APNIC IRM Tutorial

Thimphu, Bhutan

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Proudly Supported by:

APNIC

Presenter

Srinath Beldona

Senior Technical Specialist, APNIC

Contact:
Email: srinath@apnic.net

Agenda

- **Introduction to APNIC**

- Policy Development Process

- Internet Registry Policies

- Requesting IP Addresses

- Whois Database and MyAPNIC

- Autonomous System Numbers

- Reverse DNS

What is APNIC?

- Regional Internet Registry (RIR) for the Asia Pacific region
  - One of five RIRs currently operating around the world
  - A membership-based, not-for-profit organization

- Industry self-regulatory body
  - Open
  - Consensus-based
  - Transparent

- Meetings and mailing lists
  - http://meetings.apnic.net
  - http://www.apnic.net/mailing-lists

APNIC

What does APNIC do?

Resource service

- IPv4, IPv6, ASNs
- Reverse DNS delegation
- Resource registration
  - Authoritative registration server
    - Whois
    - IRR

Policy development

- Facilitating the policy development process
- Implementing policy changes

Information dissemination

- APNIC conferences
- Web and ftp site
- Publications, mailing lists
- Outreach seminars

Training

- Face to Face Workshops
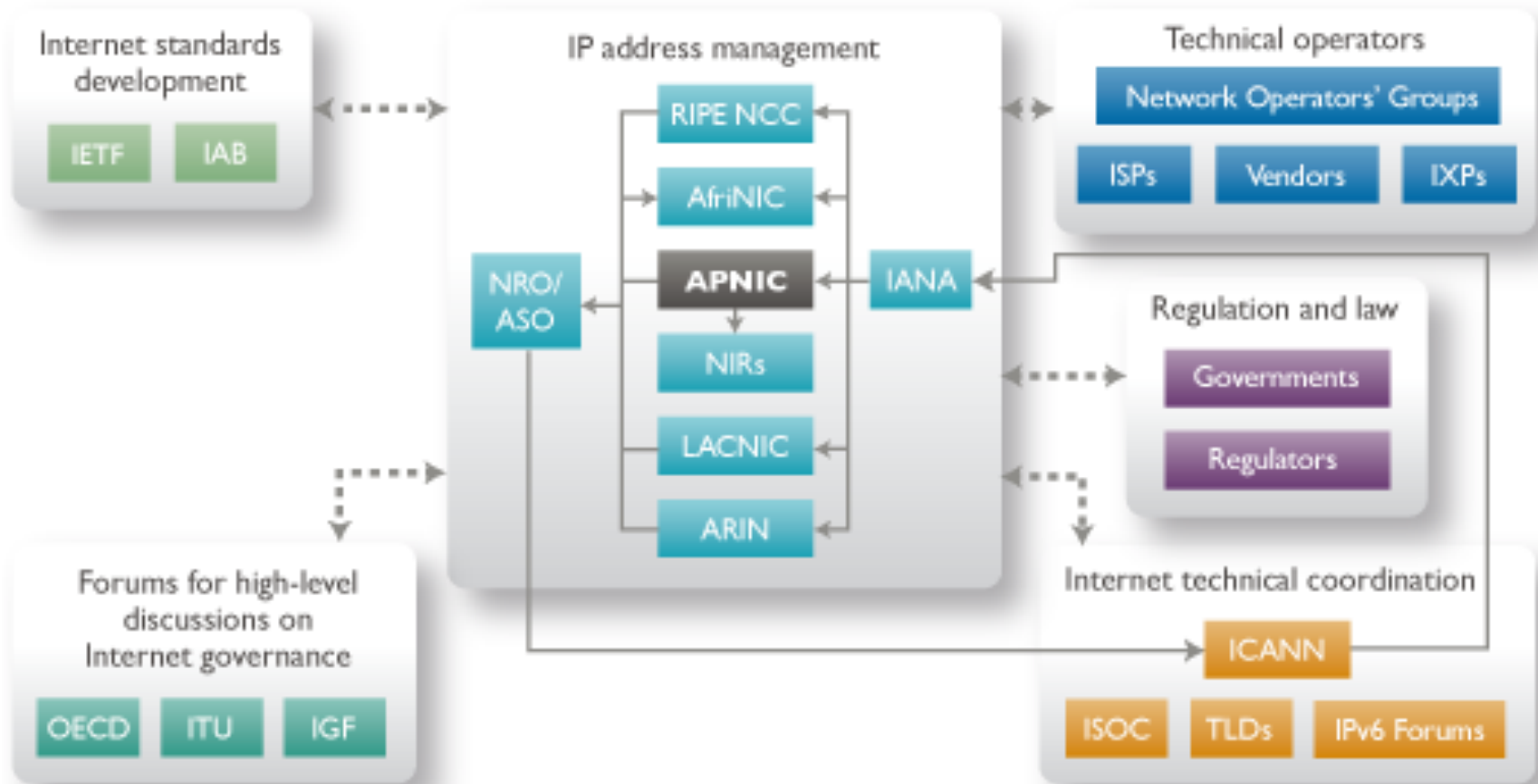 - Subsidized for members
- free eLearning webclasses

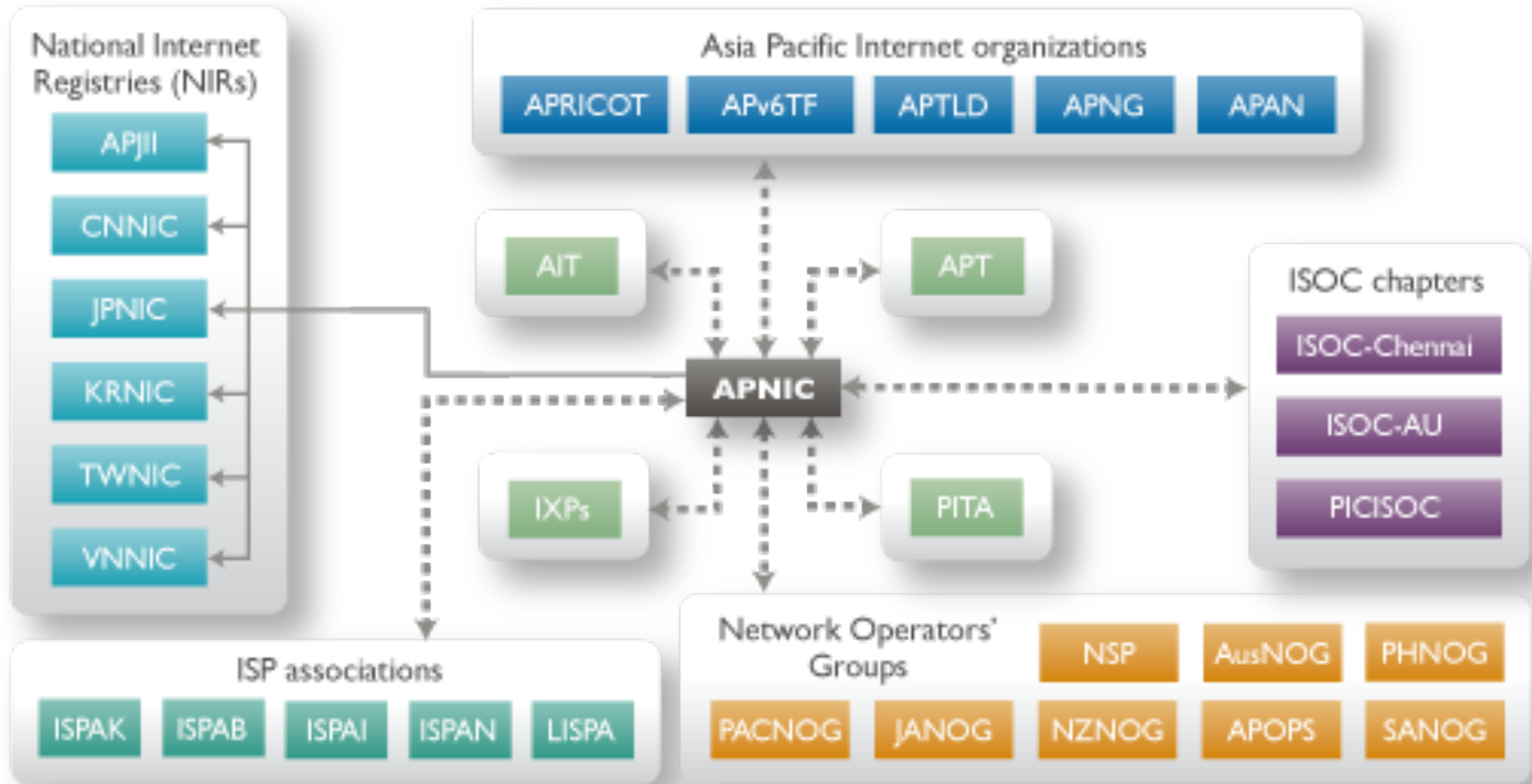# Where is the APNIC Region?

APNIC is NOT

- A network operator
  - Does not provide networking services
    - Works closely with APRICOT

- A standards body
  - Does not develop technical standards
    - Works with IETF in relevant areas (IPv6, etc.)

- A domain name registry or registrar
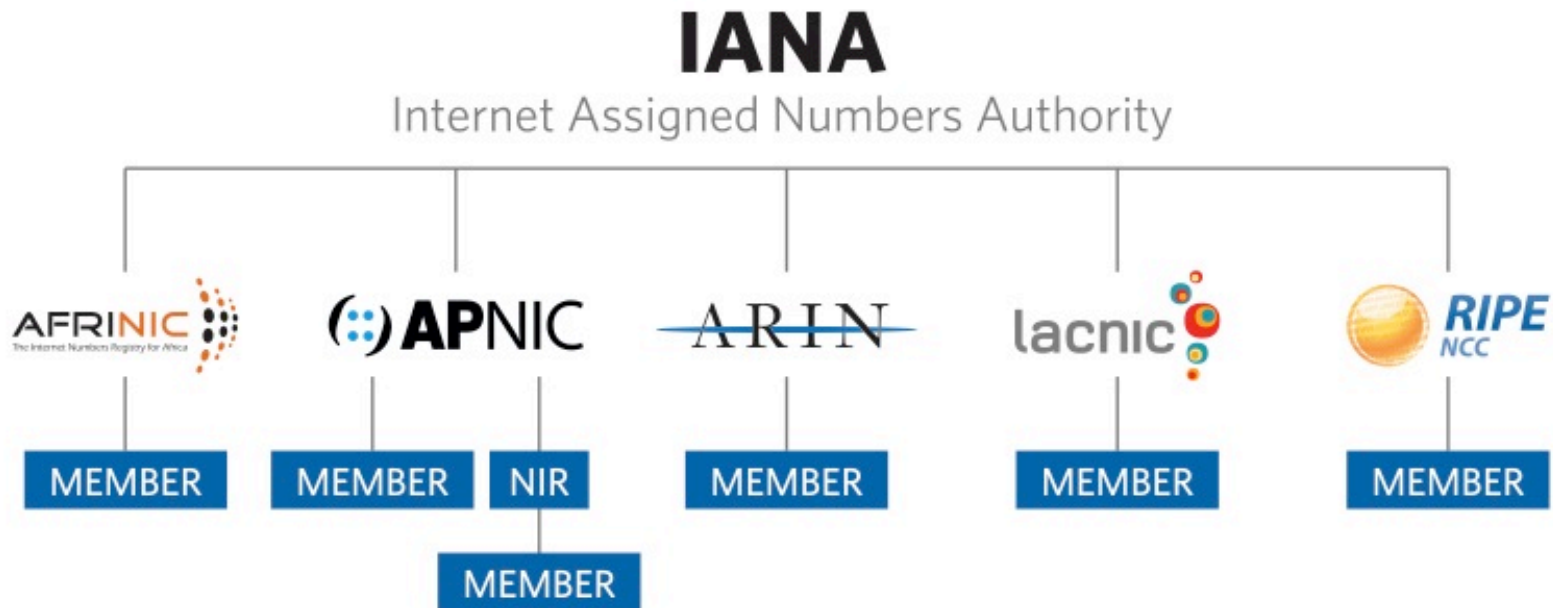   - Will refer queries to relevant parties

APNIC from a Global Perspective

APNIC in the Asia Pacific

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

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

AIT

APT

APNIC

ISOC chapters
- ISOC-Chennai
- ISOC-AU
- PICISOC

IXPs

PITA

ISP associations
- ISPAK
- ISPAB
- ISPAI
- ISPAN
- LISPA

Network Operators' Groups
- NSP
- AusNOG
- PHNOG
- PACNOG
- JANOG
- NZNOG
- APOPS
- SANOG

Internet Registry Structure

Global Policy Coordination

- The main aims of the NRO are to:
  - Protect the unallocated Internet number resource pool
  - Promote and protect the bottom-up policy development process
  - Act as a focal point for Internet community input into the RIR system

Global Policy Coordination

- The main function of ASO:
  - receives global policies and policy process details from the NRO
  - forwards global policies and policy process details to ICANN board

Where do IP Addresses come from?
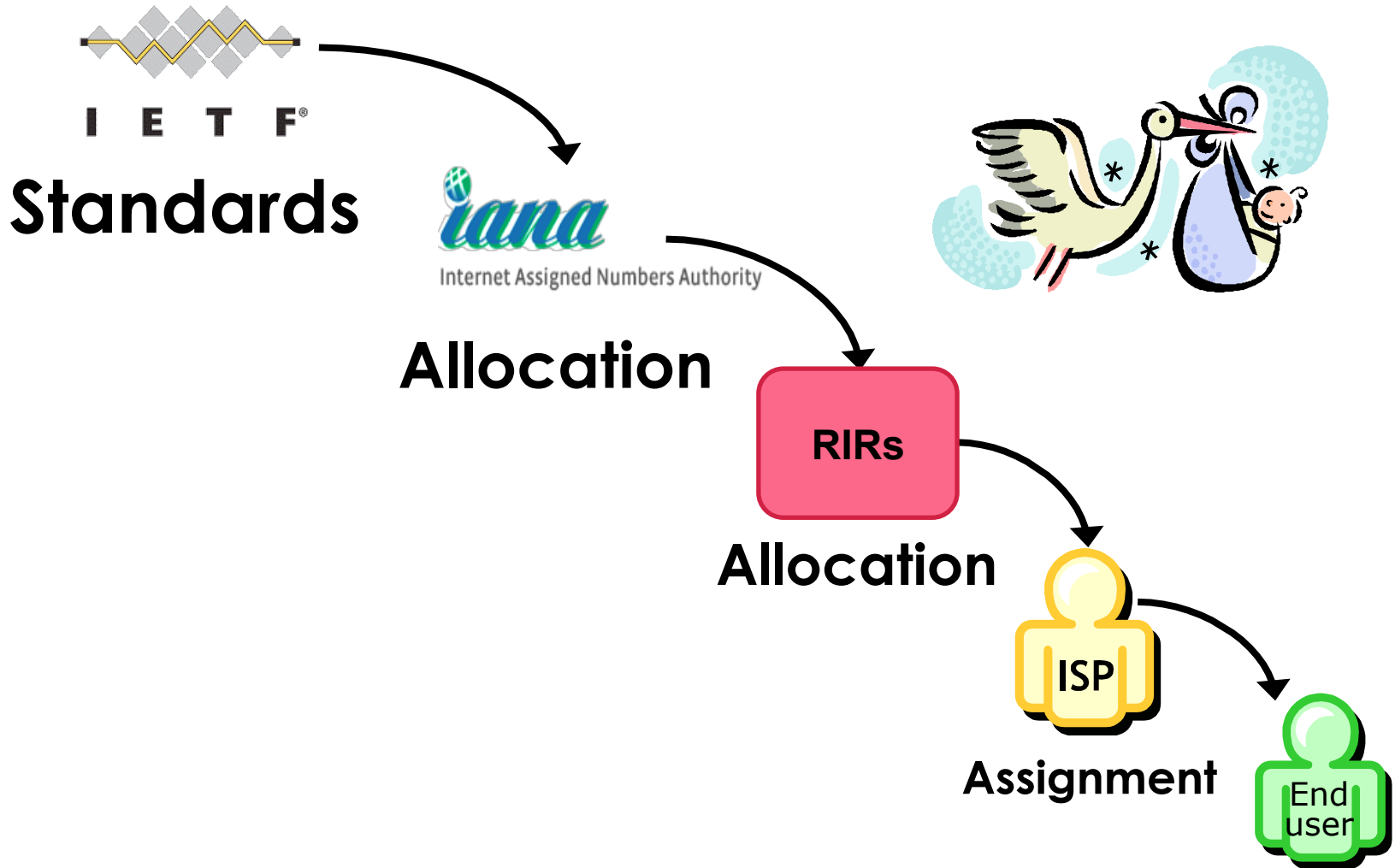
Standards

