master

**APNIC public servers**
- MyAPNIC server
- APNIC Public Servers
- Member ID Person Authority

Client

https://myapnic.net

Member’s staff
Access to MyAPNIC

- Available to all authorized contacts of APNIC accounts by registering your username and password
- Corporate Contacts can register and get instant access
  
  www.apnic.net/corporate_contacts

- Other contacts need their registration approved by their Corporate Contact
MyAPNIC Registration

https://myapnic.net/register
Registration – Corporate Contact

Your registration

Success

You have successfully registered for MYAPNIC-TEST-AP.

You will receive an email shortly containing an activation link that must be clicked for you to be able to access MyAPNIC.
Registration – Corporate Contact

helpdesk@apnic.net to me

Dear Vivek Nigam,

This email confirms your registration to access MyAPNIC for the following account:

MYAPNIC-TEST-AP

Your details are as follows:

Name          = Vivek Nigam
Username      = vn1234
Email address = viveknigam.au@gmail.com

Before you can access MyAPNIC, you will need to click the following link:

https://myapnic.net/auth/ccactivate.html?ctc_id=314773&uid=vn1234&token=6AF90522-3581-11DF-937C-156A37E08A02

Kind regards,

MyAPNIC
Registration – Corporate Contact

User account activation

- Your access for MYAPNIC-TEST-AP has been activated.
Registration – Other Contacts

Subject: MyAPNIC Registration
From: helpdesk@apnic.net
Date: 9:11 AM
To: vivek@apnic.net

Dear Vivek Nigam,

This email confirms your security code to access MyAPNIC for the following account:

MYAPNIC-TEST-AP

Your details are as follows:

Name = Vivek Nigam
Username = viv4
Email address = vivek@apnic.net
Token = wZpmI9iC5P

Before you can access MyAPNIC, you will need to provide your token to one of the following corporate contact(s) to approve your access.

* Tom H
* George K

Kind regards,

MyAPNIC
# Registration – Other Contacts

## Approve Access

### Pending access

<table>
<thead>
<tr>
<th>Date (UTC)</th>
<th>Username</th>
<th>Email address</th>
<th>Authorization code</th>
<th>Billing</th>
<th>Technical</th>
<th>Approve access</th>
<th>Reject access</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-09-19 06:11:59</td>
<td>NonCorporate</td>
<td><a href="mailto:vivek@apnic.net">vivek@apnic.net</a></td>
<td>No9jOwIAec</td>
<td></td>
<td></td>
<td>Approve</td>
<td>Reject</td>
</tr>
<tr>
<td>2011-10-21 05:09:32</td>
<td>Craigtest</td>
<td><a href="mailto:george@apnic.net">george@apnic.net</a></td>
<td></td>
<td></td>
<td></td>
<td>Approve</td>
<td>Reject</td>
</tr>
<tr>
<td>2010-12-21 05:38:14</td>
<td>smarks</td>
<td><a href="mailto:smarks@apnic.net">smarks@apnic.net</a></td>
<td></td>
<td></td>
<td></td>
<td>Approve</td>
<td>Reject</td>
</tr>
<tr>
<td>2010-08-16 23:33:50</td>
<td>flash007</td>
<td><a href="mailto:wiki@apnic.net">wiki@apnic.net</a></td>
<td></td>
<td></td>
<td></td>
<td>Approve</td>
<td>Reject</td>
</tr>
</tbody>
</table>
Registration – Other Contacts

**Approve Access**

- Access request successfully approved.

**Pending access**

<table>
<thead>
<tr>
<th>Date (UTC)</th>
<th>Username</th>
<th>Email address</th>
<th>Authorization code</th>
<th>Billing</th>
<th>Technical</th>
<th>Approve access</th>
<th>Reject access</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-10-21 05:09:32</td>
<td>Craigast</td>
<td><a href="mailto:george@apnic.net">george@apnic.net</a></td>
<td></td>
<td></td>
<td></td>
<td>Approve</td>
<td>Reject</td>
</tr>
<tr>
<td>2010-12-21 05:38:14</td>
<td>smarks</td>
<td><a href="mailto:smarks@apnic.net">smarks@apnic.net</a></td>
<td></td>
<td></td>
<td></td>
<td>Approve</td>
<td>Reject</td>
</tr>
<tr>
<td>2010-08-16 23:33:50</td>
<td>flash007</td>
<td><a href="mailto:wita@apnic.net">wita@apnic.net</a></td>
<td></td>
<td></td>
<td></td>
<td>Approve</td>
<td>Reject</td>
</tr>
</tbody>
</table>
Multiple Account Access

