Asia Pacific Network Information Centre

APNIC

APNIC Training

Internet Fundamentals and Internet Resource Management

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22 November 2010

In conjunction with

Fundamentals

- What is APNIC?
- How do I get addresses?
- What policies will affect my company?
- How do policies happen?

Getting to know us

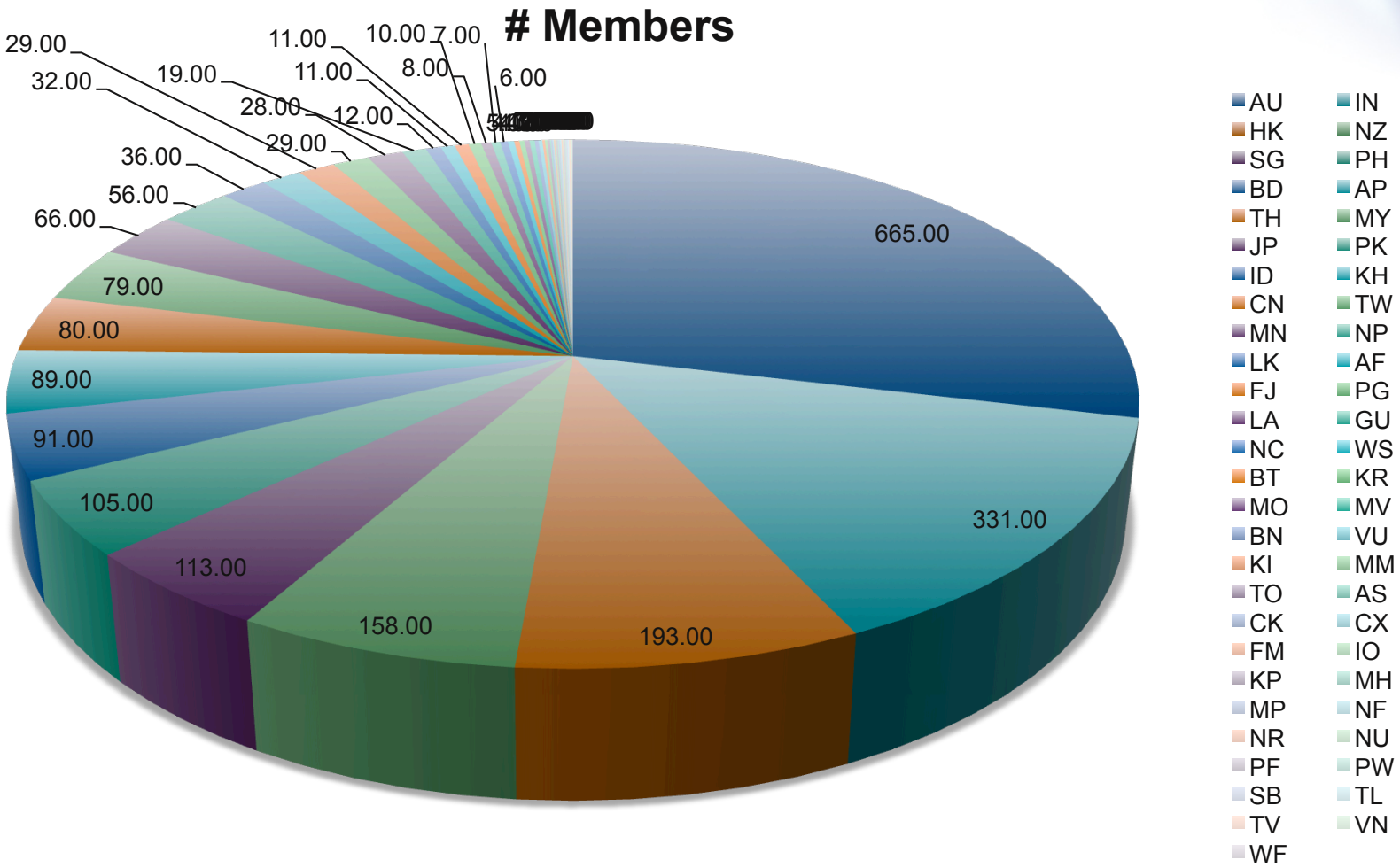
What is APNIC?

What is APNIC?

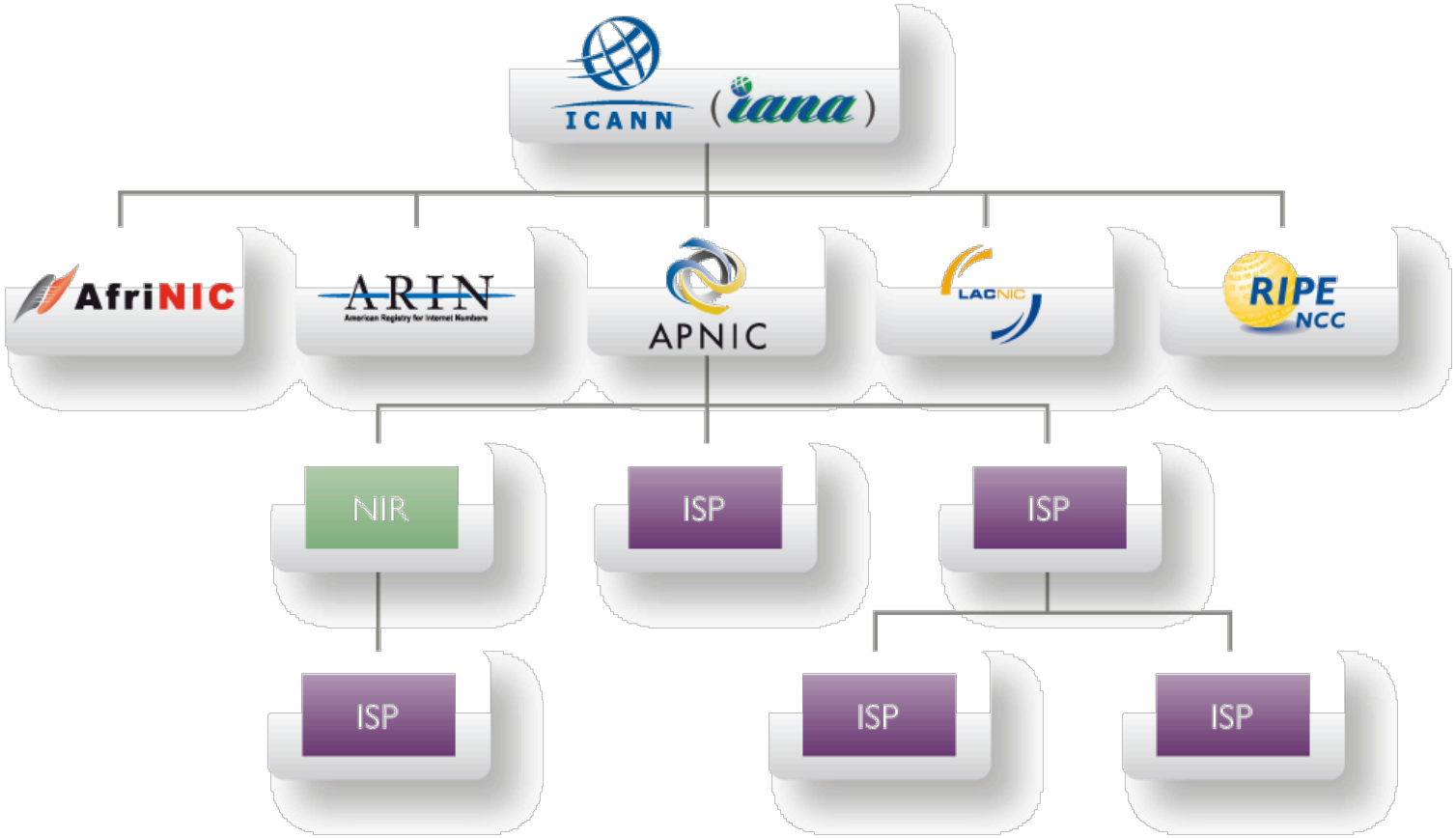
- APNIC is one of 5 Regional Internet Registries (RIRs) around the world.
- APNIC takes care of the Asia Pacific region.
- APNIC is a non-profit, membership based organisation
- Policies are proposed and agreed upon by the APNIC community.

Where Are The RIR Regions?