Allocation

RIRs

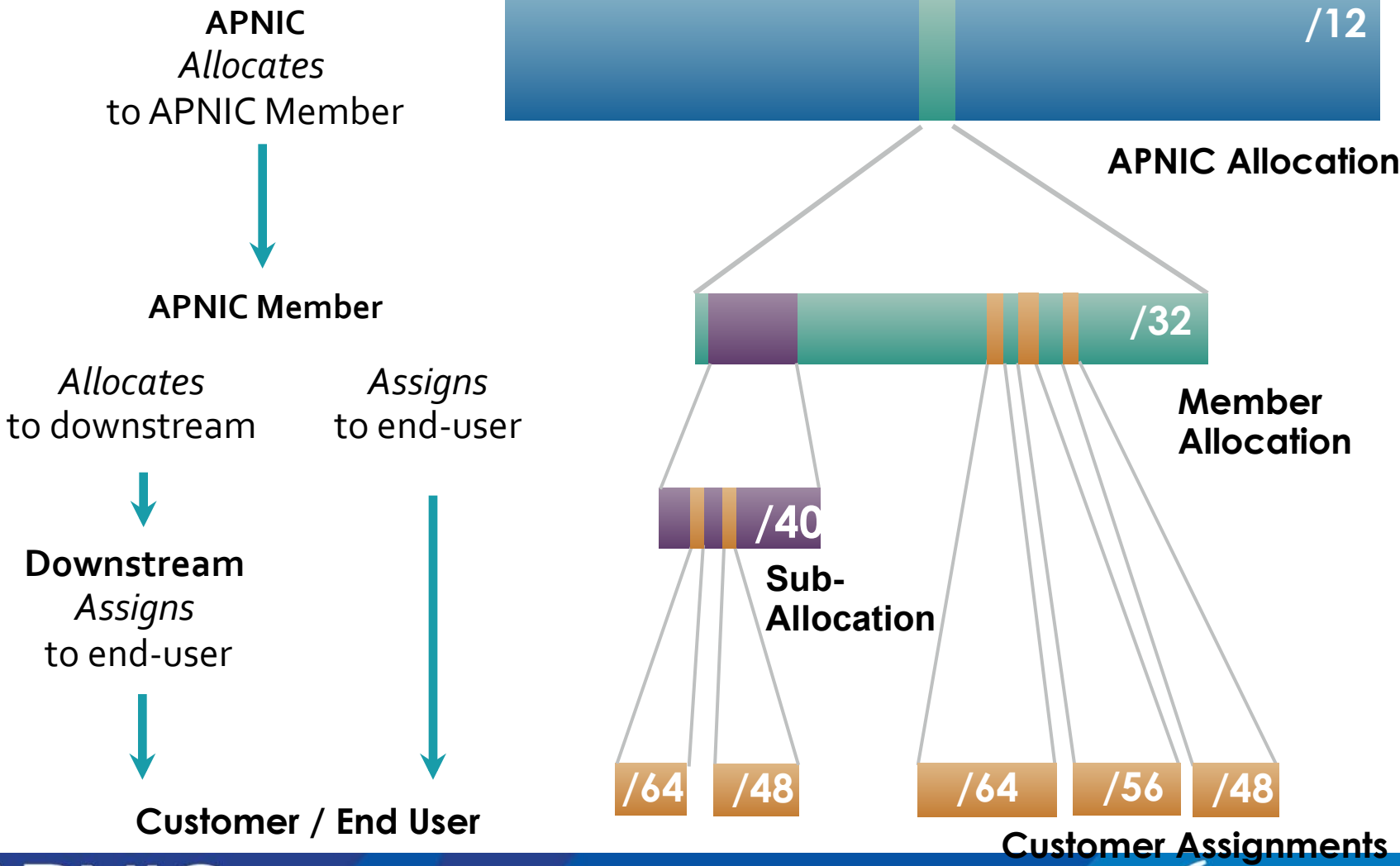**Allocation**

ISP

**Assignment**

End user

Questions

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APNIC

# You are Part of the APNIC Community!

Open forum in the Asia Pacific
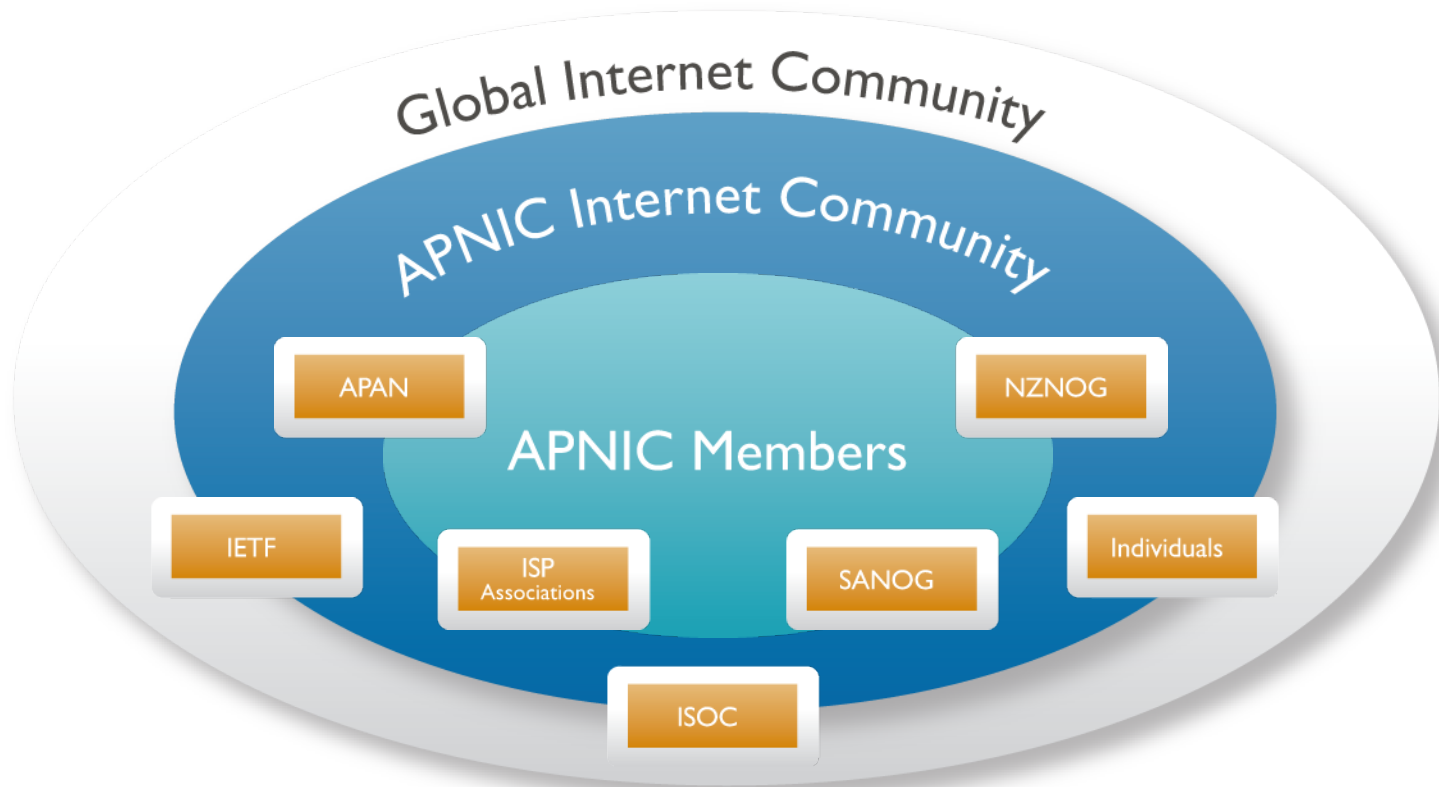
A voice in regional Internet operations through participation in APNIC

Policy Development Process

OPEN

Anyone can participate

BOTTOM UP

TRANSPARENT

Internet community proposes and approves policy

All decisions & policies documented & freely available to anyone

Policy Development Process

Need   Discuss   Consensus   Implement
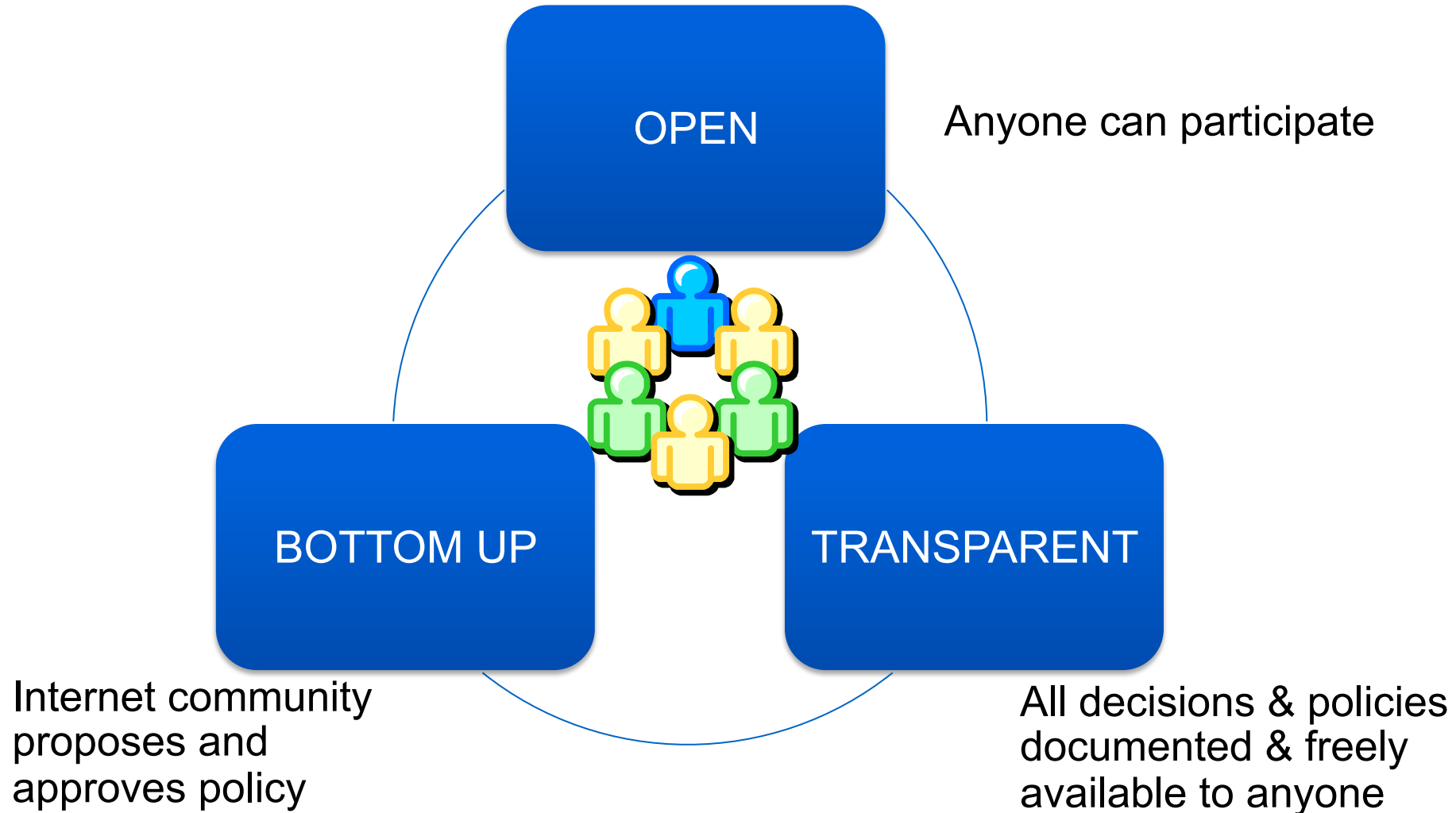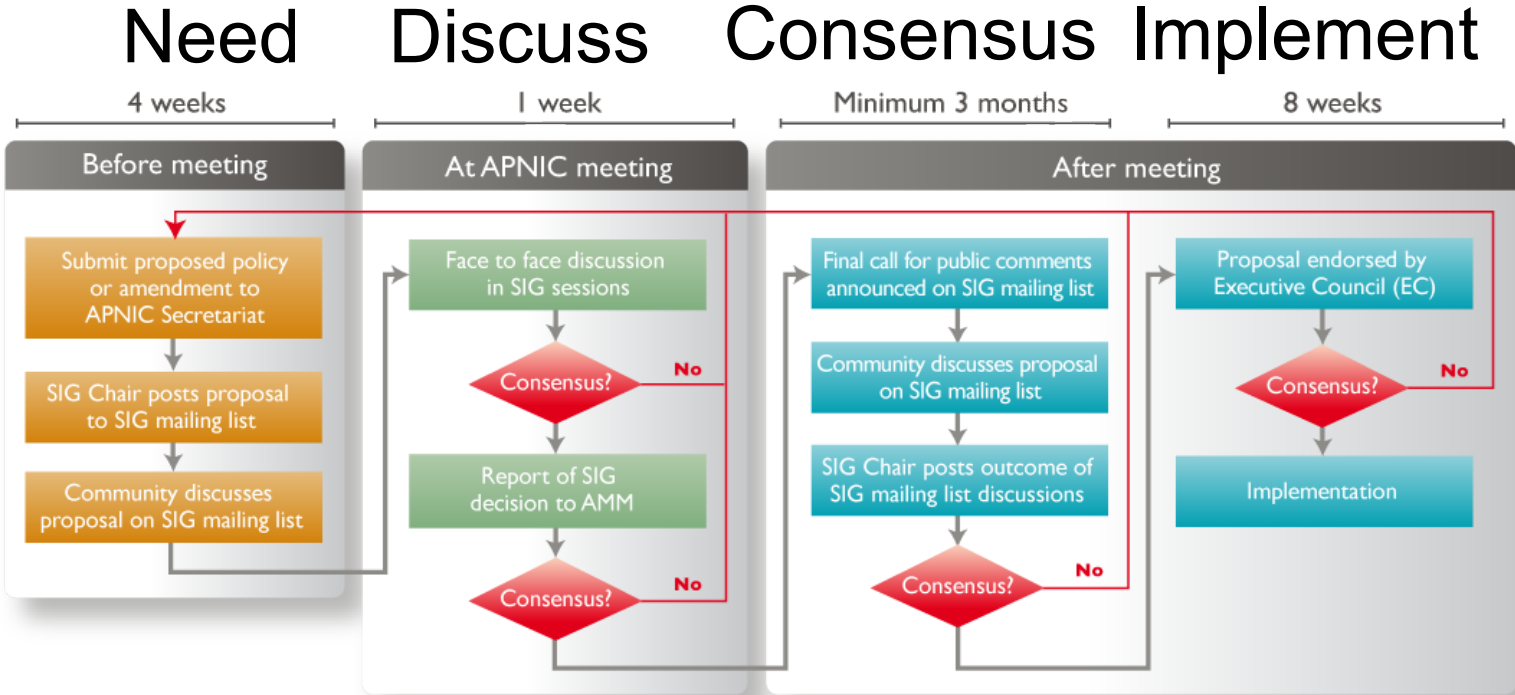
You can participate!

More information about policy development can be found at:

http://www.apnic.net/policy

APNIC Conferences

How to Make Your Voice Heard

- Contribute on the public mailing lists
  - http://www.apnic.net/mailing-lists
  - Attend APNIC conferences
  - Or send a representative
  - Watch the webcast (video streaming) from the conference web site
  - Read live transcripts from APNIC web site
  - And express your opinion via the Jabber chat

- Provide your feedback
  - Training or community outreach events

Questions

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APNIC

IPv6 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

/12

APNIC Allocation

/32

Member Allocation

/40

Sub-Allocation

/64 /48

/64 /56 /48

Customer Assignments

Portable and Non-Portable

- Portable Assignments
  - Customer addresses independent from ISP
  - Keeps addresses when changing ISP
  - Bad for size of routing tables
  - Bad for QoS: routes may be filtered, flap-dampened

