APNIC 29 Kuala Lumpur 1 - 5 March 2010

Internet Resource Management

Kuala Lumpur, 1st March 2010

In conjunction with
APRICOT 2010 / APNIC 29

Introduction

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Assumptions & Objectives

Assumptions

- Are current or prospective APNIC members
- Have not submitted many requests
- Are not familiar or up-to-date with address policies
- Are not familiar with procedures
- Are interested in address management

Objectives

- To provide an understanding of address management
- To provide a working knowledge of the procedures for requesting resources from APNIC and managing these
- To keep membership up-to-date with the latest policies
- Liaise with members.

Overview

- IRMe
  - **Introduction to APNIC**
  - APNIC policy development process
  - Internet registry policies
  - Requesting IP resources
  - Second opinion request
  - IPv6 Overview
  - APNIC whois database
  - MyAPNIC (Demo)
  - Autonomous System Numbers
  - Reverse DNS
  - APNIC Helpdesk

What is APNIC?

- Regional Internet Registry (RIR) for the Asia Pacific region
  - One of five RIRs currently operating around the world
  - Non-profit, membership organisation
- Industry self-regulatory body
  - Consensus-based
  - Open
  - Transparent decision-making and policy development
- Meetings and mailing lists
  - http://meetings.apnic.net/29
  - http://www.apnic.net/community/participate/join-discussions/sigs

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 meetings
- Web and ftp site
- Publications, mailing lists
- Outreach seminars

http://www.apnic.net/community/lists/

Training

- Face to Face
- Via e-learning

- Subsidised for members

Schedule:
http://www.apnic.net/training

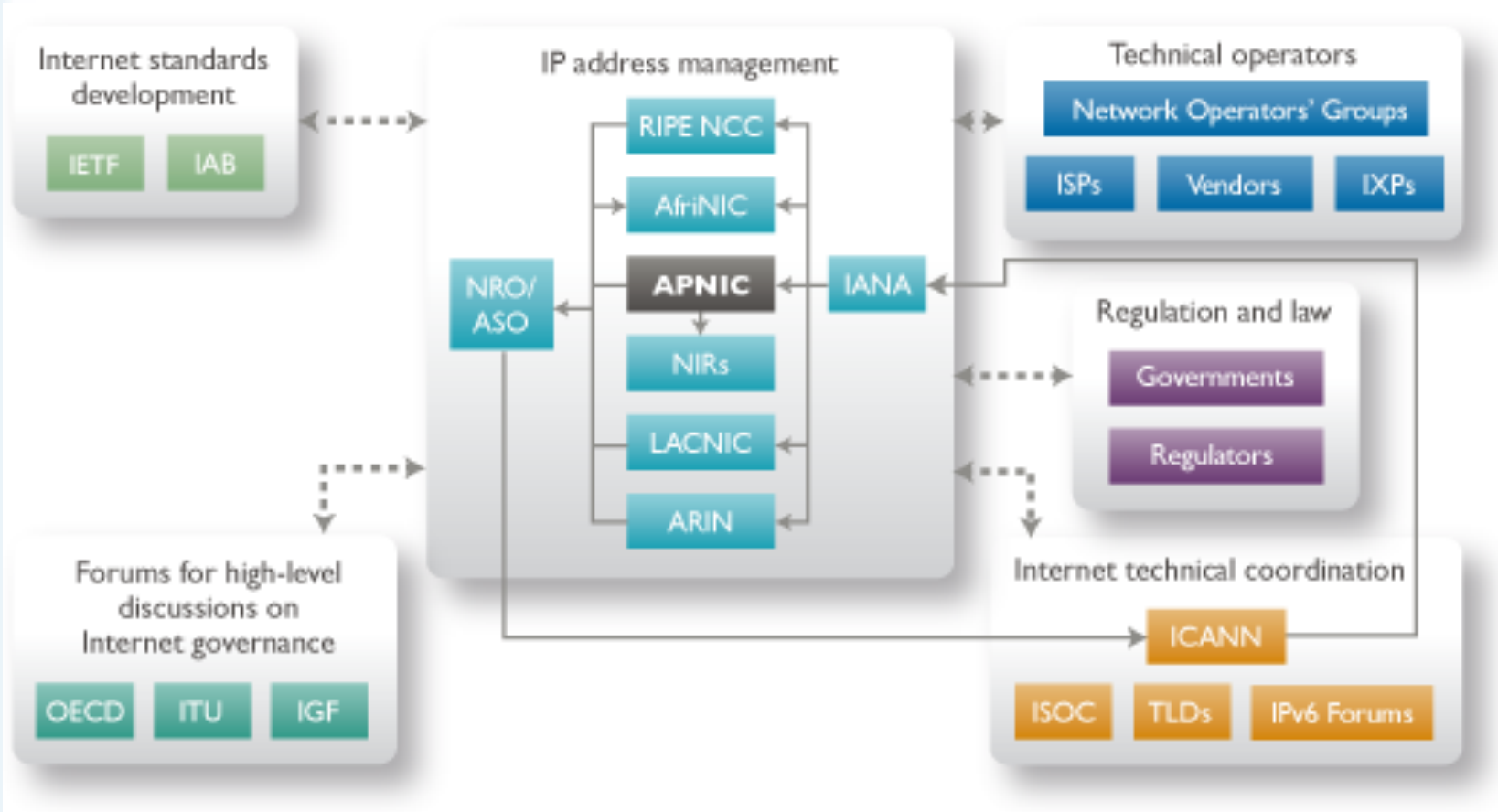
APNIC is NOT

- A network operator
  - Does not provide networking services
    - Works closely with APRICOT forum
- A standards body
  - Does not develop technical standards
    - Works within IETF in relevant areas (IPv6 etc)
- A domain name registry or registrar
    - Will refer queries to relevant parties

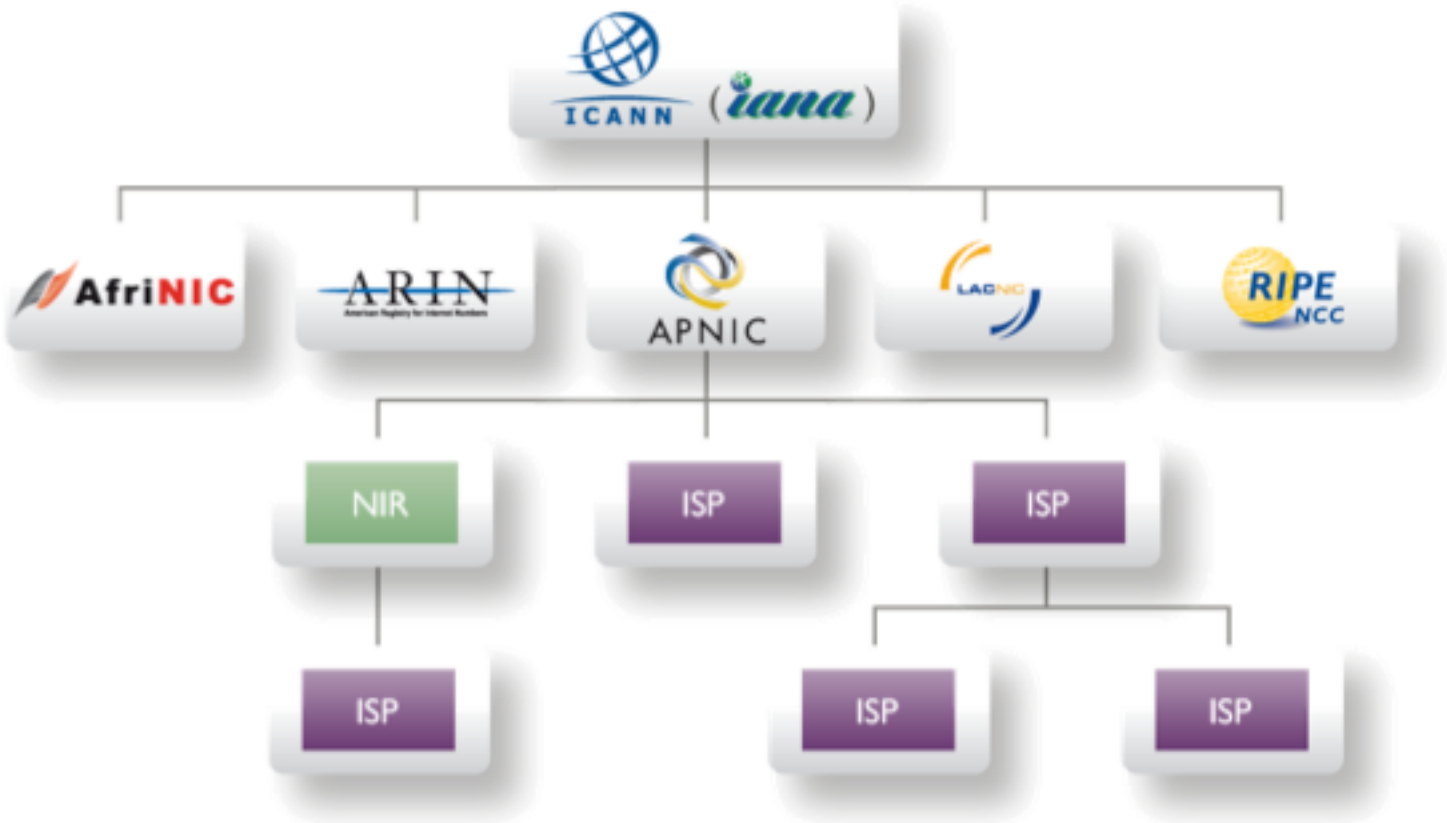
Where is the APNIC region?

What Economies are in the APNIC Region?

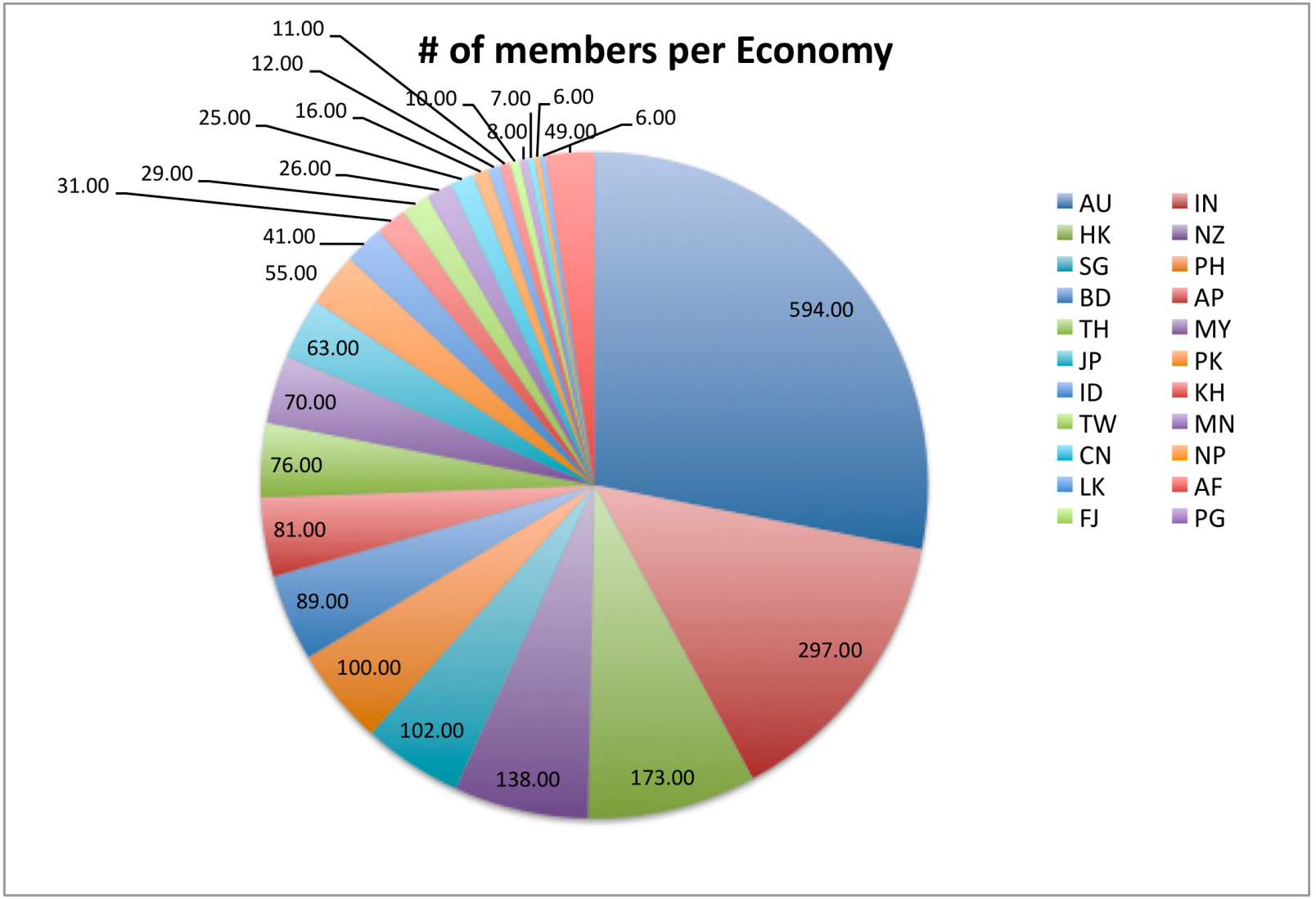
APNIC from a Global Perspective



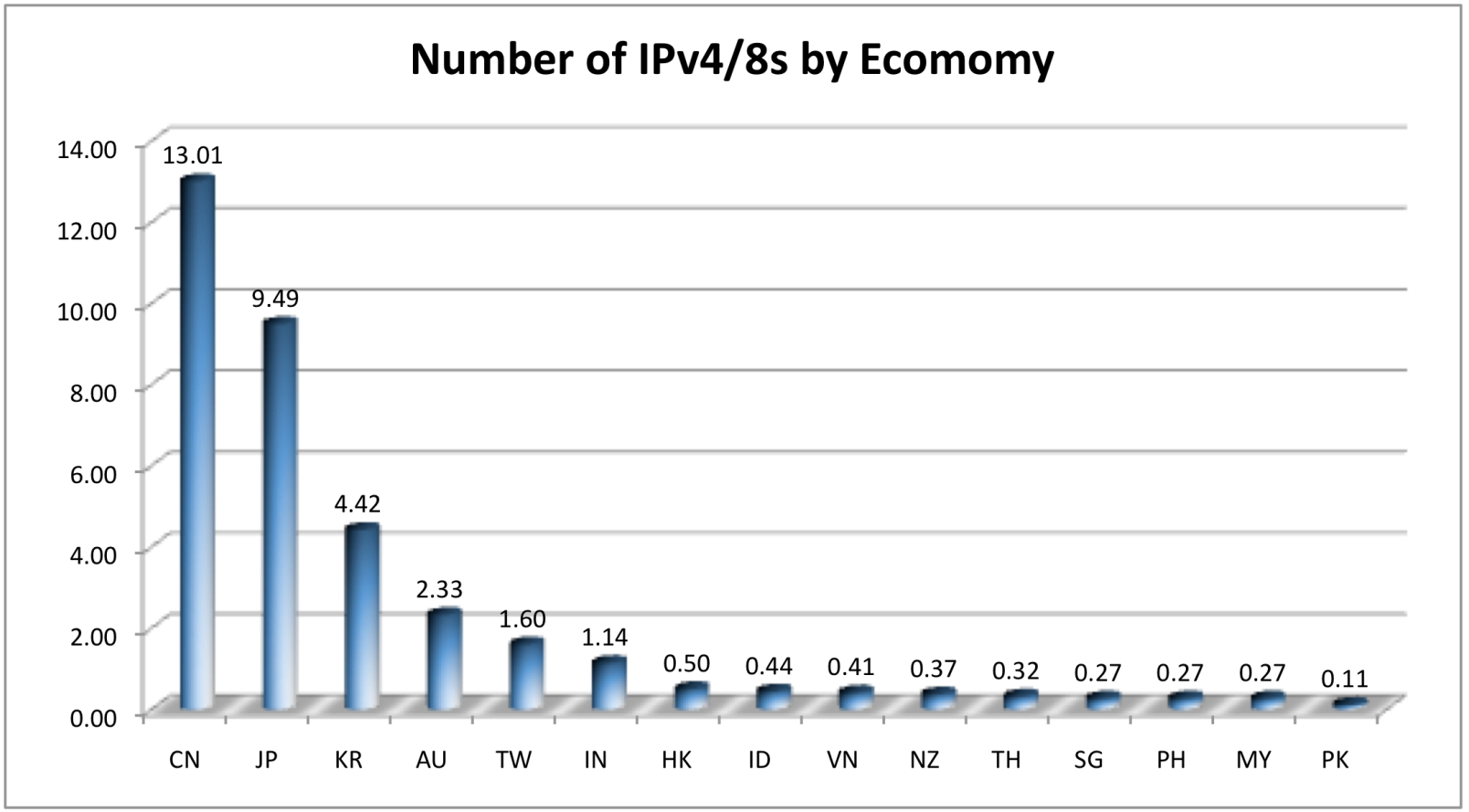
Internet Registry Structure



APNIC Membership



APNIC IPv4 allocations by economy



http://www.apnic.net/stats/o3/ as of 01/10/2009

Global policy Coordination

The main aims of the NRO:

- To protect the unallocated number resource pool
- To promote and protect the bottom-up policy development process
- To facilitate the joint coordination of activities e.g., engineering projects
- To act as a focal point for Internet community input into the RIR system

Global policy coordination

The main function of ASO:

- ASO receives global policies and policy process details from the NRO
- ASO forwards global policies and policy process details to ICANN board

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What are Internet Number Resources?

- IPv4
- IPv6
- ASN

Internet Resource Management Objectives

Conservation

- Efficient use of resources
- Based on demonstrated need

Aggregation

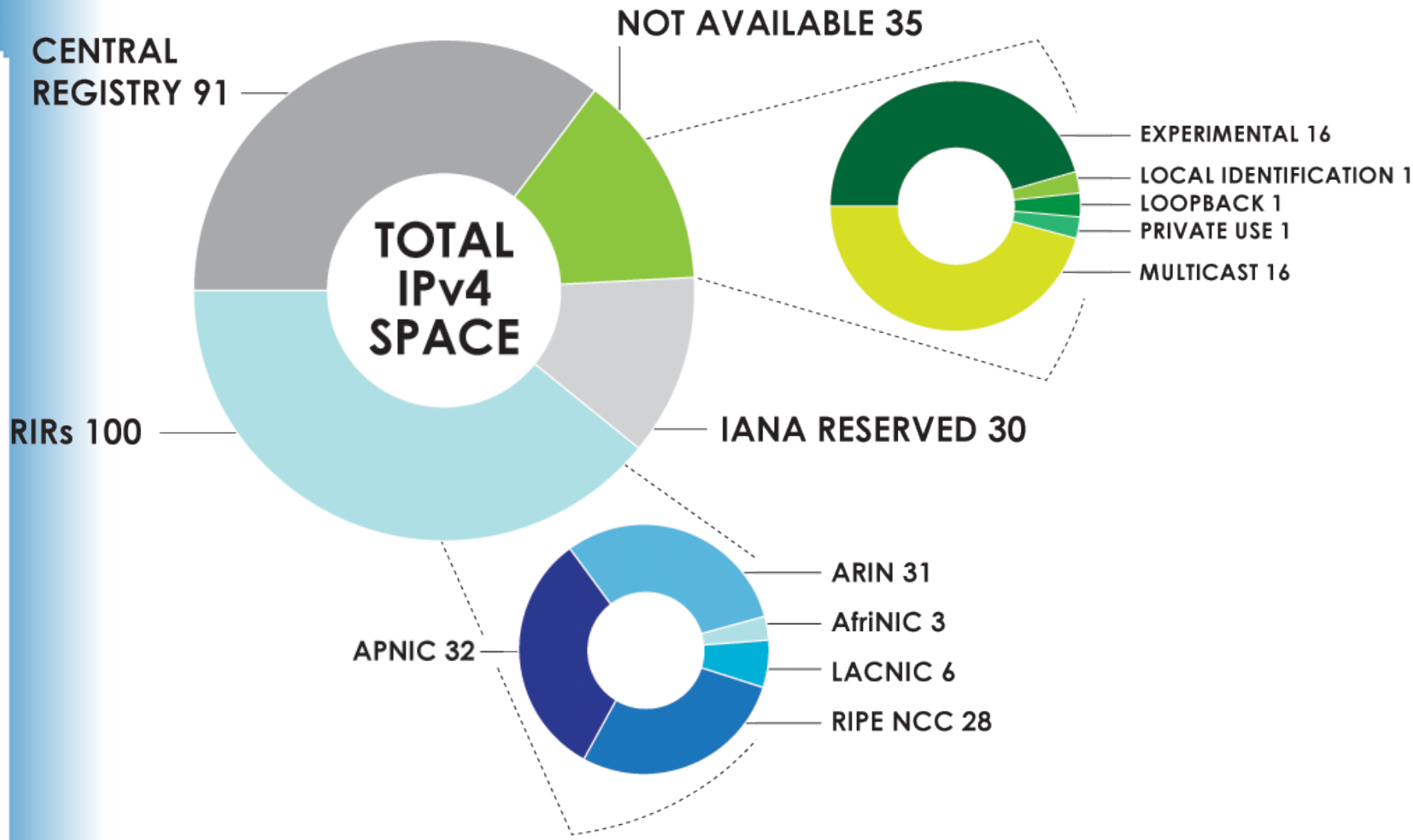
- Limit routing table growth
- Support provider-based routing