**My Profile**

**Active**

<table>
<thead>
<tr>
<th>Account</th>
<th>Email address</th>
<th>Position</th>
<th>Corporate</th>
<th>Billing</th>
<th>Technical</th>
</tr>
</thead>
<tbody>
<tr>
<td>APNICTRAINING-AU</td>
<td><a href="mailto:vivek@apnic.net">vivek@apnic.net</a></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>MYAPNIC-TEST-AP</td>
<td><a href="mailto:vivek@apnic.net">vivek@apnic.net</a></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Add another account**

To access another account, add the account name and your email for the account below.

<table>
<thead>
<tr>
<th>Account</th>
<th>Email address</th>
<th>Notifications?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Add**
MyAPNIC Digital Certificate

Required for:

• Online voting

• Resource certification

• Approve other contacts’ certificate request
Request Certificate

My Profile

Your certificates
An APNIC certificate is required to perform certain operations such as Resource Certification and Online Voting. It is also required for a Corporate Contact to approve certificate requests for other account contacts. A certificate is valid for 12 months from the date of issue.

For more information, please see APNIC Digital Certificates.

You have been issued with the following certificate(s):

<table>
<thead>
<tr>
<th>Serial number</th>
<th>Expiry date</th>
</tr>
</thead>
<tbody>
<tr>
<td>286CB96C96AFC29A</td>
<td>2011-02-25 03:53:37 (expired)</td>
</tr>
<tr>
<td>4ED4E607FD85F497</td>
<td>2015-05-11 04:26:24</td>
</tr>
<tr>
<td>3F82DE46C7079C50</td>
<td>2015-05-11 04:26:24</td>
</tr>
<tr>
<td>777D7A688877F536</td>
<td>2015-05-11 04:26:24</td>
</tr>
<tr>
<td>538E0081E6EC27F5</td>
<td>2015-05-11 04:26:24</td>
</tr>
</tbody>
</table>

If you require an additional certificate, you are advised to use a backup copy of your current valid certificate.

Please only request an additional certificate when you are not able to recover your backup copy.

To request a digital certificate, click on "Request a certificate".

Request a certificate

CA certificates
The APNIC Root CA Certificate is also provided for users that need a trusted authority in their email software, and the email software of correspondents that require secure communication.

Download CA certificate
Download root CA certificate

If you have any other queries, please email helpdesk@apnic.net for assistance.
Administration Features

View your billing history and membership details:

- Member details
- Contact details
- Access list
- Billing history
- Annual membership fee calculator
- Correspondence
Contact Management

<table>
<thead>
<tr>
<th>Resource management</th>
<th>View</th>
<th>Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource certification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASN, IPv4, IPv6 and AW</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Resource tickets</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Whois database</th>
<th>View</th>
<th>Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private objects</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Domain objects</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Membership administration</th>
<th>View</th>
<th>Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Membership details (address, phone)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>View billing history, balance and invoice</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Admin tickets</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voting</th>
<th>View</th>
<th>Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vote</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Resource Management

## Resource management

### Internet resources
- View and manage resources

### Whois database updates
- Add/Update/Delete Whois objects

### Resource request forms
- IPv4 addresses
- IPv6 addresses
- AS numbers

### Resource transfer/return
- Transfer resources into another account
- Receive resources into my account
- Transfer pre-approval
- Return resources to APNIC

### Resource certification
- Manage certification
Maintainer Page

Maintainer list

When using MyAPNIC to manage your Whois objects, MyAPNIC will retrieve the maintainer and its password from this list. You should ensure that all maintainers referenced by the Whois objects you manage are added to this list. To add a maintainer, please supply the maintainer name and its plain text password in the fields below. If you have reset the password, you must update the password saved in this list. If you do not know your maintainer name or password, please email helpdesk@apnic.net.

<table>
<thead>
<tr>
<th>Registered maintainers</th>
<th>Auth. method</th>
<th>Password</th>
<th>Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAINT-AU-VIVEK</td>
<td>CRYPT-PW</td>
<td>Valid password</td>
<td></td>
</tr>
<tr>
<td>MAINT-MYAPNIC-AP</td>
<td>CRYPT-PW</td>
<td>Valid password</td>
<td></td>
</tr>
<tr>
<td>MAINT-NEW</td>
<td>CRYPT-PW</td>
<td>Valid password</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maintainer</th>
<th>Password</th>
<th>Add</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
One-Click IPv6

Resource management

Internet resources
- View and manage resources

Whois database updates
- Add/Update/Delete Whois objects

Resource request forms
- IPv4 addresses
- IPv6 addresses
- AS numbers

Resource transfer/return
- Transfer resources into another account
- Receive resources into my account
- Return resources to APNIC
One-Click IPv6

Based on your current IPv4 holdings, your membership account is eligible to receive a /32 IPv6 allocation or a /48 IPv6 assignment via this One-click IPv6 feature without having to lodge a separate resource request.