APNIC Membership



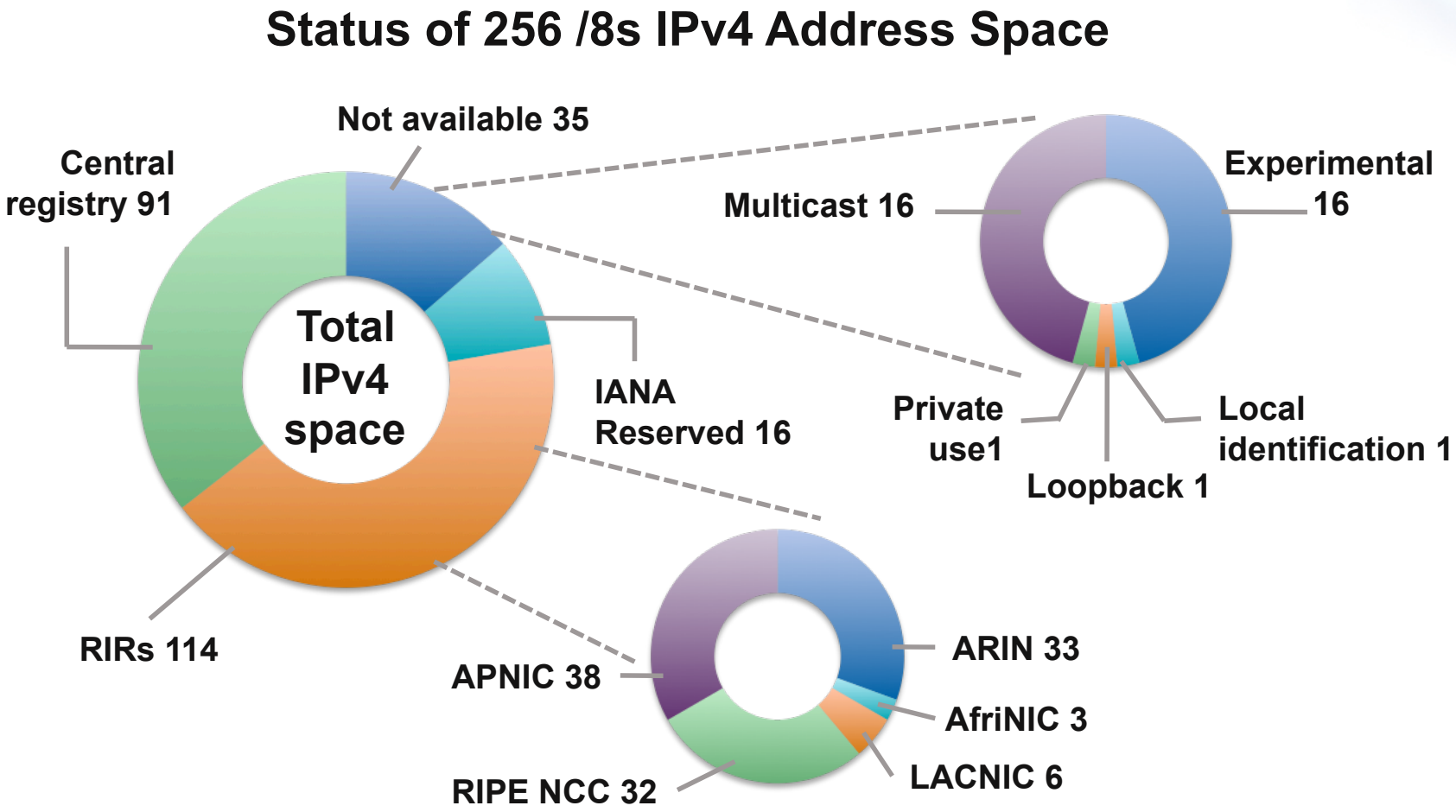
Internet Registry Structure



Internet Resource Management Goals

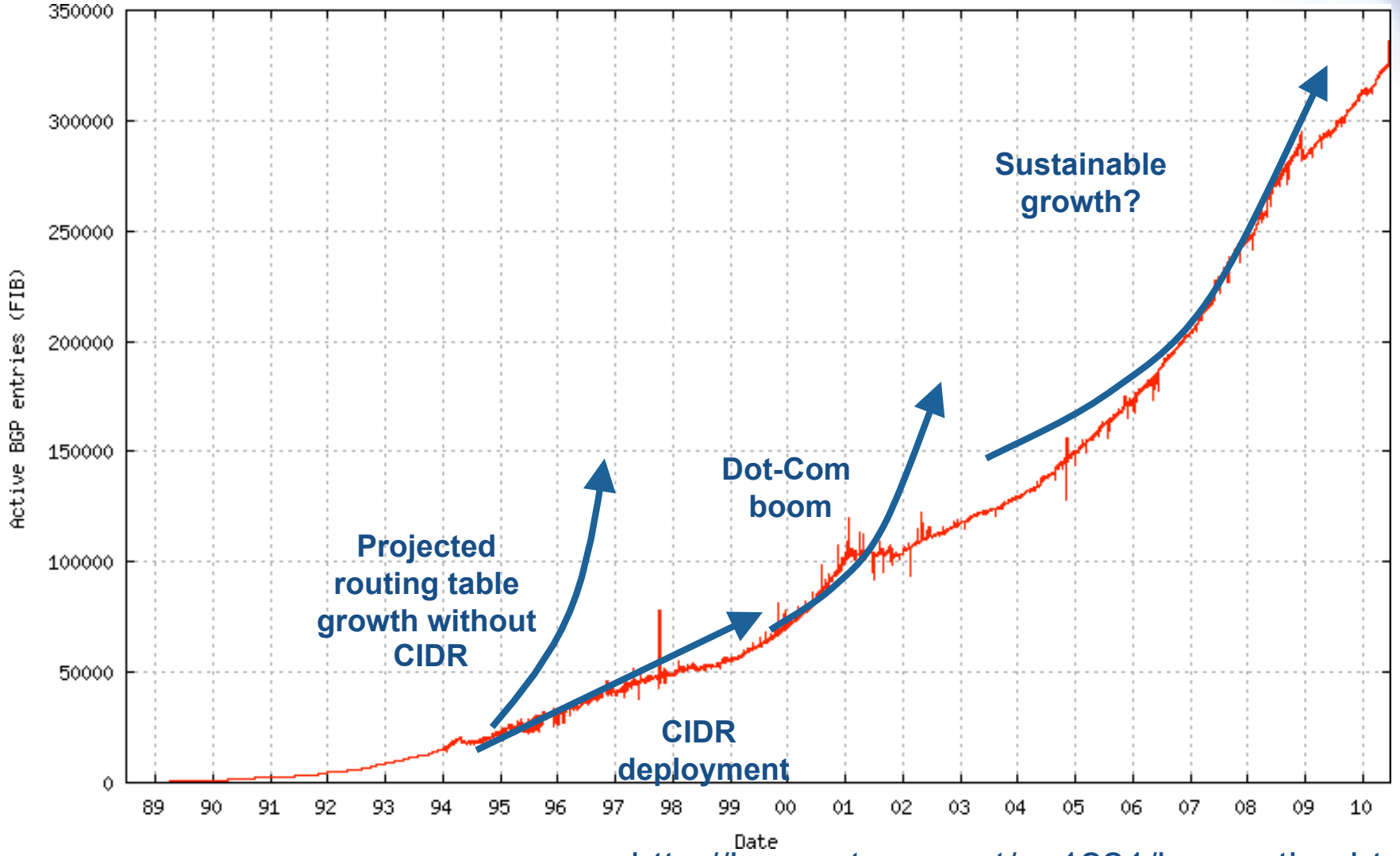
- Conservation
  - Efficient use of resources
  - Based on demonstrated need
- Aggregation
  - Limit routing table growth
  - Support provider-based routing
- Registration
  - Ensure uniqueness
  - Facilitate trouble shooting

Current Global IPv4 Delegations (/8)



Source : Number Resource Organization (NRO)

Growth Of The Global Routing Table



http://bgp.potaroo.net/as1221/bgp-active.html

What is APNIC's role?

- APNIC provides resource services to the Asia Pacific Region
  - IPv4, IPv6, ASN
  - Maintains the Whois database
  - Provides reverse DNS delegation for the resources allocated to the region

What Does APNIC Do?

- APNIC facilitates the policy development process
  - Via mailing lists and bi-annual meetings
- Implements policy changes
  - When the community has discussed and agreed upon them

Other APNIC Services

- APNIC provides training across the region to the community on a regular basis
  - Face to face
  - Via eLearning

Getting IP Addresses

How Do I Get Addresses?

- Decide what kind of number resources you need
  - IPv4, IPv6
- Check the criteria
  - On the website www.apnic.net
  - Contact the helpdesk helpdesk@apnic.net
- Become familiar with the policies
- 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 an initial address allocation at the same time.
- http://www.apnic.net/services/become-a-member

Why Become A Member?

- All APNIC members have equal access to the following benefits of membership:
  - APNIC services
  - APNIC events & education
  - Vote
  - Representation

Getting to know APNIC

Policy Development and Internet Registry Policies

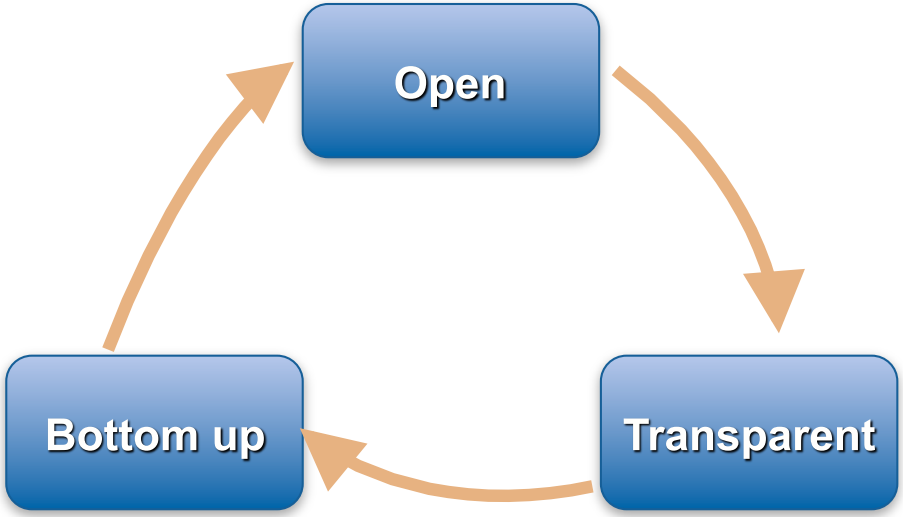
Policy Development and Internet Registry Policies

Policies and their Development

- Policies are constantly changing the meet the technical needs of the Internet
- There is a system in place called the Policy Development Process
  - Anyone can participate
  - Anyone can propose a policy
  - All decisions & policies documented & freely available to anyone

Why Participate In Policy Development?

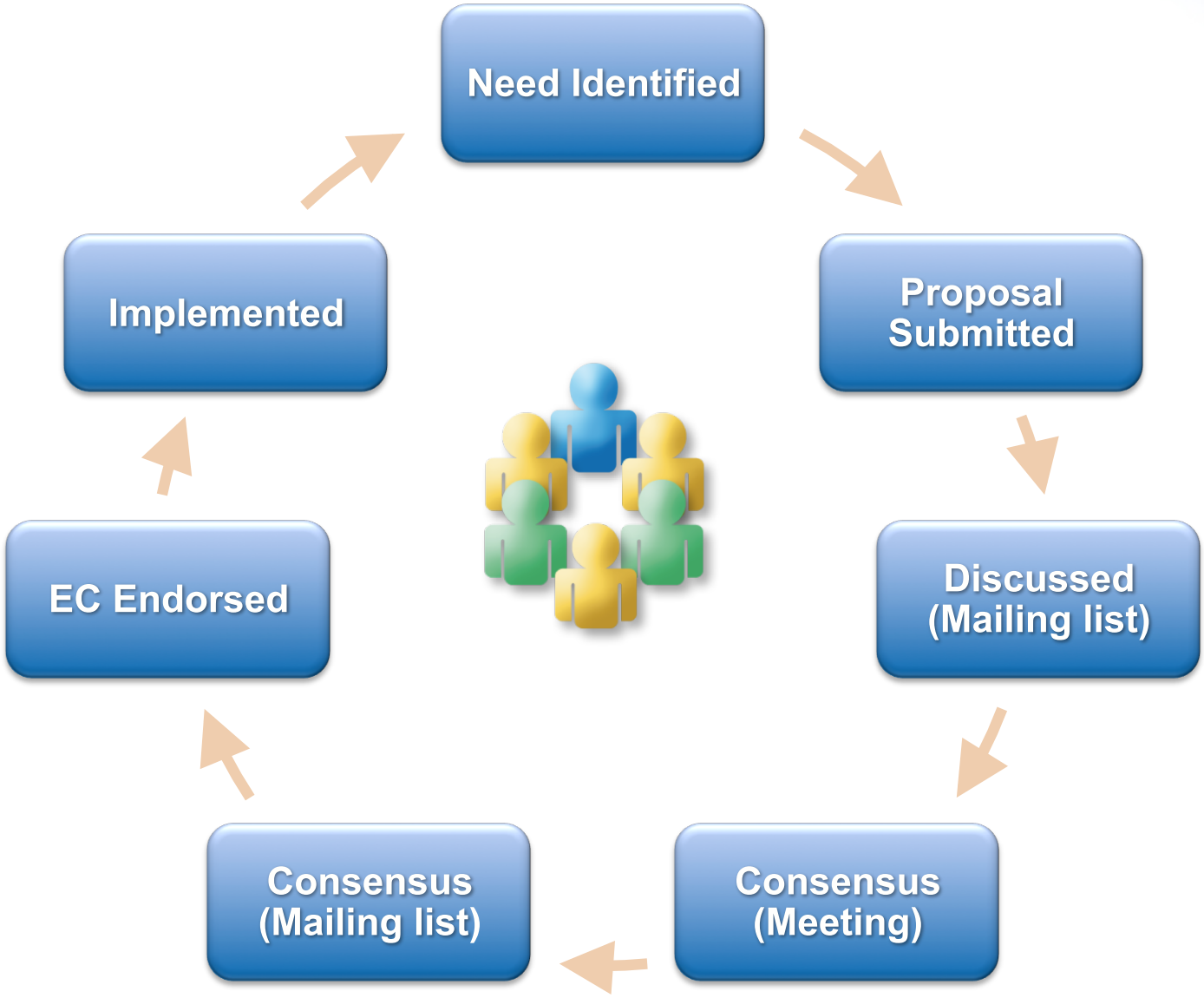
This is your opportunity to comment on policies that may directly affect the way your organisation obtains, manages and deploys Internet resources



You Can Participate!