Registration

- Ensure uniqueness
- Facilitate trouble shooting

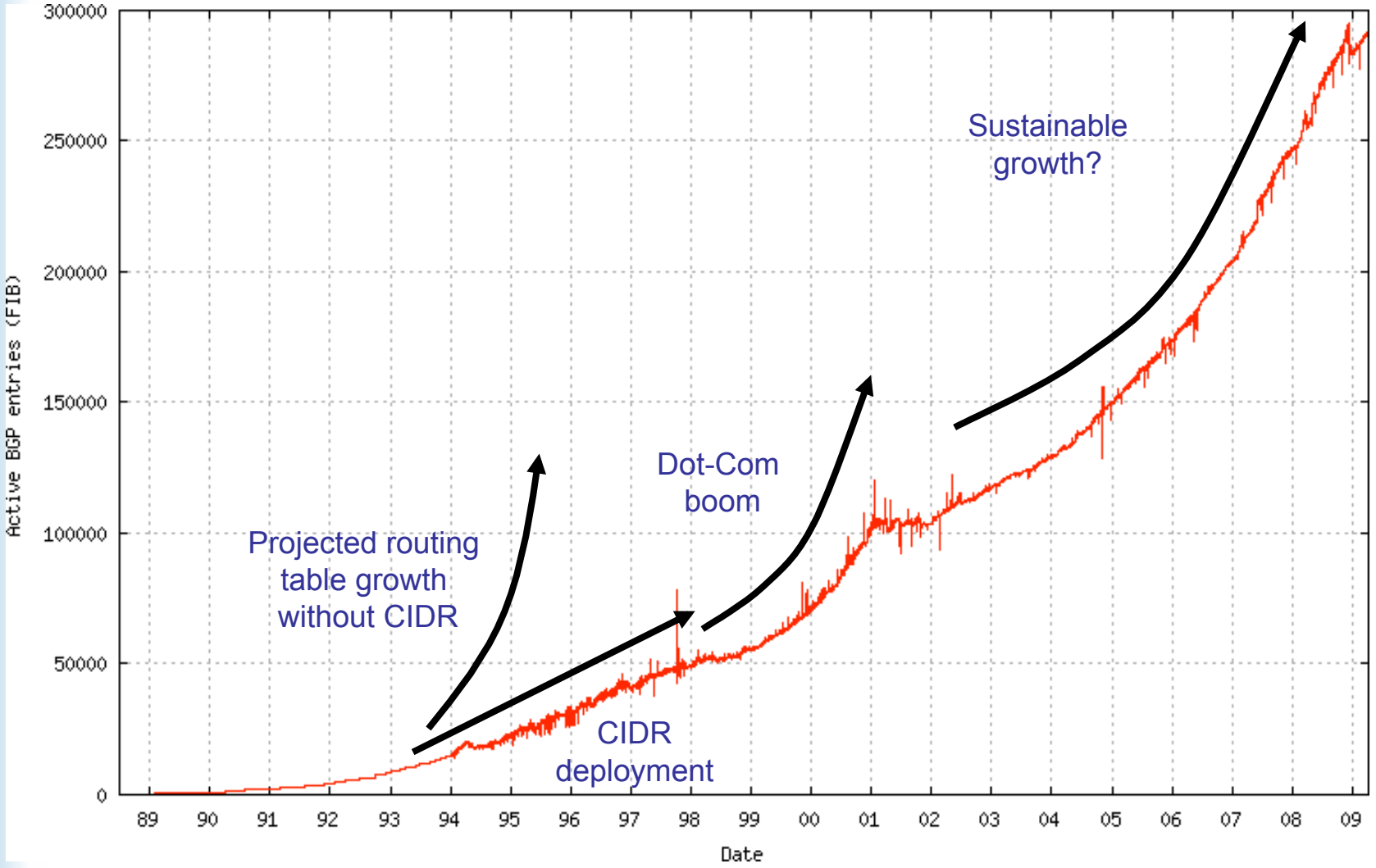
Uniqueness, fairness and consistency

Why do we Need Policies?
- Global IPv4 Delegations (in /8)



Source : Internet Number Resource Report - Number Resource Organization (NRO)

Growth of the Global Routing Table



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

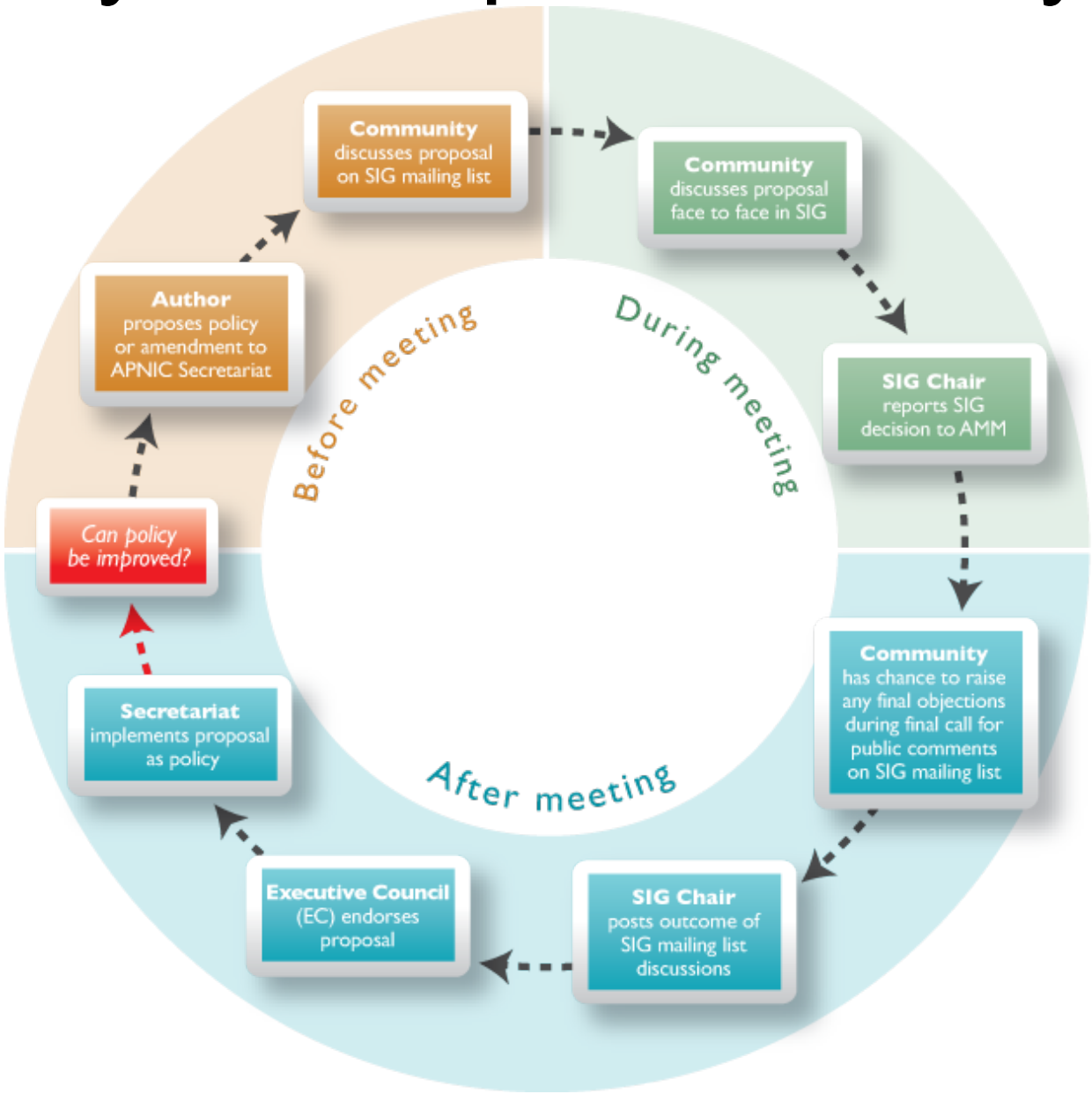
Participation in policy development

- Why?
  - Responsibility as an APNIC member
    - To be aware of the current policies for managing address space allocated to you
  - Business reasons
    - Policies affect your business operating environment and are constantly changing
    - Ensure your ‘needs’ are met
  - Educational
    - Learn and share experiences
    - Stay abreast with ‘best practices’ in the Internet

Policy Development Process

- Open
  - Anyone can propose policies
  - Everyone can discuss policy proposals
- Transparent
  - APNIC publicly documents all policy discussions and decisions
- Bottom-up
  - The community drives policy development

Policy development is a cycle



How to Make Your Voice Heard

- Contribute on the public mailing lists
  - http://www.apnic.net/community/participate/join-discussions/sigs
  - Attend meetings
  - Or send a representative
  - Watch webcast (video streaming) from the meeting web site
  - Read live transcripts from APNIC web site
  - And express your opinion via Jabber chat
- Give feedback
  - Training or seminar events

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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

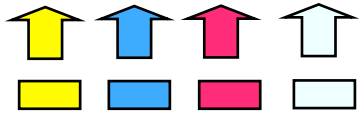
Assignment

"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')

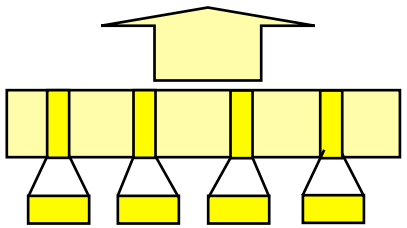
Portable & Non-portable

Portable



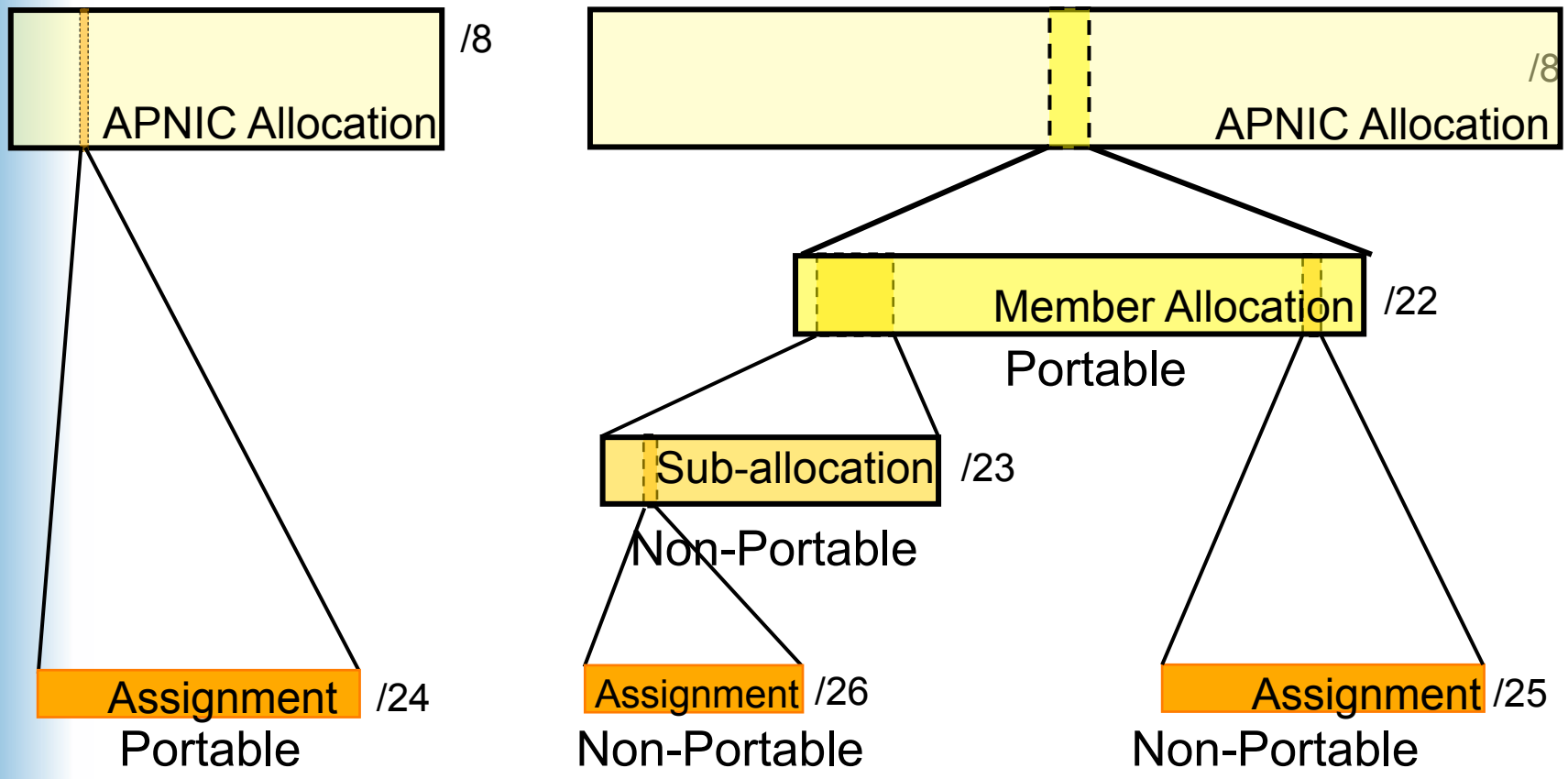
- Customer addresses independent from ISP
  - Keeps addresses when changing ISP
- Bad for size of routing tables
- Bad for QoS: routes may be filtered, flap-dampened

Non-portable



- 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

Allocation and Assignment

APNIC
Allocates
to APNIC Member

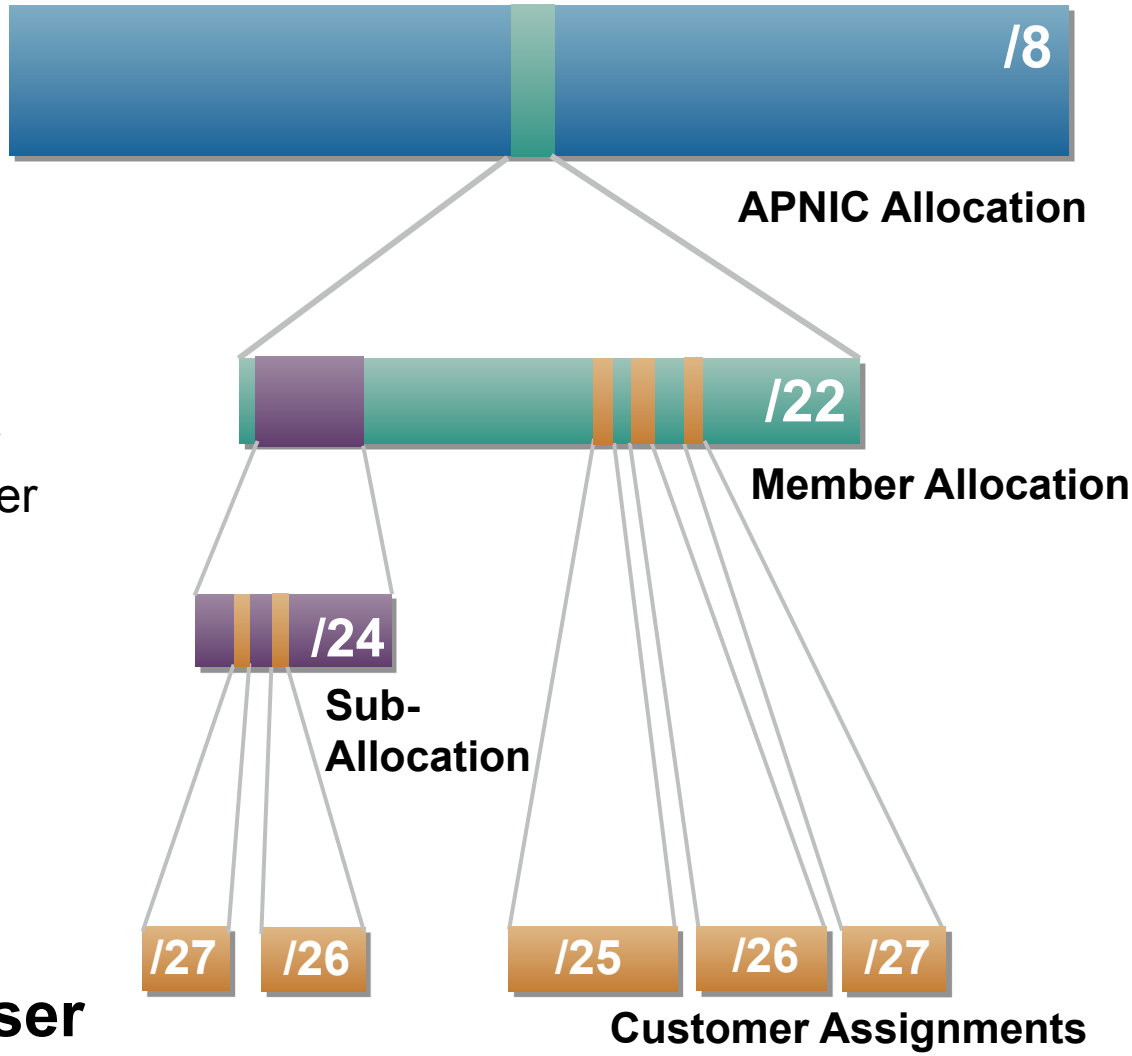
APNIC Member

Allocates
to downstream

Downstream
Assigns
to end-user

Assigns
to end-user

Customer / End User



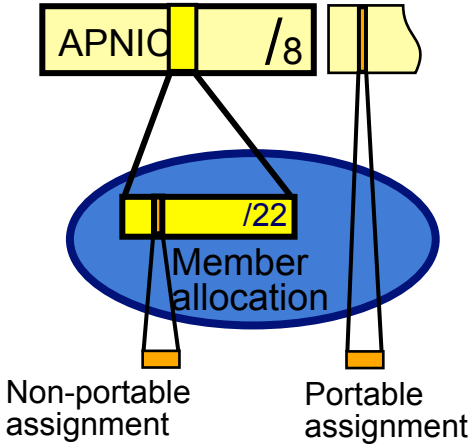
APNIC Policy Environment

"*Internet number resources are public resources*"

- Assignments & allocations on an annual lease basis
- Distribution of Internet resources are 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
  - Stockpiling not permitted

Initial IPv4 Allocation

- APNIC minimum IPv4 allocation size /22
  - Two of the criteria for an initial allocation have been updated to show:
    - 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 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

Address Assignment Policies

- Assignments based on requirements
  - Demonstrated through detailed documentation
  - Assignment should maximise utilisation
    - minimise wastage
- Classless assignments
  - showing use of VLSM
- Size of allocation
  - Sufficient for up to 12 months requirement

Portable assignments

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

Criteria

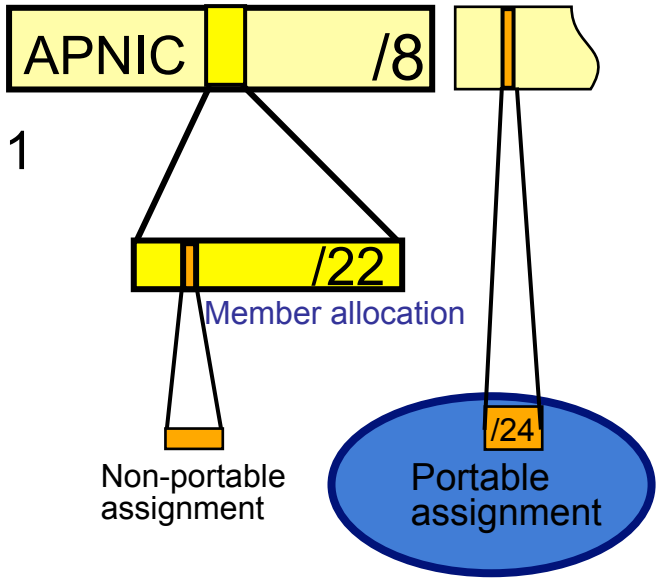
1a. Applicants currently multihomed

OR

1b. Demonstrate a plan to multihome within 1 month

2. Agree to renumber out of previously assigned space

Demonstrate need to use 25% of requested space immediately and 50% within 1 year



Policy for IXP Assignments

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

Portable Critical Infrastructure Assignments

- 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: /48 (max of /32)

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

Supporting 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

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Requesting IP Resources

IP Address Request

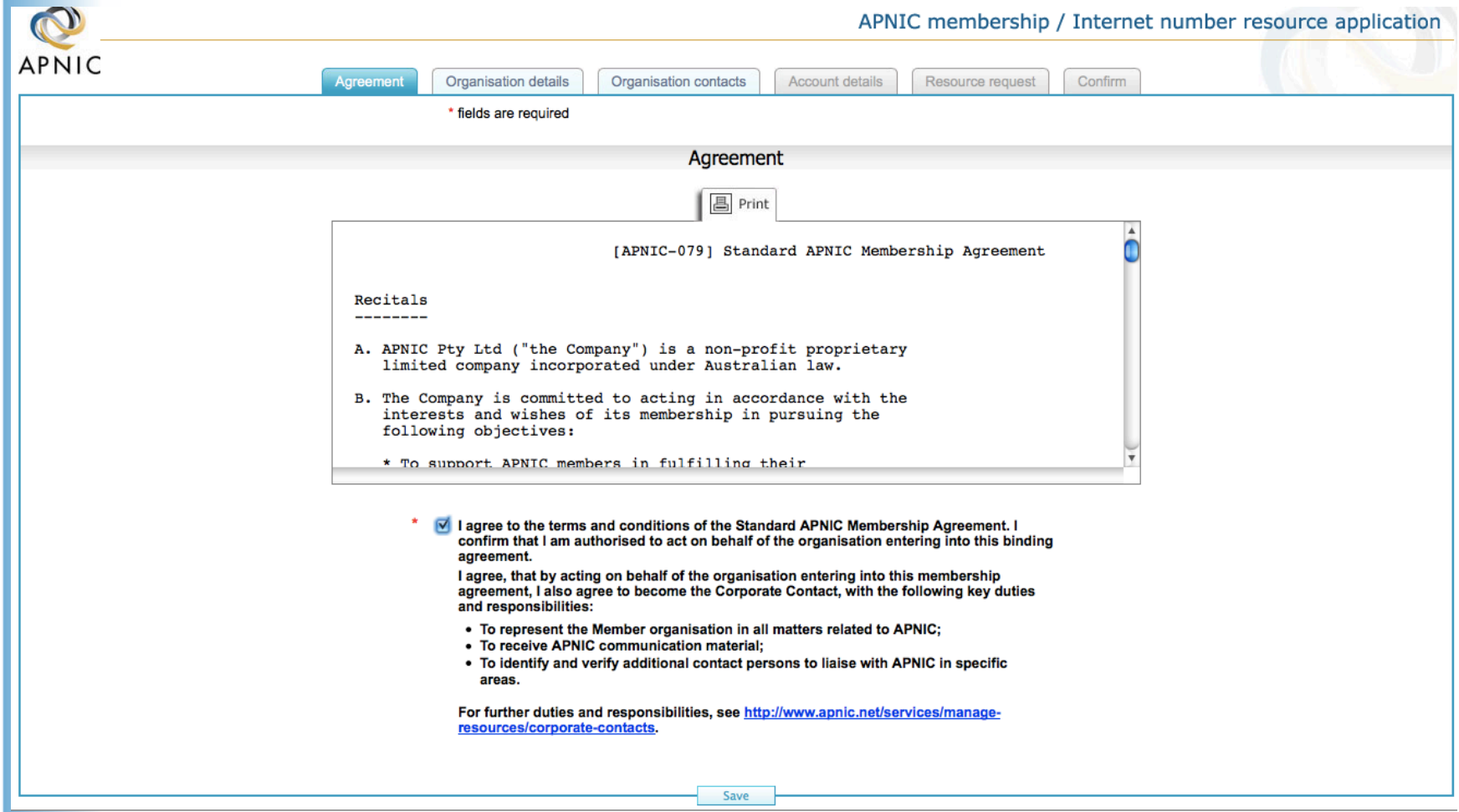
- You are required to be an APNIC member in order to initiate your IP Address Request.
- However you can apply for membership and an initial address allocation at the same time.
- http://www.apnic.net/services/become-a-member