To request a different size of IPv6 resources, please use the IPv6 resource request form located under the "Resources" tab.

By receiving this /32 allocation or /48 assignment, you acknowledge that:

- you understand the policy implementation; and
- your membership fee will be reviewed at the next renewal as per the Membership fee schedule.

To proceed, please click "Confirm" below to accept this allocation or assignment.
Manage Resources

Internet resources
- View and manage resources

Whois database updates
- Add/Update/Delete Whois objects

Resource request forms
- IPv4 addresses
- IPv6 addresses
- AS numbers

Resource transfer/return
- Transfer resources into another account
- Receive resources into my account
- Transfer pre-approval
- Return resources to APNIC

Resource certification
- Manage certification

Summary of all resources

<table>
<thead>
<tr>
<th>IPv4</th>
<th>manage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address range</td>
<td>Length</td>
</tr>
<tr>
<td>61.45.248.0</td>
<td>/24</td>
</tr>
<tr>
<td>61.45.249.0</td>
<td>/24</td>
</tr>
<tr>
<td>61.45.251.0</td>
<td>/24</td>
</tr>
<tr>
<td>61.45.253.0</td>
<td>/24</td>
</tr>
<tr>
<td>203.176.189.0</td>
<td>/24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IPv6</th>
<th>manage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Range</td>
<td>Length</td>
</tr>
<tr>
<td>2001:DF0:000A::</td>
<td>/48</td>
</tr>
<tr>
<td>2406:6400::</td>
<td>/32</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ASN</th>
<th>manage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>17821</td>
<td></td>
</tr>
<tr>
<td>45192</td>
<td></td>
</tr>
<tr>
<td>131107</td>
<td></td>
</tr>
</tbody>
</table>
## Sub-allocation

IPv4 resources - all resources

<table>
<thead>
<tr>
<th>Start IP</th>
<th>Length</th>
<th>Date</th>
<th>Usage</th>
<th>Assignment status</th>
<th>Reverse DNS</th>
<th>Private</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>61.45.248.0</td>
<td>/24</td>
<td>2010-09-27</td>
<td>100%</td>
<td></td>
<td>update</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.45.249.0</td>
<td>/24</td>
<td>2010-09-27</td>
<td>100%</td>
<td></td>
<td>update</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.45.251.0</td>
<td>/24</td>
<td>2010-04-07</td>
<td>100%</td>
<td></td>
<td>update</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.45.253.0</td>
<td>/24</td>
<td>2010-04-07</td>
<td>100%</td>
<td></td>
<td>update</td>
<td></td>
<td></td>
</tr>
<tr>
<td>203.176.189.0</td>
<td>/24</td>
<td>2008-04-24</td>
<td>100%</td>
<td></td>
<td>update</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:  
- < 20%  
- = 20%  
- = 40%  
- = 60%  
- = 80%  
- > 80%  

Select All  
Select All  
Download as .ZIP
Updating Attributes in Parent Object

IPv4 assignments within/covering 61.45.248.0/24

Parent records

<table>
<thead>
<tr>
<th>Network name</th>
<th>Start IP</th>
<th>End IP</th>
<th>Maintained by</th>
<th>Changed</th>
</tr>
</thead>
<tbody>
<tr>
<td>APNIC-SERVICES-V4</td>
<td>61.45.248.0</td>
<td>61.45.255.255</td>
<td>APNIC-HM</td>
<td><a href="mailto:hm-changed@apnic.net">hm-changed@apnic.net</a> 20150106</td>
</tr>
</tbody>
</table>

Public records (shown in whois.apnic.net)

Make new public assignment | Upload | Download

Private records

Make new private assignment | Upload | Download

<table>
<thead>
<tr>
<th>Network name</th>
<th>Start IP</th>
<th>End IP</th>
<th>Maintained by</th>
<th>Changed</th>
</tr>
</thead>
<tbody>
<tr>
<td>MYAPNIC-TEST</td>
<td>61.45.248.0</td>
<td>61.45.248.255</td>
<td>MAINT-AP-WITA</td>
<td><a href="mailto:wita@apnic.net">wita@apnic.net</a> 20100726</td>
</tr>
</tbody>
</table>
Requesting Resources

Internet number resource request

The **current policy** for IPv4 address space management in the Asia Pacific region permits each new or existing APNIC account holder to receive delegations totalling a maximum of a /21 since 15 April 2011.