- Send a proposal to the Secretariat
- Discuss proposals via public mailing lists
  - http://www.apnic.net/community/participate/join-discussions
- Attend meetings
  - http://meetings.apnic.net/30
  - Remote participation available

Policy Development Process



Allocation And Assignment

- Allocation
  - “A block of address space held by an IR (or downstream ISP) for subsequent allocation or assignment”
    - Not yet used to address any networks
- Assignment
  - “A block of address space used to address an operational network”
    - May be provided to ISP customers, or used for an ISP’s infrastructure (‘self-assignment’)

Allocation And Assignment

APNIC
Allocates
to APNIC Member

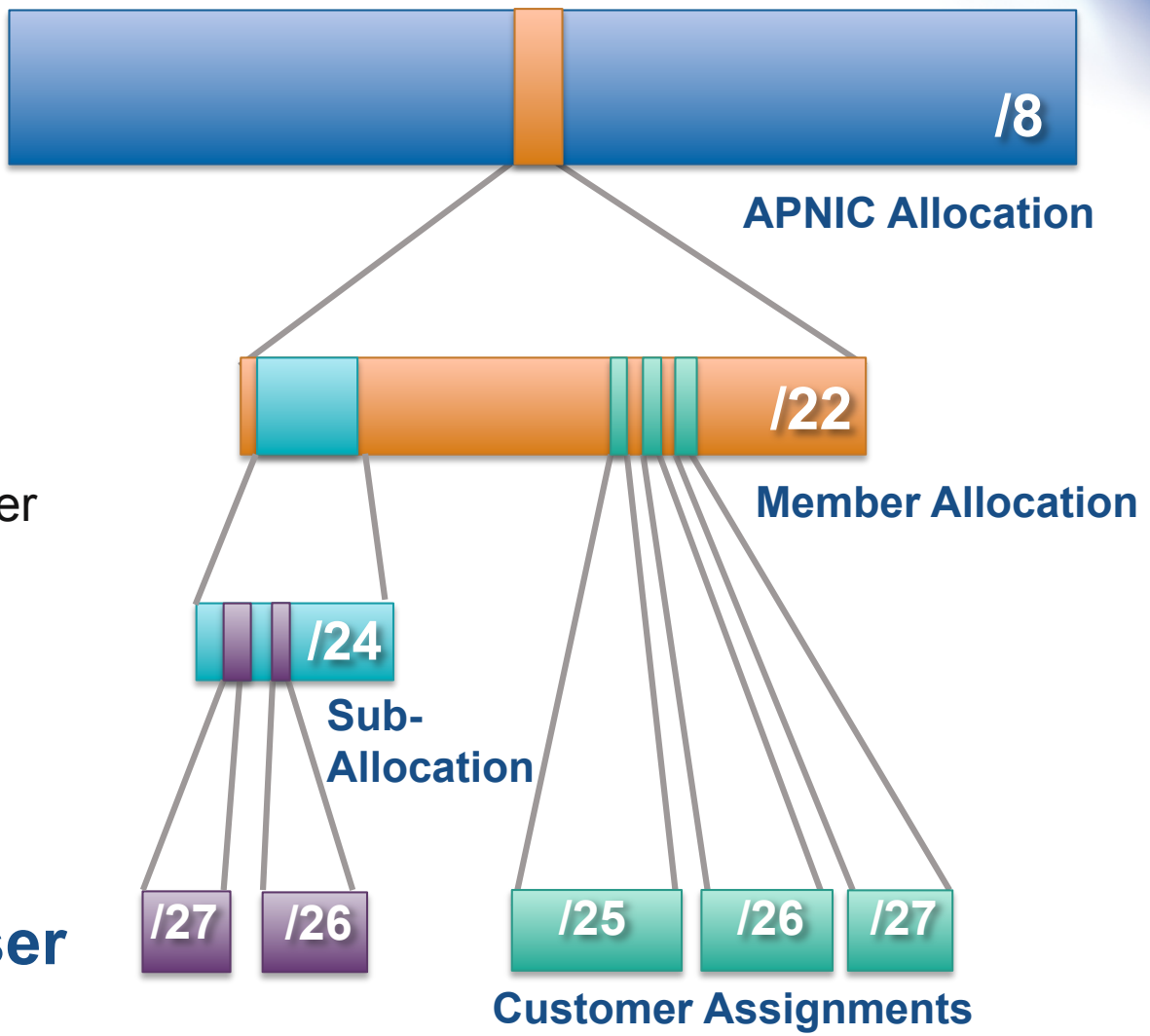
APNIC Member

Allocates
to downstream

Assigns
to end-user

Downstream
Assigns
to end-user

Customer / End User

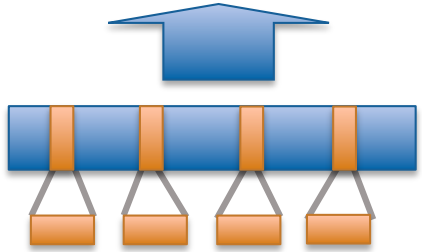


Portable And Non-portable

Portable Assignments

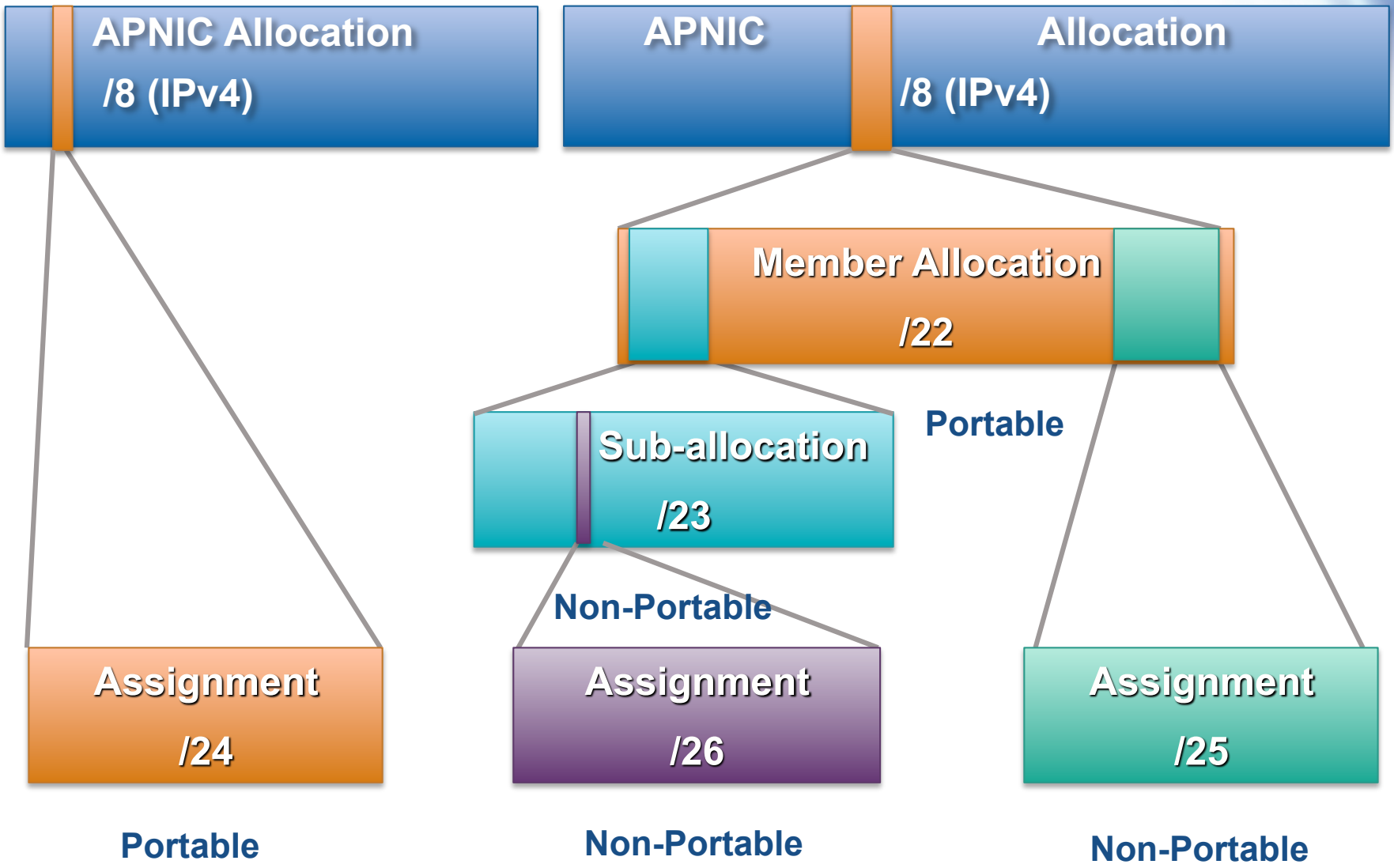
- Customer addresses independent from ISP
  - Keeps addresses when changing ISP
- Bad for size of routing tables