Resource application requirements

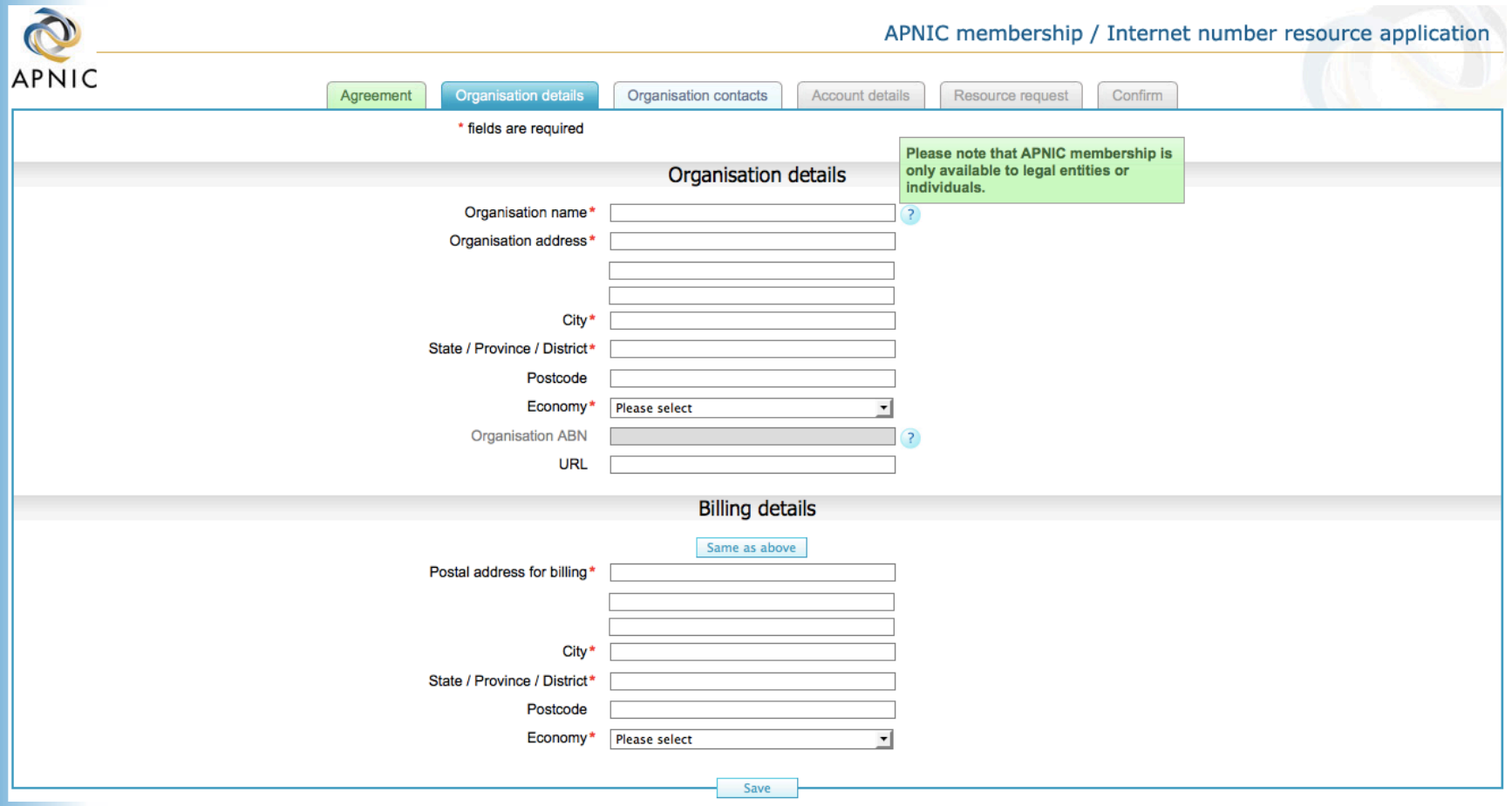
- How do I become a member?
- How many IP addresses do I need?
- Do I need an ASN?

Applying for Resources

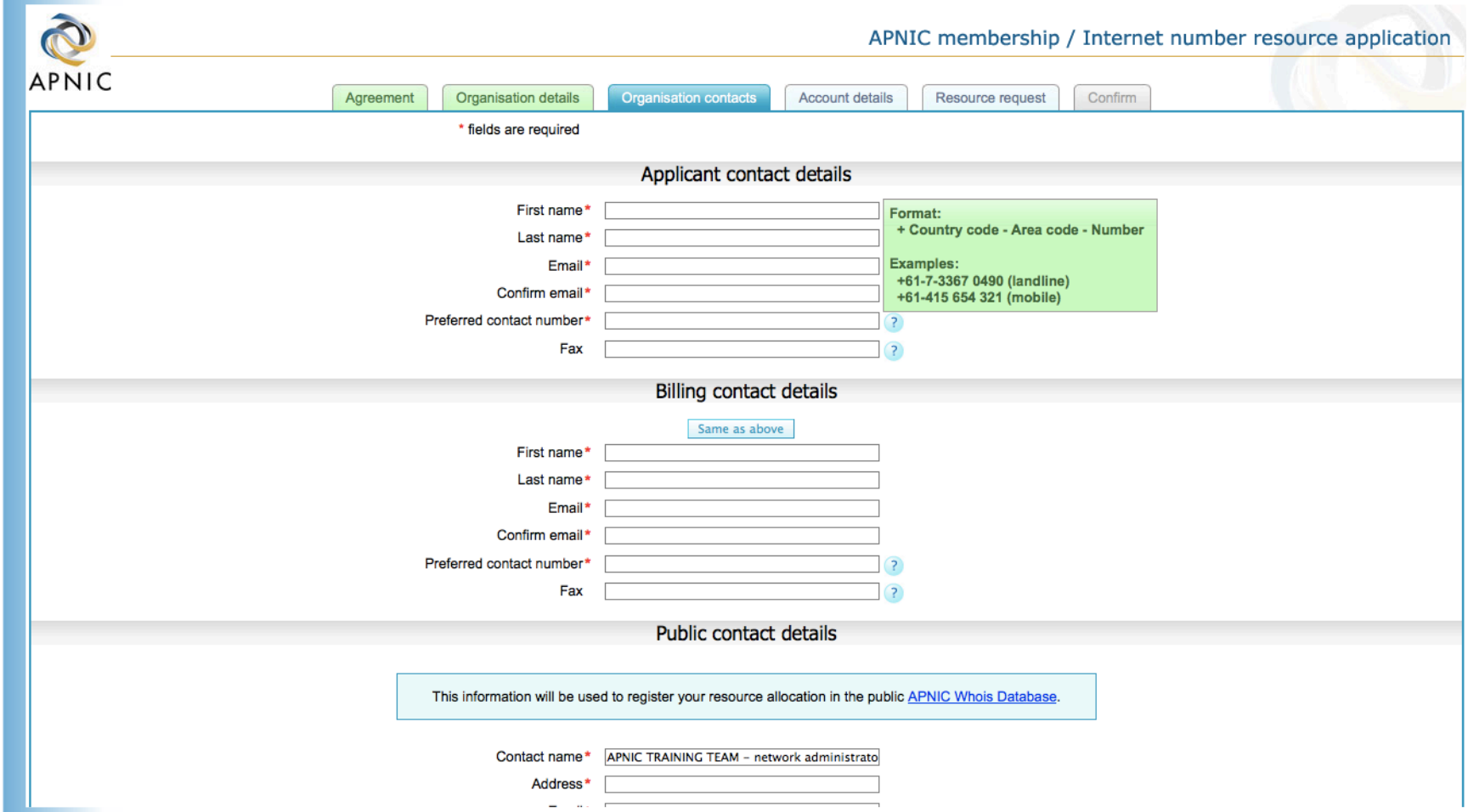
Client First - Agreement



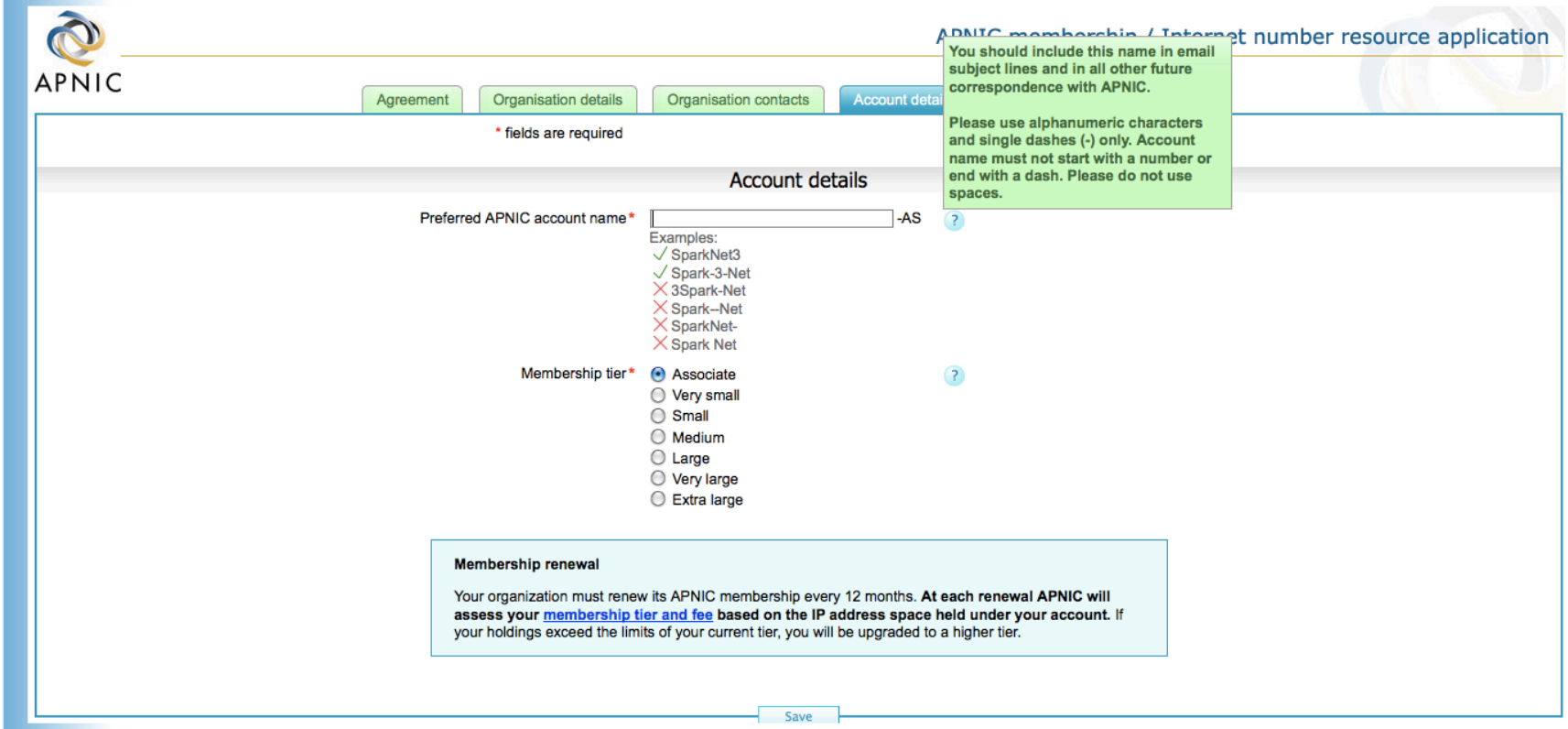
Organisation Details



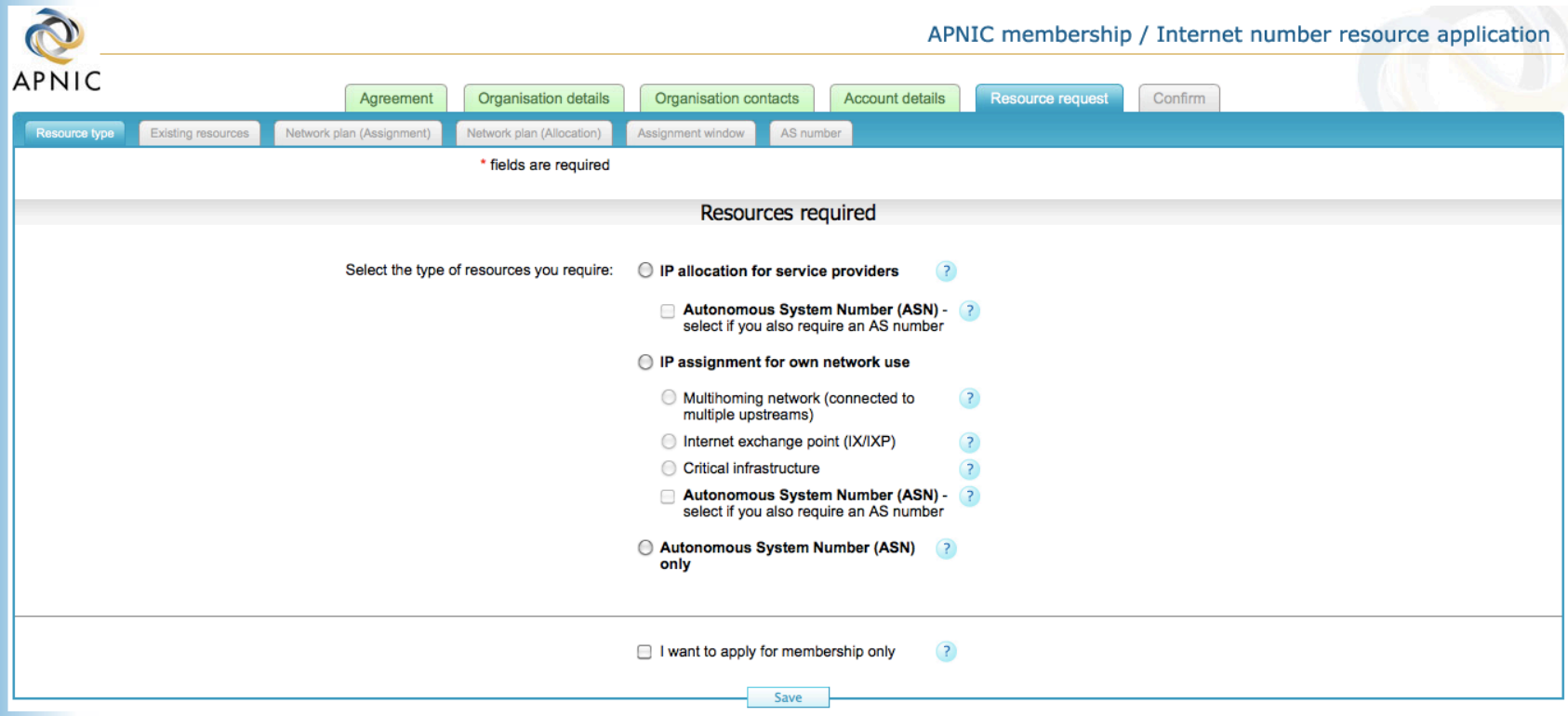
Contact Details



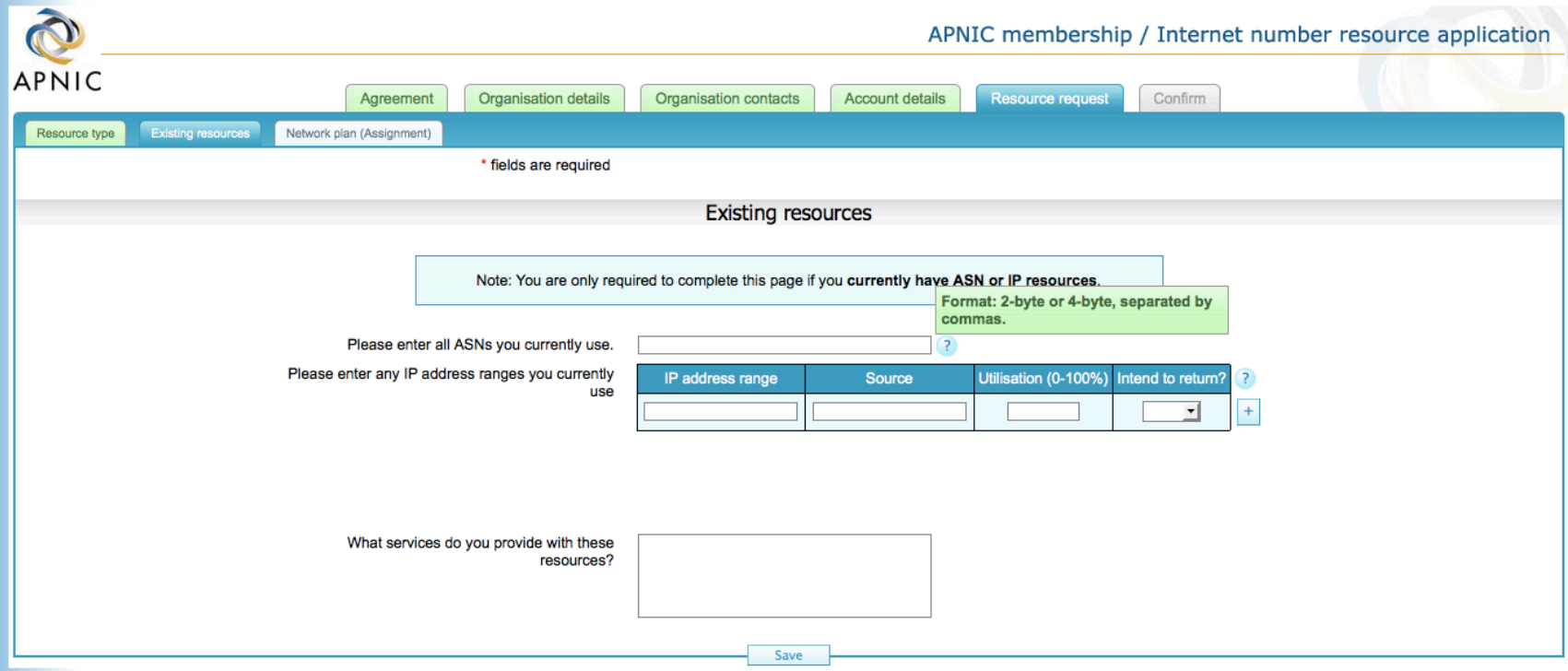
Account Details



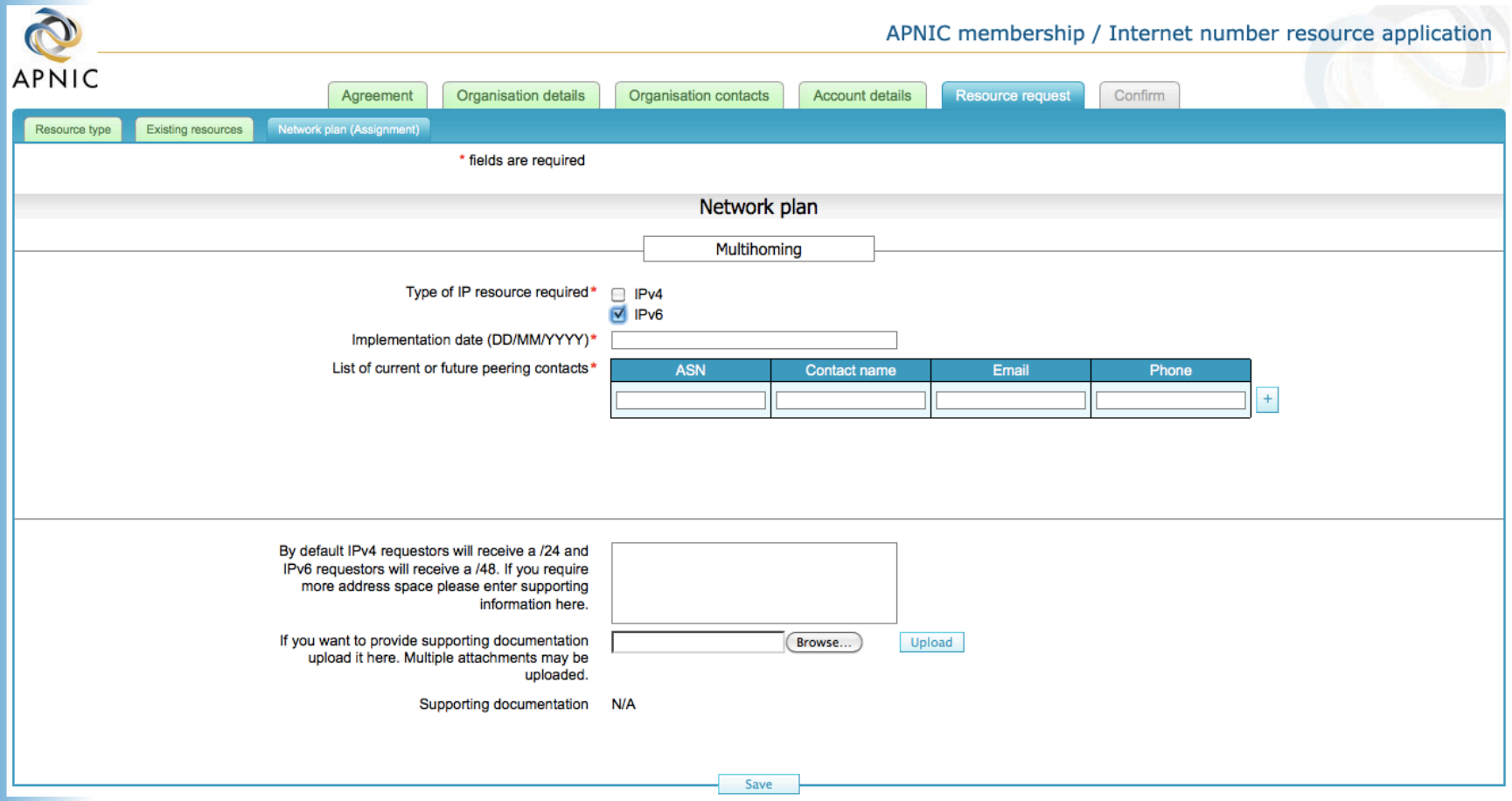
Resources Required



Existing Resources



Network Plan



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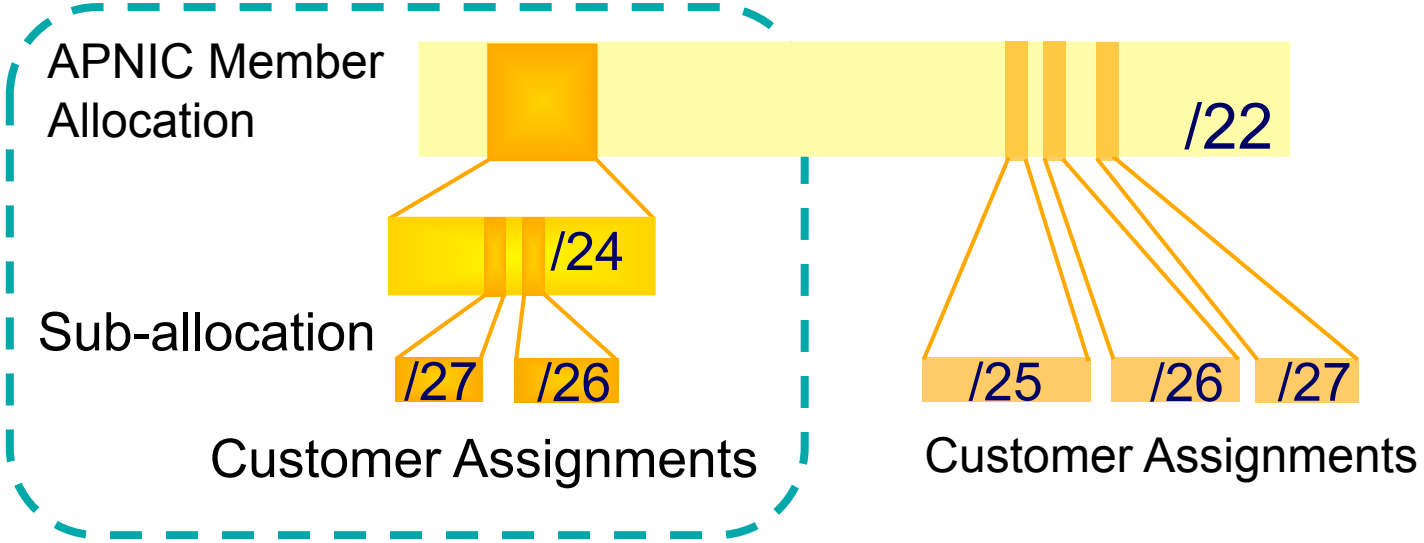
Assignments and sub-allocations



- 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

What is an Assignment Window?