<table>
<thead>
<tr>
<th>Maximum delegation limit</th>
<th>/21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received resources</td>
<td>/24</td>
</tr>
<tr>
<td>Available resources</td>
<td>7 x /24</td>
</tr>
</tbody>
</table>
Whois Updates

MyAPNIC Whois Update

The information you register will be available publicly in the APNIC Whois database, unless the 'Private' option is available and specified.

Object type: Please select
Adding Objects

The route object represents a single IPv4 route injected into the Internet routing mesh. The route attribute is the address prefix of the route and the origin attribute is the AS number of the AS that originates the route.

- **route**: 
- **descr**: 
- **origin**: 
- **mnt-lower**: MAINT-MYAPNIC-AP
- **mnt-routes**: MAINT-MYAPNIC-AP
- **mnt-by**: MAINT-MYAPNIC-AP
- **changed**: 
- **source**: APNIC

![Add field](Add field)
## Updating Objects

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
<th>T</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>route</td>
<td>61.45.252.0/22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>descr</td>
<td>Test route object – Training in PK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>origin</td>
<td>AS131211</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mnt-lower</td>
<td>MAINT-MYAPNIC-AP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mnt-routes</td>
<td>MAINT-MYAPNIC-AP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mnt-by</td>
<td>MAINT-MYAPNIC-AP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>changed</td>
<td><a href="mailto:vivek@apni.net">vivek@apni.net</a> 20120717</td>
<td></td>
<td></td>
</tr>
<tr>
<td>country</td>
<td></td>
<td>T</td>
<td></td>
</tr>
<tr>
<td>source</td>
<td>APNIC</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Deleting Objects

![Image of a web interface for deleting objects with the object type set to 'route' and a search query for '61.45.252.0/22'. The interface includes fields for object details such as route, descr, origin, mnt-lower, mnt-routes, mnt-by, changed, and source. There is also a field for a delete message and a submit button.]
Bulk Updates

Home / Resource management / Bulk update

Whois bulk update

Bulk update requests

All objects (text file upload)

Please attach a plain text file containing the object templates you wish to register, update, or delete.

Whois type

Public

Please select file to upload

Browse... No file selected.

Submit

Single attribute update

Domain objects (zone file upload)
# Resource Transfer / Return

<table>
<thead>
<tr>
<th>Home</th>
<th>Resources</th>
<th>Administration</th>
<th>Events</th>
<th>Contact</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPv4</td>
<td>IPv6</td>
<td>ASN</td>
<td>Whois updates</td>
<td>Maintainers</td>
<td>IRTs</td>
</tr>
</tbody>
</table>

## Resource management

### Internet resources
- View and manage resources

### Whois database updates
- Add/Update/Delete Whois objects

### Resource request forms
- IPv4 addresses
- IPv6 addresses
- AS numbers

## Resource transfer/return
- Transfer resources into another account
- Receive resources into my account
- Transfer pre-approval
- Return resources to APNIC

**Useful links**
- Resource management
- Assignment window
- FAQ
Resource management

Transfer resources

Select the range and/or ASN to transfer and then click 'Add'. This will copy the value into the 'IPv4 block' and AS Number(s) field. If you only want to transfer part of the IP range, then the value can be adjusted at this point.

IPv4:
- 61.45.248.0/24
- 61.45.249.0/24
- 61.45.251.0/24
- 61.45.253.0/24
- 203.176.189.0/24

ASN:
- 17821
- 45192
- 131107

Example: 202.128.12.0/22

Reason for transfer:

Recipient's account name *

Next
Receiving Resources

Receive resources into my account

From account | Resources
-------------|-------------
MYAPNIC-TEST-AP | 202.125.97.0/24

Receive | Reject

Please note that this transfer is subject to APNIC's approval.
Transfer pre-approval

This form is used by the recipient account before locating the source of the IPv4 transfer and to facilitate a smooth transfer when a source account is ready to relinquish their addresses.

Before you proceed, please read the following terms and conditions carefully.