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

- Portable allocations
  - Allocations made by APNIC/NIRs

ISP

Customer assignments

ISP Allocation

Customer assignments
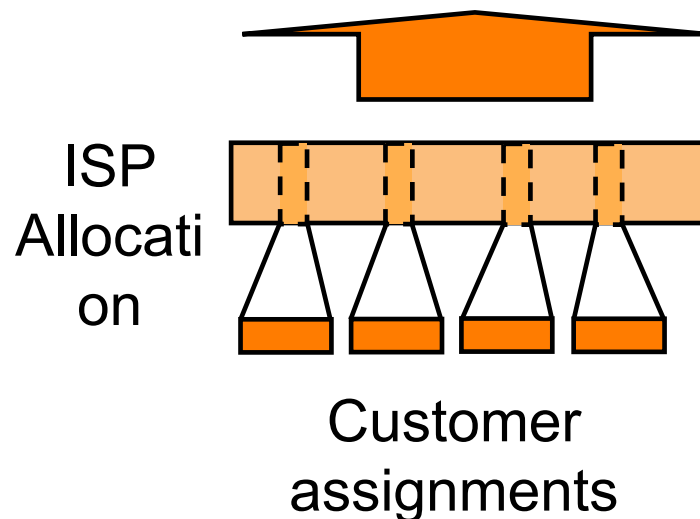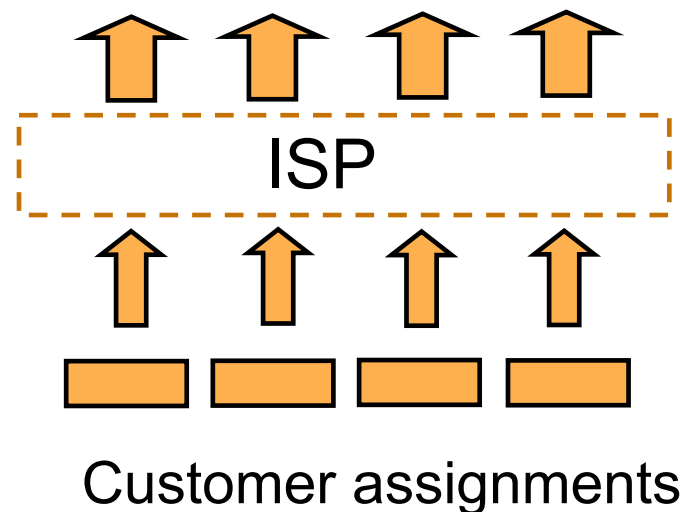
Address Management Hierarchy
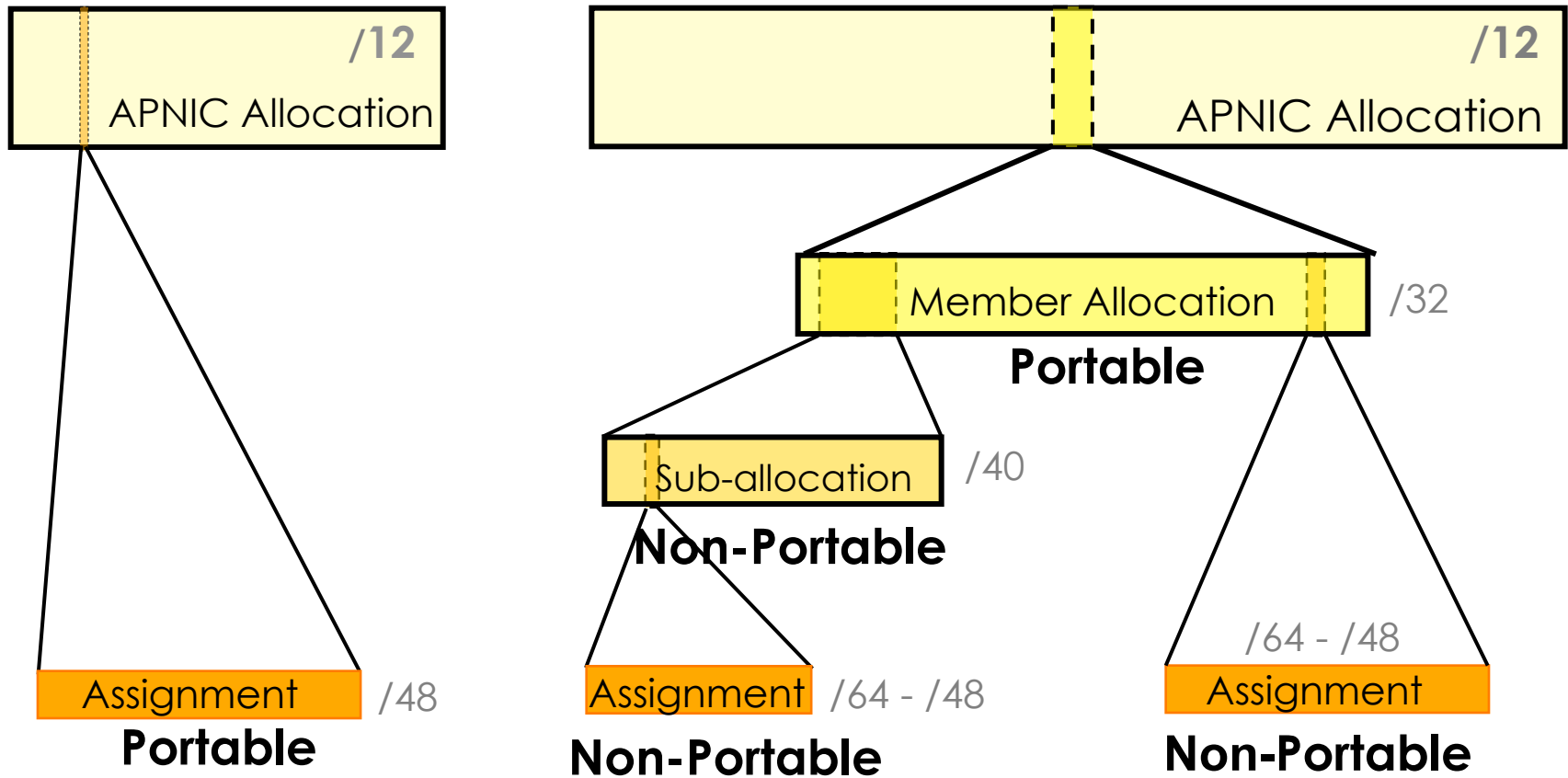
Describes "portability" of the address space

APNIC

Internet Resource Management 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
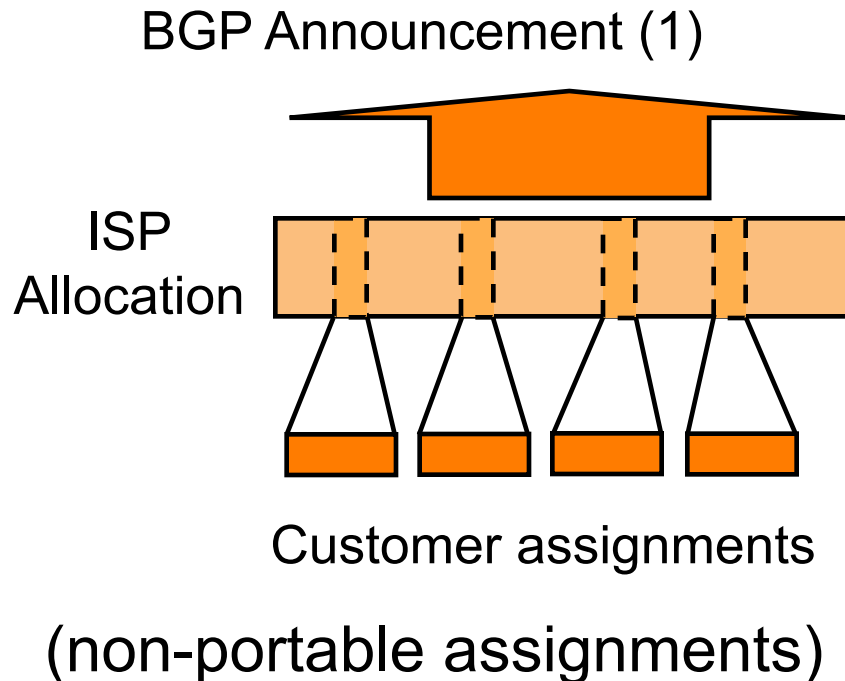
Aggregation and Portability

Aggregation — No aggregation

BGP Announcement (1) — BGP Announcements (4)

ISP Allocation — ISP

Customer assignments — Customer assignments

(non-portable assignments) — (portable assignments)

Aggregation and Portability

Aggregation — (4 routes) — (non-portable assignments)

No aggregation — (21 routes) — (portable assignments)
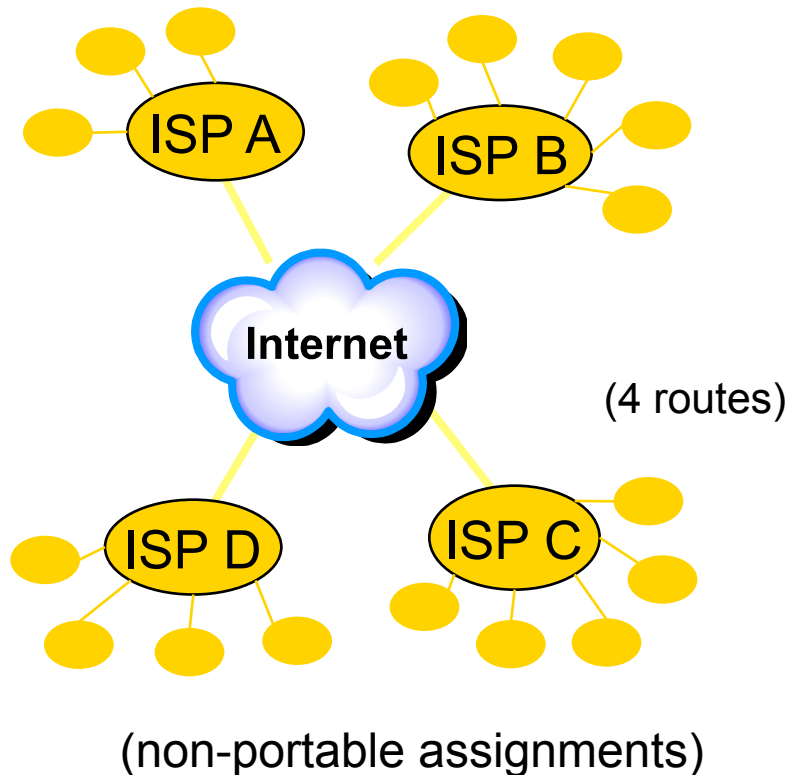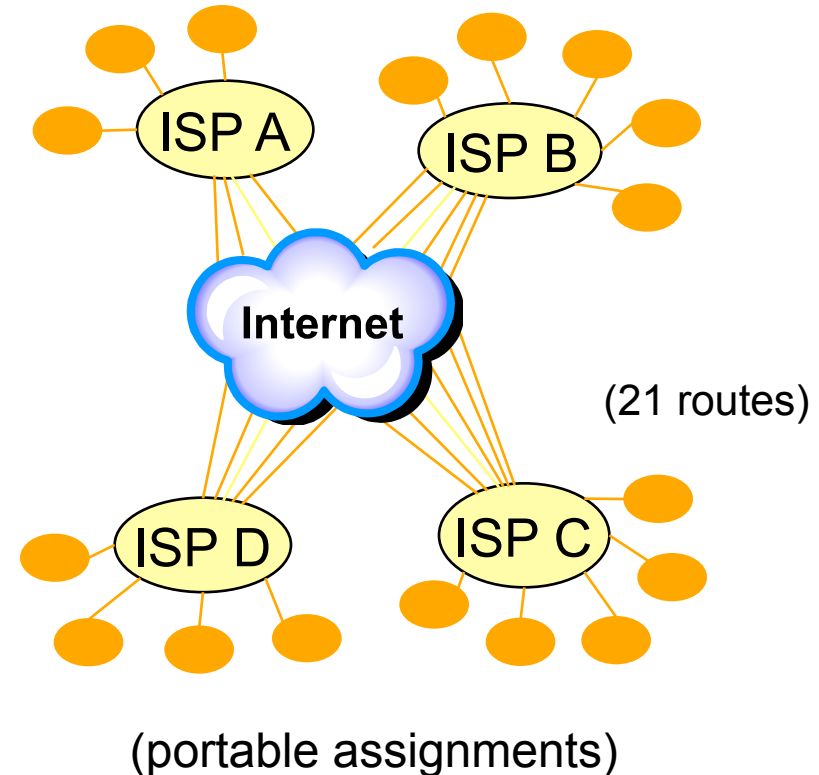
APNIC

Growth of the Global Routing Table

487889 prefixes
As of 27 Dec 2013

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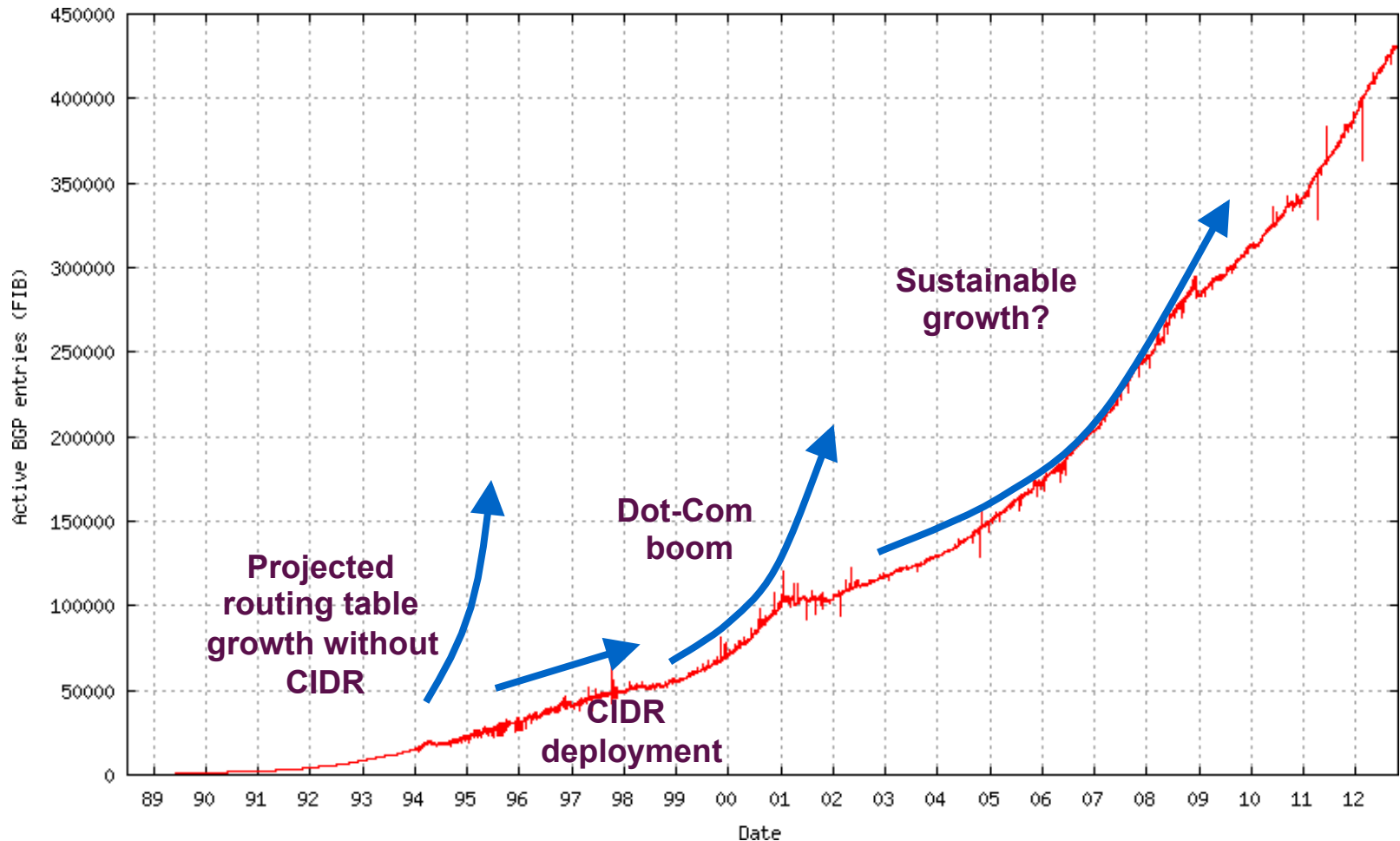
APNIC

APNIC Policy Environment

"IP addresses are not freehold property"

- Assignments & allocations on license basis
  - Addresses *cannot* be bought or sold
  - Internet resources are public resources
  - 'Ownership' is contrary to management goals

"Confidentiality & security"

- APNIC to observe and protect trust relationship
  - Non-disclosure agreement signed by staff

APNIC

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
  - Stockpiling is not permitted

APNIC IPv4 Allocation Policies

- APNIC IPv4 allocation size per account holder
  - Minimum /24
  - Maximum /22

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

APNIC   /8

/22

Member allocation

Non-portable assignment

Portable assignment

IPv4 Sub-allocations

APNIC Member Allocation

/22

Sub-allocation

/24

/27   /26

Customer Assignments

/25   /26   /27
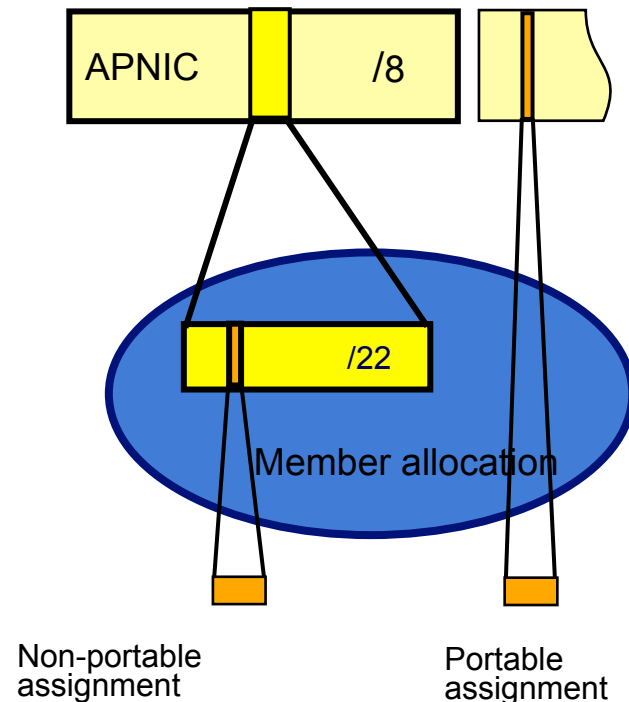
Customer Assignments
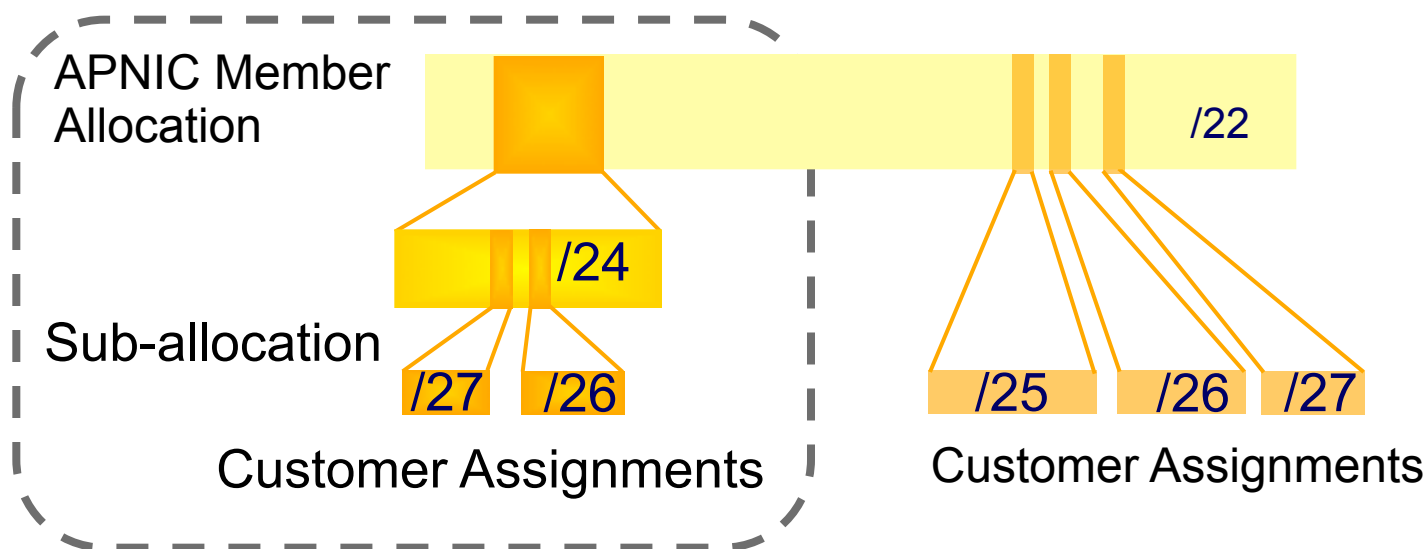
- No max or min size
  - Max 1 year requirement