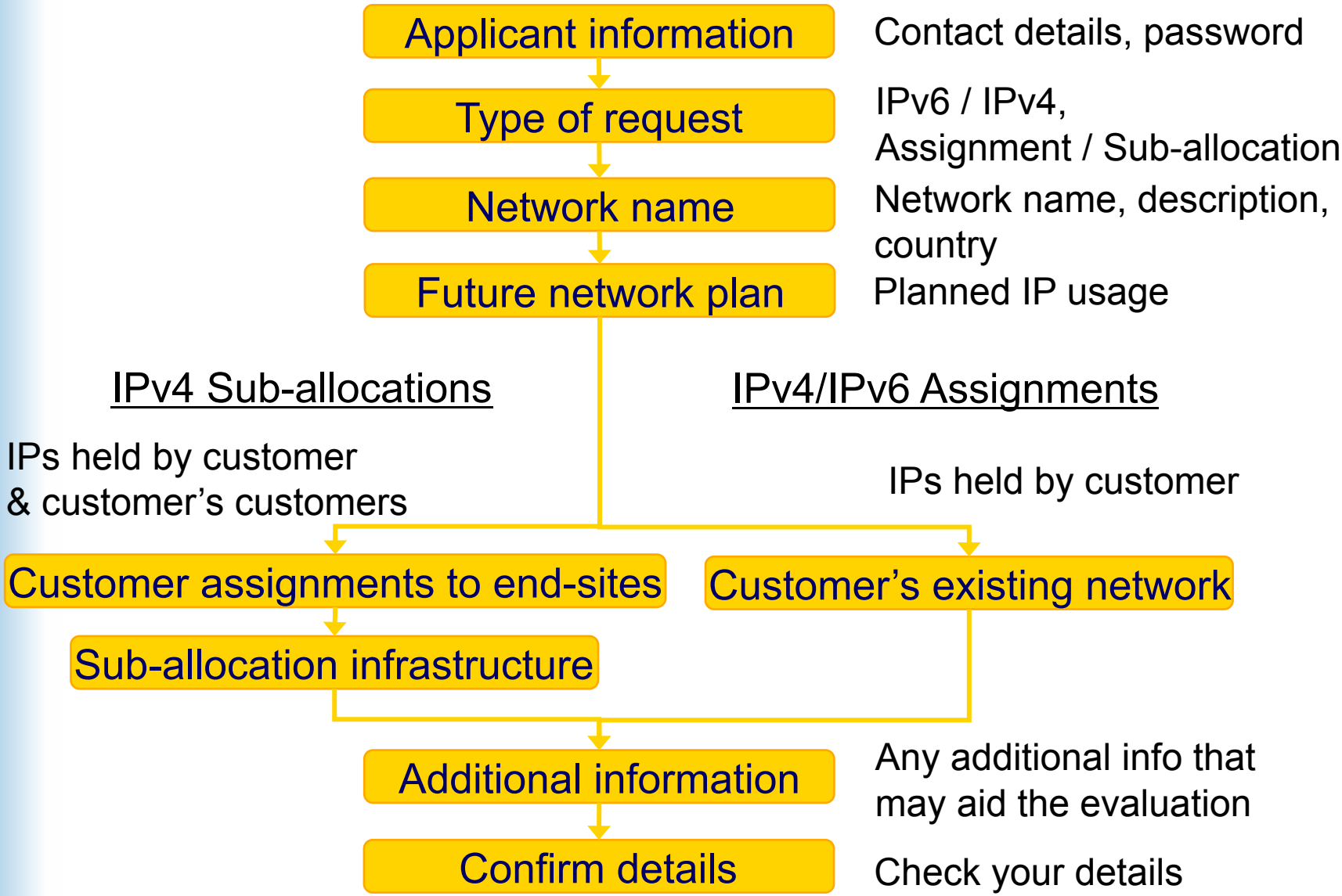
"The amount of address space a member may assign without a 'second opinion'"

- All members have an AW
  - 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 members AW

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

Overview of 2nd Opinion Form



2nd Opinion Evaluation (policy)

- Efficiency
  - More than 50% used in any one subnet?
  - Can different subnet sizes be used?
  - More than 80% used for previous assignment?
- Stockpiling
  - Is all address space held declared on form?
  - Has organisation obtained address space from more than one member/ISP?
- Registration
  - Is previous assignment in APNIC database and are they correct and up to date?

2nd Opinion Evaluation

- APNIC & Member evaluation
  - Should be the same
    - If NO, APNIC will ask member to obtain more information
      - iterative process
    - If YES, APNIC approves 2nd opinion request

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"
```

Customer Assignment

- Member updates internal records
  - Select address range to be assigned
  - Archive original documents sent to APNIC
  - Update APNIC database
- Clarify status of address space
  - APNIC requirement is ‘Non portable’
  - ‘Portable’ assignments are made by APNIC only with the end-user request form
    - Organisation must have technical requirement

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Rationale

- Address depletion concerns
  - Squeeze on available addresses space
    - Probably will never run out, but will be harder to obtain
  - End to end connectivity no longer visible
    - Widespread use of NAT

➡ IPv6 provides much larger IP address space than IPv4

Main IPv6 Benefits

- Expanded addressing capabilities
- Server-less autoconfiguration (“plug-n-play”) and reconfiguration
- More efficient and robust mobility mechanisms
- Built-in, strong IP-layer encryption and authentication
- Streamlined header format and flow identification
- Improved support for options / extensions

IPv6 Addressing

- 128 bits of address space
- Hexadecimal values of eight 16 bit fields
  - X:X:X:X:X:X:X:X (X=16 bit number, ex: A2FE)
  - 16 bit number is converted to a 4 digit hexadecimal number
- Example:
  - FE38:DCE3:124C:C1A2:BA03:6735:EF1C:683D
  - Abbreviated form of address
    - 4EED:0023:0000:0000:0000:036E:1250:2B00

    →4EED:23:0:0:0:36E:1250:2B00

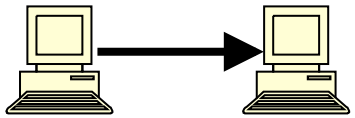
    →4EED:23::36E:1250:2B00

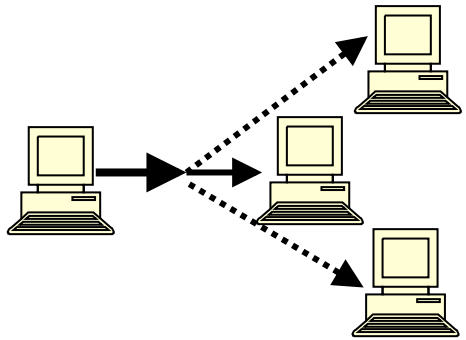
    (Null value can be used only once)

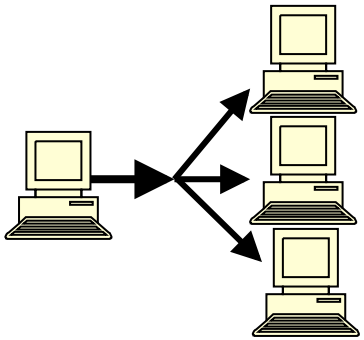
IPv6 Addressing Model

- **IPv6 Address type**
  - Unicast
    - An identifier for a single interface
  - Anycast
    - An identifier for a set of interfaces
  - Multicast
    - An identifier for a group of nodes

RFC 4291

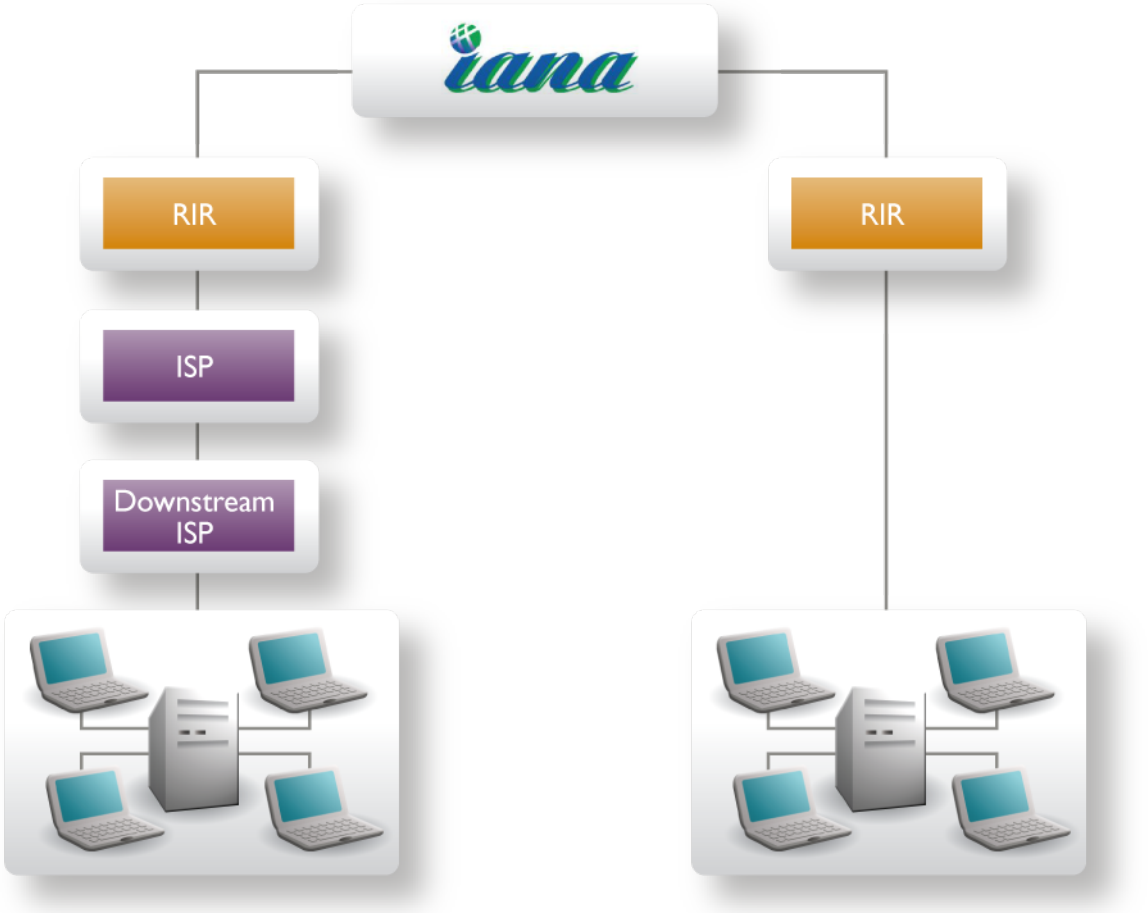






IPv6 Policies and Procedures

IPv6 Address Management Hierarchy



IPv6 Address Policy Goals

- Efficient address usage
  - Avoid wasteful practices
- Aggregation
  - Hierarchical distribution
  - Aggregation of routing information
  - Limiting number of routing entries advertised
- Minimise overhead
  - Associated with obtaining address space
- Registration, Uniqueness, Fairness & consistency

Allocation and Assignment Policies for IPv6

- Initial allocation size is /32
  - Default allocation (“slow start”)
- Any size longer than /48
  - Decision is up to ISPs or ISPs
    - Implication: any size between /64 - /48
  - Global coordination is required
  - Assuming the HD ratio changes to a larger value
    - HD ratio measurement unit: /48 => /56
      - Implication: Register all assignments shorter than /56?
    - HD ratio: 0.8 => 0.94

Subsequent Allocation

- Must meet HD = 0.94 utilisation requirement of previous allocation (subject to change)
- Other criteria to be met
  - Correct registrations (all /48s registered)
  - Correct assignment practices etc
- Subsequent allocation results in a doubling of the address space allocated to it
  - Resulting in total IPv6 prefix is 1 bit shorter
  - Or sufficient for 2 years requirement

IPv6 Utilisation

- Utilisation determined from end site assignments
  - ISP responsible for registration of all /48 assignments
  - Intermediate allocation hierarchy not considered
- Utilisation of IPv6 address space is measured differently from IPv4
  - Use HD ratio to measure
- Subsequent allocation may be requested when IPv6 utilisation requirement is met

IPv6 Assignment and Utilisation Requirement

- IPv6 assignment and utilisation requirement policy
  - HD ratio: 0.94
  - Measurement unit: /56
- The HD ratio threshold is
  - HD=log(/56 units assigned) / log (16,777,216)
  - 0.94 = 6,183,533 x /56 units
- Calculation of the HD ratio
  - Convert the assignment size into equivalent /56 units
    - Each /48 end site = 256 x /56 units
    - Each /52 end site = 16 x /56 units
    - Each /56 end site = 1 x /56 units
    - Each /60 end site = 1/16 x /56 units
    - Each /64 end site = 1/256 x /56 units

IPv6 Utilisation (HD = 0.94)

- Percentage utilisation calculation

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

RFC 3194

> "In a hierarchical address plan, as the size of the allocation increases, the density of assignments will decrease."

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

IPv6 Portable Assignment for Multi-homing

- 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
  - Assignment from a specified block separately from portable allocations address space

How do I Apply for IPv6 Addresses?

Check your eligibility for IPv6 addresses

Read IPv6 policies
http://www.apnic.net/policy/ipv6-address-policy

Read IPv6 guideline
http://www.apnic.net/publications/media-library/corporate-documents/resource-guidelines/ipv6-guidelines

Do you have an APNIC account?

If not, become an APNIC member or open a non-member account

Complete an IPv6 address request form

Submit the form hostmaster@apnic.net

Questions:
email: helpdesk@apnic.net
Helpdesk chat: http://www.apnic.net/helpdesk

Questions?

Overview

- IRMe
  - Introduction to APNIC
  - APNIC policy development process
  - Internet registry policies
  - Requesting IP resources
  - Second opinion request
  - IPv6 Overview
  - **APNIC whois database**
  - MyAPNIC (Demo)
  - Autonomous System Numbers
  - Reverse DNS
  - APNIC Helpdesk

What is the APNIC Database?

- Public network management database
  - Operated by IRs
    - 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)
  - Authorisation

Whois Database Query - Clients

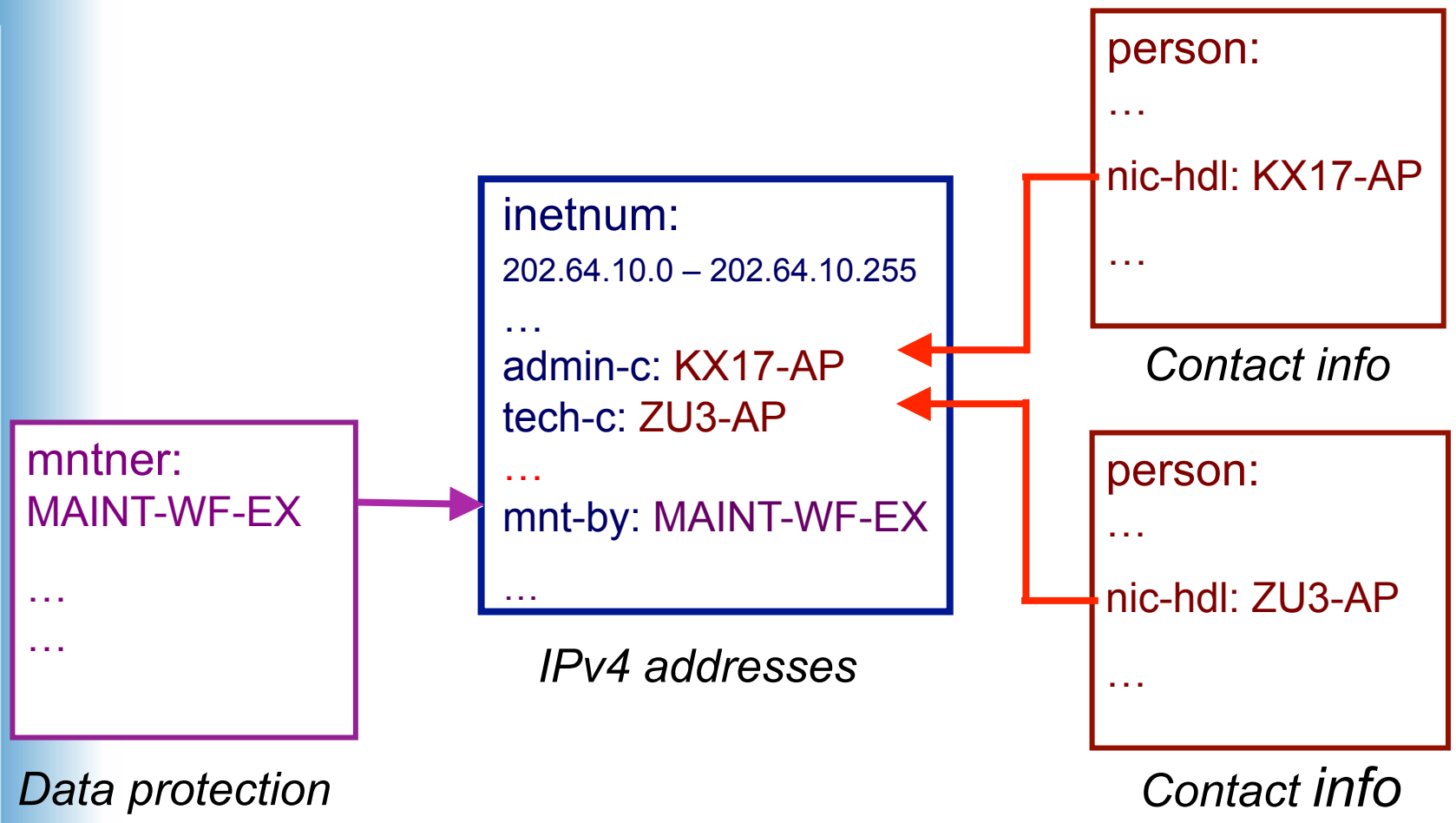
- Standard whois client
  - Included with many Unix distributions
  - RIPE extended whois client
    - http://ftp.apnic.net/apnic/dbase/tools/ripe-dbase-client.tar.gz
- Query via the APNIC website
  - http://www.apnic.net/apnic-bin/whois2.pl
- Query clients - MS-Windows etc
  - Many available

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/

Inter-related Objects



Database Query – Look-up Keys

OBJECT TYPE	ATTRIBUTES – LOOK-UP KEYS
person	name, nic-hdl, e-mail
role	name, nic-hdl, e-mail
mntner	maintainer name
inetnum	network number, name
domain	domain name
aut-num	as number
as-macro	as-macro name
route	route value
inet6num	network number, name

* Whois supports queries on any of these objects/keys

Object Templates

To obtain template structure*, use :

whois -t <object type>

```
% whois -h whois.apnic.net -t person
```

```
person:   [mandatory]  [single]     [primary/look-up key]
address:  [mandatory]  [multiple]   [ ]
country:  [mandatory]  [single]     [ ]
phone:    [mandatory]  [multiple]   [ ]
fax-no:   [optional]   [multiple]   [ ]
e-mail:   [mandatory]  [multiple]   [look-up key]
nic-hdl:  [mandatory]  [single]     [primary/look-up key]
remarks:  [optional]   [multiple]   [ ]
notify:   [optional]   [multiple]   [inverse key]
mnt-by:   [mandatory]  [multiple]   [inverse key]
changed:  [mandatory]  [multiple]   [ ]
source:   [mandatory]  [single]     [ ]
```

*Recognised by the RIPE whois client/server

Person Object Example

– Person objects contain contact information

Attributes	Values
person:	Ky Xander
address:	ExampleNet Service Provider
address:	2 Pandora St Boxville
address:	Wallis and Futuna Islands
country:	WF
phone:	+680-368-0844
fax-no:	+680-367-1797
e-mail:	kxander@example.com
nic-hdl:	KX17-AP
mnt-by:	MAINT-WF-EX
changed:	kxander@example.com 20020731
source:	APNIC

What is a nic-hdl?

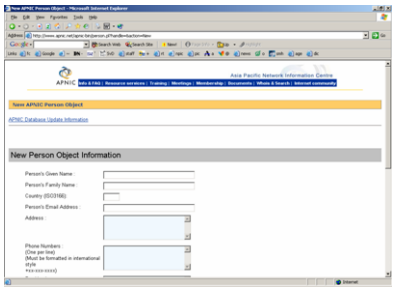
- Unique identifier for a person
- Represents a person object
  - Referenced in objects for contact details
    - (inetnum, aut-num, domain…)
  - format: <XXXX-AP>
    - Eg: KX17-AP