Non-portable Assignments



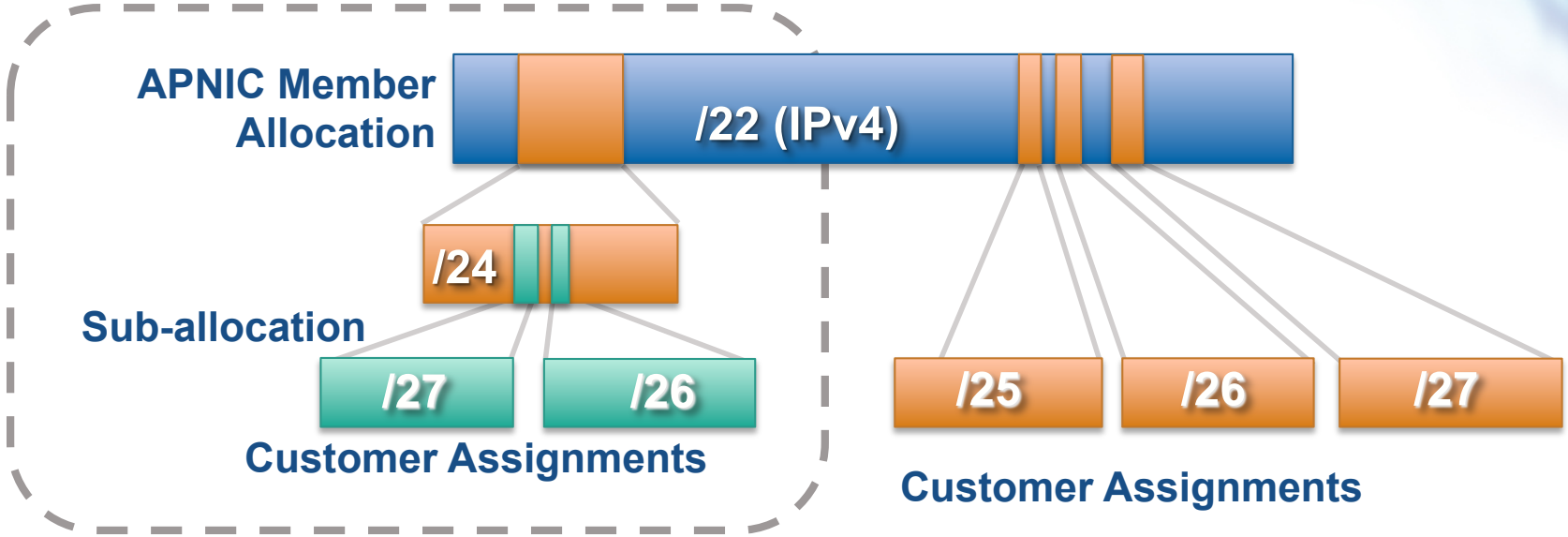
- Customer uses ISP's address space
  - Must renumber if changing ISP
- Only way to effectively scale the Internet

Address Management Hierarchy



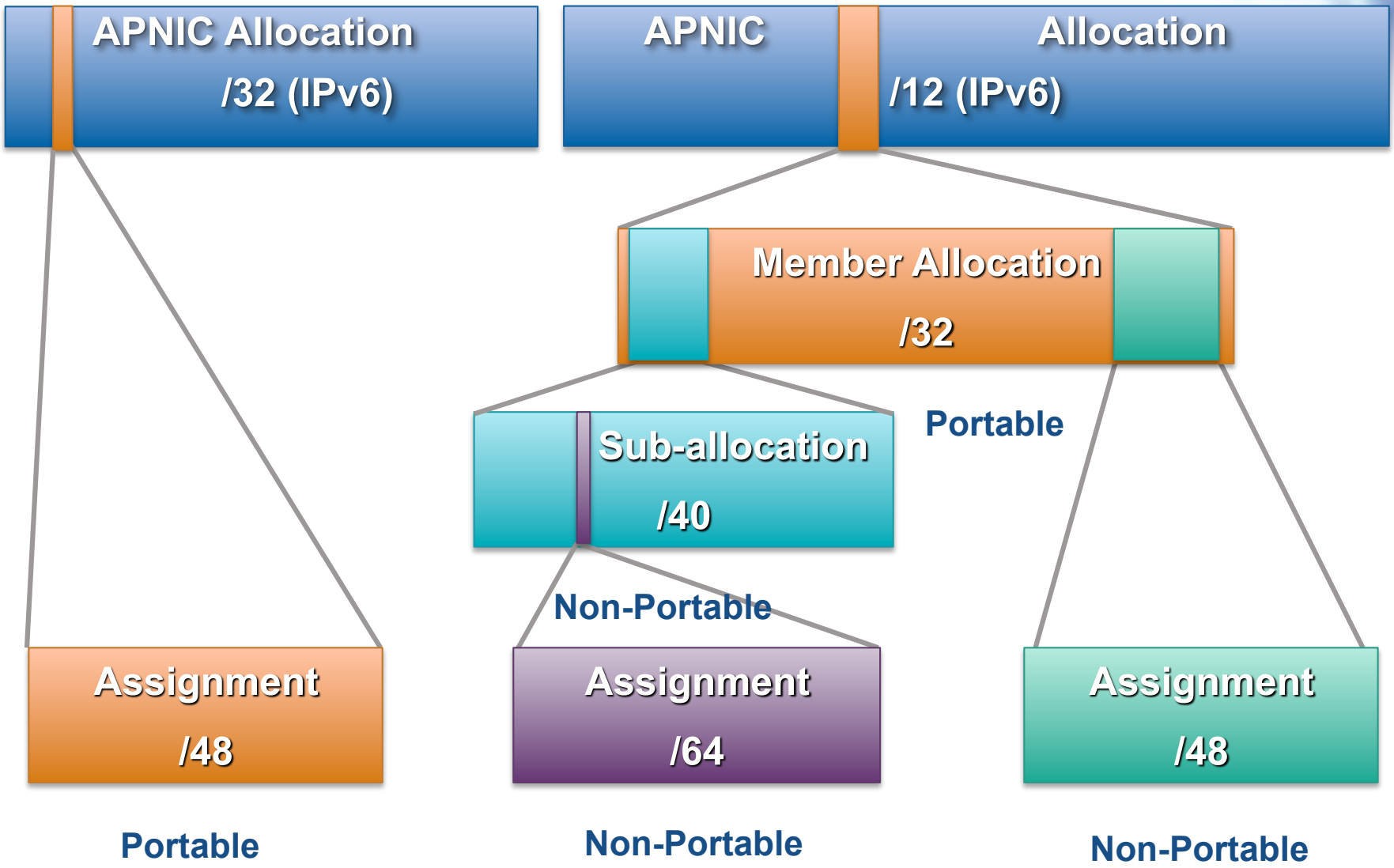
- Describes “portability” of the address space

Sub-allocations



- **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

Address Management Hierarchy



- Describes “portability” of the address space

APNIC 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
  - Address space to be obtained from one source
    - routing considerations may apply

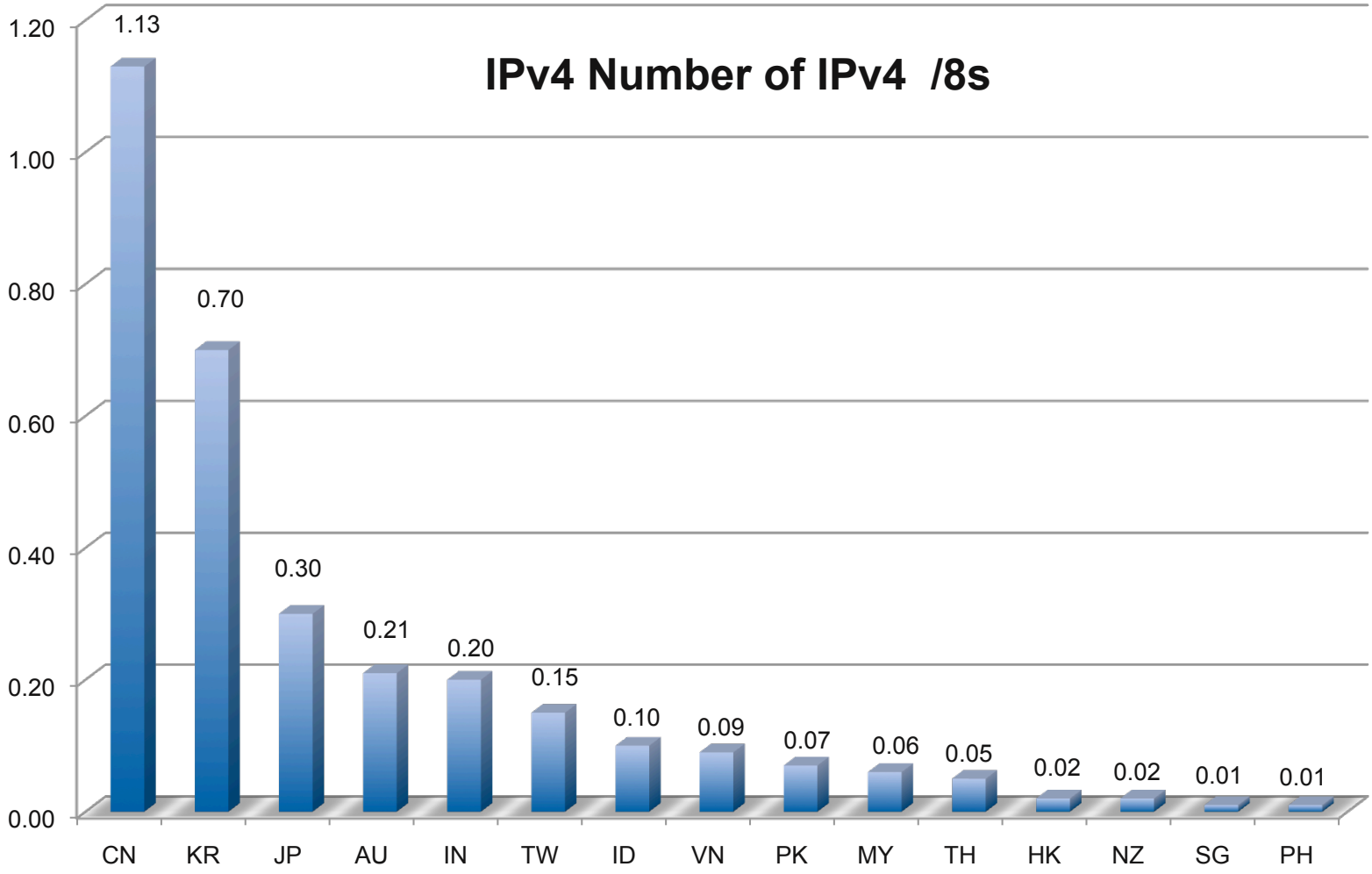
APNIC Allocation Policies

- Transfer of address space
  - Not automatically recognised
    - Return unused address space to appropriate IR
- Effects of mergers, acquisitions & take-overs
  - Will require contact with IR (APNIC)
    - contact details may change
    - new agreement may be required
  - May require re-examination of allocations
    - requirement depends on new network structure

Initial IPv4 Allocation

- APNIC minimum IPv4 allocation size /22
  - An ISP must have used a /24 from their upstream provider or demonstrate an immediate need for a /24
  - An ISP must demonstrate a detailed plan for use of a /23 within a year

APNIC IPv4 Allocations By Economy



http://www.apnic.net/stats/o3/ as of 22/06/2010

Initial IPv6 Allocation

- To qualify for an initial allocation of IPv6 address space, an organization must:
  - Not be an end site (must provide downstream services)
  - Plan to provide IPv6 connectivity to organizations to which it will make assignments