Terms and conditions

1. APNIC policy requires that recipients of IPv4 address transfers justify their need for additional addresses. The pre-approval requests must meet the IPv4 transfer policy criteria.

   http://www.apnic.net/policy/transfer-policy

2. Pre-approvals are valid for 24 months from the date of approval. If another pre-approval is requested and approved within that period, it will replace the previous pre-approval.

3. The recipient account must remain "open" to receive any transfer.

4. The recipient account will be required to provide additional justification when the size of transfer to receive is larger than what has already been pre-approved.

I agree to the terms and conditions.
Transfer pre-approval

Resource type

Resources required

* fields are required

Select the type of IPv4 resources you require:
- IP allocation for service providers - for own network infrastructure and further delegations to customer networks
- IP assignment for own network use

Save
Transfer Pre-approval

Home / Resource management / Transfer pre-approval

Transfer pre-approval

Your account already has a valid pre-approval:

- Approval date: 2011-11-20
- Expiry date: 2012-11-20
- Prefixes available: /17, /18, /19 and /20

Only complete this form if your IPv4 requirements have changed.
MyAPNIC EC Submission

EC Submission

Send a new submission or view your submissions that have not yet been resolved.

New submission

<table>
<thead>
<tr>
<th>Ticket Number</th>
<th>Status</th>
<th>Subject</th>
<th>Requestor</th>
<th>Created</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No submissions found.
Referral Application

**What can I do?**

- Complete a **referral application** for a customer
- View and update your **resource information** for IPv4, IPv6, AS numbers and Whois updates
- Manage your **resource certificates**
- View your **Member details and Contact details**.
- Use the **Events** section to view training and events history
- Use the **APNIC looking glass** or generate a prefix report
Available Utilities

The Reverse domain verification tool enables you to check that your zone has been configured correctly, in order to complete your delegation successfully. This includes verification of the required records for DNSSEC implementation.

- Reverse domain
- DNSSEC verification

Submit
The IPv6 Sparse Assignment tool enables you to create assignments that are spaced apart from one another, ensuring assignments can grow as needed while maintaining route aggregation.

Enter an IPv6 address of a block where the assignments will come from (beginning address & prefix length), number of assignments you need to make, and the minimum size of the assignment (optional).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning address</td>
<td>2406:6400::</td>
</tr>
<tr>
<td>Prefix length</td>
<td>32</td>
</tr>
<tr>
<td>Number of assignments</td>
<td>8</td>
</tr>
<tr>
<td>Minimum assignment size</td>
<td></td>
</tr>
</tbody>
</table>

---

Prefix entered => 2406:6400::/32  
Block count => 8  
Required minimum block length => 128  
Actual minimum block length => 35  
---

Beginning address

2406:6400::  
2406:6400:8000::  
2406:6400:4000::  
2406:6400:c000::  
2406:6400:2000::  
2406:6400:a000::  
2406:6400:6000::  
2406:6400:e000::
Tools – IPv6 Subnet

The IPv6 subnet calculator allows you to subnet any given IPv6 prefix with a specified subnet length. Enter an IPv6 prefix and click on 'Submit' to view subnets based on the subnet length selected.

<table>
<thead>
<tr>
<th>Address prefix *</th>
<th>2406:6400::/32 e.g. 2001::/32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subnet length *</td>
<td>48 e.g. 48</td>
</tr>
</tbody>
</table>

---

Prefix entered => 2406:6400::/32  
Subnet mask => FFFF:FFFF:FFFF::  
Subnet length => 48  
Number of subnets => 65,536

/48 prefixes

2406:6400::/48  
2406:6400:1::/48  
2406:6400:2::/48  
2406:6400:3::/48  
2406:6400:4::/48  
2406:6400:5::/48  
2406:6400:6::/48  
2406:6400:7::/48  
2406:6400:8::/48  
2406:6400:9::/48  
2406:6400:A::/48  
2406:6400:B::/48  
2406:6400:C::/48  
2406:6400:D::/48  
2406:6400:E::/48  
2406:6400:F::/48  
2406:6400:10::/48  
2406:6400:11::/48  
2406:6400:12::/48  
2406:6400:13::/48  
2406:6400:14::/48

APNIC
Tools – Reverse Domain Verification

The Reverse domain verification tool enables you to check that your zone has been configured correctly, in order to complete your delegation successfully. This includes verification of the required records for DNSSEC implementation.

Reverse domain

42.119.203.in-addr.arpa.