```
person:   Ky Xander
address:      ExampleNet Service Provider
address:      2 Pandora St Boxville
address:      Wallis and Futuna Islands
country:      WF
phone:        +680-368-0844
fax-no:       +680-367-1797
e-mail:       kxander@example.com
nic-hdl:  KX17-AP
mnt-by:       MAINT-WF-EX
changed:      kxander@example.com 20020731
source:       APNIC
```

Creating a Person Object

Creating objects in Whois:

http://www.apnic.net/apnic-info/whois_search2/using-whois/updating-whois/Creating-objects



1. **Fill out person object form on web**
   - Name, e-mail, phone, address etc
   - Tick 'MNT-NEW' for temporary protection
2. **Completed template is sent to you**
3. **Forward template to** **<auto-dbm@apnic.net>**
4. **Person object created and nic-hdl is generated**

Inetnum Object Example

– Contain IP address allocations / assignments

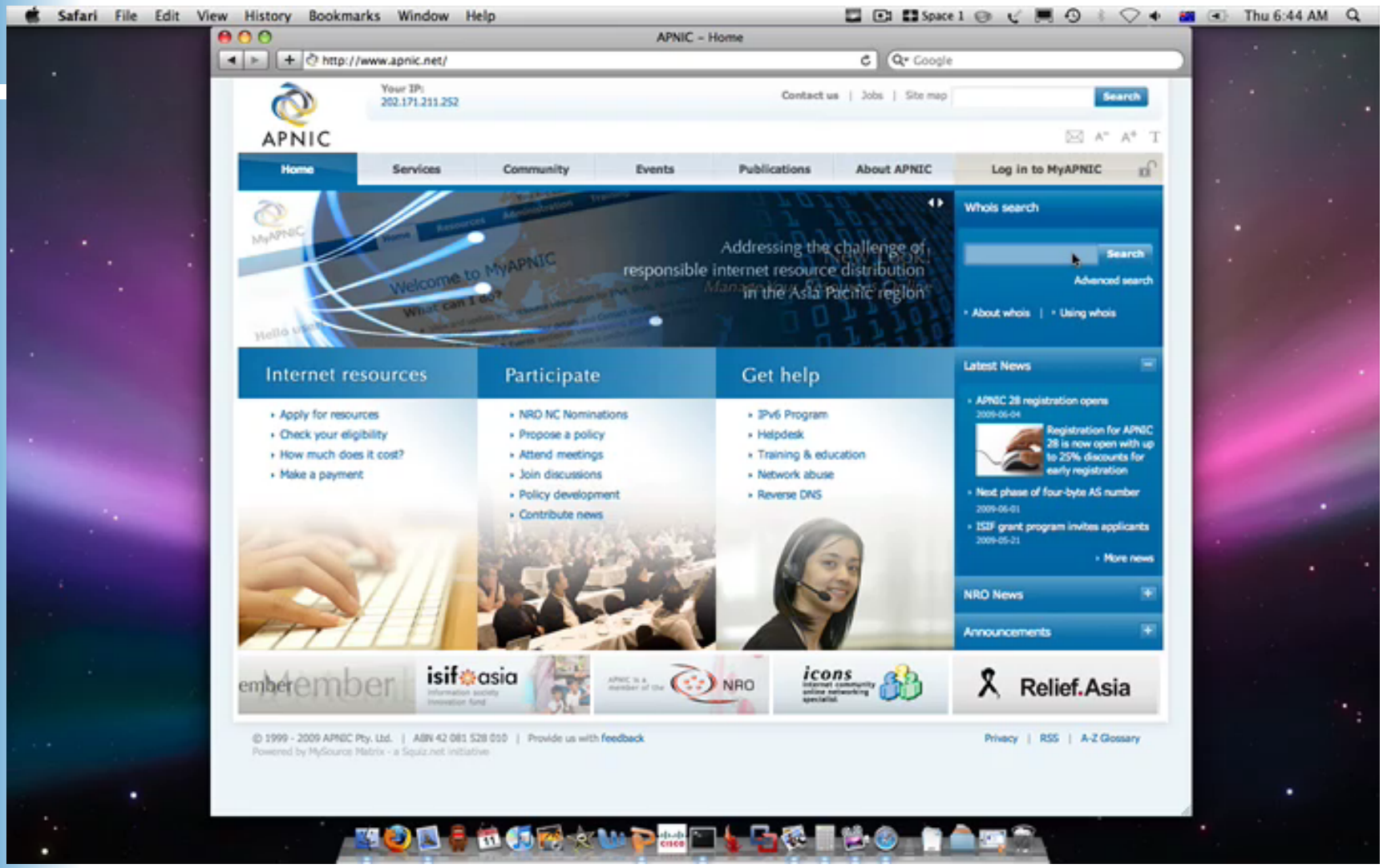
Attributes	Values
inetnum:	202.51.64.0 - 202.51.95.255
netname:	CCNEP-NP-AP
descr:	Communication & Communicate Nepal Ltd
descr:	VSAT Service Provider, Kathmandu
country:	NP
admin-c:	AS75-AP
tech-c:	AS75-AP
mnt-by:	APNIC-HM
mnt-lower:	MAINT-NP-ARUN
changed:	hostmaster@apnic.net 20010205
status:	ALLOCATED PORTABLE
source:	APNIC

Whois Database Query - UNIX

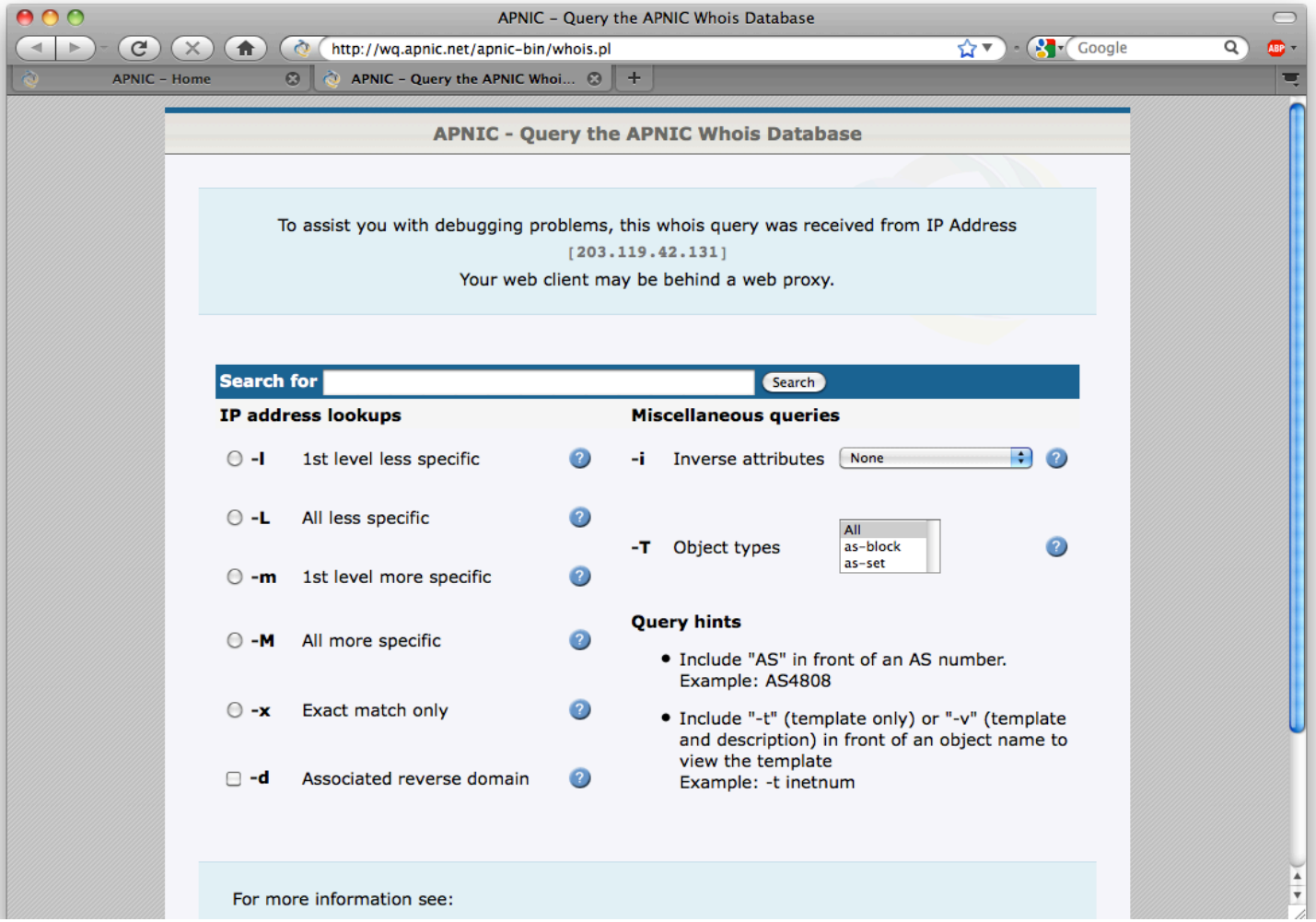
```
% whois zulrich@example.com
% whois zu3-ap
% whois "zane ulrich"

person:      Zane Ulrich
address:     ExampleNet Service Provider
address:     2 Pandora St Boxville
address:     Wallis and Futuna Islands
country:     WF
phone:       +680-368-0844
fax-no:      +680-367-1797
e-mail:      zulrich@example.com
nic-hdl:     ZU3-AP
mnt-by:      MAINT-WF-EX
changed:     zulrich@example.com 20020731
source:      APNIC
```

APNIC Whois Web Query



APNIC Whois web query



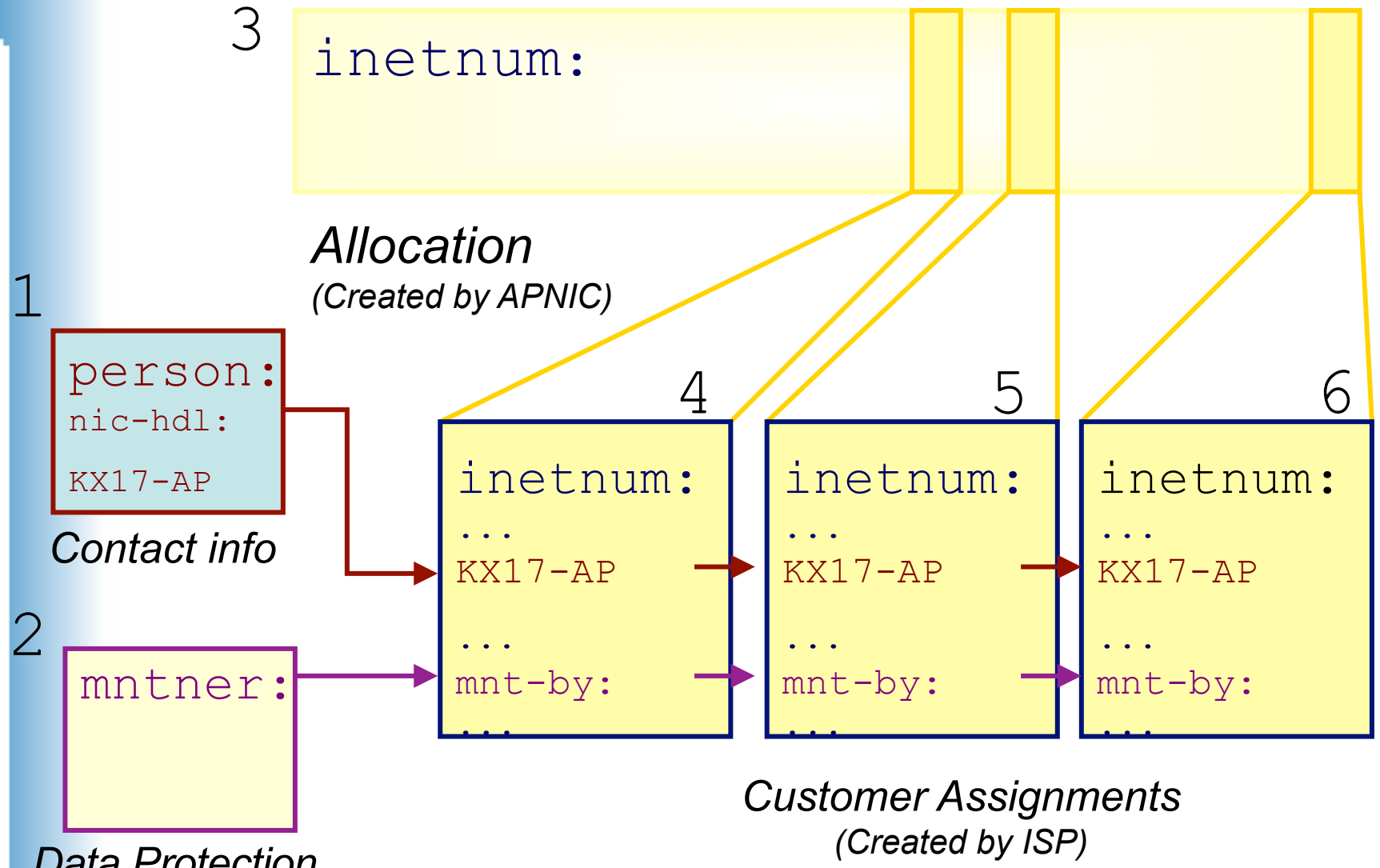
ISP Registration Responsibilities

1. Create person objects for contacts
   - To provide contact info in other objects
2. Create mntner object
   - To provide protection of objects

     (To be discussed later)

3. Create inetnum objects for all customer address assignments as private data
   - But you may change these to be public data if you wish
   - Allocation object created by APNIC

Using the db – Step by Step



Role Object - Example

– Contains contact info for several contacts

Attributes	Values
role:	Xnet IP ADMINISTRATORS
address:	2000 Miller Road North Sydney
country:	AU
phone:	+61-2-93420000
phone:	+61-2-93420000
fax-no:	+61-2-9342-0900
fax-no:	+61-2-9342-6100
e-mail:	noc@xnet.net.au
admin-c:	XNC2-AP
tech-c:	XNC2-AP
tech-c:	XNB120-AP
nic-hdl:	XND1-AP
mnt-by:	MAINT-XNET-AP
source:	APNIC

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

Replacing Contacts in the db

- *using person objects*

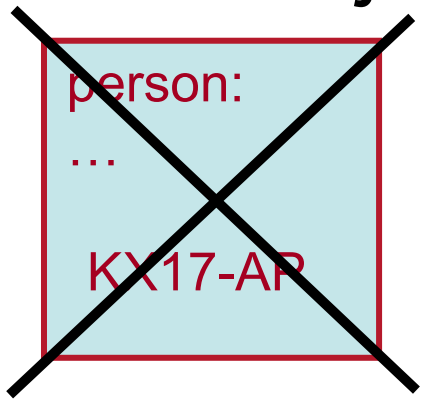
K. Xander is leaving my organisation. Z. Ulrich is replacing him.

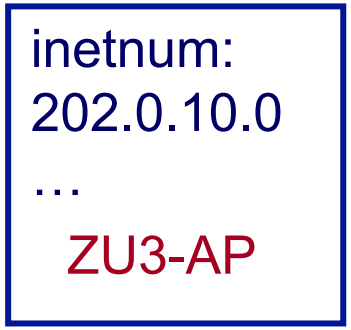
1. Create a person object for new contact (Z. Ulrich).

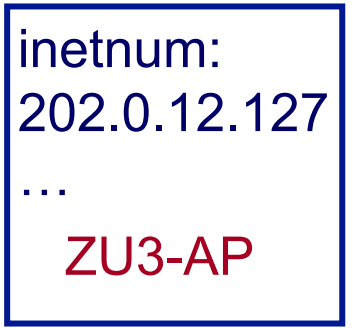
2. Find all objects containing old contact (K. Xander).

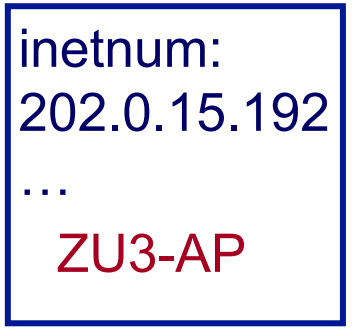
3. Update all objects, replacing old contact (KX17-AP) with new contact (ZU3-AP).

4. Delete old contact's (KX17-AP) person object.









Replacing Contacts in the db

– *using a role object*

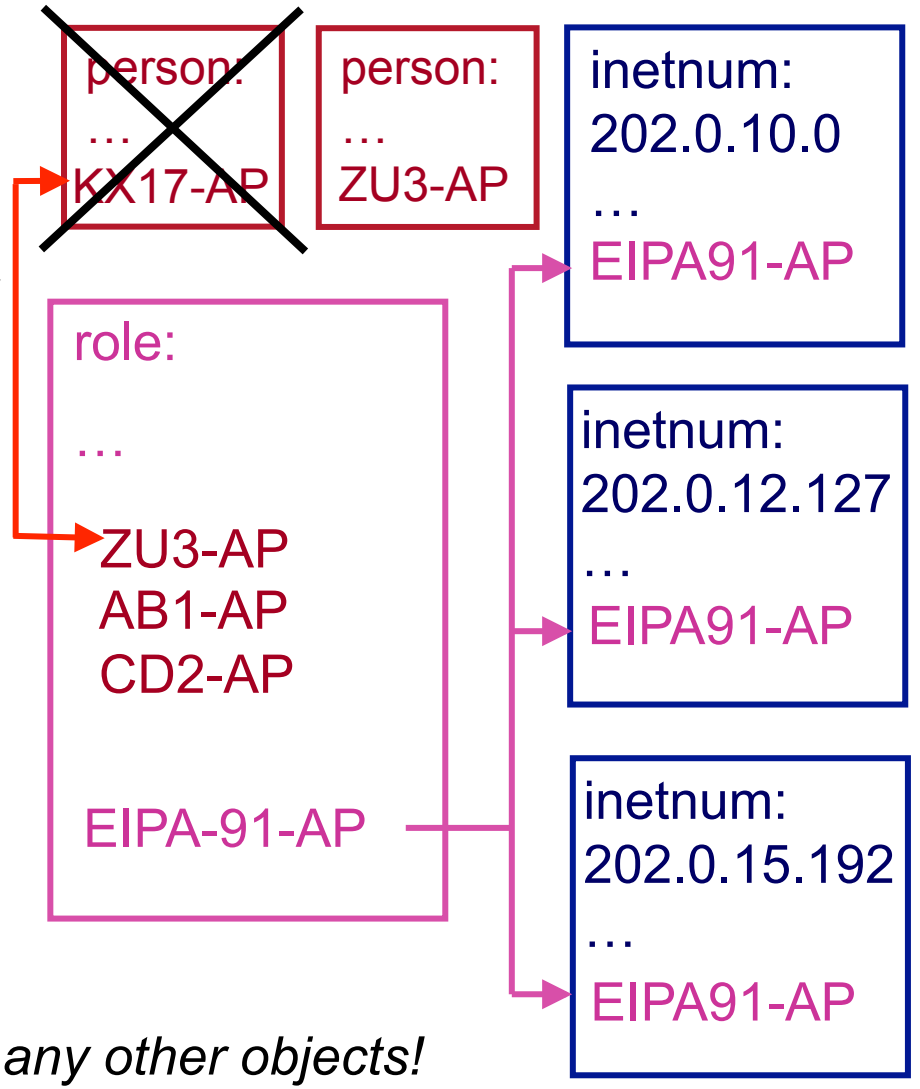
K. Xander is leaving my organisation. Z. Ulrich is replacing him.

I am using a role object containing all contact persons, which is referenced in all my objects.

1. Create a person object for new contact (Z. Ulrich).

2. Replace old contact (KX17-AP) with new contact (ZU3-AP) in role object

3. Delete old contact's person object.



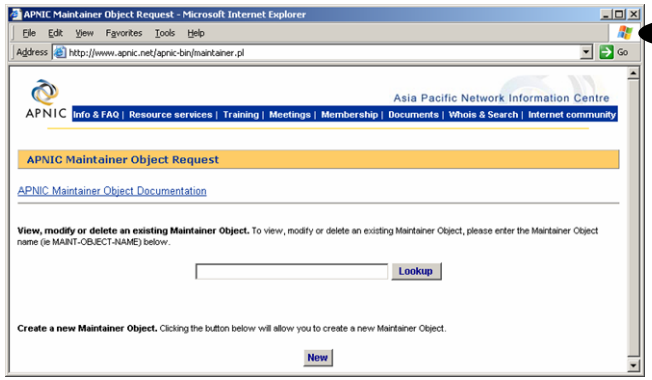
No need to update any other objects!

Database Protection - Maintainer Object

```
mntner: MAINT-WF-EX
descr:          Maintainer for ExampleNet Service Provider
country:        WF
admin-c:        ZU3-AP
tech-c:         KX17-AP
upd-to:         kxander@example.com
mnt-nfy:        kxander@example.com
auth:           CRYPT-PW apHJ9zF3o
mnt-by:         MAINT-WF-EX
referral-by:    MAINT-APNIC-AP
changed:        kxander@example.com 20020731
source:         APNIC
```

- protects other objects in the APNIC database

Creating a Maintainer Object



1. Fill out webform
   - Provide:
     - Admin-c & tech-c
     - password
     - email address etc
2. Completed form will be sent to you
3. Forward request to maint-request@apnic.net
4. Maintainer will be created *manually*
   - Manual verification by APNIC Hostmasters
5. Update your person object with mntner

http://www.apnic.net/services/whois_guide.html

Database Protection

- Authorisation
  - "mnt-by" references a mntner object
    - Can be found in all database objects
    - "mnt-by" should be used with every object!
- Authentication
  - Updates to an object must pass the authentication rule specified by its maintainer object

Authorisation Mechanism

```
inetnum:        202.137.181.0 – 202.137.185.255
netname:        EXAMPLENET-WF
descr:          ExampleNet Service Provider
……
mnt-by:         MAINT-WF-EX
```

```
mntner: MAINT-WF-EX
descr:          Maintainer for ExampleNet Service Provider
country:        WF
admin-c:        ZU3-AP
tech-c:         KX17-AP
upd-to:         kxander@example.com
mnt-nfy:        kxander@example.com
auth:           CRYPT-PW apHJ9zF3o
mnt-by:         MAINT-WF-EX
changed:        kxander@example.com 20020731
source:         APNIC
```

Authentication Methods

- ‘auth’ attribute
  - Crypt-PW
    - Crypt (Unix) password encryption
    - Use web page to create your maintainer
  - PGP – GNUPG
    - Strong authentication
    - Requires PGP keys
  - MD5
    - Available

Mnt-by & Mnt-lower

- ‘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 mntner object
  - Hierarchical authorisation for inetnum & domain objects
  - The creation of child objects must satisfy this mntner
  - Protects against unauthorised updates to an allocated range - highly recommended!

Authentication / Authorisation
– APNIC allocation to member

- Created and maintained by APNIC

```
Inetnum:     203.146.96.0 - 203.146.127.255
netname:     LOXINFO-TH
descr:       Loxley Information Company Ltd.
Descr:       304 Suapah Rd, Promprab,Bangkok
country:     TH
admin-c:     KS32-AP
tech-c:      CT2-AP
mnt-by:      APNIC-HM
mnt-lower:   LOXINFO-IS
changed:     hostmaster@apnic.net 19990714
source:      APNIC
```

1. Only APNIC can change this object
2. Only LOXINFO-TH can create assignments within this allocation

Authentication / Authorisation

– Member assignment to customer

- Created and maintained by APNIC member