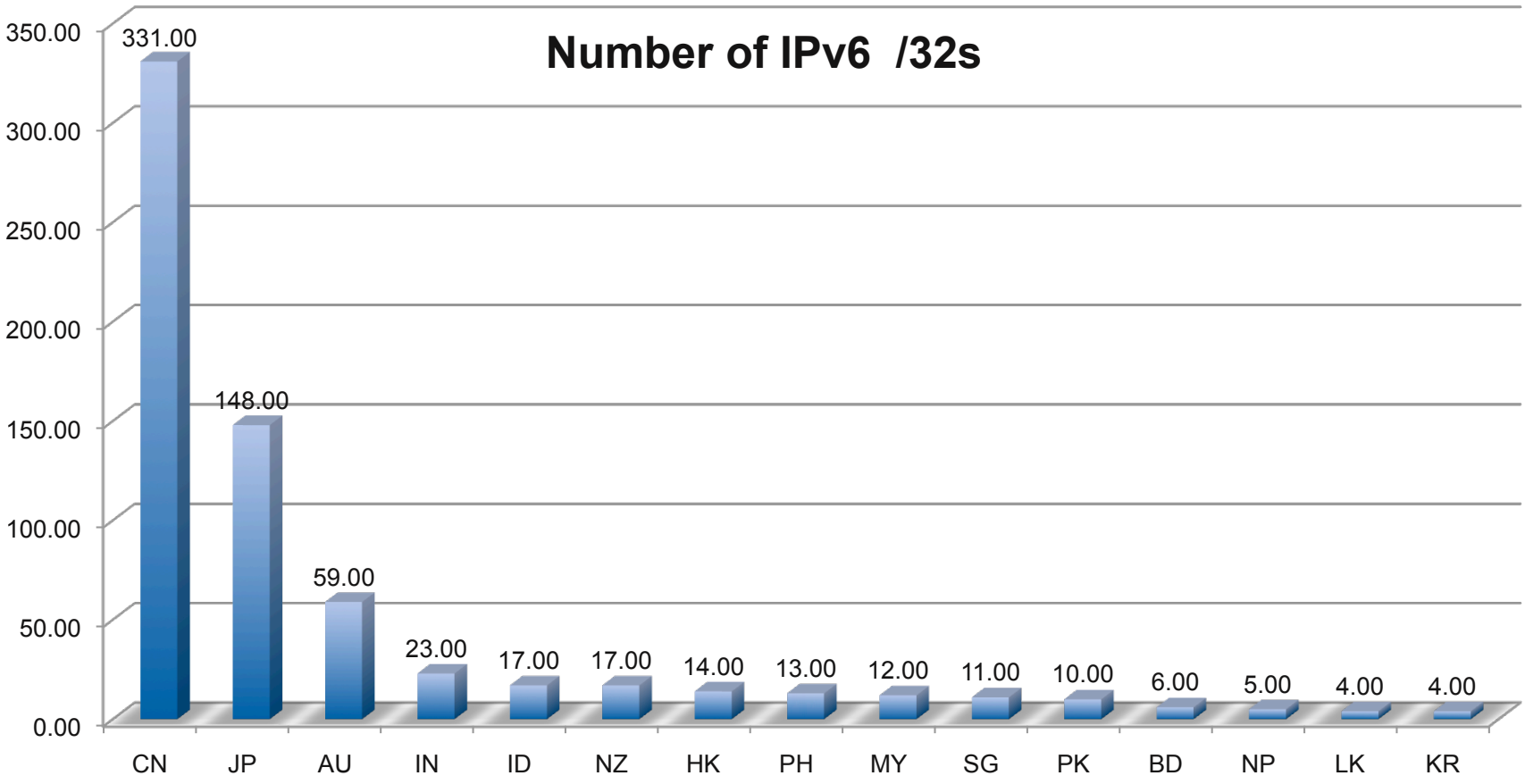
IPv6 Initial Allocation (cont.)

- Meet one of the two following criteria:
  - Have a plan for making at least 200 assignments to other organizations within two years OR
  - Be an existing ISP with IPv4 allocations from an APNIC or an NIR, which will make IPv6 assignments or sub-allocations to other organizations and announce the allocation in the inter-domain routing system within two years

“One Click” IPv6 Policy

- Members with IPv4 holdings can click the button in MyAPNIC to instantly receive their IPv6 block
  - No forms to fill out!
- A Member that has an IPv4 allocation is eligible for a /32
- A Member that has an IPv4 assignment is eligible for a /48

APNIC IPv6 Allocations By Economy



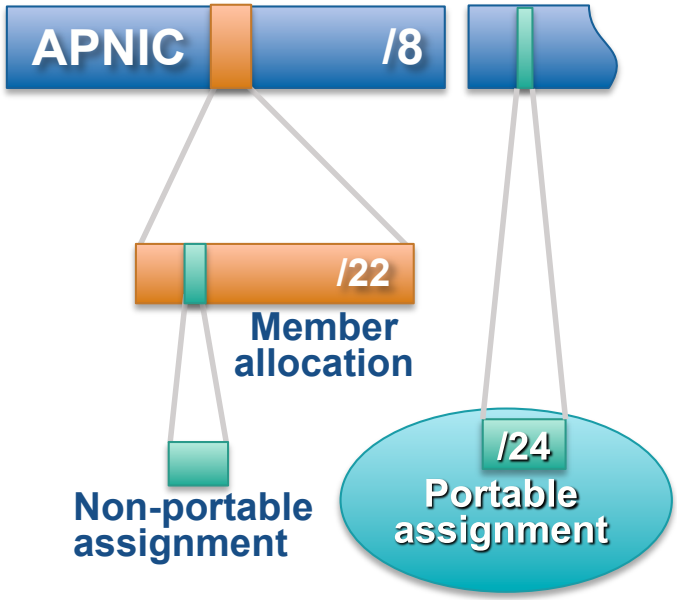
http://www.apnic.net/stats/o3/ as of 22/06/2010

Sub-allocation Guidelines

- Sub-allocate cautiously
  - Only allocate or assign what the customer has demonstrated a need for
  - Seek APNIC advice if in doubt
- Efficient assignments
  - Member is responsible for overall utilisation
- Database registration (WHOIS Db)
  - Sub-allocations & assignments must be registered in the whois db

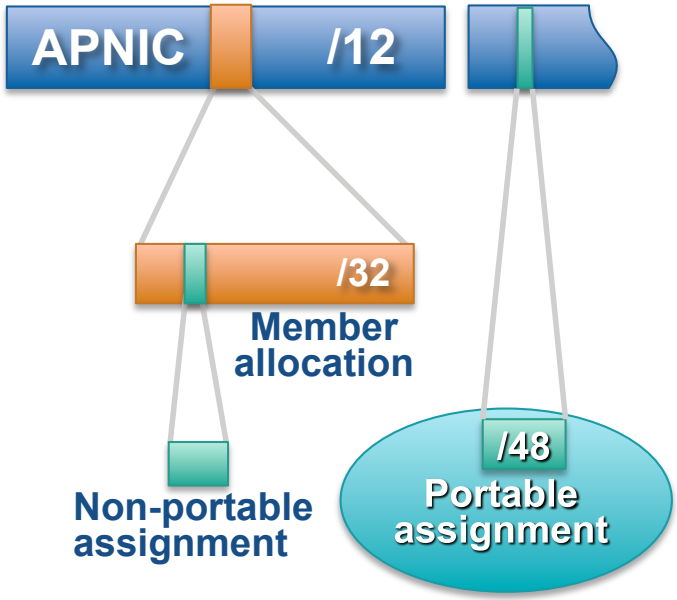
Portable Assignments for IPv4

- For (small) organisations who require a portable assignment for multi-homing purposes
  - Applicants currently multihomed OR demonstrate a plan to multihome within 1 month
  - Agree to renumber out of previously assigned space
  - Demonstrate need to use 25% of requested space immediately and 50% within 1 year



Portable Assignments for IPv6

- For (small) organisations who require a portable assignment for multi-homing purposes
  - The current policy allows for IPv6 portable assignment to end-sites
  - Size: /48, or a shorter prefix if the end site can justify it
  - To be multihomed within 3 months



IXP IPv4 Assignments Policy

- Criteria
  - 3 or more peers
  - Demonstrate “open peering policy”
- APNIC has reserved blocks of space from which to make IXP assignments

IXP IPv6 Assignment Policy

- Criteria
  - Demonstrate ‘open peering policy’
  - 3 or more peers
- Portable assignment size: /48
  - All other needs should be met through normal processes
  - /64 holders can “upgrade” to /48
    - Through NIRs/ APNIC
    - Need to return /64

Portable Critical Infrastructure Assignments

- What is Critical Internet Infrastructure?
  - Domain Registry Infrastructure
    - Operators of Root DNS, gTLD, and ccTLD
  - Address Registry Infrastructure
    - IANA, RIRs & NIRs
- Why a specific policy ?
  - Protect stability of core Internet function
- Assignment sizes:
  - IPv4: /24 or IPv6: /32

Supporting Historical IPv4 Resource Transfer

- Bring historical resource registrations into the current policy framework
  - Allows 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”
    - Resources must be registered in WHOIS DB

Questions?

Supporting Internet Development

Projects - Root Server Deployment

- A number of mirrored root server sites have been placed into the Asia Pacific region
- Lowers the transit cost by using a nearby instance of a root server
- The sites are partially or fully funded by APNIC, but operate as "anycast" mirror copies of existing Root servers, by the applicable root server operator

Grants For Community Support

- The Information Society Innovation Fund is a small grants program funding innovative approaches to the extension of Internet infrastructure and services in the Asia Pacific region
  - 19 projects have been funded since Jan 2009
  - ISIF is actively seeking sponsorship to support innovation in the Asia Pacific region

www.isif.asia

Community Collaboration

- Internet Community of Online Networking Specialists (ICONS) website provides an opportunity to share information on networking topics
- The ICONS site contains:
  - An online forum
  - Documents and presentations
  - Links to interesting external material

http://icons.apnic.net

Community Collaboration - TTM

- The Test Traffic Measurement (TTM)
- Continuously monitors connectivity between the host and the rest of the Internet.
- This project is in collaboration with RIPE NCC
  www.apnic.net/community/support/ttm

Resource Quality Assurance

- APNIC acts to minimize any problems in routability through communication, training, and testing
- Testing “new” /8 blocks
  - NOC mailing lists notification
  - Reachability test conducted in conjunction with RIPE NCC
  - APNIC conducts further testing, to quantify the extent to which networks attract “pollution” or “unwanted” traffic

Whois Database

Resource Registration

- As part of your membership agreement with APNIC, all members are required to register their resources in the APNIC database
- Records need to be kept up-to-date by members
  - Whenever there is a change in contacts
  - When new resources are received
  - When resources are sub-allocated or assigned

What Is The APNIC Database?