- Assignment Window & 2nd Opinion
  - applies to both sub-allocation & assignments
  - Sub-allocation holders don't need to send in 2nd opinions

APNIC

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 Sub-allocations

APNIC Member Allocation

/32

Sub-allocation

/40

/64 /48

Customer Assignments

/64 /56 /48

Customer Assignments
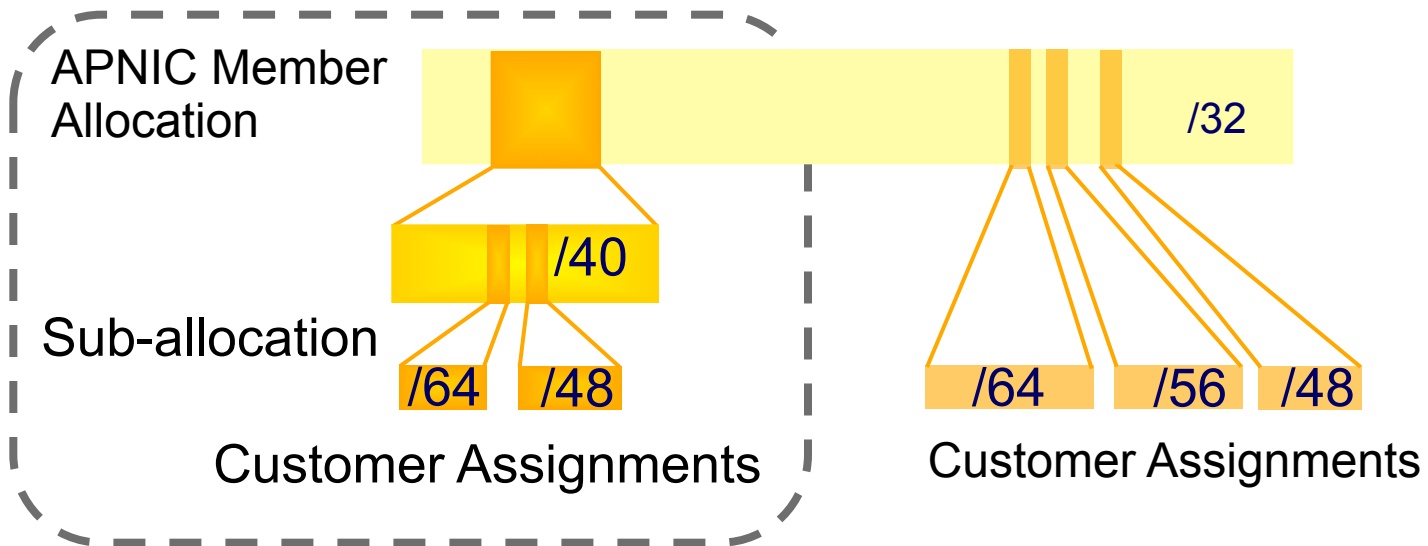
- No specific policy for LIRs to allocate space to subordinate ISPs

- All /48 assignments to end sites must be registered

- Second opinion
  - LIRs do not need to submit second opinion request before making sub-allocations to downstream ISPs
  - Must submit a second opinion request for assignments more than /48

APNIC

IPv6 Assignment Policies

- Assignment address space size
  - Minimum of /64 (only 1 subnet)
  - Normal maximum of /48
  - Initial allocation larger than /32 may be justified

- 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 PoP as the service infrastructure of an IPv6 service operator

Portable assignments

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

- Criteria
  - Applicants currently multihomed, or demonstrate a plan to multihome within 1 month
  - Demonstrate need to use 25% of requested space immediately, and 50% within 1 year

APNIC /8

/22
Member allocation

Non-portable assignment

/24
Portable assignment
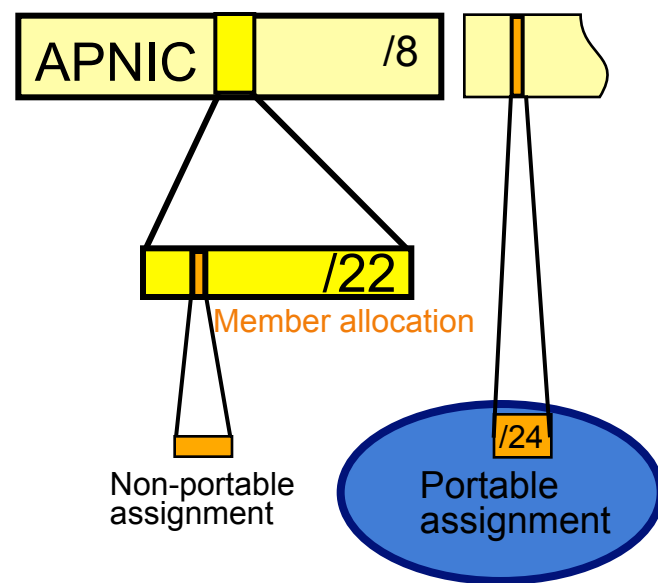
IXP Assignments

- Criteria
  - 3 or more peers
  - Demonstrate "open peering policy"

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

- 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 ?
  - Protect stability of core Internet function

- 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 should approach APNIC for portable allocation

- Efficient assignments
  - ISPs responsible for overall utilisation
    - Sub-allocation holders need to make efficient assignments

- Database registration (WHOIS Db)
  - Sub-allocations & assignments to be registered in the db

APNIC

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 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 members
    - no technical review or approval
    - historical resource holder must be verified
    - resources will then be considered "current"

- Address space subject to current policy framework

Questions

APNIC

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APNIC

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

APNIC

IPv4 Address Space

STATUS OF 256 /8s IPv4 ADDRESS SPACE

CENTRAL REGISTRY 91

NOT AVAILABLE 35

TOTAL IPv4 SPACE

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

RIRs 130

IANA RESERVED 0

APNIC 45

ARIN 36
AfriNIC 5
LACNIC 9
RIPE NCC 35
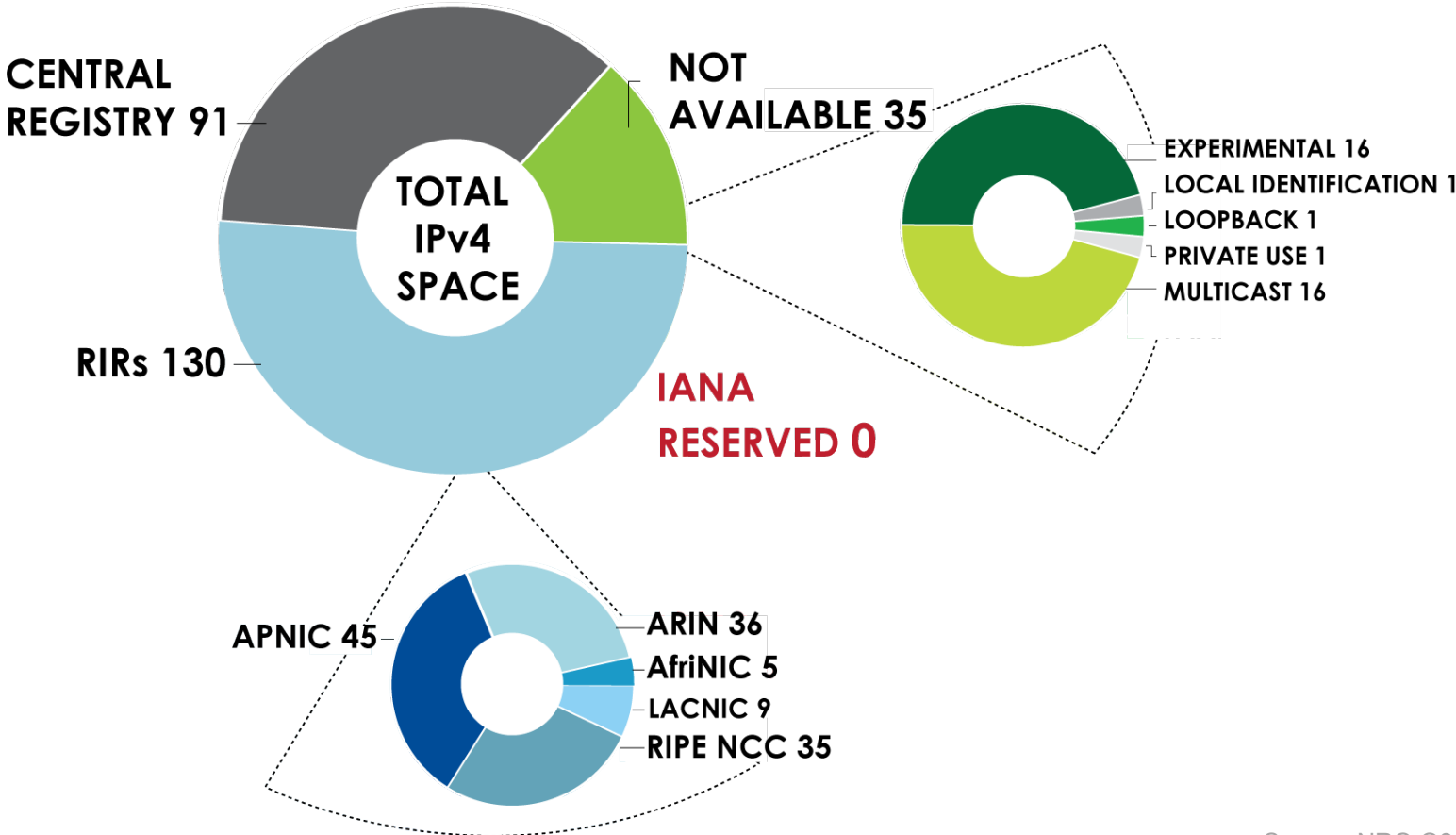
APNIC

AVAILABLE IPv4 /8s IN EACH RIR
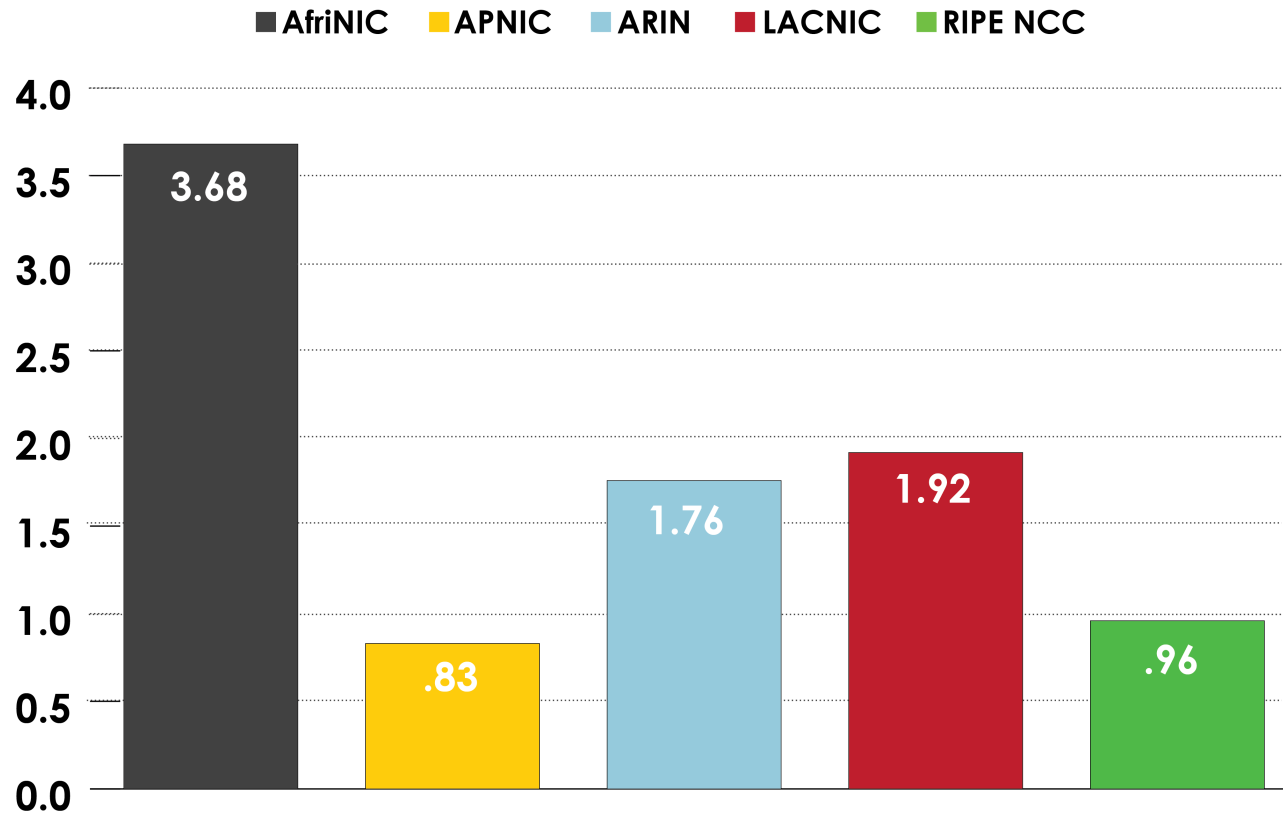
Legend: AfriNIC, APNIC, ARIN, LACNIC, RIPE NCC

RIR	Available /8s
AfriNIC	3.68
APNIC	.83
ARIN	1.76
LACNIC	1.92
RIPE NCC	.96

Source: NRO Q3 2013

APNIC

How Do I Get Addresses?

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How Do I Get Addresses?
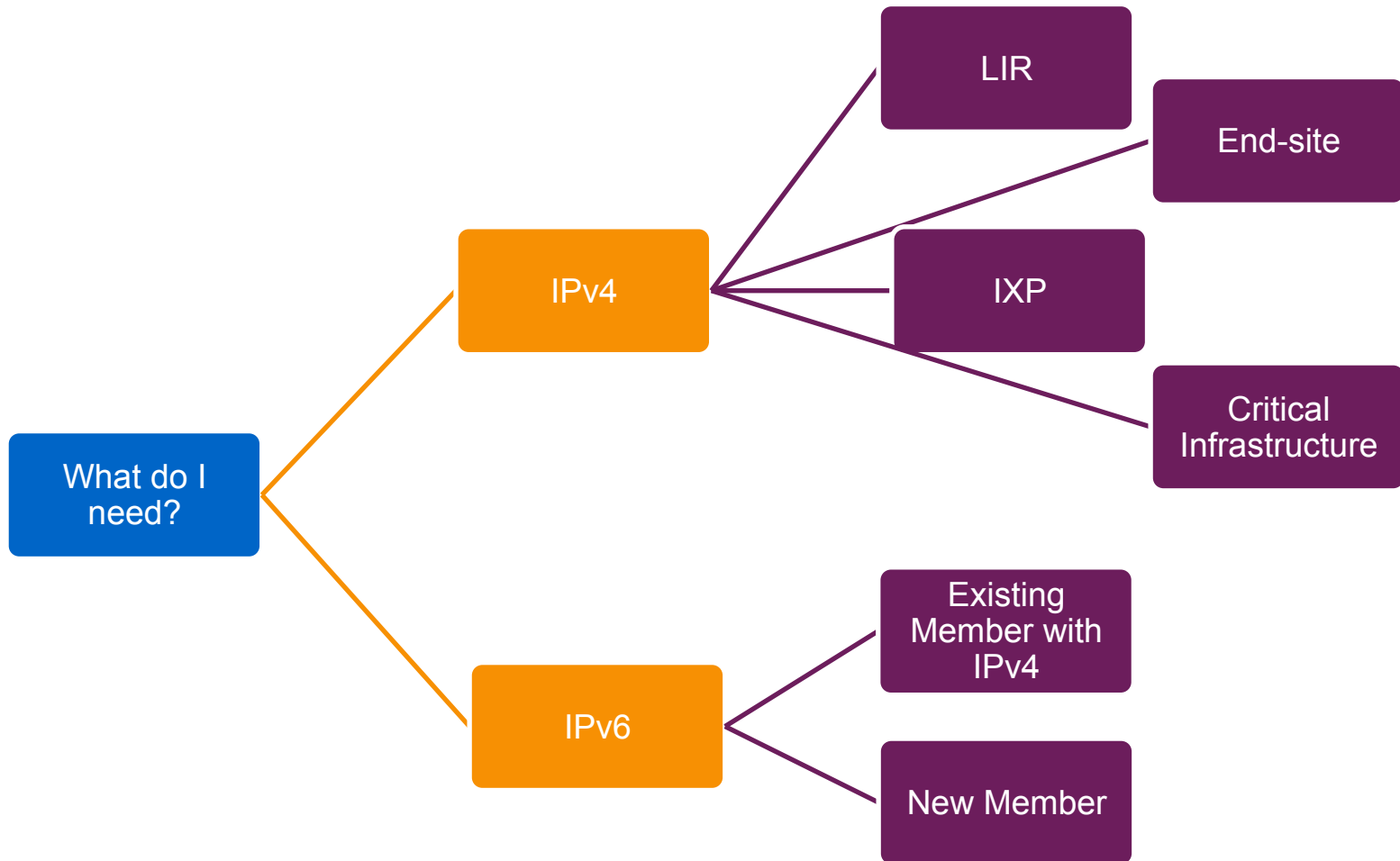
Which group do you belong?