```
Inetnum:     203.146.113.64 - 203.146.113.127
netname:     SCC-TH
descr:       Sukhothai Commercial College
Country:     TH
admin-c:     SI10-AP
tech-c:      VP5-AP
mnt-by:      LOXINFO-IS
changed:     voraluck@loxinfo.co.th 19990930
source:      APNIC
```

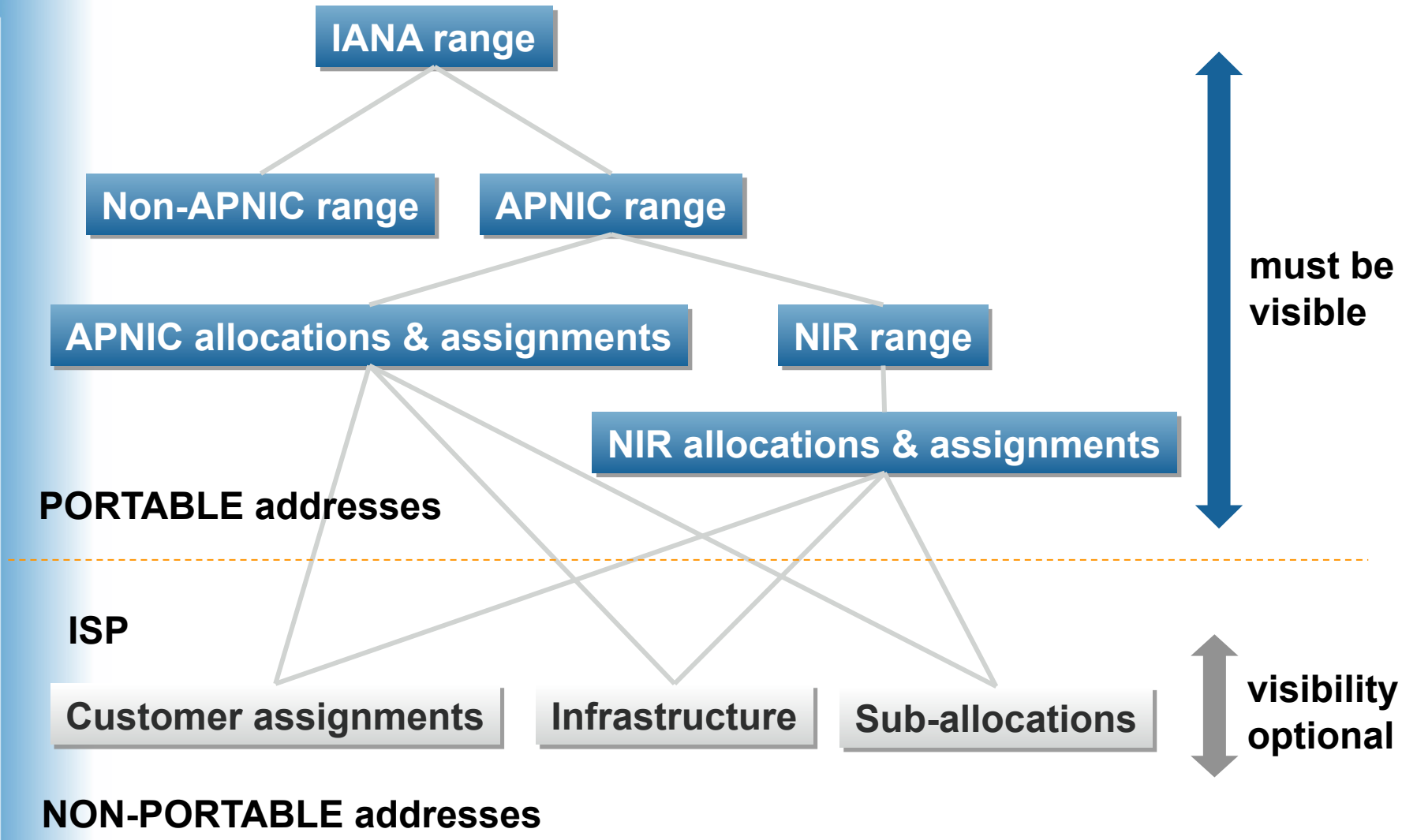
Only LOXINFO-IS can change this object

Privacy of Customer Assignments

Customer Privacy

- Privacy issues
  - Concerns about publication of customer information
  - Increasing government concern
- APNIC legal risk
  - Legal responsibility for accuracy and advice
  - Damages incurred by maintaining inaccurate personal data
- Customer data is hard to maintain
  - APNIC has no direct control over accuracy of data
- Customer assignment registration is still mandatory

What Needs to be Visible?



Questions?

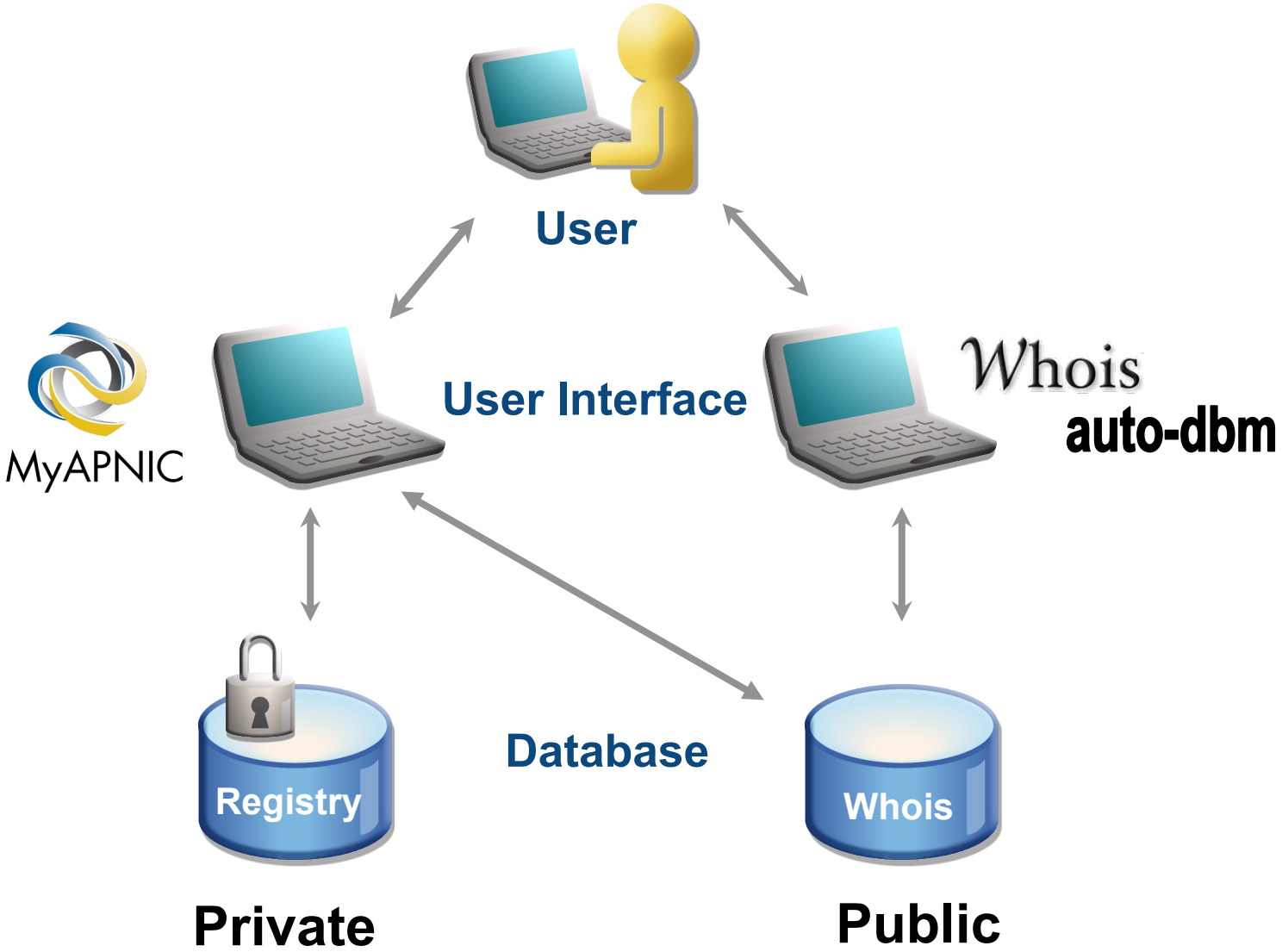
Overview

- IRMe
  - Introduction to APNIC
  - APNIC policy development process
  - Internet registry policies
  - Requesting IP resources
  - Second opinion request
  - IPv6 Overview
  - APNIC whois database
  - **MyAPNIC (Demo)**
  - Autonomous System Numbers
  - Reverse DNS
  - APNIC Helpdesk

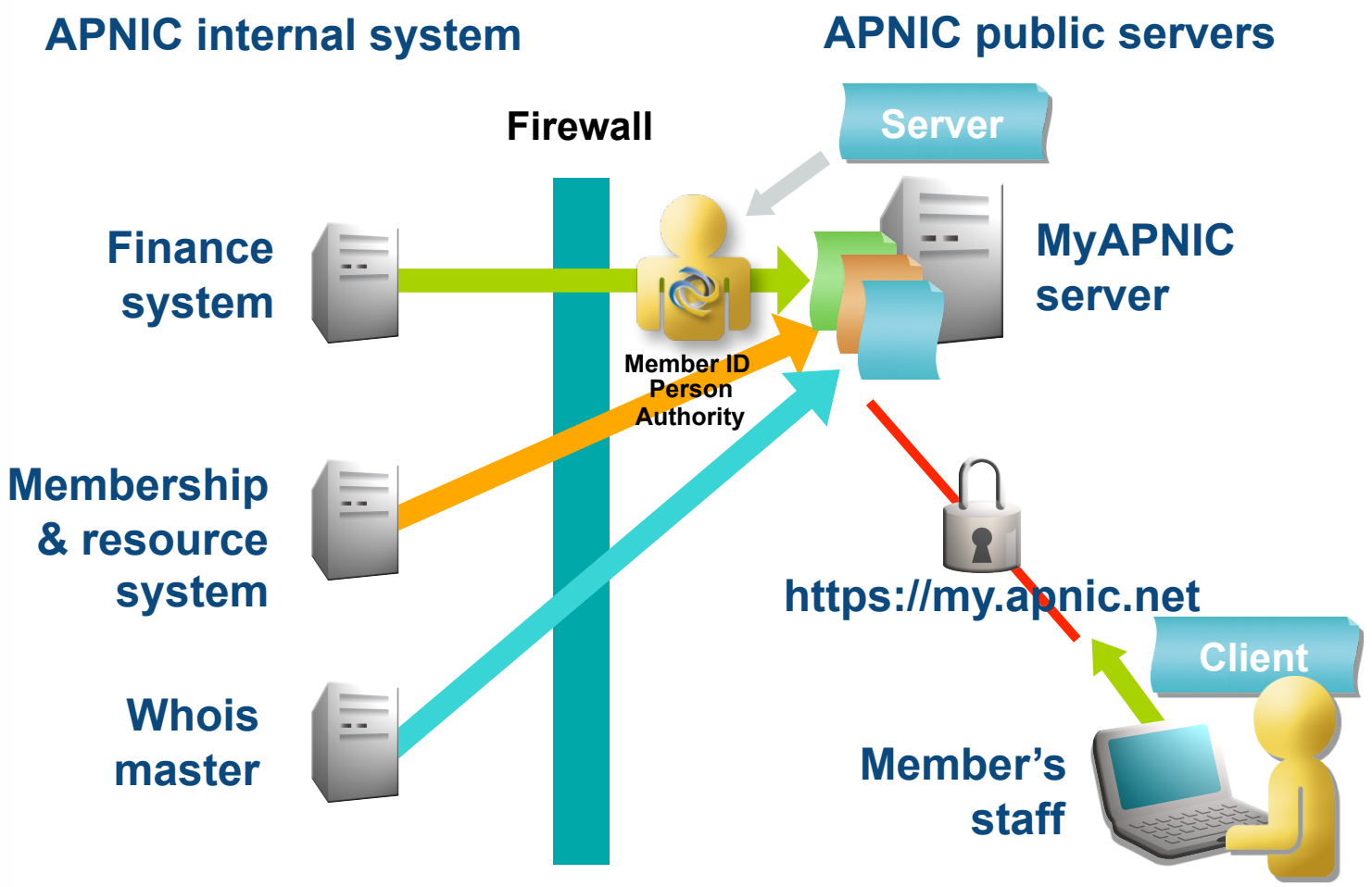
MyAPNIC

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

Database Tools



How it Works


APNIC internal system
APNIC public servers
Firewall
Server
Finance system
Membership & resource system
Whois master
Member ID
Person
Authority
MyAPNIC server
https://my.apnic.net
Client
Member's staff

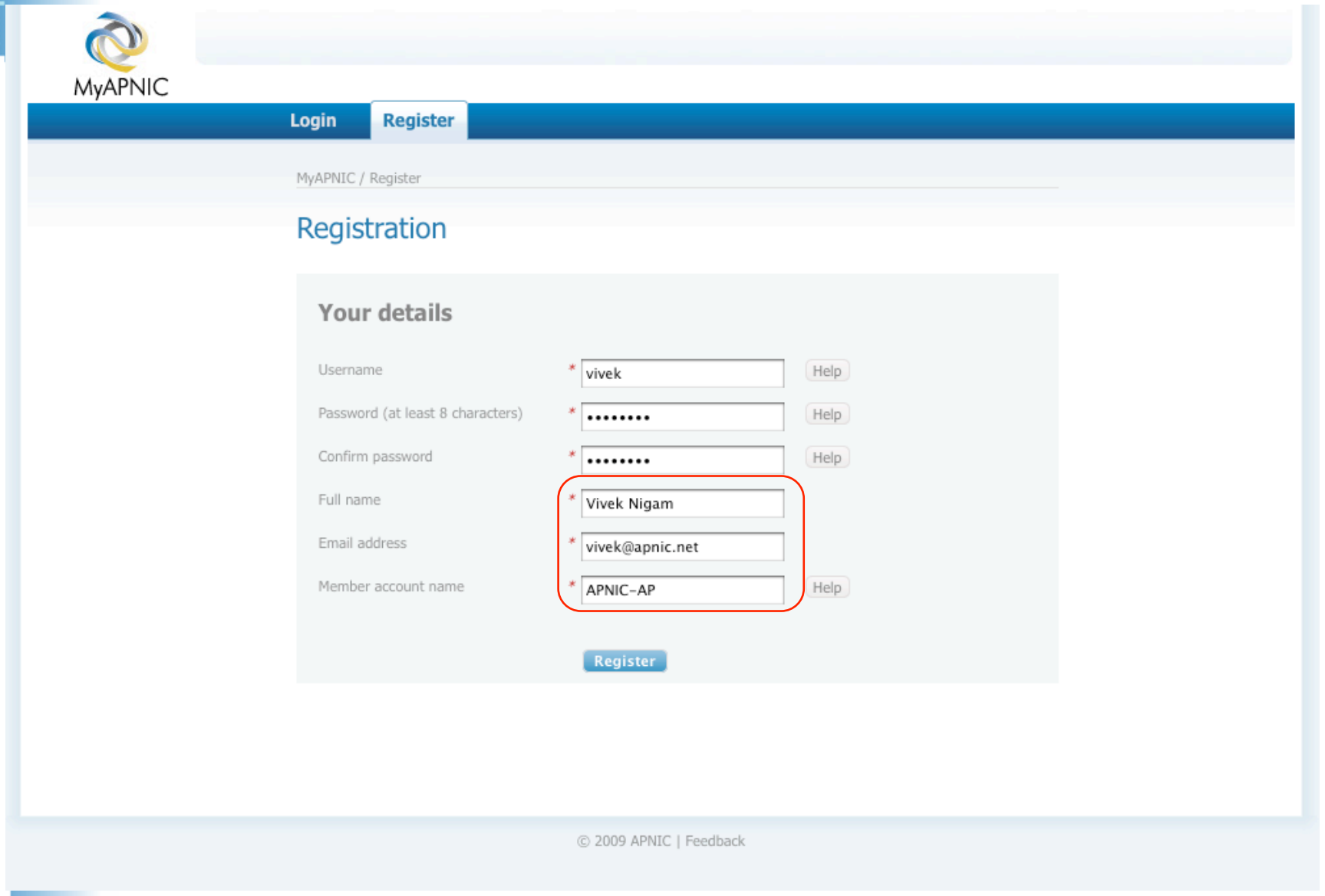
Accessing My APNIC

- Two options
  - Digital Certificate (Corporate Contact)
  - Username & Password (limited access to My APNIC)

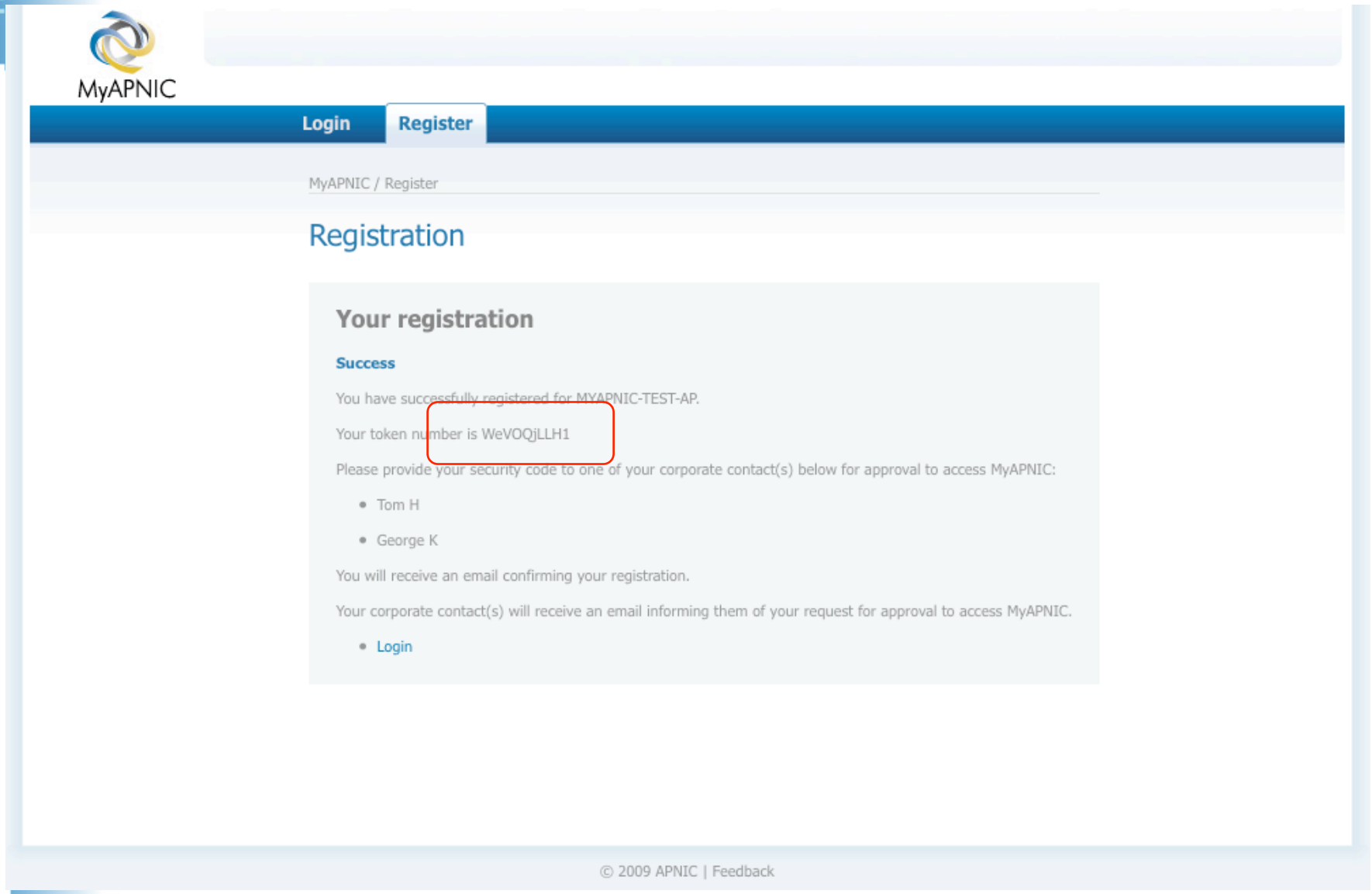
MyAPNIC Functions

- Resource information
  - IPv4, IPv6, ASN
- Administration
  - Membership detail
  - Contact persons
  - Billing history
- Training
  - Training history
  - Training registration
- Technical
  - Looking glass
- Tools

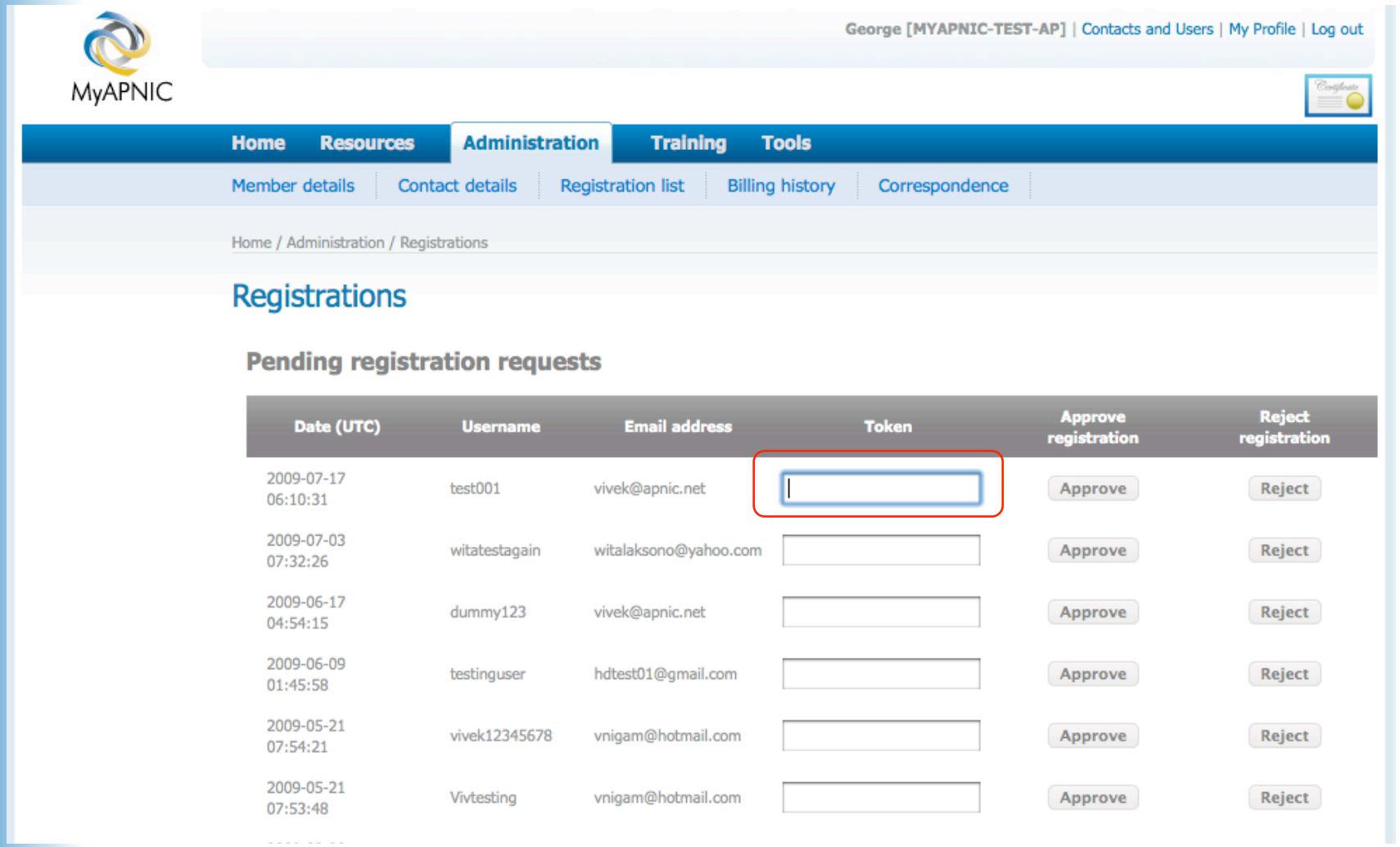
MyAPNIC registration



MyAPNIC Registration



MyAPNIC Registration

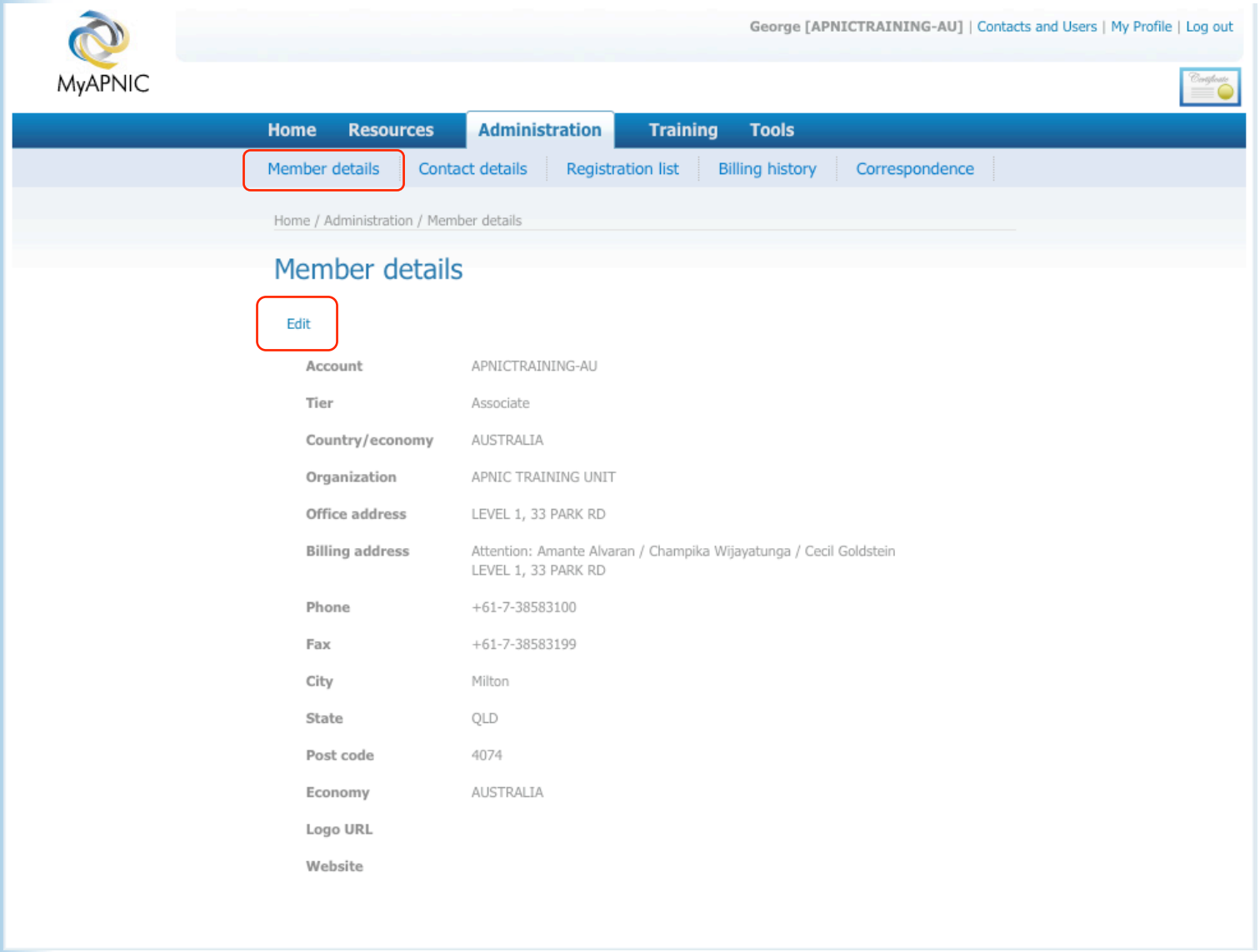


MyAPNIC

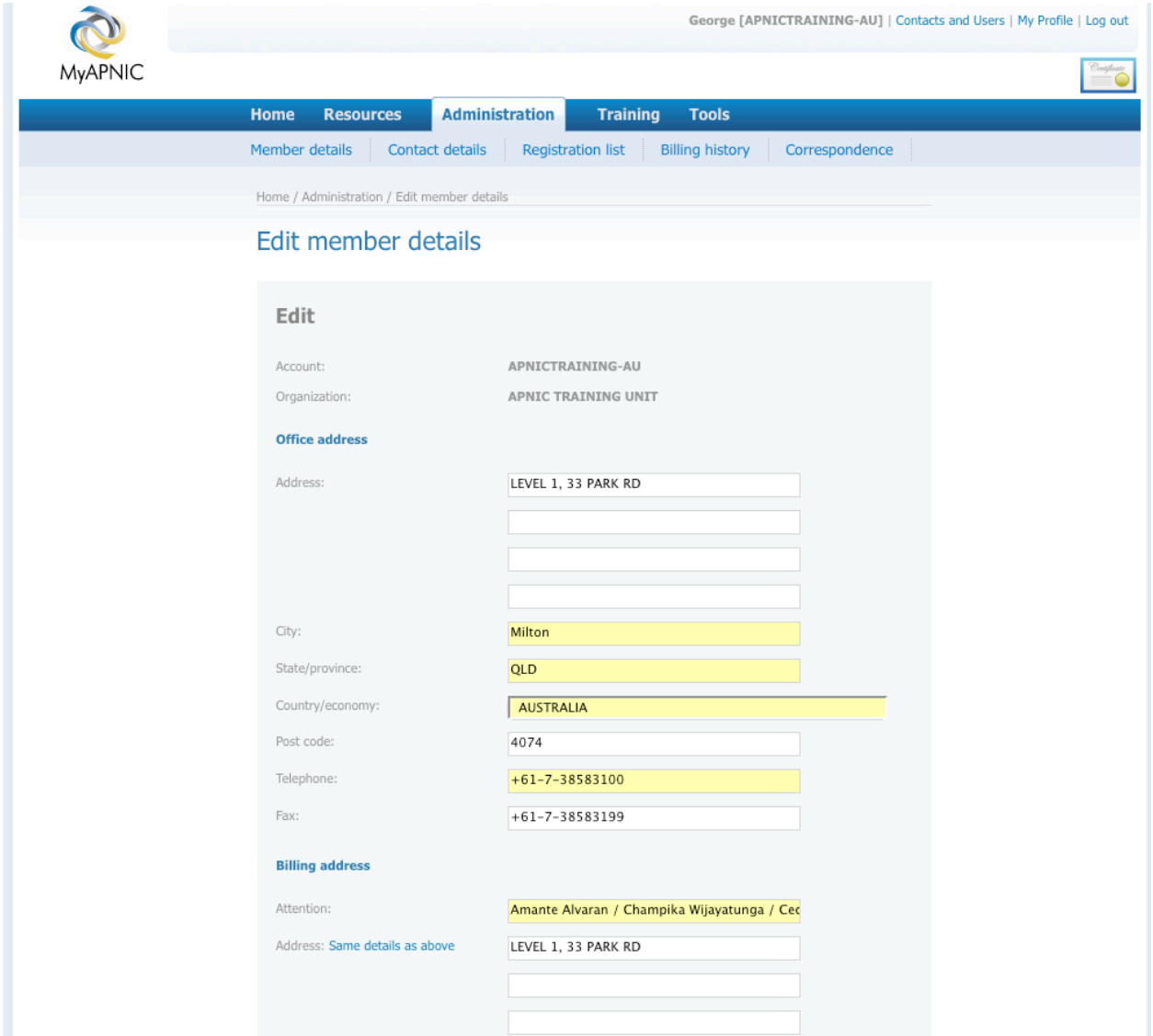
Digital certificates

- Privileges of Digital Certificate
- Approve new users
- Add or remove contacts
- Update organization details
- Online voting