- Public network management database
  - Operated by Internet Registries
    - Public data only (For private data, please see "Privacy of customer assignment" module)
- Tracks network resources
  - IP addresses, ASNs, Reverse Domains, Routing policies
- Records administrative information
  - Contact information (persons/roles)
  - Authorization

Object Types

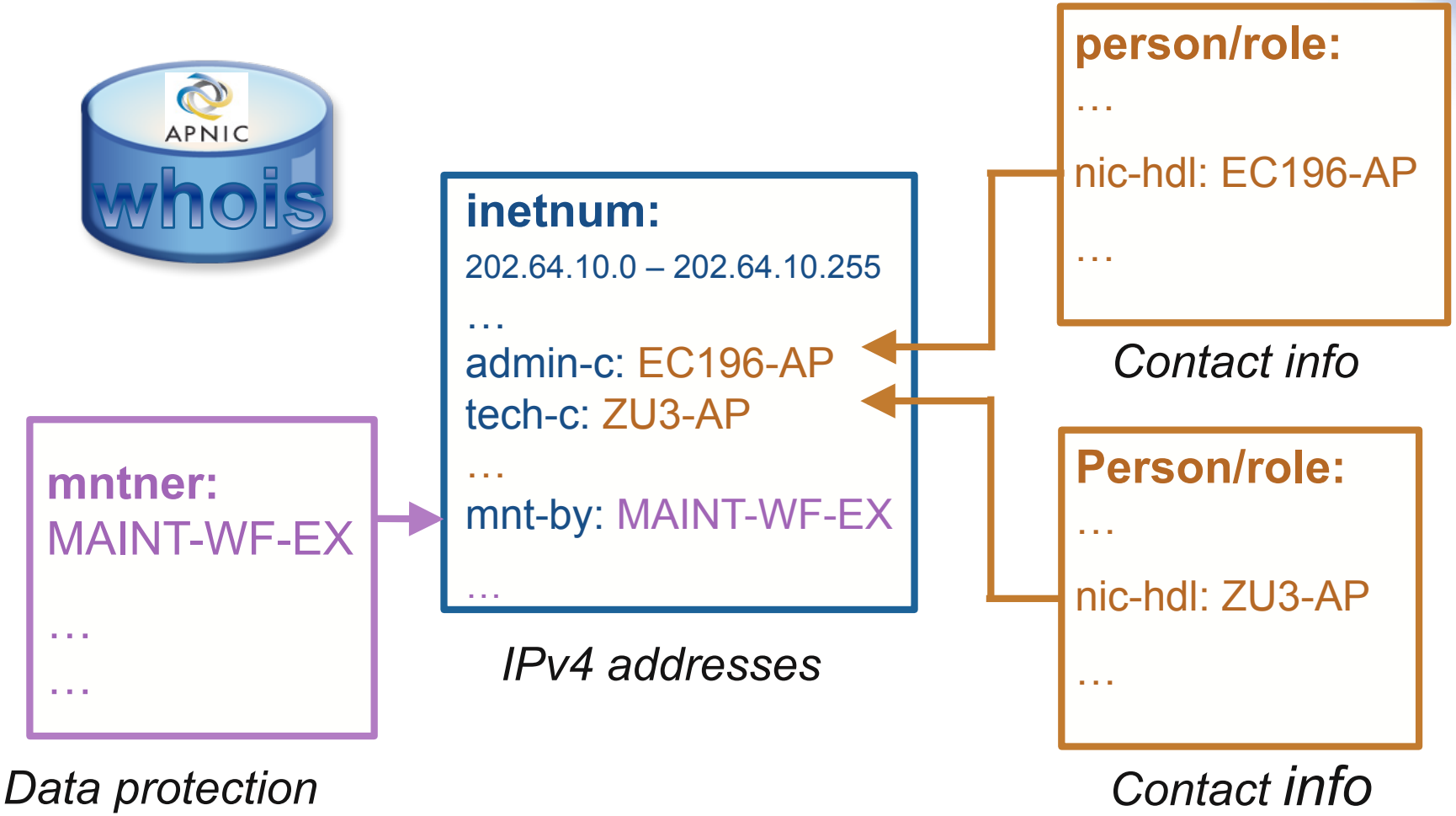
OBJECT	PURPOSE
person	contact persons
role	contact groups/roles
inetnum	IPv4 addresses
inet6num	IPv6 addresses
aut-num	Autonomous System number
domain	reverse domains
route	prefixes being announced
mntner	(maintainer) data protection

http://www.apnic.net/db/

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)
  - Autnum object (if you received an ASN)
- Information is taken from your application for resources and membership

Inter-related Objects



* Please note that the following slides refer back to this one.

What Is A ‘nic-hdl’?

- Unique identifier for a person or role
- Represents a person or role object
  - Referenced in objects for contact details
    - (inetnum, aut-num, domain…)
  - format: <XXXX-AP>
    - Eg: EC196-AP

```
Person: Eric Chu
address:      ExampleNet Service Provider
address:      Level 1 33 Park Road Milton
address:      Wallis and Futuna Islands
country:      WF
phone:        +680-368-0844
fax-no:       +680-367-1797
e-mail:       echu@example.com
nic-hdl: EC196-AP
mnt-by:       MAINT-WF-EX
changed:      echu@example.com 20020731
source:       APNIC
```

Person Object

- Represents a contact person for an organisation
  - Every member must have at least one contact person registered
  - Large organisations often have several contacts for different purposes
- Is referenced in other objects
- Has a nic-hdl
  - Eg. EC17-AP

Role Object

- Represents a group of contact persons for an organisation
  - Eases administration
  - Can be referenced in other objects instead of the person objects for individuals
- Also has a nic-hdl
  - Eg. HM20-AP

http://www.apnic.net/db/role.html

Whois - Role vs. Person Objects

```
% APNIC found the following authoritative answer from: whois.apnic.net

% [whois.apnic.net node-1]
% Whois data copyright terms    http://www.apnic.net/db/dbcopyright.html

role:           APNIC Training
address:        Level 1 33 Park Rd. 4064 Milton, Brisbane
country:        AU
phone:          +617 38583100
fax-no:         +617 38583199
e-mail:         training@apnic.net
admin-c:        AA196-AP
tech-c:         AA196-AP
nic-hdl:        AT480-AP
mnt-by:         MAINT-AU-APNICTRAINING
changed:        hm-changed@apnic.net 20080424
source:         APNIC

person:         Amante Alvaran
nic-hdl:        AA196-AP
e-mail:         amante@apnic.net
address:        Level 1 33 Park Road Milton
address:        Brisbane QLD Australia
phone:          +617-3858-3100
fax-no:         +617-3858-3199
country:        AU
mnt-by:         MAINT-AU-APNICTRAINING
changed:        hm-changed@apnic.net 20051025
changed:        hm-changed@apnic.net 20080424
source:         APNIC
```

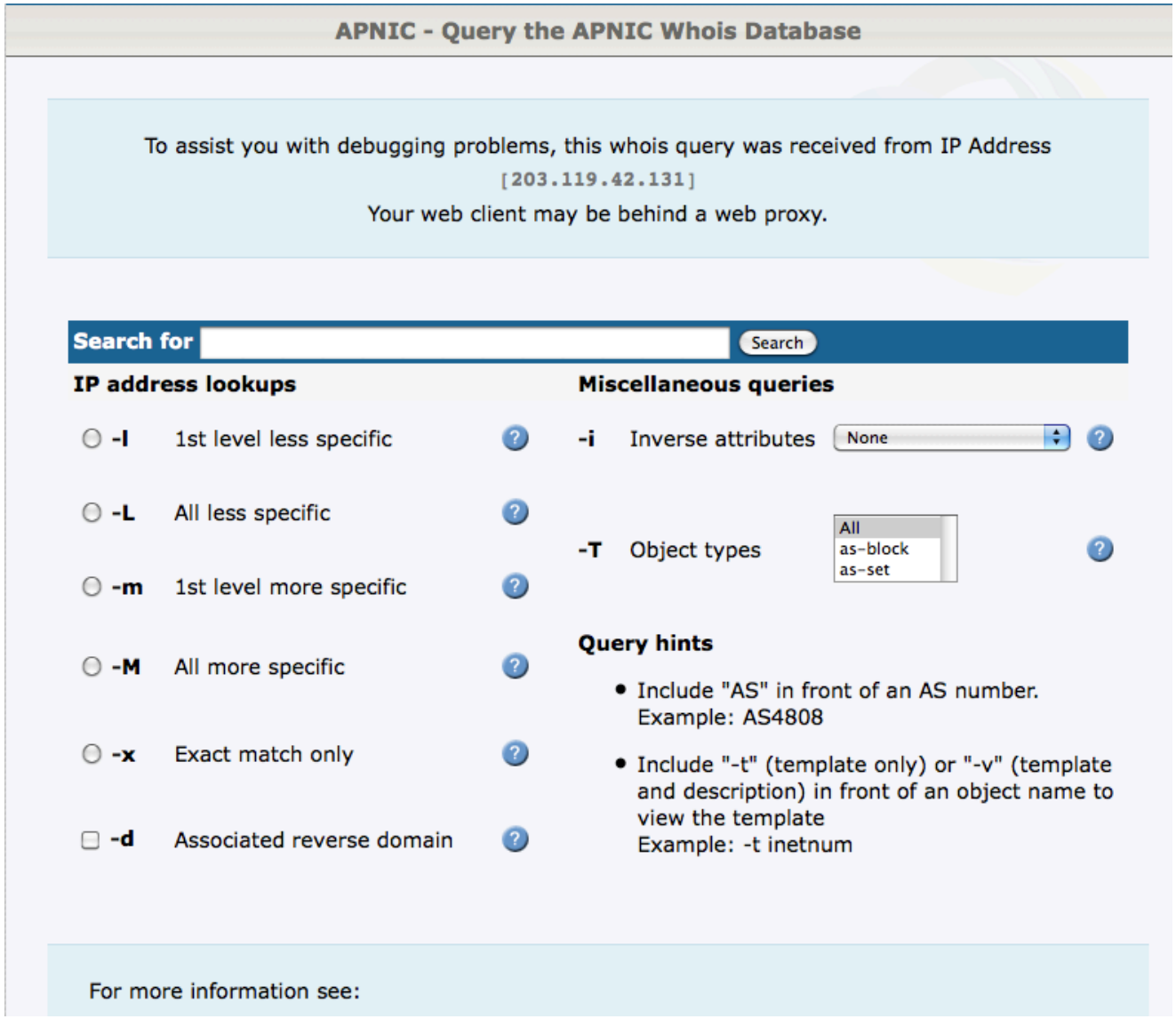
Inetnum / Inet6num Objects

- Contains IP allocation and assignment information
- APNIC creates an inetnum (or inet6num) object for each allocation or assignment they make to the member
- All members must create inetnum (or inet6num) objects for each sub-allocation or assignment they make to customers

Whois – Inet6num Example

```
inet6num:      2001:0DF0:000A::/48
netname:       APNICTRAININGIPv6-20080424
descr:         APNIC Training IPv6 Address
country:       AU
admin-c:       AA196-AP
tech-c:        AA196-AP
status:        ASSIGNED PORTABLE
mnt-by:        MAINT-AU-APNICTRAINING
mnt-routes:    MAINT-AU-APNICTRAINING
remarks:       -+-+-+-+-+-+-+-+-+-+-+-++-+-+-+-+-+-+-+-+-+-+-+-+-+
remarks:       This object can only be updated by APNIC hostmasters.
remarks:       To update this object, please contact APNIC
remarks:       hostmasters and include your organisation's account
remarks:       name in the subject line.
remarks:       -+-+-+-+-+-+-+-+-+-+-+-++-+-+-+-+-+-+-+-+-+-+-+-+-+
changed:       hm-changed@apnic.net 20080424
source:        APNIC
```

APNIC Whois Web Query



What Is A Maintainer?