IPv4

- **LIR** — Local Internet Registry, Service providers, Network Operators
- **End-site** — Big corporations, banks, academic institutions, etc.
- **IXP** — Internet Exchange Point
- **Critical Infrastructure** — Root servers, GTLD servers, RIR
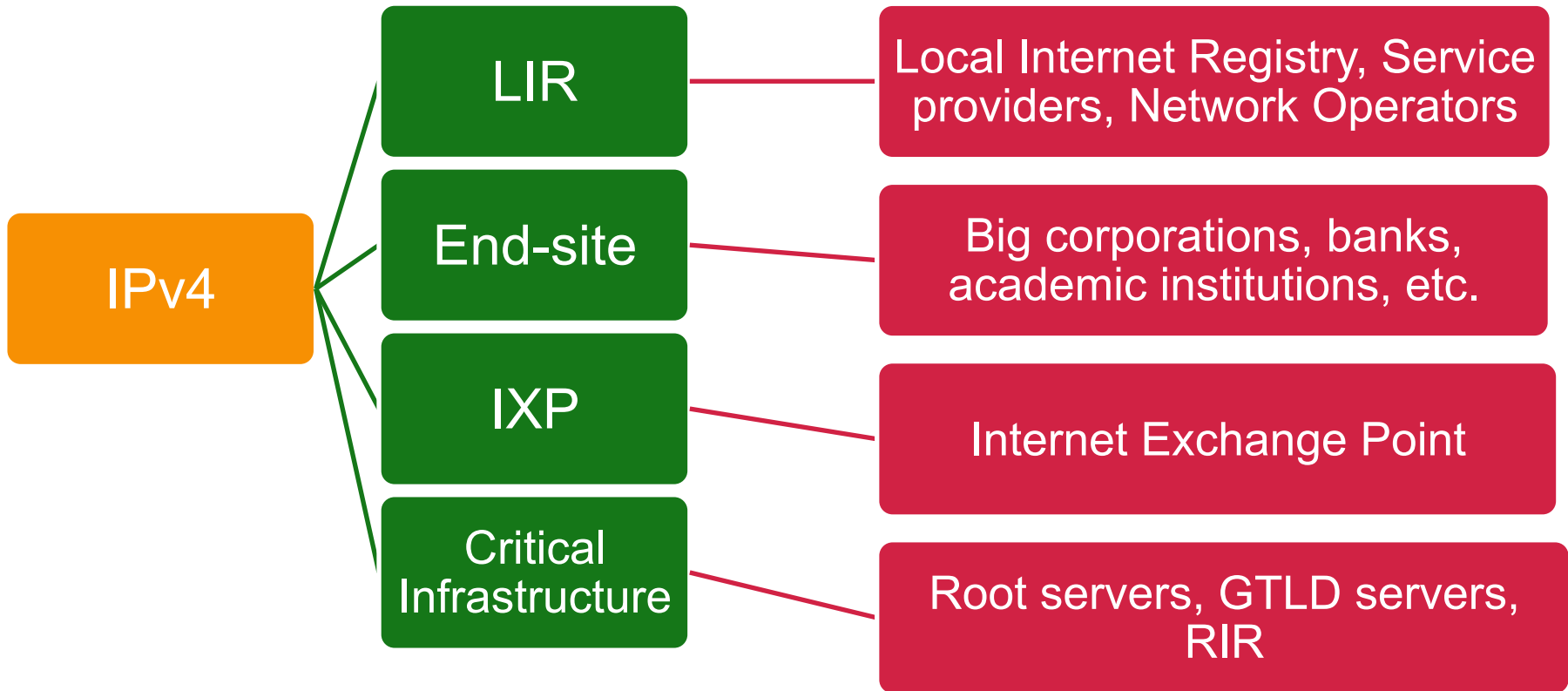
Initial LIR Delegation Requirements

- Have used a /24 ('slash 24') from their upstream provider or can demonstrate an immediate need for a /24

- Have complied with applicable policies in managing all address space previously allocated to it

- Be able to demonstrate a detailed plan to use a /23 within a year

Criteria for Small Multihoming Delegations

- currently multihomed with provider-based addresses, or

- demonstrates a plan to multihome within one month.

- must demonstrate that they are able to use 25% of the requested addresses immediately and 50% within one year.

More of these at:
http://www.apnic.net/services/apply-for-resources/
check-your-eligibility/check-ipv6

IPv6 Eligibility

You have IPv4 — Eligible to receive IPv6

New member —
- Must be an LIR, not an end site
- Plans to provide IPv6 within two years
- Plans to make 200 assignments

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

APNIC

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

APNIC

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 for an initial address allocation at the same time.

- http://www.apnic.net/services/become-a-member

APNIC

1	2	3	4	5
Applicant	Organization	IP / ASN	Confirmation	Payment

Applicant Contact Details

[Restart](#)

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

> Next

New Member Application Form

- Online payment and automated invoicing

- Applicants can make payment immediately for all requests

- More user friendly, interactive, and informative

- Contacts Management

- Kickstart IPv6 integration

- Essential Whois objects will be created automatically

Applying for Resources

Resources ➜ Resource request forms

Evaluation by APNIC

- All address space held should be documented
  - Check other RIR, NIR databases for historical allocations

- 'No reservations' policy
  - Reservations may never be claimed
  - Fragments address space
  - Customers may need more or less address space than is actually reserved

First Allocation

- APNIC IPv4 allocation size per account holder
  - minimum of /24
  - maximum of /22

- Initial IPv6 allocation criteria
  - minimum of /32 IPv6 block
  - larger than /32 may be justified
  - subsequent allocation is based on HD-ratio

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APNIC

Resource Registration

- As part of your membership agreement with APNIC, all Members are required to register their resources in the APNIC database
  - Members must keep records up to date
  - 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
mnt-irt	Incident Response Team

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

APNIC

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

whois

inetnum:
202.64.10.0 – 202.64.10.255
…
admin-c: EC196-AP
tech-c: ZU3-AP
…
mnt-by: MAINT-WF-EX
…

IPv4 addresses

mntner:
MAINT-WF-EX

…
…

Data protection

person/role:
…
nic-hdl: EC196-AP
…

Contact info

person/role:
…
nic-hdl: ZU3-AP
…

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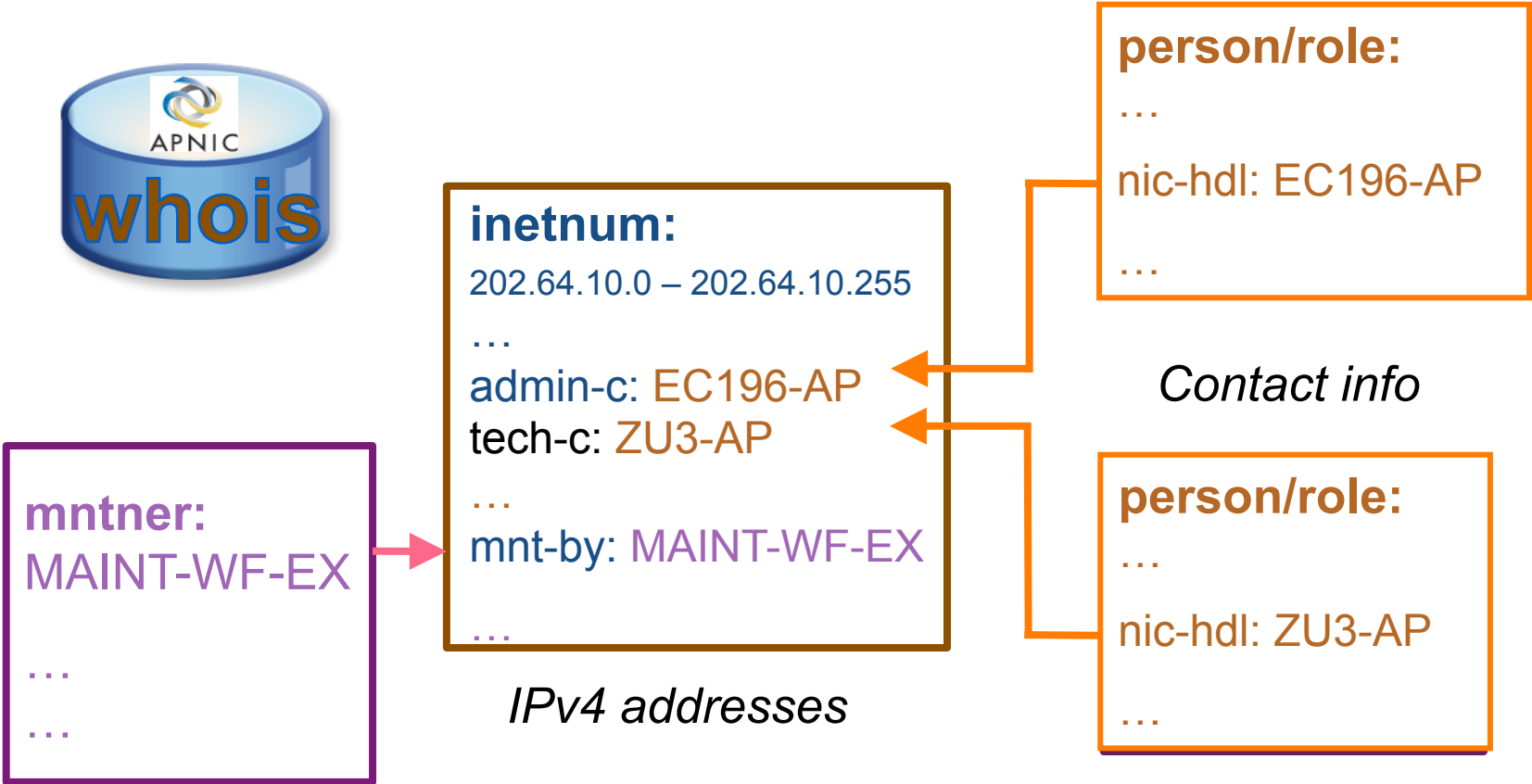
* Please note that the following slides refer back to this one.

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
  - Eg. EC17-AP

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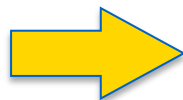
```
Person: Eric Chu
address:     ExampleNet Service Provider
address:     Level 1 33 Park Road Milton
address:     Wallis and Futuna Islands
country:     WF
phone:       +680-368-0844
fax-no:      +680-367-1797
e-mail:      echu@example.com
nic-hdl: EC196-AP
mnt-by:      MAINT-WF-EX
changed:     echu@example.com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

Role Object

- Represents a group of contact persons for an organization
  - Eases administration

- Also has a nic-hdl
  - Eg. HM20-AP

- used instead of a Person Object as a reference in other objects
  - This means only a single replacement is required instead of many

Replacing Contacts in the DB - Using Person Objects

E. Chu is leaving my organization. A. Nagali is replacing him.

1. Create a Person Object for new contact (**E. Chu**)

2. Find all objects containing old contact (**E. Chu**)

3. Update all objects, replacing old contact (EC196-AP) with new contact (AN3-AP)

4. Delete old contact's (EC196-AP) Person Object

person:
...

EC196-AP

person:
...

AN3-AP

inetnum:
202.0.10.0
...

AN3-AP

inetnum:
202.0.12.127
...

AN3-AP

inetnum:
202.0.15.192
...

AN3-AP

APNIC
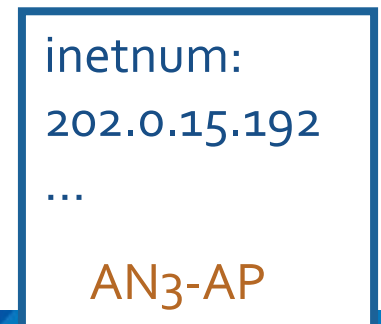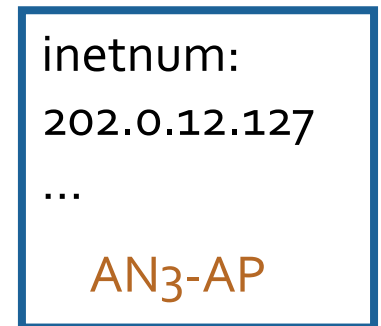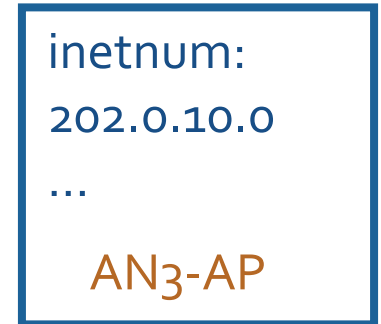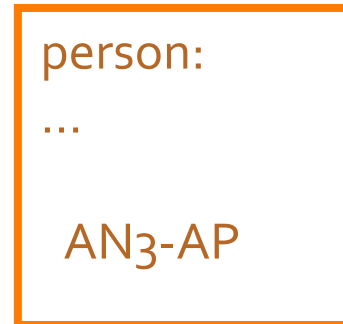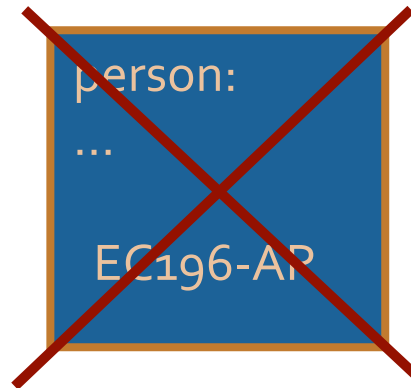
Replacing Contacts in the DB – Using a Role Object

E. Chu is leaving my organization.
A. Nagali is replacing him.

My Role Object contains all contact info, that is referenced in all my objects.

1. Create a Person Object for new contact (A. Nagali)

2. Replace old contact (EC196-AP) with new contact (AN3-AP) in Role Object

3. Delete old contact's Person Object.
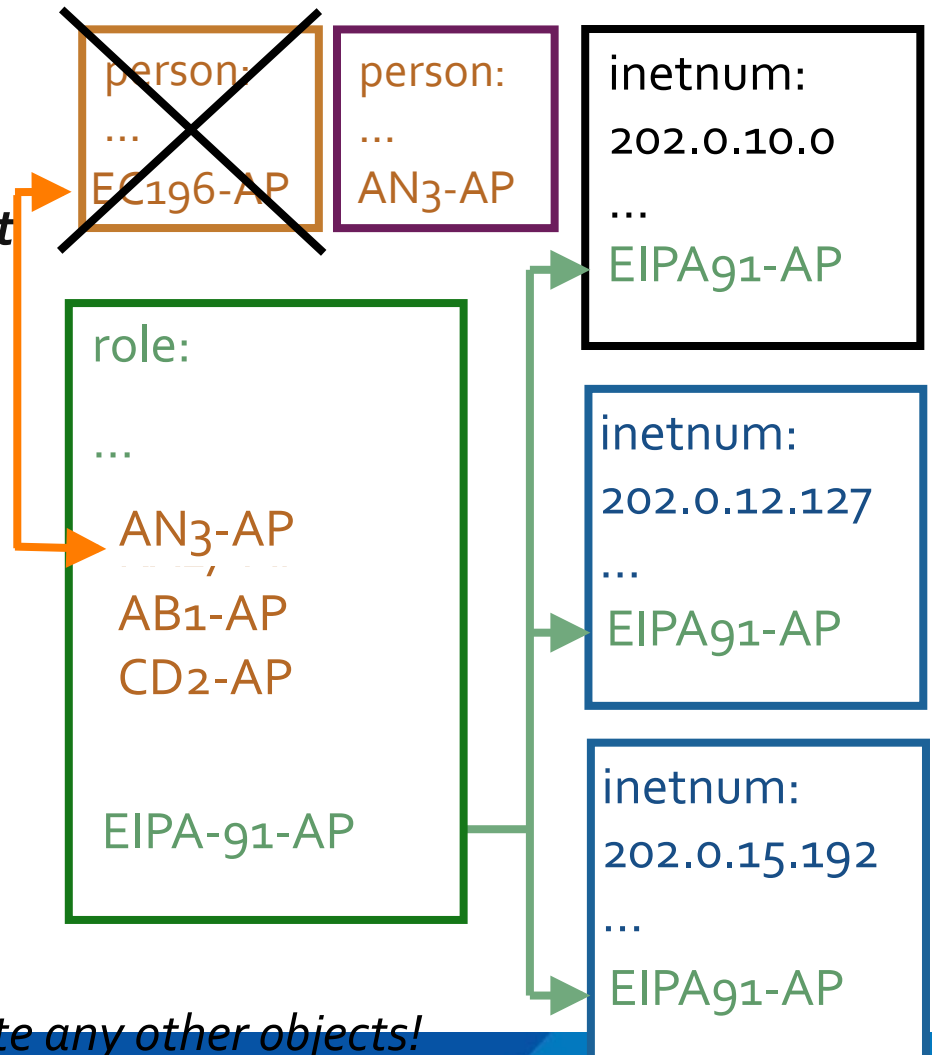
No need to update any other objects!

person:
...
EC196-AP

person:
...
AN3-AP

inetnum:
202.0.10.0
...
EIPA91-AP

role:
...
AN3-AP
AB1-AP
CD2-AP

EIPA-91-AP

inetnum:
202.0.12.127
...
EIPA91-AP

inetnum:
202.0.15.192
...
EIPA91-AP

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

APNIC Whois Web Query

What is a Maintainer?

- Protects other objects in the APNIC Whois Database:

- Multiple levels of maintainers exist in a hierarchical manner

- 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

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
```