DNSSEC verification

<table>
<thead>
<tr>
<th>IP address</th>
<th>Name</th>
<th>Accessible</th>
<th>SOA found</th>
<th>AAA bit set</th>
<th>Zones match</th>
<th>SOA serial</th>
</tr>
</thead>
<tbody>
<tr>
<td>202.12.29.59</td>
<td>cumin.apnic.net</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2014051168</td>
</tr>
<tr>
<td>2001:dc0:2001:a:4608::59</td>
<td>cumin.apnic.net</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2014051168</td>
</tr>
<tr>
<td>202.12.28.140</td>
<td>sec3.apnic.net</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2014051168</td>
</tr>
<tr>
<td>2001:dc0:1:0:4777::140</td>
<td>sec3.apnic.net</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2014051168</td>
</tr>
<tr>
<td>202.12.29.60</td>
<td>tinnie.apnic.net</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2014051168</td>
</tr>
<tr>
<td>2001:dc0:2001:a:4608::64</td>
<td>tinnie.apnic.net</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2014051168</td>
</tr>
</tbody>
</table>
Questions
Agenda

• Introduction to APNIC
• Policy Development Process
• Internet Registry Policies
• Requesting IP Addresses
• Whois Database
• Using MyAPNIC
• **Autonomous System Numbers**
• Reverse DNS
• Resource Certification
What is an AS Number?

- Autonomous System Number (ASN)
- Globally unique identifiers for IP networks
  – uniquely identifies each network on the Internet
- Allocated to each Autonomous System (AS) for use in BGP routing
- Used in the exchange of exterior routing information (between neighboring AS) and as an identifier of the AS itself
AS and AS numbers

• **Autonomous System (AS)** - group of IP-based networks with the same routing policy, usually under single ownership, trust or administrative control

• **Autonomous System Number (ASN)** - globally unique identifiers for IP networks, used in the exchange of exterior routing information (BGP)
How do Autonomous Systems work?
When do I need an ASN?

• ASN is needed if you have a
  – Multi-homed network to different providers, and
  – Routing policy different to external peers

• RFC1930: Guidelines for creation, selection and registration of an Autonomous System
## ASN Representation

<table>
<thead>
<tr>
<th>ASN Range</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 65535</td>
<td>16-bit AS number</td>
</tr>
<tr>
<td>0 and 65535</td>
<td>Reserved</td>
</tr>
<tr>
<td>1 - 64495</td>
<td>Public Internet</td>
</tr>
<tr>
<td>64496 - 64511</td>
<td>Documentation and sample code (RFC5398)</td>
</tr>
<tr>
<td>64512 - 65534</td>
<td>Reserved for private use (RFC6996)</td>
</tr>
<tr>
<td>23456</td>
<td>AS_TRANS (RFC6793)</td>
</tr>
<tr>
<td>65536 - 4294967295</td>
<td>32-bit AS number</td>
</tr>
<tr>
<td>65536 - 65551</td>
<td>Documentation and sample code (RFC5398)</td>
</tr>
<tr>
<td>65552 – 131071</td>
<td>Reserved (RFC5398)</td>
</tr>
<tr>
<td>131072 - 4199999999</td>
<td>Public Internet</td>
</tr>
<tr>
<td>42000000000 - 4294967294</td>
<td>Reserved for private use (RFC6996)</td>
</tr>
<tr>
<td>4294967295</td>
<td>Reserved (RFC7300)</td>
</tr>
</tbody>
</table>

http://www.iana.org/assignments/as-numbers/as-numbers.xhtml
16-bit and 32-bit ASN

• With the introduction of the “new” 32-bit AS Numbers, and the continuation of use of “old” 16-bit AS Numbers, a method was needed to get them to work together.

• The solution is known as **AS23456**, which allows BGP to either convert or truncate the AS number if it detects an “old” 16-bit number as part of the exchange.
Requesting an ASN

• Eligibility
  – Should be multihomed
  – Has a single, clearly defined routing policy that is different from its providers’ routing policies

• Request Process: Complete the request form
  – Check with peers if they can handle 4-byte ASN
  – Existing members send the request from MyAPNIC
  – New Members can send AS request along with membership application
Requesting an ASN

• If a member requests an ASN for their own network
  – AS number is **portable**
  – Member responsible for registration

• If a member requests an ASN for its customer
  – AS number is **non-portable**
  – Customer must meet criteria
  – Member responsible for registration
  – AS number is returned if customer changes provider
From 2-byte to 4-byte Delegation