- Protects other objects in the APNIC database
- Multiple levels of maintainers exist in a hierarchical manner
  - Maint-by
  - Maint-lower
- Applied to any object created directly below that maintainer object

Database Protection Maintainer Object

```
mntner:         MAINT-AU-APNICTRAINING
descr:          APNIC Training
country:        AU
admin-c:        AA196-AP
tech-c:         AA196-AP
auth:           MD5-PW $1$FUrnj.4g$sIyzbkZj2XJoDanL/ndXN0
mnt-by:         MAINT-AU-APNICTRAINING
upd-to:         amante@apnic.net
referral-by:    APNIC-HM
changed:        hm-changed@apnic.net 20080424
changed:        hm-changed@apnic.net 20090325
changed:        hm-changed@apnic.net 20090403
changed:        hm-changed@apnic.net 20090702
changed:        hm-changed@apnic.net 20091111
changed:        hm-changed@apnic.net 20091217
changed:        hm-changed@apnic.net 20100528
source:         APNIC
```

Authorisation Mechanism

inet6num:	2001:0DF0:000A::/48
netname:	APNICTRAININGIPv6-20080424
descr:	APNIC Training IPv6 Address
…….	
mnt-by:	MAINT-AU-APNICTRAINING

mntner:	MAINT-AU-APNICTRAINING
descr:	APNIC Training
country:	AU
admin-c:	AA196-AP
tech-c:	AA196-AP
mnt-by:	MAINT-AU-APNICTRAINING
upd-to:	amante@apnic.net
referral-by:	APNIC-HM
changed:	hm-changed@apnic.net 20080424
source:	APNIC

Mnt-by Attribute

- Can be used to protect any object
- Changes to protected object must satisfy authentication rules of ‘mntner’ object.

Mnt-lower Attribute

- Also references mnt-by object
- Hierarchical authorisation for inetnum & domain objects
- The creation of child objects must satisfy this maintainer
- Protects against unauthorised updates to an allocated range - highly recommended!

Authentication / Authorisation

- APNIC allocation to member
  - Created and maintained by APNIC

```
inetnum:        203.176.189.0 - 203.176.189.255
netname:        APNICTRAININGIPv4
descr:          APNIC Training IPv4 Address
country:        AU
admin-c:        AA196-AP
tech-c:         AA196-AP
status:         ASSIGNED PORTABLE
mnt-by:         MAINT-AU-APNICTRAINING
mnt-routes:     MAINT-AU-APNICTRAINING
remarks:        -+-+-+-+-+-+-+-+-+-+-++-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
remarks:        This object can only be updated by APNIC hostmasters.
remarks:        To update this object, please contact APNIC
remarks:        hostmasters and include your organisation's account
remarks:        name in the subject line.
remarks:        -+-+-+-+-+-+-+-+-+-+-++-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
changed:        hm-changed@apnic.net 20080424
source:         APNIC
```

1 → mnt-by: MAINT-AU-APNICTRAINING

2 → remarks: -+-+-+-+-+-+-+-+-+-+-++-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

1. Only APNICTRAINING-AU can create assignments within this allocation
2. Only APNIC can change this object

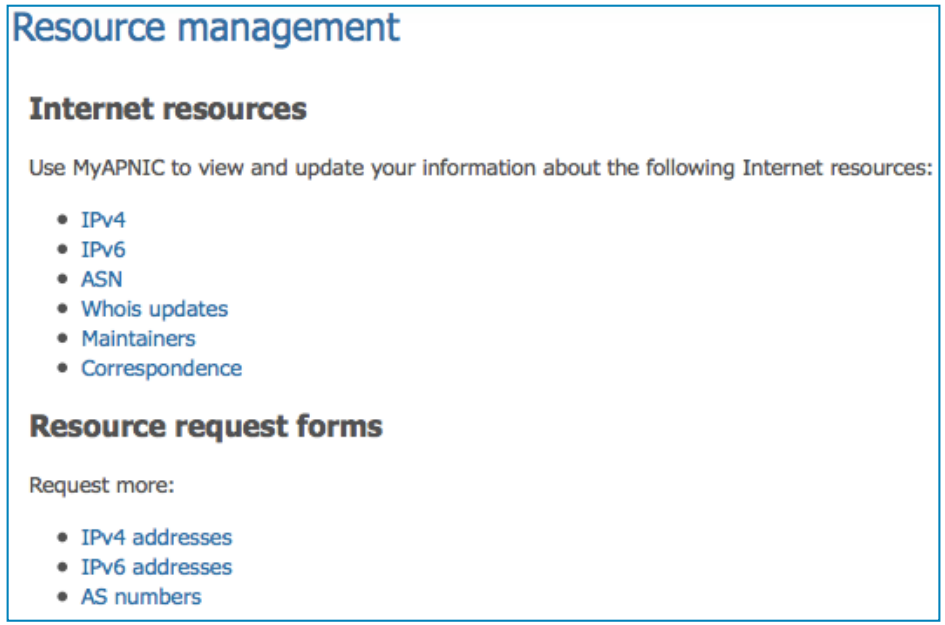
MyAPNIC

MyAPNIC

A day-to-day tool to manage your APNIC account and resources

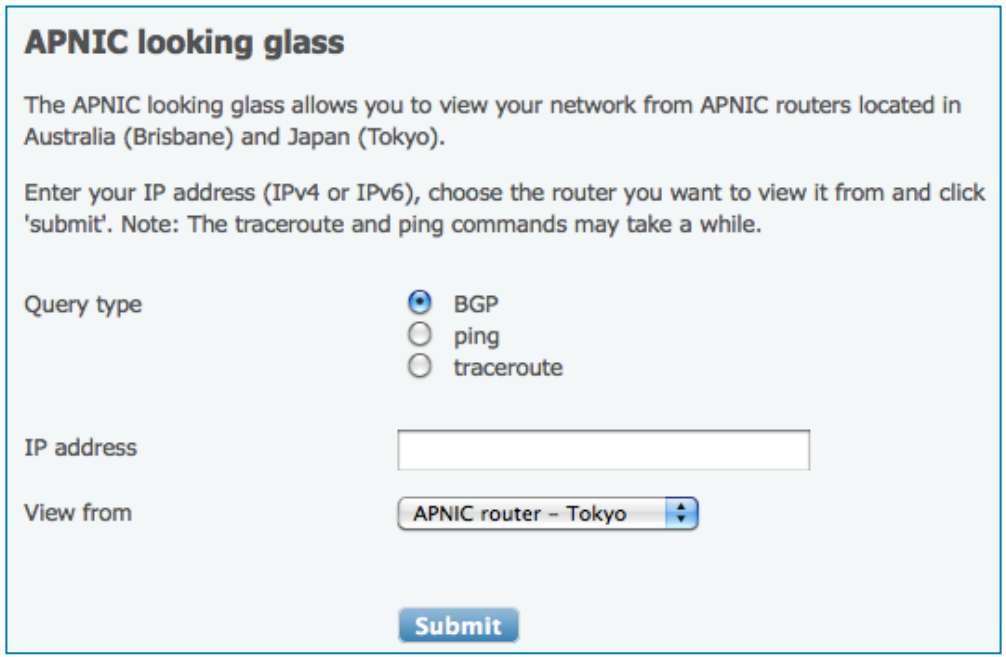
MyAPNIC Functions

- Resource information
  - IPv4
  - IPv6
  - ASN
- Administration
  - Membership detail
  - Contact persons
  - Billing history



MyAPNIC Functions (cont.)

- Training
  - Training history
  - Training registration
- Tools
  - Looking Glass
  - MD5
  - Prefix Report



Autonomous System Numbers

What Is An Autonomous System?

- Collection of networks with same routing policy
- Usually under single ownership, trust or administrative control

When Do I Need An ASN?

- An ASN is needed if you have a
  - Multi-homed network to different providers AND
  - Routing policy different to external peers

* For more information please refer to RFC1930: Guidelines for creation, selection and registration of an Autonomous System

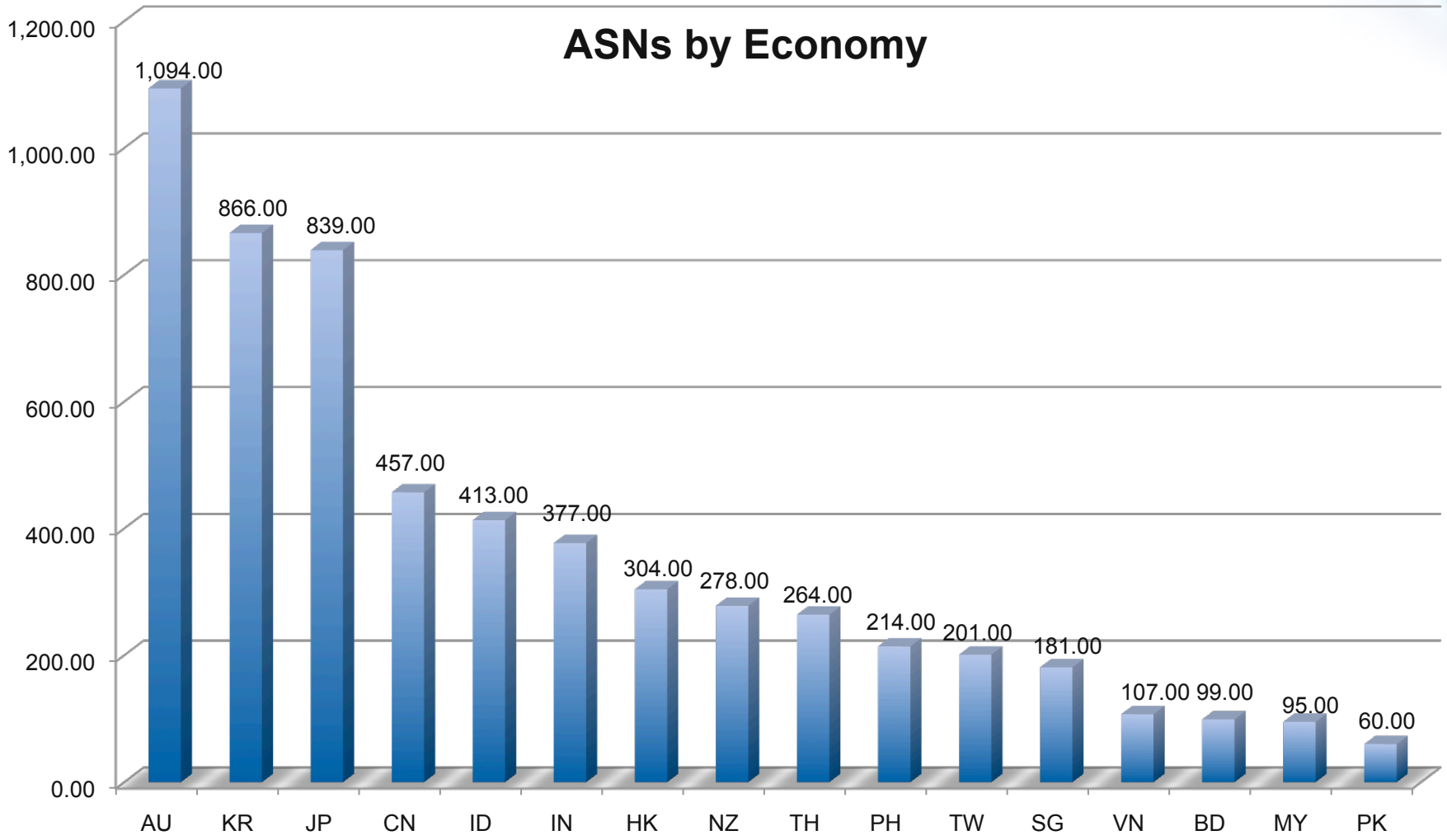
Requesting An ASN

- 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
- Transfers of ASNs
  - Require legal documentation (mergers etc)