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 'mntner' object

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

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

APNIC | Allocation /8 (IPv4)

Member Allocation /22

Sub-allocation /23

Assignment /26

Assignment /25
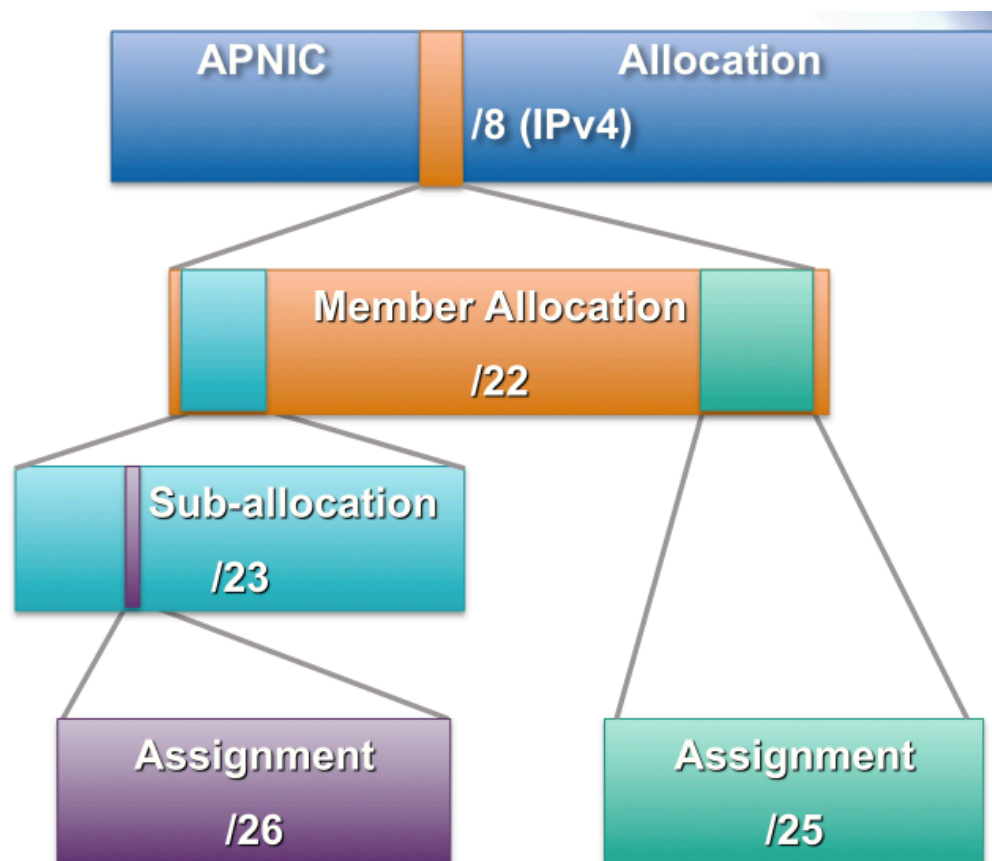
APNIC

Authentication / Authorization

- 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 (arrow pointing to mnt-routes)
2 (arrow pointing to remarks)

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

APNIC

What is MyAPNIC?

- A secure services website that enables Members to manage Internet resources and account interactions with APNIC online

- Uses 128-bit SSL

- https://myapnic.net

How it Works

APNIC internal system

APNIC public servers

Firewall

Server

Finance system

Member ID Person Authority

MyAPNIC server

Membership & resource system

https://myapnic.net

Whois master

Client

Member's staff
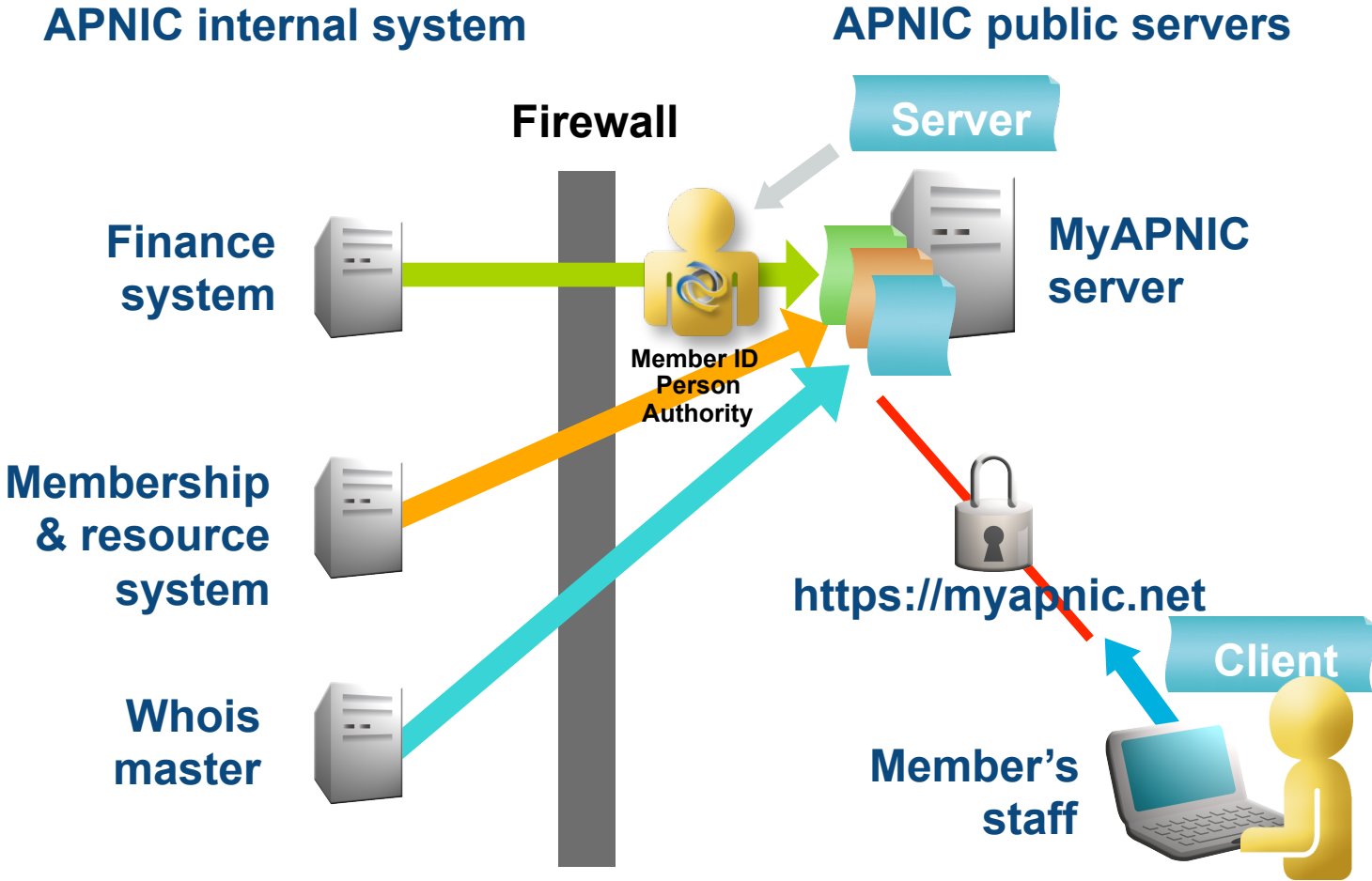
APNIC

Access to MyAPNIC

- MyAPNIC access is 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

APNIC

Corporate Contact Registration

https://myapnic.net/register

Corporate Contact Registration

Login | **Register**

MyAPNIC / Register

Registration

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.

APNIC

Corporate Contact Registration

Other Contact Registration

https://myapnic.net/register

MyAPNIC / Register

Registration

Your registration

Success

You have successfully registered for MYAPNIC-TEST-AP.

Your authorization code is No9jOwfAec

Please provide your authorization code to one of your corporate contact(s) below for approval to access MyAPNIC:

- Tom H
- George K
- Vivek Nigam
- gkgk
- Wita Laksono
- tomd
- Frank
- Boom Buchanan
- Zen Chuan Ng
- Raga Yarlagadda
- Tom Do
- Viv Nigam

You will receive an email confirming your registration.

Your corporate contact(s) will receive an email informing them of your request for approval to access MyAPNIC.

- Login

APNIC

Other Contact Registration

Other Contact Registration

Multiple Account Access

Multiple Account Access

Multiple Account Access

MyAPNIC Digital Certificate

Required for:

- Online voting

- Resource certification

- Approve other contacts' certificate request

Digital Certificate – Corporate Contact

Corporate Contact can download certificate immediately

Digital Certificate – Corporate Contact

Digital Certificate – Other Contact

Other contacts need to request for a certificate

Requesting new Certificate

Requesting new Certificate

Home / My Profile / Certificates

Your Certificates

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

Serial number	Expiry date
2E9D	2010-02-03 06:27:44

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.

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 on APNIC certificates, please see http://www.apnic.net/services/manage-resources/digital-certificates.

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

Request a certificate

APNIC

Administrative features

Administrative features

Contact Management

Full name	Email (red == invalid)	Job title	MyAPNIC username	Corporate	Billing	Technical		
Champika Wijayat	champika@apnic.	Training Manager	Champ	✓	☑	☑	Delete	
George Kuo	george@apnic.ne		gk	✓	☑	☑	Delete	
Tanya Samuel	tanya@apnic.net	hostmaster	samuelt	✓	☐	☑	Delete	
Anna	anna@apnic.net		[+] anna		☐	☑	Delete	
Arth Paulite	arth@dnskey.net		destiny	✓	☑	☑	Delete	
Adam Gosling	adam@apnic.net		[+] adamgosling		☐	☑	Delete	
Vivek Nigam	vivek@apnic.net		viveknigam	✓	☑	☑	Delete	
Raga Yarlagadda	ragay@apnic.net		ragay-1	✓	☑	☑	Delete	
Joe Kuo	george@apnic.ne	administrator	joekuo	✓	☐	☑	Delete	
gkgk Kuo	george@apnic.ne		[+] gkgk		☑	☑	Delete	
Wita Laksono	wita@apnic.net		witatrain	✓	☑	☑	Delete	
andrew	andrew@apnic.ne	tech			☑	☐	Delete	
Md Nurul Islam	nurul@apnic.net	Administrator	romanislam	✓	☑	☑	Delete	
Sheryl Hermoso	sheryl@apnic.net		Sheryl	✓	☑	☑	Delete	
tomd	tomd@apnic.net		[+] tomd		☑	☑	Delete	
Zen Chuan Ng	zenchuan@apnic.	Administrator	zenc	✓	☑	☑	Delete	
xiaohong deng	xiaohong@apnic.		[+] xiaohong		☐	☑	Delete	Approve certificate

Update

Add new contact person

			-		☐	☐

Add

Contact Management

Resource management features

Maintainer Object

One Click IPv6

One Click IPv6

Home / Resource management / One-Click IPv6

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.

/32 allocation	/48 assignment
Confirm	**Confirm**

APNIC

View and Manage resources

View and Manage resources

Home / Resource management / Summary

Summary of all resources

IPv4 manage

Address range	Length
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

IPv6 manage

Address Range	Length
2001:0DF0:000A::	/48
2406:6400::	/32

ASN manage

Number
17821
45192
131107

APNIC

View and Manage resources

Home / Resource management / IPv4 assignments

IPv4 assignments within/covering 61.45.254.0/23

Public records (shown in whois.apnic.net)

Make new public assignment | Upload | Download

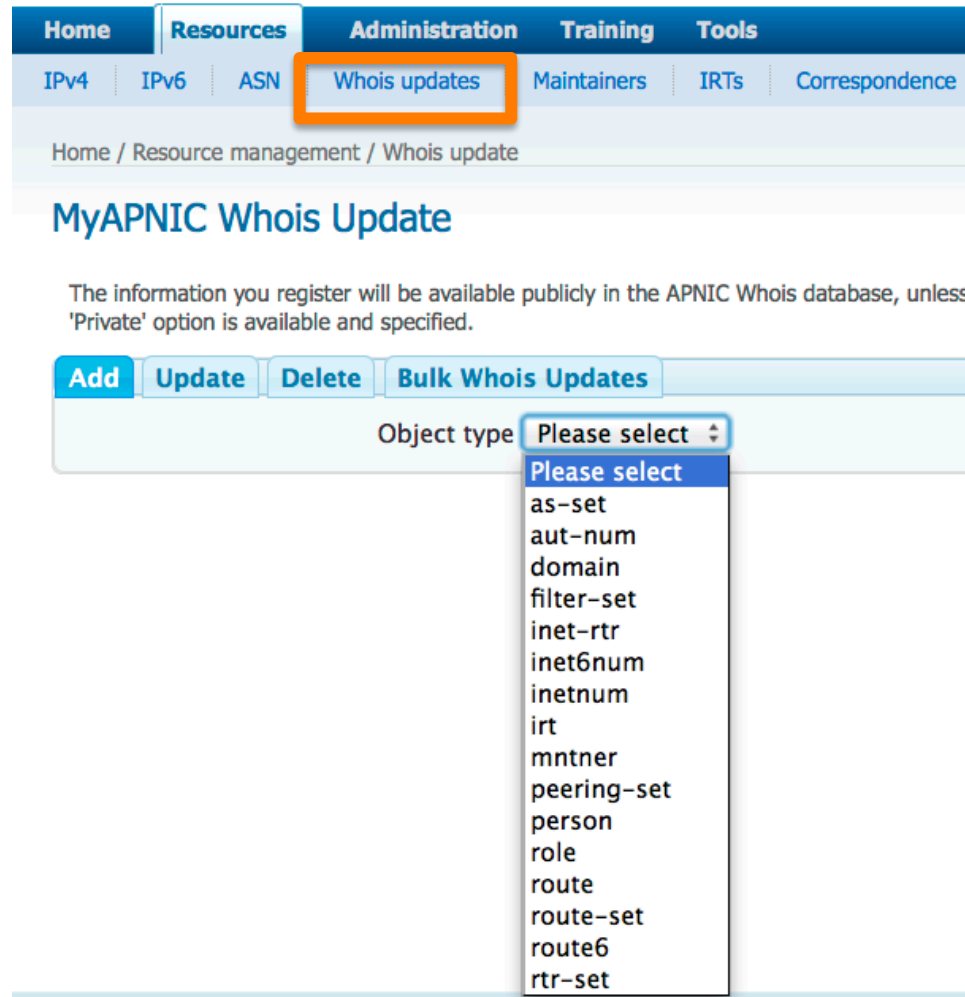| Network name	Start IP	End IP	Maintained by	Changed	Mark all
Infrastructure-C	61.45.254.0	61.45.254.49	MAINT-AU-VIVEK	hm-changed@apnic.net 20130521	☐
Infrastructure-A	61.45.254.50	61.45.254.80	MAINT-AU-VIVEK	hm-changed@apnic.net 20130521	☐
Infrastructure-B	61.45.254.50	61.45.254.100	MAINT-AU-VIVEK	hm-changed@apnic.net 20130521	☐
Customer-D	61.45.254.50	61.45.254.110	MAINT-AU-VIVEK	hm-changed@apnic.net 20130521	☐
Customer-C	61.45.254.50	61.45.254.120	MAINT-AU-VIVEK	hm-changed@apnic.net 20130521	☐
Customer-B	61.45.254.50	61.45.254.130	MAINT-AU-VIVEK	hm-changed@apnic.net 20130521	☐
Customer-A	61.45.254.50	61.45.254.150	MAINT-AU-VIVEK	hm-changed@apnic.net 20130521	☐