• January 2007
  – 2-byte ASN by default, process 4-byte ASN as requested

• January 2009
  – 4-byte ASN by default, process 2-byte ASN as requested

• July 2009
  – 4-byte ASN by default, process requests for 2-byte through demonstrated need

• January 2010
  – No distinction between two-byte and four-byte only AS numbers
  – Will operate AS number assignments from an undifferentiated four-byte AS number pool
ASN Transfers

• Transfers of ASNs
  – Within the APNIC region and
  – Between regions with compatible inter-regional ASN transfer policies
Aut-num Object Example

aut-num: AS4777
as-name: APNIC-NSPIXP2-AS
Descr: Asia Pacific Network Information Centre
descr: AS for NSPIXP2, remote facilities site
import: from AS2500 action pref=100; accept ANY
import: from AS2524 action pref=100; accept ANY
import: from AS2514 action pref=100; accept ANY
export: to AS2500 announce AS4777
export: to AS2524 announce AS4777
export: to AS2514 announce AS4777
default: to AS2500 action pref=100; networks ANY
admin-c: PW35-AP
tech-c: NO4-AP
remarks: Filtering prefixes longer than /24
mnt-by: MAINT-APNIC-AP
changed: paulg@apnic.net 19981028
source: APNIC
Four-byte ASN Global Distribution

Source: NRO Q3 2014
Questions
Agenda

• Introduction to APNIC
• Policy Development Process
• Internet Registry Policies
• Requesting IP Addresses
• Whois Database
• Using MyAPNIC
• Autonomous System Numbers

**Reverse DNS**

• Resource Certification (RPKI)
What is Reverse DNS?

• **Forward DNS** maps names to numbers
  svc00.apnic.net ➔ 202.12.28.131

• **Reverse DNS** maps numbers to names
  202.12.28.131 ➔ svc00.apnic.net
Uses of Reverse DNS

• Service denial
  – That only allow access when fully reverse delegated eg. anonymous ftp

• Diagnostics
  – Assisting in network troubleshooting (ex: traceroute)

• Spam identifications
  – Reverse lookup to confirm the source of the email
  – Failed lookup adds to an email’s spam score
Reverse DNS Tree

Mapping numbers to names - ‘reverse DNS’

ROOT

- net
- org
- com
- arpa

- apnic
- iana

- in-addr

- 202
- 203
- 204
- 210

- 64

- 22

22.64.202.in-addr.arpa.
Reverse DNS Tree – with IPv6

ROOT

- net
  - apnic
- org
  - iana
- com
- arpa
  - in-addr
    - 202
    - 203
      - 64
      - 22
  - ip6
    - IPv6 addresses

RFC 3152
Reverse Zone Example

$ORIGIN 1.168.192.in-addr.arpa.
@ 3600 IN SOA test.company.org. (sys\admin.company.org.
2002021301 ; serial
1h ; refresh
30M ; retry
1W ; expiry
3600 ) ; neg. answ. ttl

NS ns.company.org.
NS ns2.company.org.

1 PTR gw.company.org.
router.company.org.

2 PTR ns.company.org.

;auto generate: 65 PTR host65.company.org
$GENERATE 65-127 $ PTR host$.company.org.
Managing Reverse DNS

• APNIC manages reverse delegation for both IPv4 and IPv6
• Before you register your domain objects, you need to ensure that your reverse zones have been configured and loaded in your DNS name servers.
• APNIC does not host your DNS name servers or configure your reverse zone files.
• APNIC only delegates the authority of your reverse zones to the DNS name servers you provide through your domain objects.
Reverse Delegation Requirements

• /24 Delegations
  – Address blocks should be delegated
  – At least one name server

• /16 Delegations
  – Same as /24 delegations
  – APNIC delegates entire zone to member

• < /24 Delegations
  – Read “classless in-addr.arpa delegation”
  – Not supported
APNIC & LIR Responsibilities

• APNIC
  – Manage reverse delegations of address block distributed by APNIC
  – Process organisations requests for reverse delegations of network allocations

• Organisations
  – Be familiar with APNIC procedures
  – Ensure that addresses are reverse-mapped
  – Maintain nameserver(s) for allocations
  – Keep accurate records in the database
  – Keep reverse DNS current with the Whois DB
Reverse Delegation Procedures

• Standard APNIC database object
  – Can be updated through myAPNIC

• Nameserver/domain set up verified before being submitting to the database.