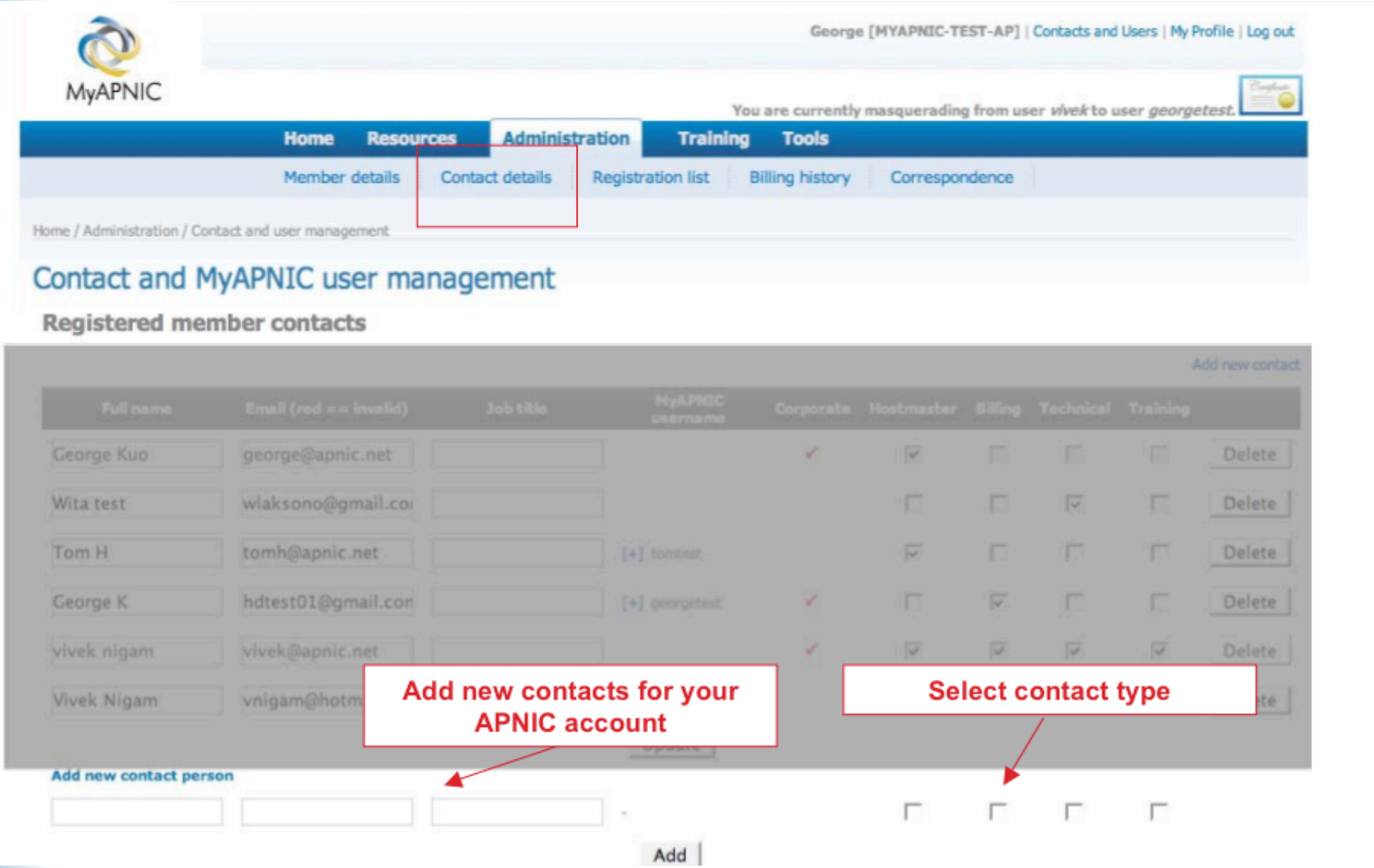
Manage your membership



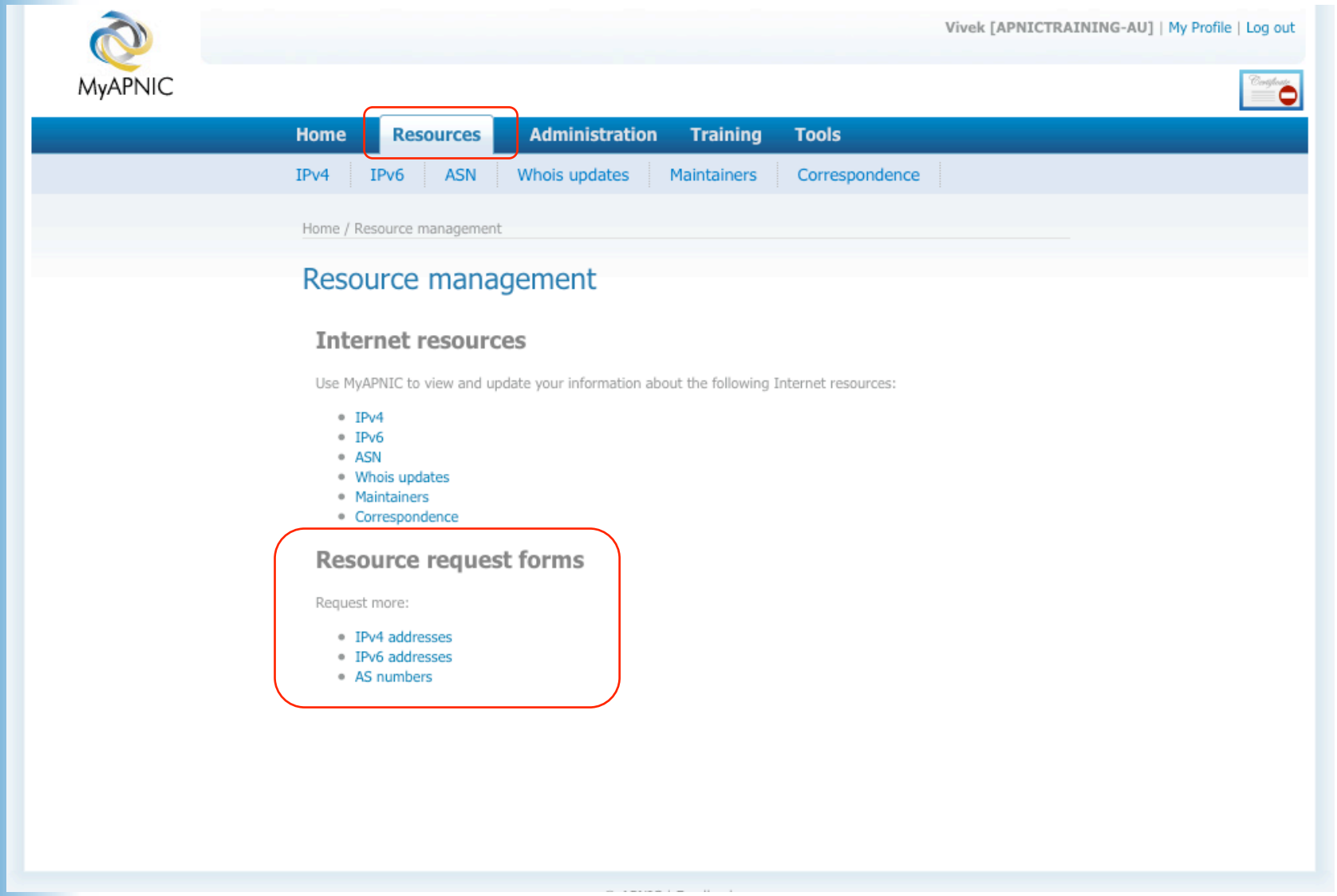
Manage your membership



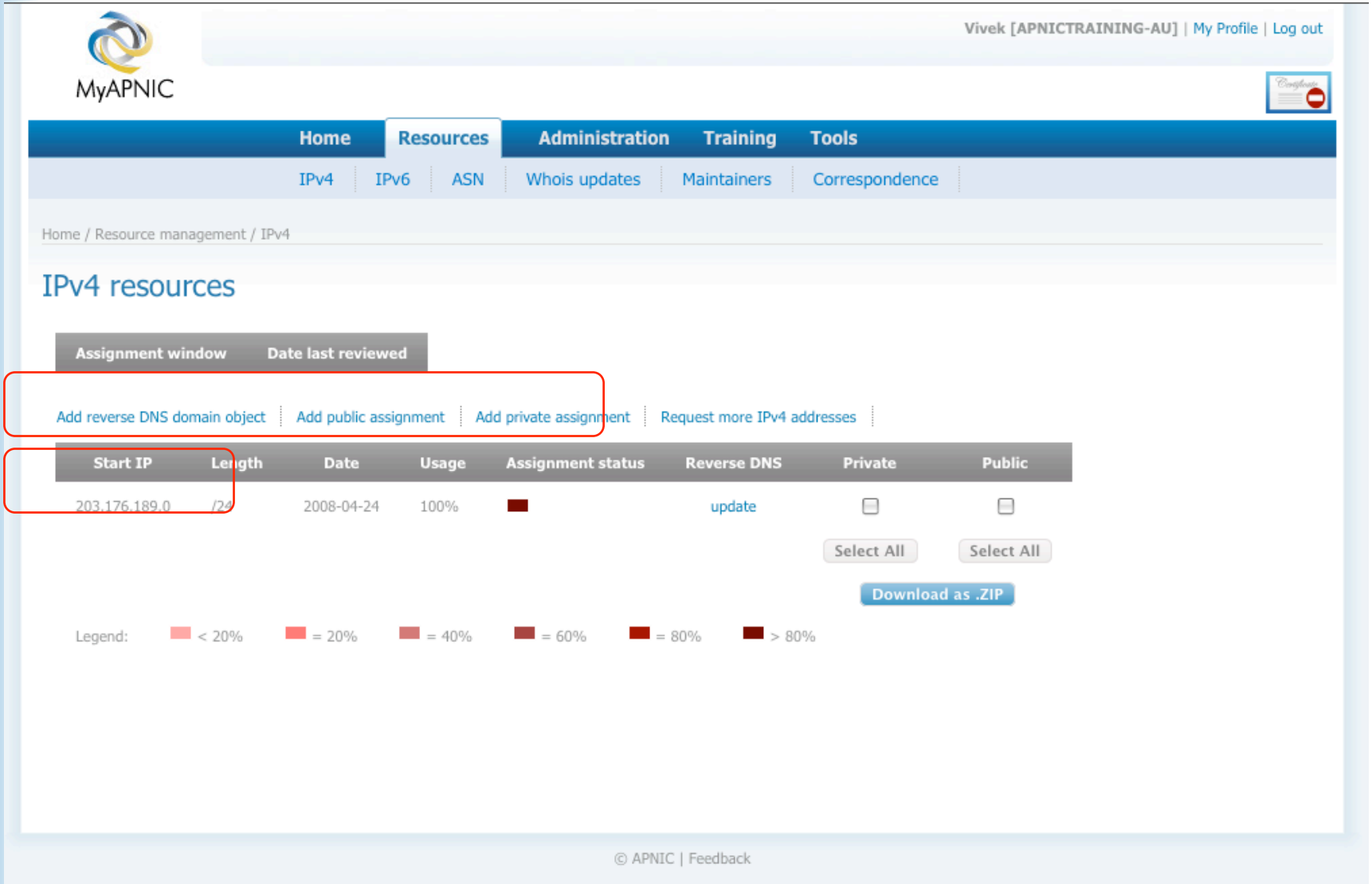
Update contact details



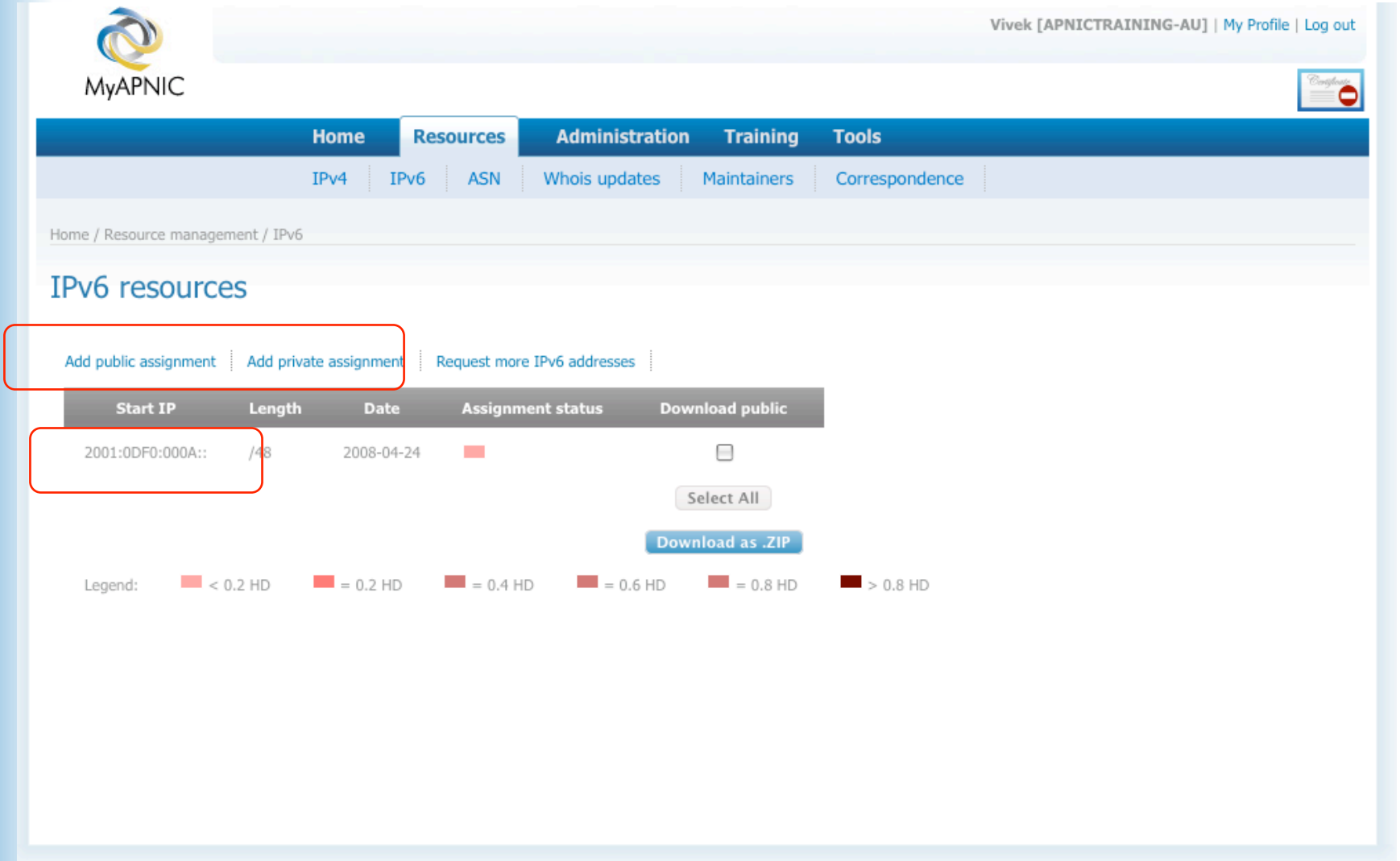
Manage Internet Resources



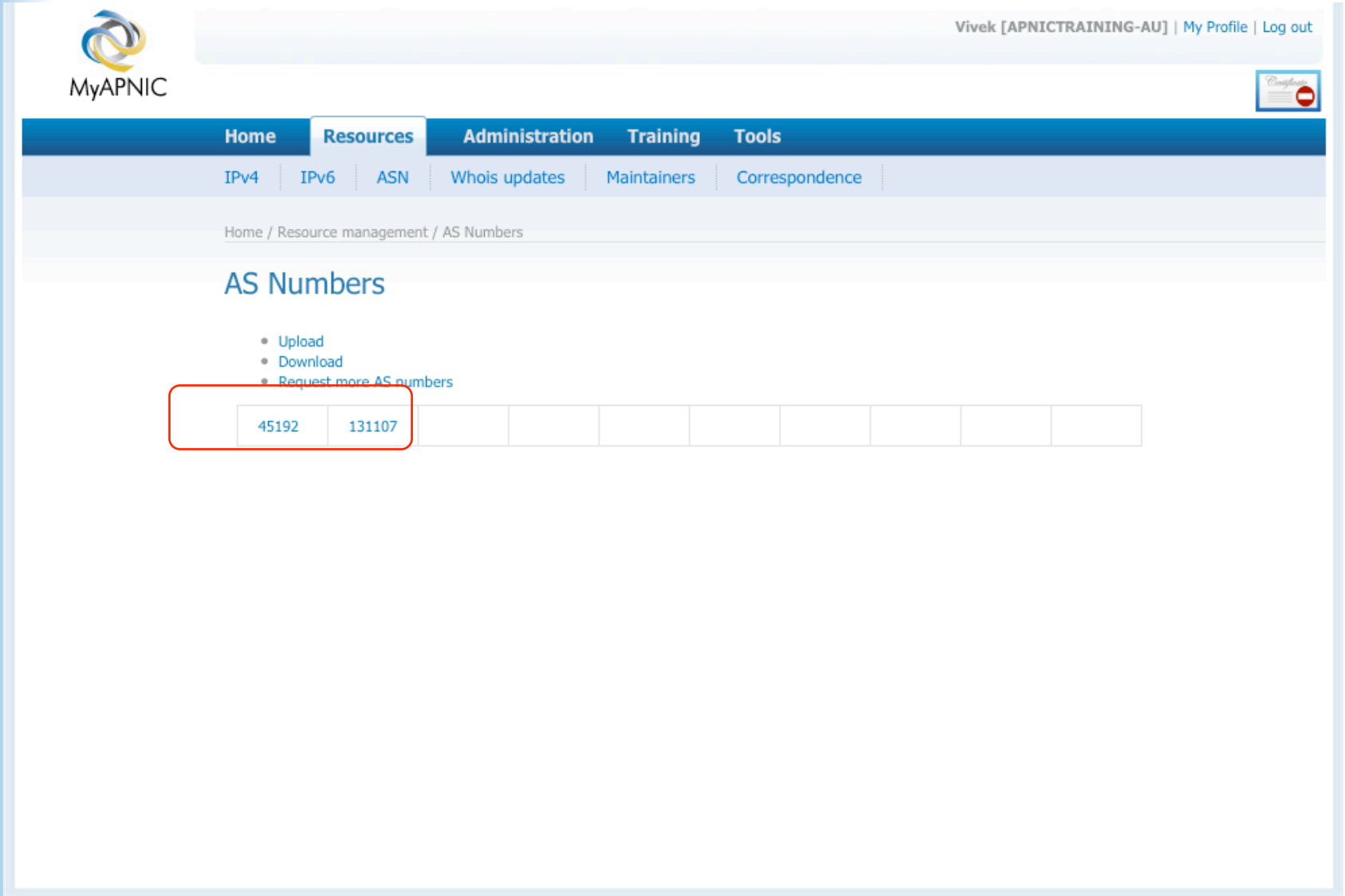
IPv4 Resources



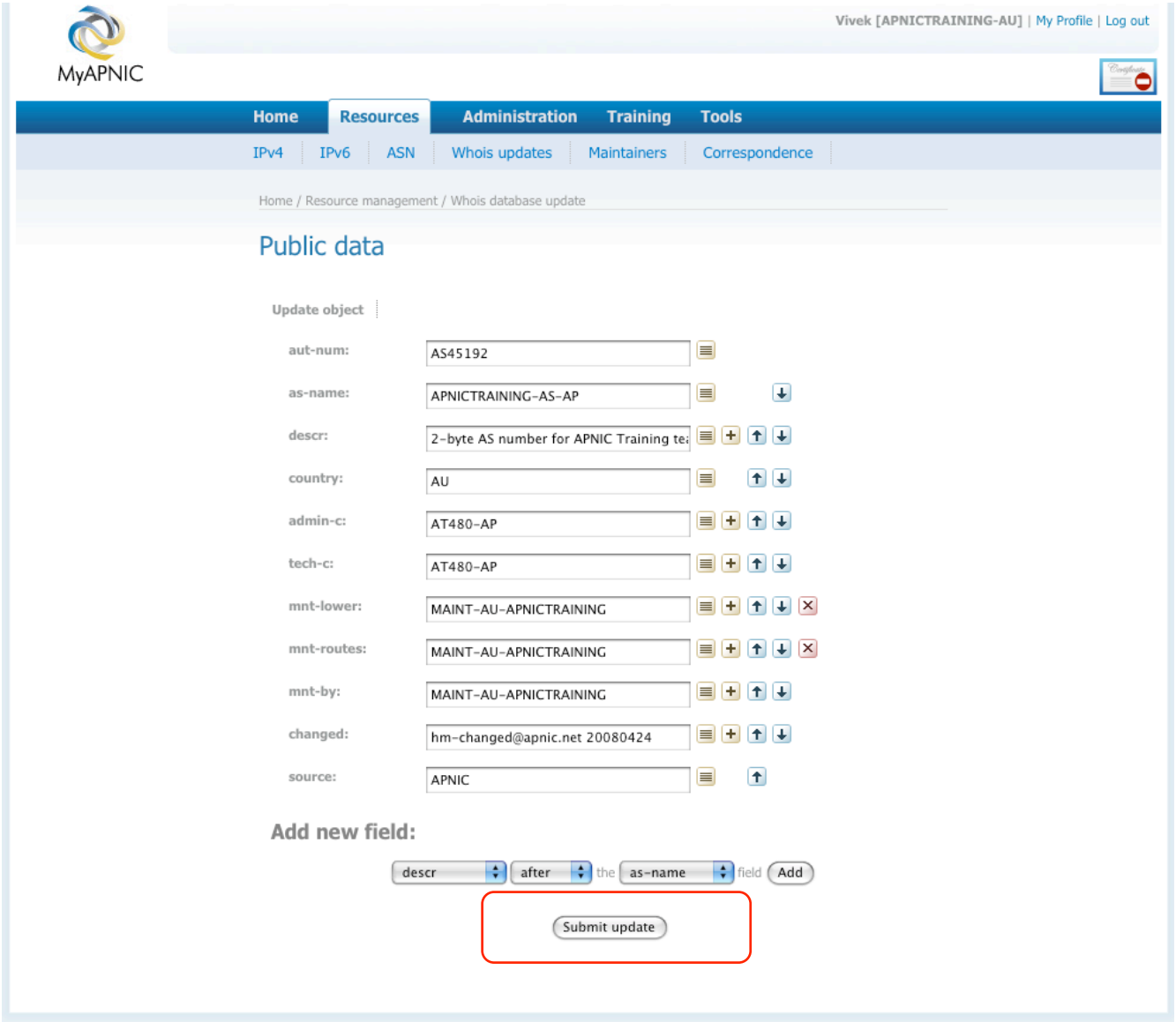
IPv6 Resources



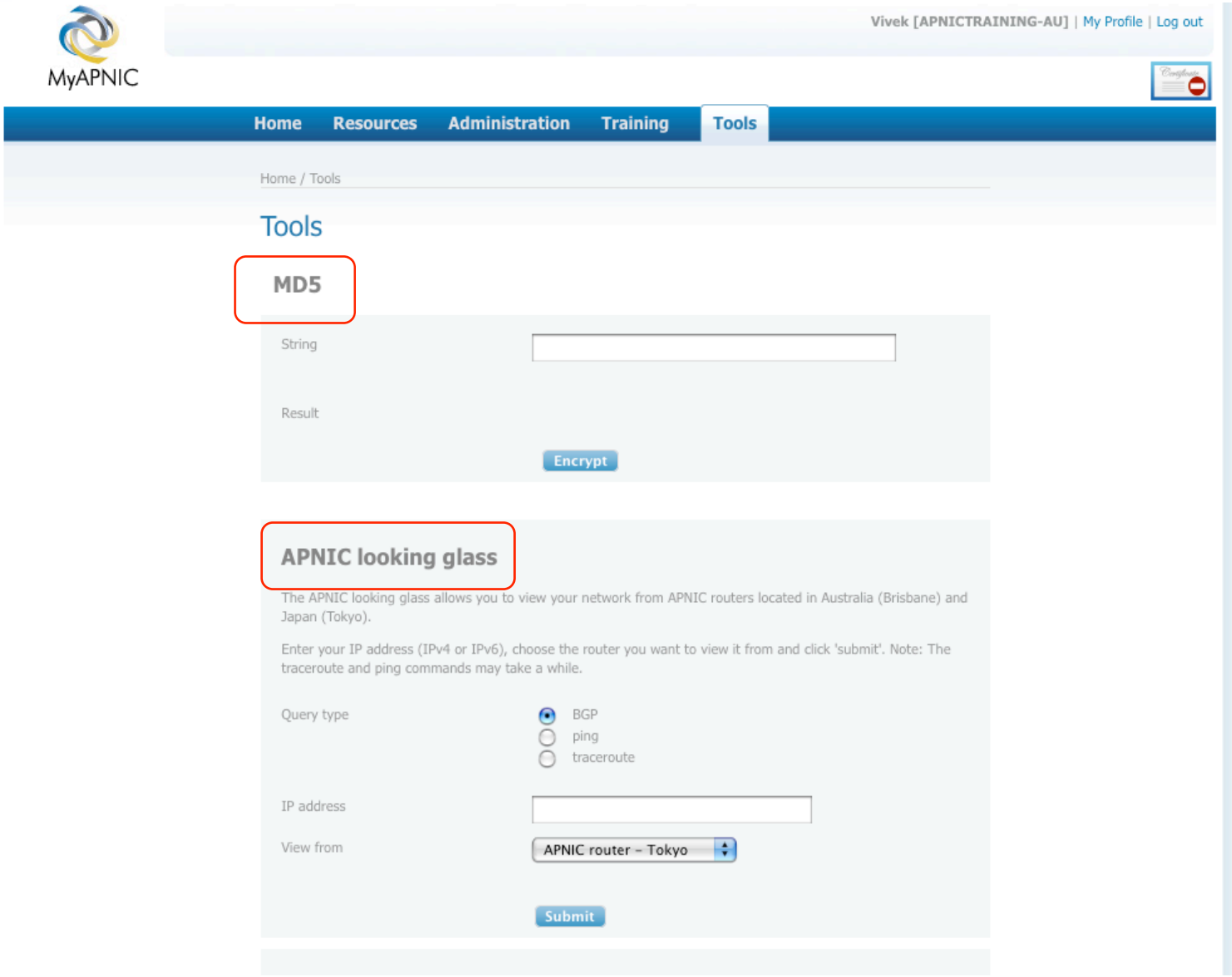
AS number Resources



AS number Resources



Useful tools



Digital Certificates

- Are used:
  - to manage staff contacts. Only registered Corporate Contacts have the authority to change or approve users in MyAPNIC.
  - for online voting in the APNIC elections
  - to secure email exchange with APNIC

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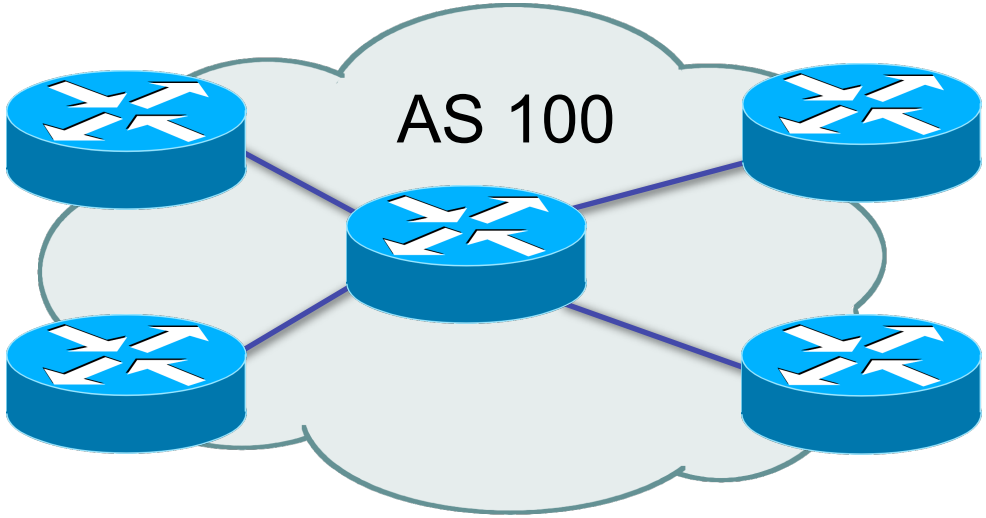
  - **Autonomous System Number (ASN)**
  - Reverse DNS
  - APNIC Helpdesk

What is an Autonomous System?

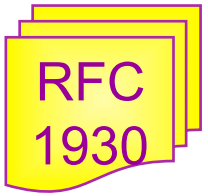


- Collection of networks with same routing policy
- Usually under single ownership, trust or administrative control

When do I Need an ASN?

- When do I need an AS?
  - Multi-homed network to different providers and
  - Routing policy different to external peers

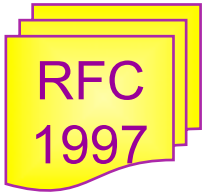
RFC1930: Guidelines for creation, selection and registration of an Autonomous System



When Don't I Need an ASN?

Factors that don't count:

- Transition and 'future proofing'
- Multi-homing to the same upstream
  - RFC2270: A dedicated AS for sites homed to a single provider
- Service differentiation
  - RFC1997: BGP Communities attribute



Requesting an AS Number

1. Requested from APNIC for own network infrastructure
   - AS number is “portable”
2. Requested from APNIC for member customer network
   - ASN is “non-portable”
   - ASN returned if customer changes provider

- Transfers of ASNs
  - Need legal documentation (mergers etc)
  - Should be returned if no longer required

Requesting an ASN

- Complete the request form
  - Existing member:

    Will send request from MyAPNIC
  - New Member:

    Can send AS request along with membership application

4 byte AS Numbers

Background

- Previously 2 byte ASN (16 bits)
  - Possibly run into exhaustion by 2010
  - 4 byte ASN was developed by IETF