Move to private

Private records

Make new private assignment | Upload | Download

Network name	Start IP	End IP	Maintained by	Changed	Mark all

Move to public

APNIC

Whois Database Updates

Add Objects

APNIC

Update objects

Delete Objects

IPv4 transfers

Transfer Resources
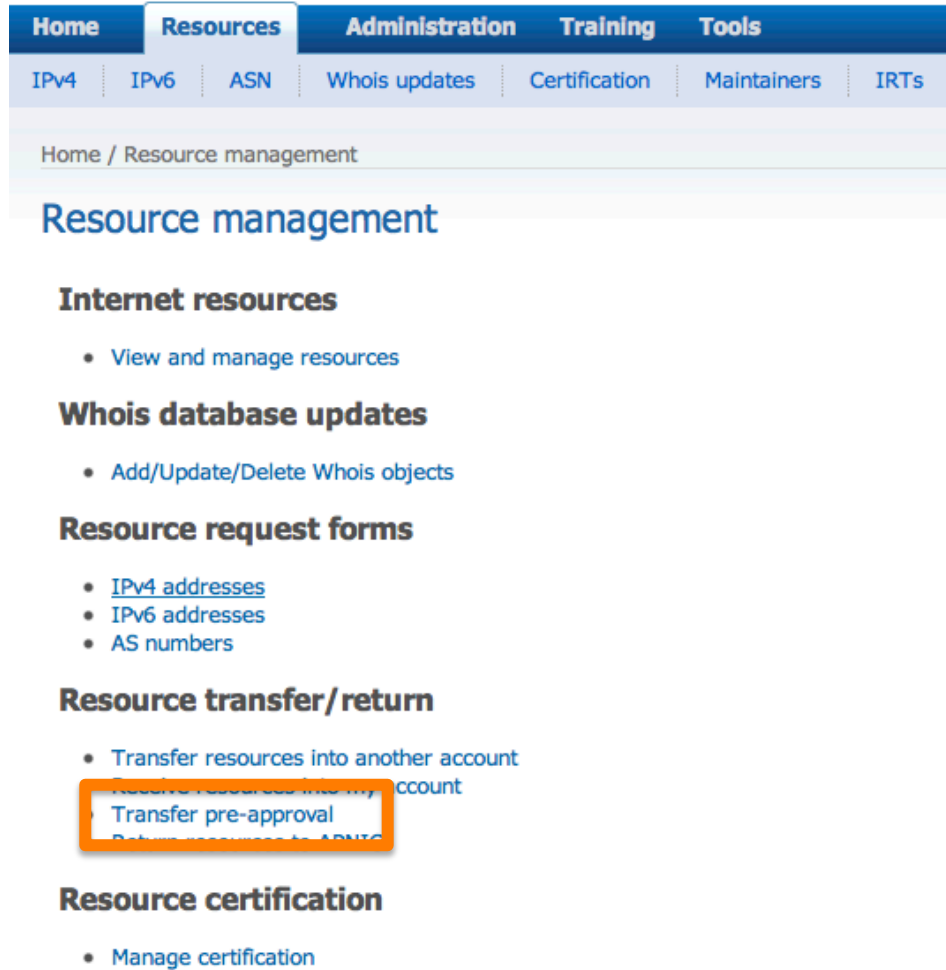
Receive Resources

Receive Resources

Transfer pre-approval

Resource Certification

- Collaborative effort by all the RIR

- Secure the Internet routing Infrastructure

- Resource Certification uses RPKI framework

- Public repository   http://rpki.apnic.net

- Creation on Route Origin Authorization (ROA) Object

Activate RPKI engine

Create ROA objects

Available Utilities

Questions

APNIC

Agenda

- Introduction to APNIC

- Policy Development Process

- Internet Registry Policies

- Requesting IP Addresses

- Whois Database and MyAPNIC

- **Autonomous System Numbers**

- Reverse DNS

What is an Autonomous System Number?

- Autonomous System Numbers (ASNs) are globally unique identifiers for IP networks

- ASNs are allocated to each Autonomous System (AS) for use in BGP routing

- AS numbers are important because the ASN uniquely identifies each network on the Internet

What Is an Autonomous System?

- Group of Internet Protocol-based networks with the same routing policy

- Usually under single ownership, trust or administrative control

- The AS is used both in the exchange of exterior routing information (between neighboring ASes) and as an identifier of the AS itself

How Do Autonomous Systems Work?

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

RFC 1930
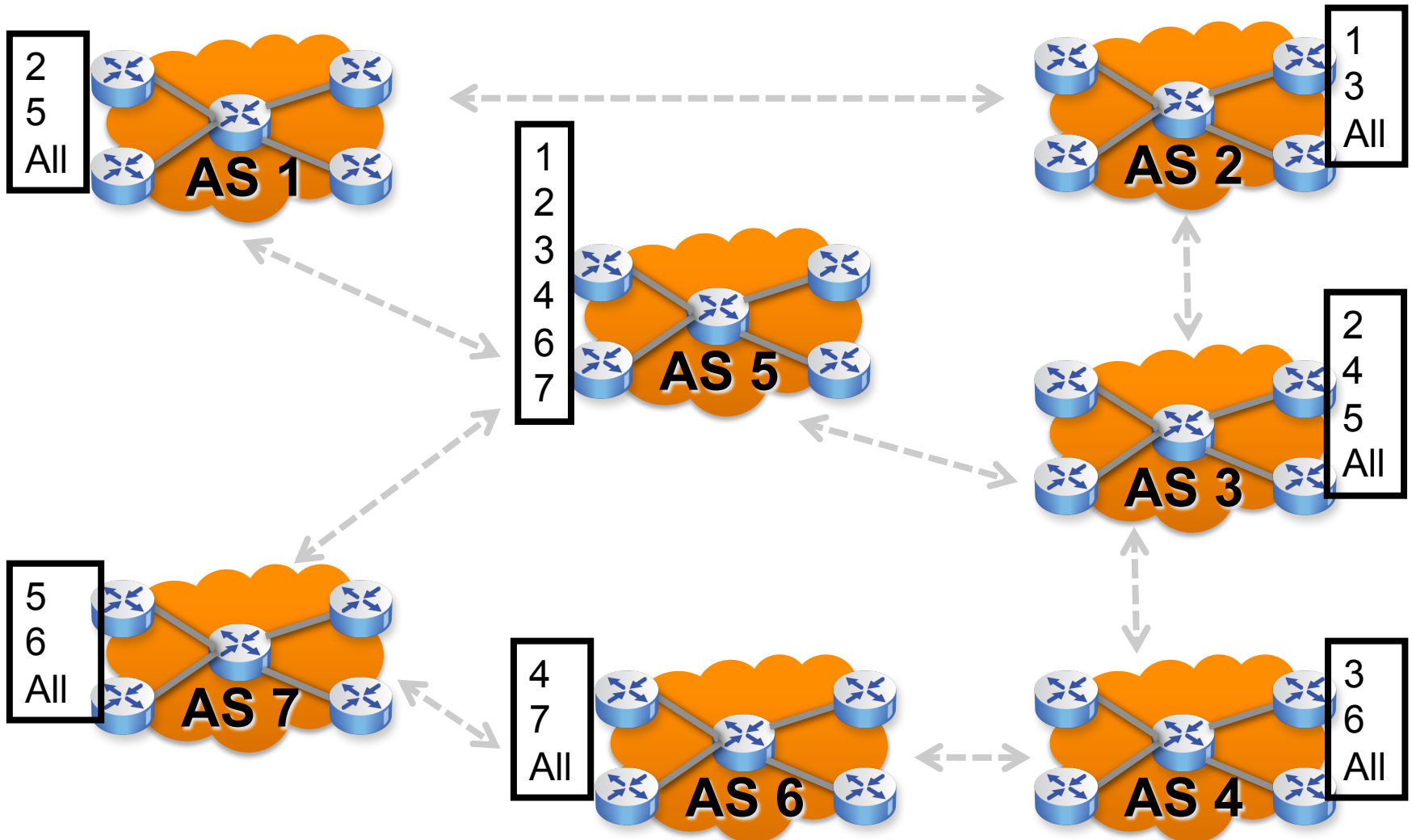
Requesting an AS Number

- Eligibility
  - should be multihomed, or will be soon in 1 month.
  - has a single, clearly defined routing policy that is different from the organization's upstream 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

- 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

- Current Distribution
  - Previously 2 byte ASN (16 bits) runs into possibility of exhaustion
  - Currently 4 byte ASN distribution policy 32 bits
  - 2 byte ASN on request with documented justification

Representation of Routing Policy

- Routing and packet flows
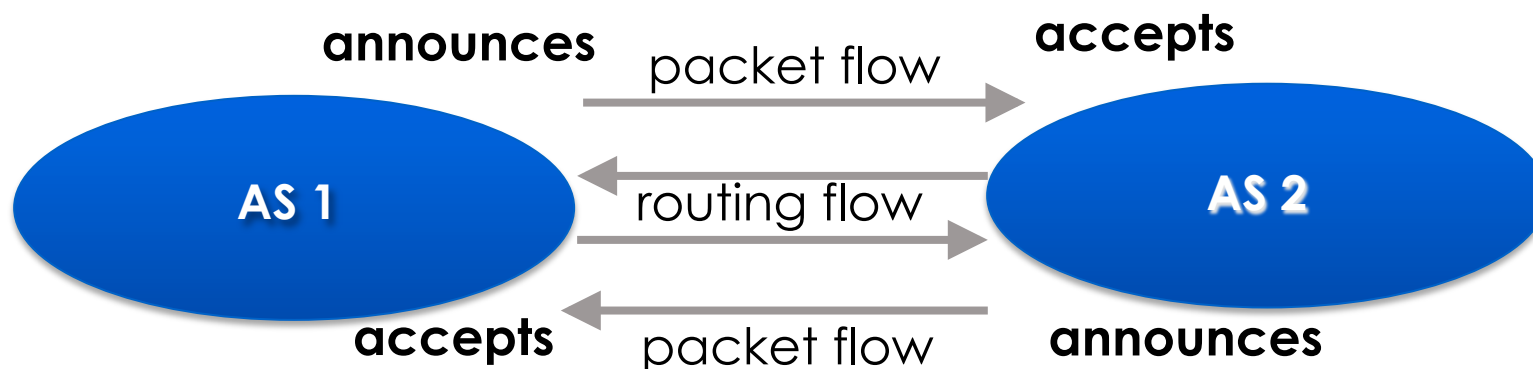
For AS1 and AS2 networks to communicate
- AS1 must announce to AS2
- AS2 must accept from AS1
- AS2 must announce to AS1
- AS1 must accept from AS2

APNIC

Representation of Routing Policy

Basic concept

AS 1 — AS 2
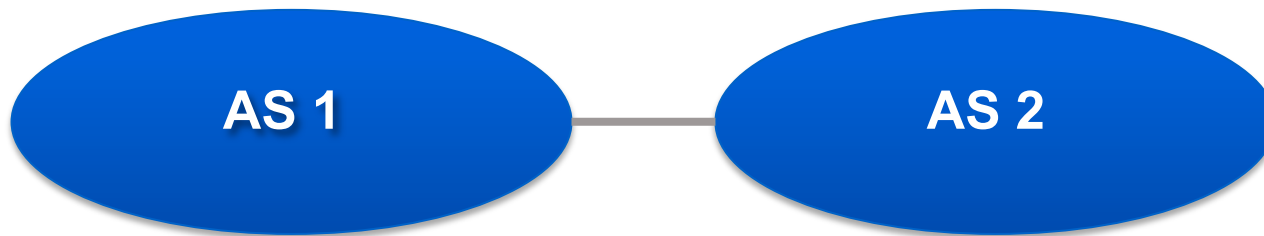
"action pref" - the lower the value,
the more preferred the route

aut-num: AS1

…

import: from AS2
         action pref=100;
         accept AS2
export: to AS2 announce AS1

aut-num: AS2

…

import: from AS1
         action pref=100;
         accept AS1
export: to AS1 announce AS2