• Protection by maintainer object
  – Current authentication options: CRYPT-PW, MD5
Reverse Delegation Procedures

Add reverse DNS delegation

Important: The information you provide in the form below will be used to create your domain object in the APNIC Whois Database. Please make sure that your name servers are running and are authoritative for the zone, or your reverse DNS delegation might not function correctly.

Address range:
Use CIDR address prefix notation. Multiple range allowed, one range per line.

Example:
2001:de0:2001::/48
2001:al0::/31

Name servers:
List fully qualified domain name of at least one server.
Important: Do not list IP addresses or reverse DNS names.

Example:
ns1.example.com
ns2.example.com

Maintainer:

Example:
MAINT-AU-EXAMPLE
Whois Domain Object

admin-c: NO4-AP
tech-c: AIC1-AP
zone-c: NO4-AP
nserver: cumin.apnic.net
nserver: tinnie.apnic.net
nserver: tinnie.arin.net
mnt-by: MAINT-APNIC-AP
mnt-lower: MAINT-AP-DNS
changed: inaddr@apnic.net 20021023
changed: inaddr@apnic.net 20040109
changed: hm-changed@apnic.net 20091007
changed: hm-changed@apnic.net 20111208
source: APNIC
Questions
Agenda

• Introduction to APNIC
• Policy Development Process
• Internet Registry Policies
• Requesting IP Addresses
• APNIC Whois Database
• Using MyAPNIC
• Autonomous System Numbers
• Reverse DNS
• Resource Certification (RPKI)
What is RPKI?

- **Resource Public Key Infrastructure (RPKI)**
- A robust security framework for verifying the association between resource holder and their Internet resources
- Created to address the issues in RFC 4593 “Generic Threats to Routing Protocols”
- Helps to secure Internet routing by validating routes
  - Proof that prefix announcements are coming from the legitimate holder of the resource

**RFC 6480** – An Infrastructure to Support Secure Internet Routing (Feb 2012)
“Right” to Resources

• LIR gets their resources from the RIR
• LIR notifies its upstream of the prefixes to be announced
• Upstream must check the WHOIS database if resource has been delegated to customer LIR

We need to be able to authoritatively prove who owns an IP Prefix and what AS(s) may announce it.
APNIC Resource Certification

• A robust security framework for verifying the association between resource holders and their Internet resources
  – Collaborative effort by all RIRs

• Initiative from APNIC aimed at
  – Improving the security of inter-domain routing
  – Augmenting the information published in the Whois database

• Verifies a holder’s current “right-of-use” over an Internet resource
Route Origin Authorization (ROA)

• A digital object that contains a list of address prefixes and one ASN

• It is an authority created by a prefix holder to authorize an ASN to originate one or more specific route advertisements

• Publish an ROA using MyAPNIC
APNIC RPKI Service

• Enhancement to the RIRs
  – Offers verifiable proof of resource holdings

• Resource certification is an opt-in service
  – Resource holders choose to request a certificate and provide their public key to be certified

• APNIC has integrated the RPKI management service into MyAPNIC for APNIC Member use

• Public repository at rpki.apnic.net
How it Works

RPKI Component elements and interactions

Public access
- Provisioning protocol over HTTP
- F5
- Rsync repository
- Web access

Internal boundary
- APNIC CA
- Signing Engine
- Internal firewall
- HSM
- RPKI DB
- MEMBER CA
- Signing Engine
- RPKI DB
- “Command & Control function”

Registry DB
Activate RPKI Engine

Select if you want to operate in the MyAPNIC RPKI portal or if you want to host your own certificate authority.

Enable Resource Certification

Currently, you have not enabled resource certification for your registry.

- I want to operate in the MyAPNIC RPKI portal.
- I want to host my own certification authority and run an RPKI engine myself.

Next
Create ROA Objects

### RPKI

#### ROA Configuration

<table>
<thead>
<tr>
<th>Origin ASN</th>
<th>Prefix</th>
<th>Max Length</th>
<th>Add</th>
<th>Add &amp; clone</th>
<th>Clear</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS12345</td>
<td>61.45.248.0/23</td>
<td>24</td>
<td>Add</td>
<td>Add &amp; clone</td>
<td>Clear</td>
</tr>
</tbody>
</table>

**Certified Resources**

- 61.45.248.0/23
- 61.45.251.0/24
- 61.45.252.0/22
Ready to ROA

• ROA sessions conducted at different events to help Members explore resource certification
• Join the ROA sessions
• Check out the APNIC page
  – http://www.apnic.net/roa
Questions
Thank You!

End of Session