Requesting An AS Number

- If a member requests an ASN from APNIC for own network infrastructure
  - AS number is “portable”
- If a member requests an ASN from APNIC for its downstream customer network
  - ASN is “non-portable”
  - ASN is returned if the customer changes provider

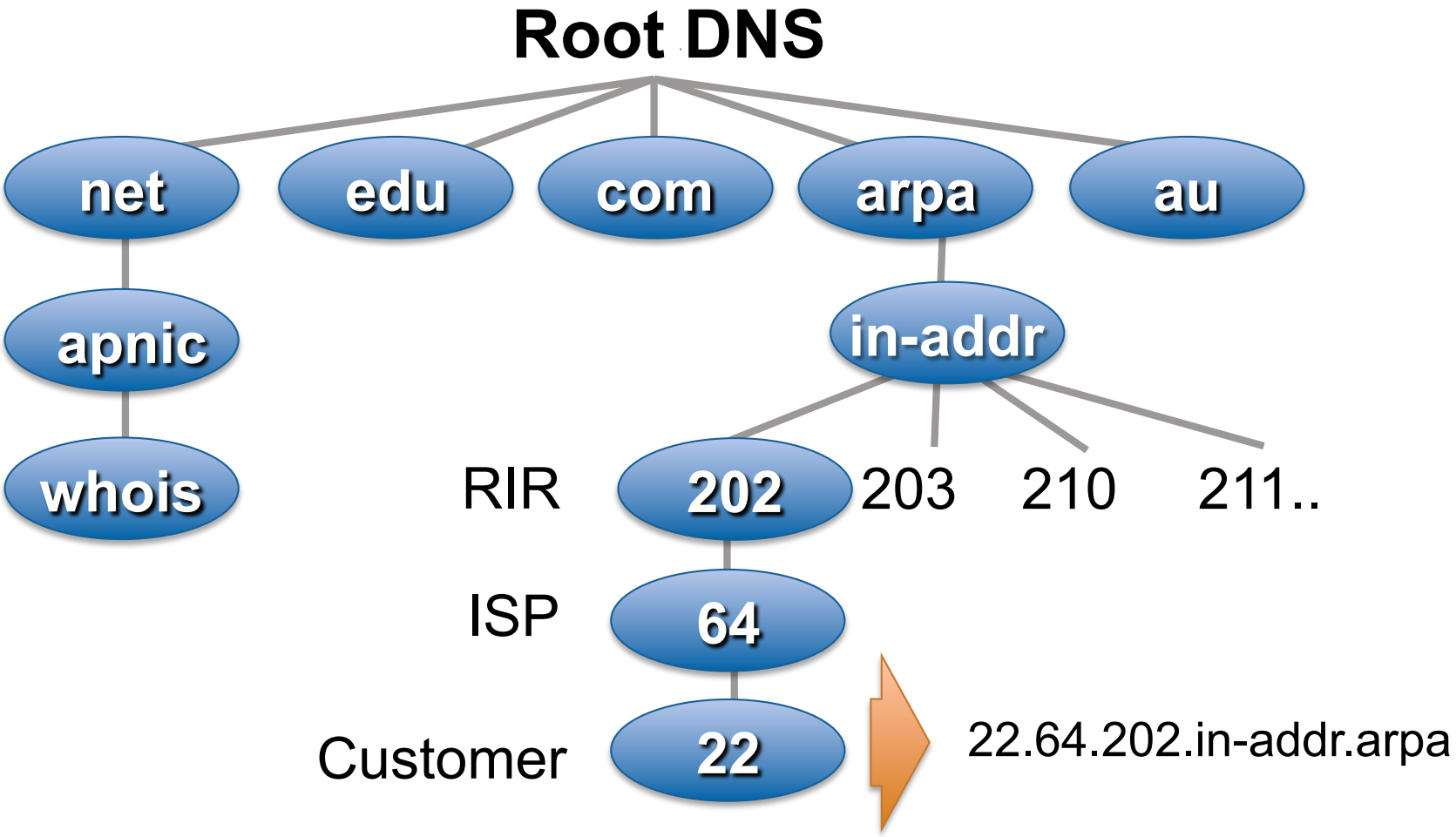
APNIC ASN By Economy



Reverse DNS

Principles – DNS Tree

Mapping numbers to names - 'reverse DNS'



Reverse Delegation Requirements

- /24 Delegations
  - Address blocks should be assigned/allocated
  - At least two name servers
- /16 Delegations
  - Same as /24 delegations
  - APNIC delegates entire zone to member
- < /24 Delegations
  - Read “classless in-addr.arpa delegation”

A 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.
```

Example ‘Domain’ Object

domain:	124.54.202.in-addr.arpa
descr:	co-located server at mumbai
country:	PK
admin-c:	VT43-AP
tech-c:	IA15-AP
zone-c:	IA15-AP
nserver:	dns.isp.net.pk
nserver:	giasbm01.isp.net.pk
mnt-by:	MAINT-PK-isp
changed:	gps@isp.net.pk 20010612
source:	APNIC

Adding A Domain Object To The Whois DB

- Using My APNIC (Instant)
- Sending Domain object template to APNIC Helpdesk (1 working day)
- Name servers must be configured before submitting request

Delegation Procedures – Request Form

- Complete the documentation
  - ftp://ftp.apnic.net/apnic/docs/reverse-dns
- On-line form interface
  - Real time feedback
  - Gives errors, warnings in zone configuration
    - serial number of zone consistent across nameservers
    - nameservers listed in zone consistent
  - Uses database ‘domain’ object
    - examples of form to follow..

Evaluation

- Parser checks for
  - ‘whois’ database
    - IP address range is assigned or allocated
    - Must be in APNIC database
  - Maintainer object
    - Mandatory field of domain object
  - Nic-handles
    - zone-c, tech-c, admin-c

Finishing Up

Need any help?

Member Services Helpdesk

-One point of contact for all member enquiries
-Online chat services

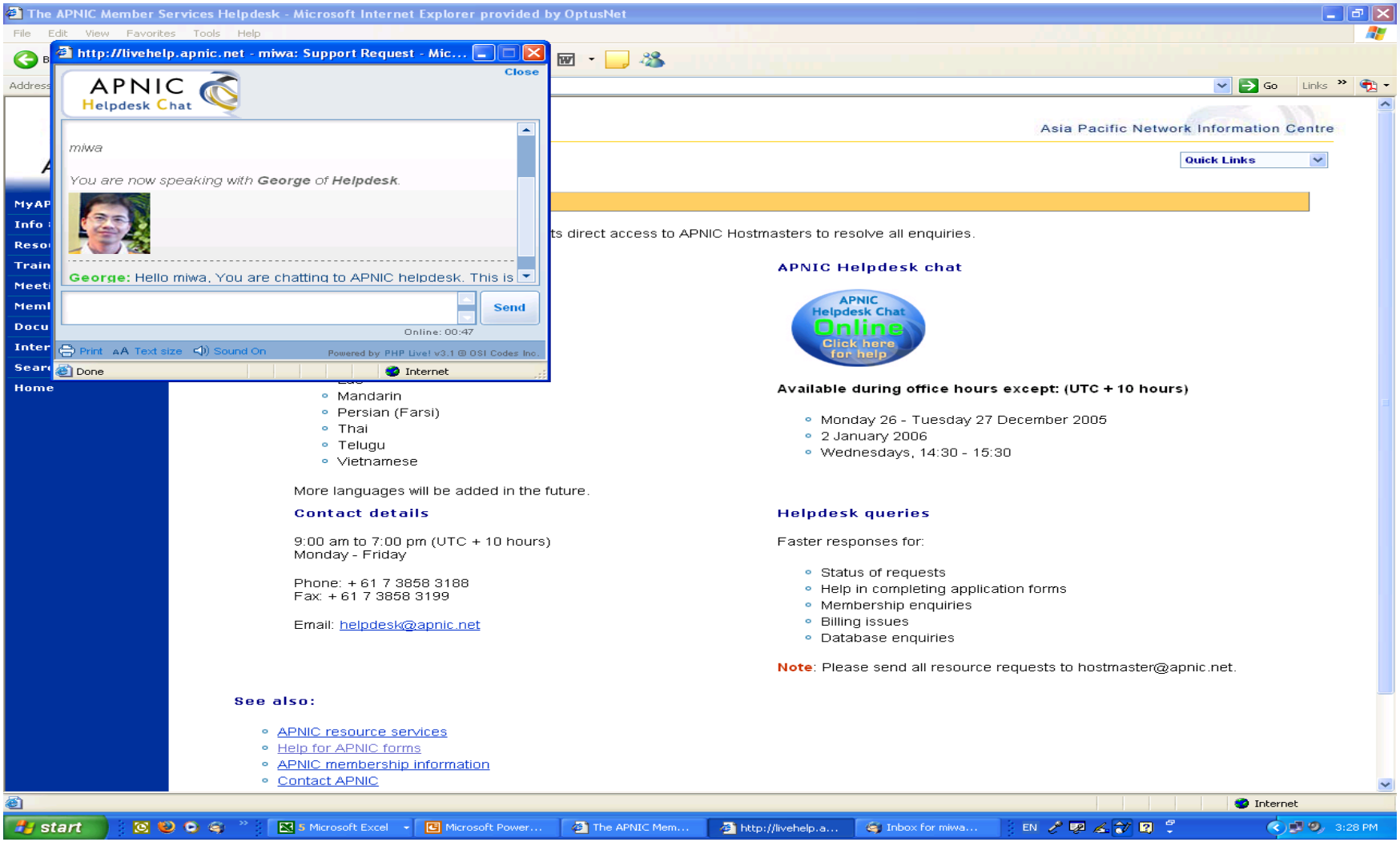
Helpdesk hours

9:00 am - 9:00 pm (AU EST, UTC + 10 hrs)

ph: +61 7 3858 3188 fax: 61 7 3858 3199

- *More personalised service*
  - Range of languages:
    Bahasa Indonesia, Bengali, Cantonese, English, Hindi, Mandarin, Thai, etc.
- *Faster response and resolution of queries*
  - IP resource applications, status of requests, obtaining help in completing application forms, membership enquiries, billing issues & database enquiries

APNIC Helpdesk chat



APNIC Website

Summary

- APNIC is the Regional Internet Registry for the APNIC region
- APNIC (the Secretariat) facilitates the Policy Development process
- Members have access to APNIC services including IP addresses, ASN numbers, MyAPNIC tools and subsidized training
- APNIC is involved in various projects in the APNIC region

Meeting Reminder

- The next meeting is being held in Hong Kong from
  21 – 25 February 2011 in conjunction with APRICOT 2011.
- You can participate in person or remotely
- See the website for more details:
  http://meetings.apnic.net/31/home
- We look forward to seeing you there!

Questions?

Thank You! ☺