Representation of Routing Policy

AS 123 — AS4 — AS5

AS4 — AS10
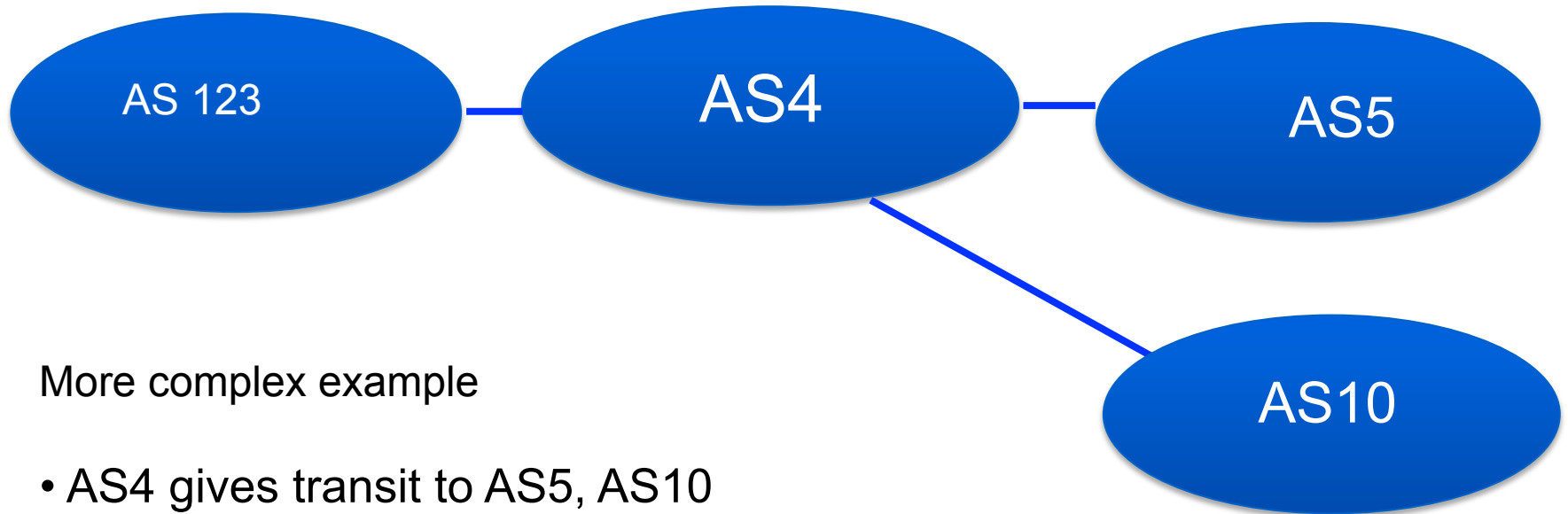
More complex example

- AS4 gives transit to AS5, AS10
- AS4 gives local routes to AS123

Representation of Routing Policy

AS 123 — AS4 — AS5
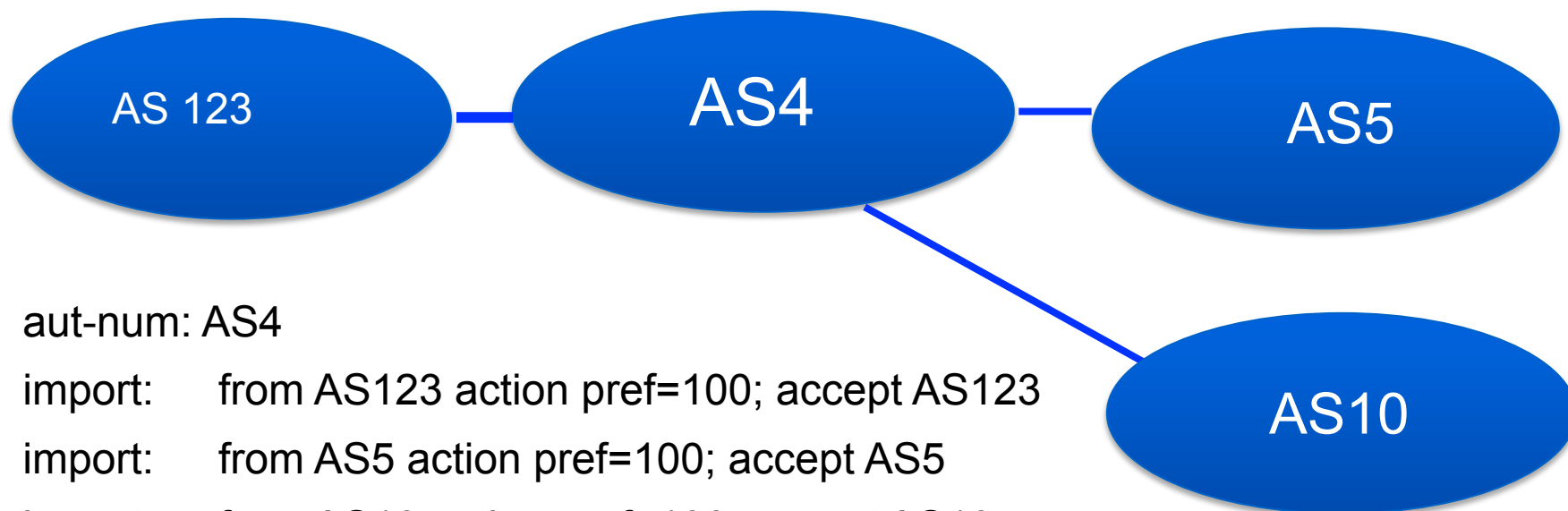
AS4 — AS10

aut-num: AS4

import: from AS123 action pref=100; accept AS123

import: from AS5 action pref=100; accept AS5

import: from AS10 action pref=100; accept AS10

export: to AS123 announce AS4

export: to AS5 announce AS4 AS10

export: to AS10 announce AS4 AS5   ← Not a path

APNIC

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
mnt-by:       MAINT-APNIC-AP
changed:      paulg@apnic.net 19981028
source:       APNIC
```

POLICY
RPSL

AS Number Representation

- 2-byte only AS number range : 0 – 65535

- 4-byte only AS number range – represented in two ways
  - AS PLAIN: 65,536 - 4,294,967,295
  - AS DOT: 1.0 - 65535.65535

- Usages
  - 0 and 65535 Reserved
  - 1 to 64495 Public Internet
  - 64496 to 64511 Documentation –RFC5398
  - 64512 to 65534 Private use
  - 23456 represent 32 Bit range in 16 bit world
  - 65536 to 65551 Documentation – RFC 5398
  - 65552 to 4294967295 Public Internet

AS PLAIN

- IETF preferred standard notation RFC5396

- Continuation on how a 2-Byte AS number has been represented historically

- Notation: The 32 bit binary AS number is translated into a single decimal value
  – Example: AS 65546

- Total AS Plain range:
  2 byte: 0 – 65535 (original 16-bit range)
  4 byte: 65,536 - 4,294,967,295 (RFC4893)
  – APNIC region uses the AS PLAIN style of numbering

APNIC

AS DOT

- Based upon 2-Byte AS representation
  - <Higher2bytes in decimal> . <Lower2bytes in decimal>
    - For example: AS 65546 is represented as 1.10
  - Easy to read, however hard for regular expressions
  - There is a meta character "." in regular expression
    - For example, a.c matches "abc", etc., but [a.c] matches only "a", "32 bit AS number representation

- Example: AS PLAIN Converted to AS DOT
  - AS PLAIN: 131072 ~ 132095
  - AS DOT: 2.0 ~ 2.1023

16 bit and 32 bit ASN - Working Together

- With the introduction of the "new" 32 bit AS Numbers, and the continuation of use of "old" 16 bit AS Numbers, a way had to be found 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

4-Byte ASN Global Distribution
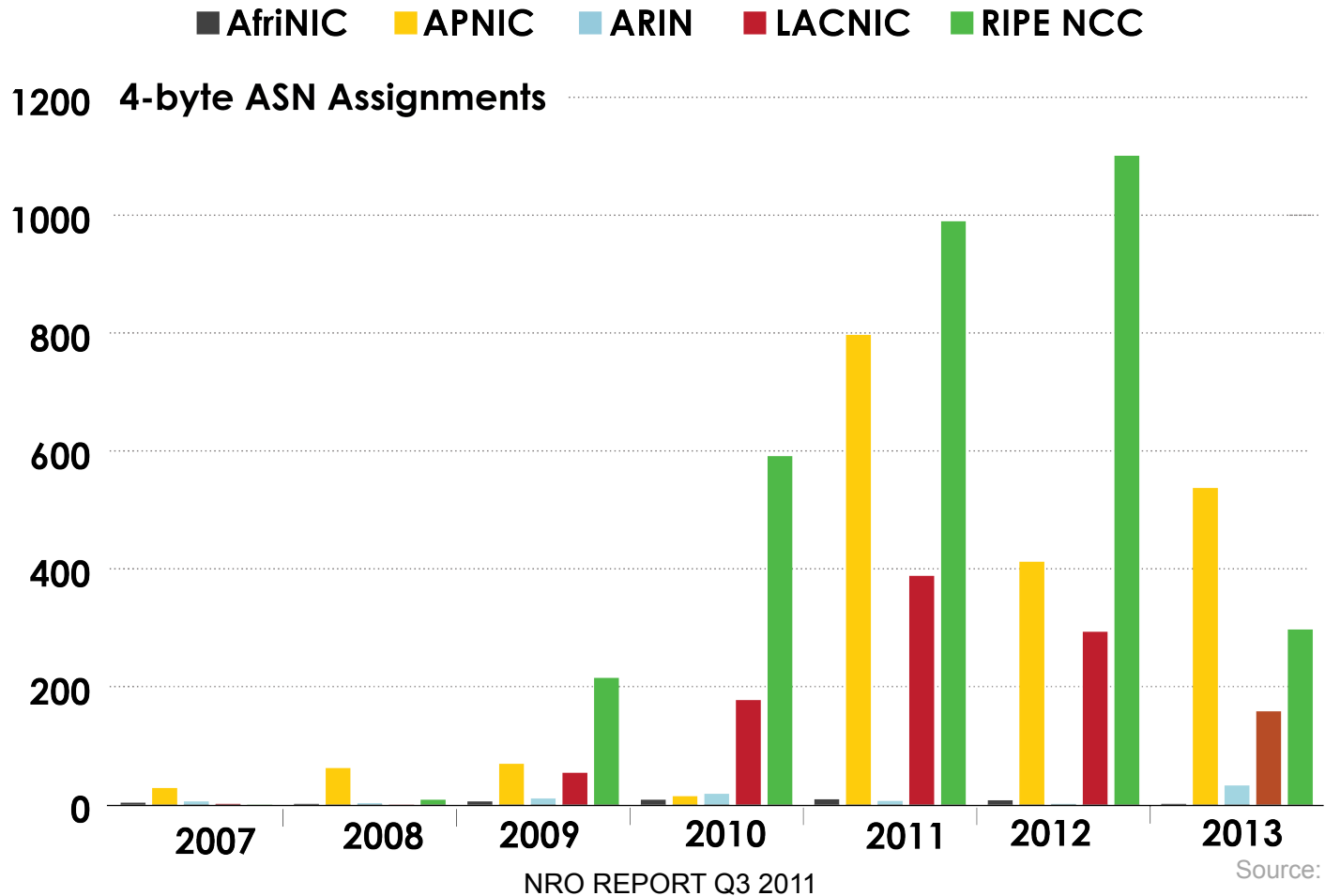
Source: NRO Q3 2013

NRO REPORT Q3 2011

APNIC

Questions

APNIC

Agenda

- Introduction to APNIC

- Policy Development Process

- Internet Registry Policies

- Requesting IP Addresses

- Whois Database and MyAPNIC

- Autonomous System Numbers

- **Reverse DNS**

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

Person (Host)   Address (IPv4/IPv6)
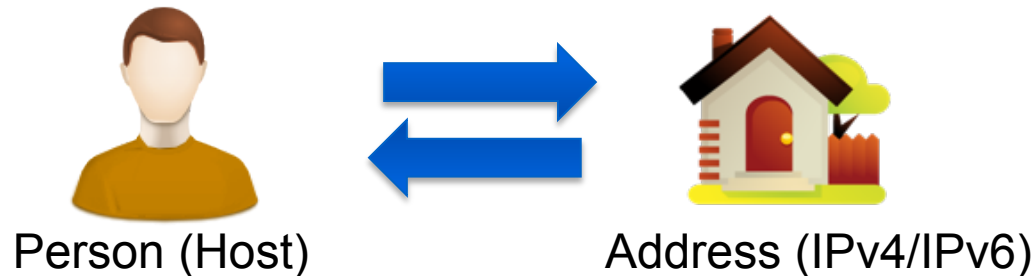
Reverse DNS - why bother?

- 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

- Registration responsibilities

Principles – DNS tree
- Mapping numbers to names - 'reverse DNS'
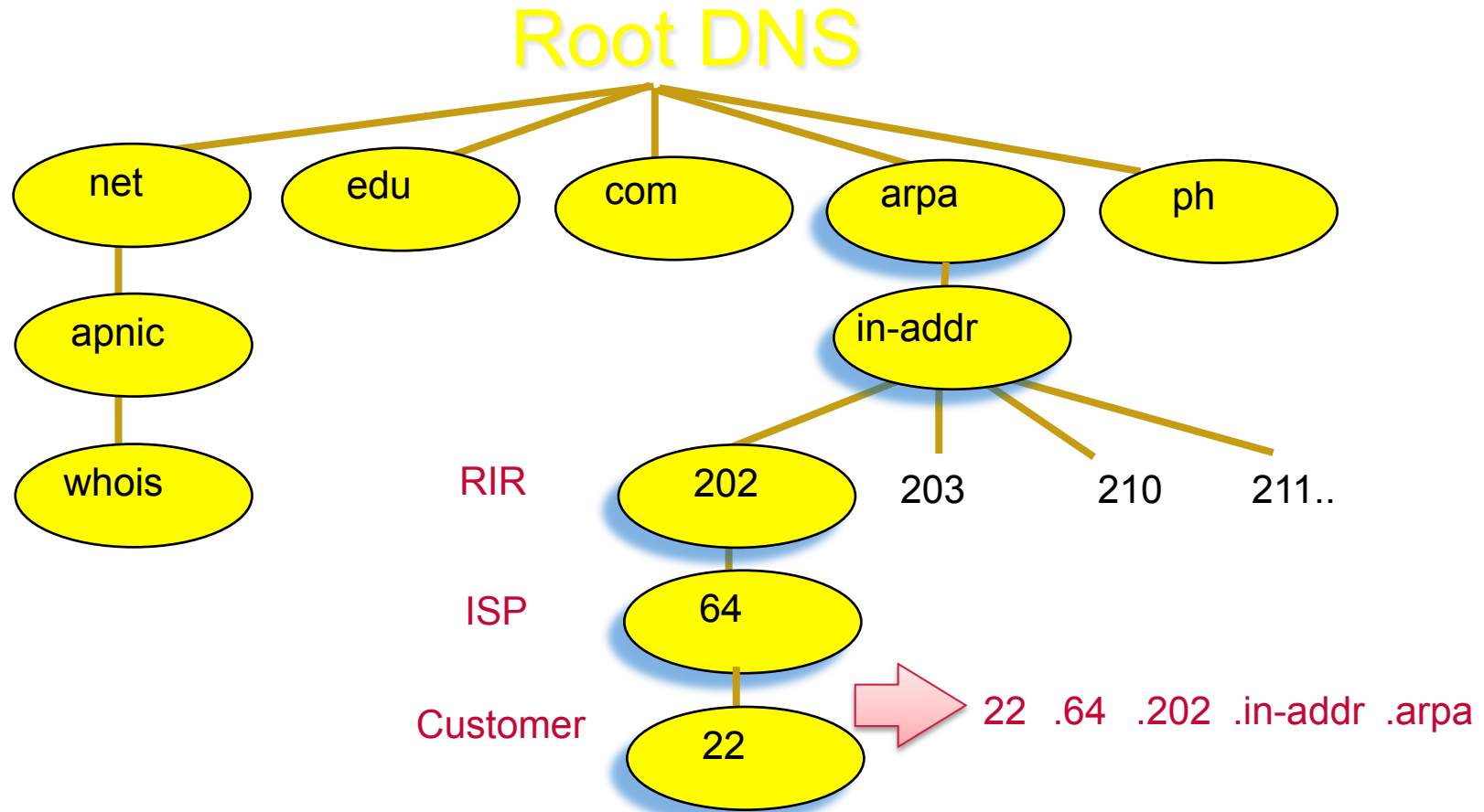
Reverse DNS Tree – with IPv6

RFC 3152

Root DNS

net

edu

com

arpa

int

apnic

in-addr

whois

RIR 202

203   210

ISP 64

IP6

Customer 22

IPv6 Addresses
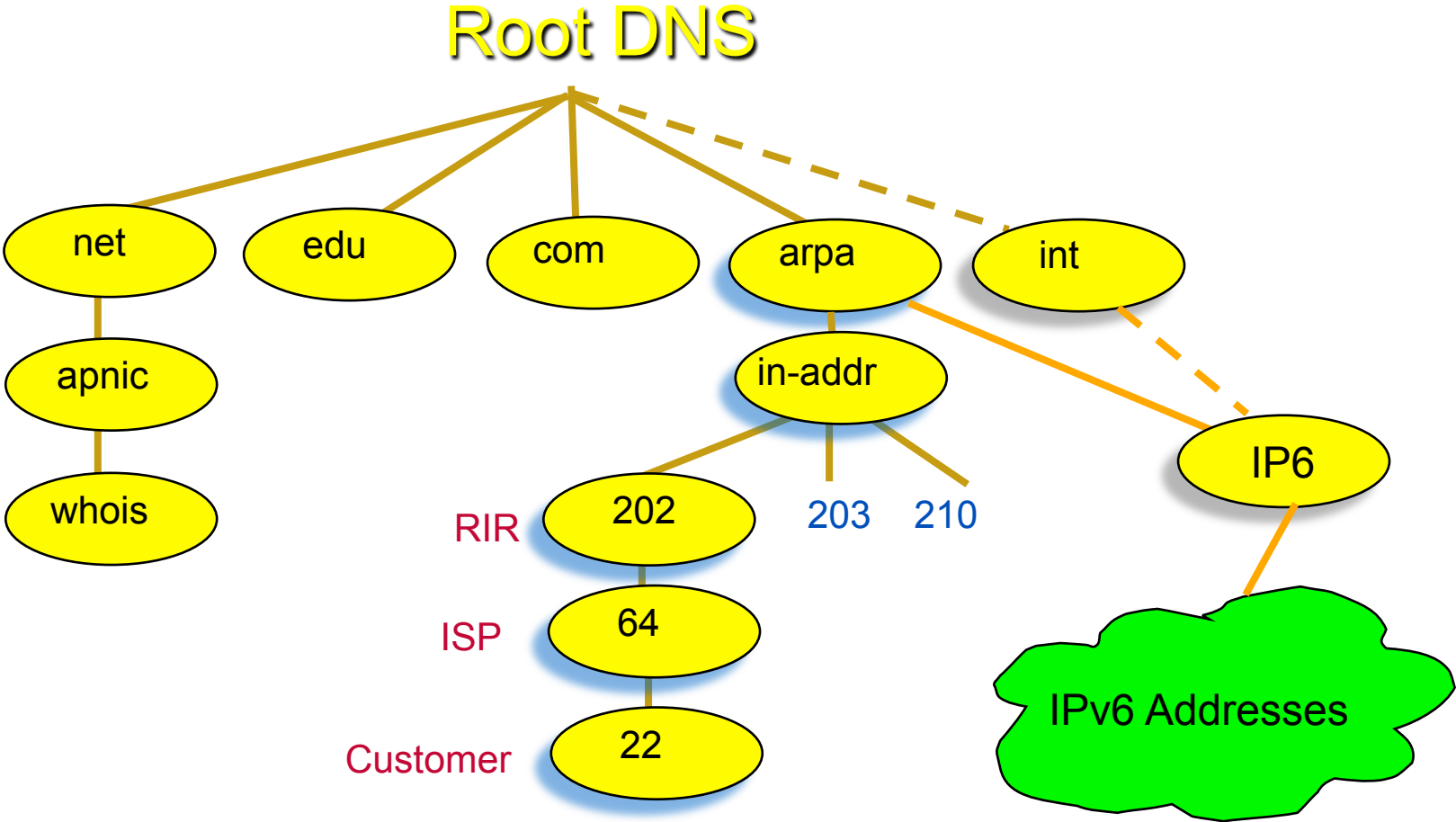
Creating reverse zones

- Same as creating a forward zone file
  - SOA and initial NS records are the same as normal zone

- Main difference
  - need to create additional PTR records

- Can use BIND or other DNS software to create and manage reverse zones
  - Details can be different

Creating reverse zones (continued)

- Files involved
  - Zone files
    - Forward zone file
    - e.g. db.domain.net
  - Reverse zone file
    - e.g. db.192.168.254
  - Configuration files
    - <named.conf>
  - Other
    - Hints files etc.
    - Root.hints

Start of Authority (SOA) record

-

```
<domain.name.>          CLASS   SOA     <hostname.domain.name.>
<mailbox.domain.name> (
                                        <serial-number>
                                        <refresh>
                                        <retry>
                                        <expire>
                                        <negative-caching> )
```

253.253.192.in-addr.arpa.

Pointer (PTR) records

- Create pointer (PTR) records for each IP address

131.28.12.202.in-addr.arpa. IN PTR svc00.apnic.net.

-

  or

131   IN   PTR   svc00.apnic.net.

IPv6 Reverse Lookups – PTR records

- Similar to the IPv4 reverse record

b.a.9.8.7.6.5.0.4.0.0.0.3.0.0.0.2.0.0.0.1.0.0.0.0.0.0.0.1.2.3.4.ip6.arpa.

   IN   PTR   test.ip6.example.com.

- Example: reverse name lookup for a host with address 3ffe: 8050:201:1860:42::1

- $ORIGIN 0.6.8.1.1.0.2.0.0.5.0.8.e.f.f.3.ip6.arpa.

- 1.0.0.0.0.0.0.0.0.0.0.0.2.4.0.0 14400 IN PTR host.example.com.

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.
```

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"

RFC 2317

APNIC & ISPs 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 nameservers for allocations
  - Minimise pollution of DNS

Reverse Delegation Procedures

- Standard APNIC database object,
  - can be updated through myAPNIC

- Nameserver/domain set up verified before being submitted to the database.

- Protection by maintainer object
  - (current auths: CRYPT-PW, PGP).

- Any queries
  - Contact helpdesk@apnic.net

Reverse Delegation Procedures

Whois domain object

```
domain:      28.12.202.in-addr.arpa
Descr:       in-addr.arpa zone for 28.12.202.in-addr.arpa
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 2002102?
changed:     inaddr@apnic.net 20040109
changed:     hm-changed@apnic.net 20091007
changed:     hm-changed@apnic.net 20111208
source:      APNIC
```

Reverse Zone

Contacts

Name Servers

Maintainers (protection)

Questions

Thank You!

End of Session

APNIC