- Currently 4 byte ASN distribution policy (32 bits)
- Timeline
  - July 1 2009: Default 4 byte ASN, 2 byte ASN on request with documented justification
  - Jan 2010: 4 byte ASN only

4 Byte AS number

- 2-byte only AS number range 0 – 65535
  (decimal range 0- 65,535)
- 4-byte only AS number range 1.0 - 65535.65535
  (decimal range 65,536 - 4,294,967,295)
- AS number representation
  - AS DOT
  - AS PLAIN

4 Byte AS number

- AS number representation
  - **AS PLAIN**
  - ASPLAIN IETF preferred notation
  - 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 (0 – 65535 - 65,536 - 4,294,967,295)

4 Byte AS number

APNIC resource range:

- In AS DOT: 2.0 ~ 2.1023
- In AS PLAIN: 131072 ~ 132095

AS number converter

http://submit.apnic.net/cgi-bin/convert-asn.pl

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

POLICY RPSL

Questions?

Overview

- IRMe
  - Introduction to APNIC
  - APNIC policy development process
  - Internet registry policies
  - Requesting IP resources
  - Second opinion request
  - IPv6 Overview
  - APNIC whois database
  - MyAPNIC (Demo)
  - Autonomous System Number (ASN)
  - **Reverse DNS**
  - APNIC helpdesk

Reverse DNS - why bother?

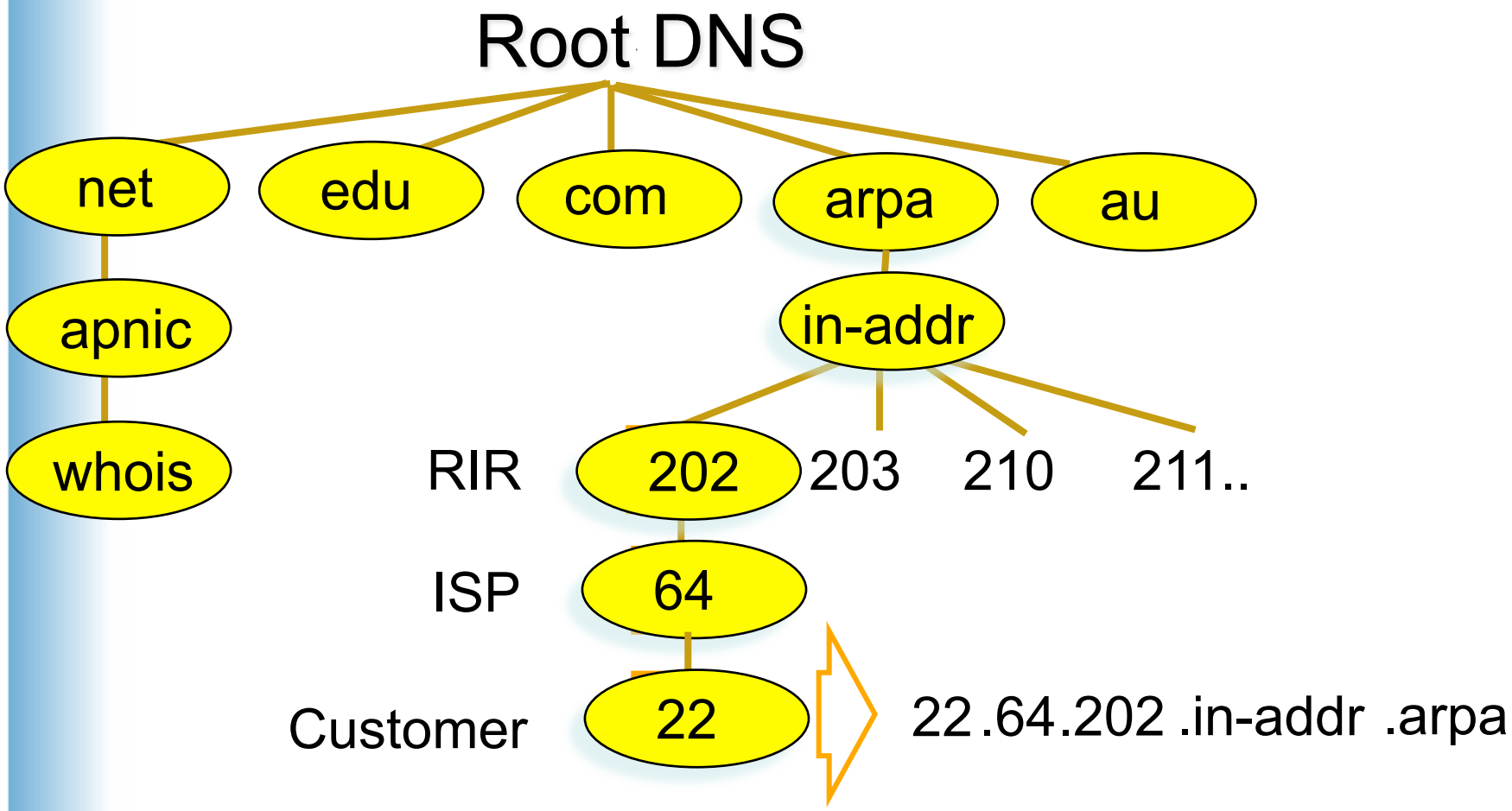
- Service denial
  - That only allow access when fully reverse delegated eg. anonymous ftp
- Diagnostics
  - Assisting in trace routes etc
- Spam identification
- Registration
  - Responsibility as a member and Local IR

APNIC & Member responsibilities

- APNIC
  - Manage reverse delegations of address block distributed by APNIC
  - Process members requests for reverse delegations of network allocations
- Members
  - Be familiar with APNIC procedures
  - Ensure that addresses are reverse-mapped
  - Maintain nameservers for allocations
    - Minimise pollution of 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:	**IN**
admin-c:	**VT43-AP**
tech-c:	**IA15-AP**
zone-c:	**IA15-AP**
nserver:	**dns.isp.net.in**
nserver:	**giasbm01.isp.net.in**
mnt-by:	**MAINT-IN-isp**
changed:	**gps@isp.net.in 20010612**
source:	**APNIC**

Adding Domain Object to WHOIS

- 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

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  - Reverse DNS
  - **APNIC helpdesk**

Member Services Helpdesk

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

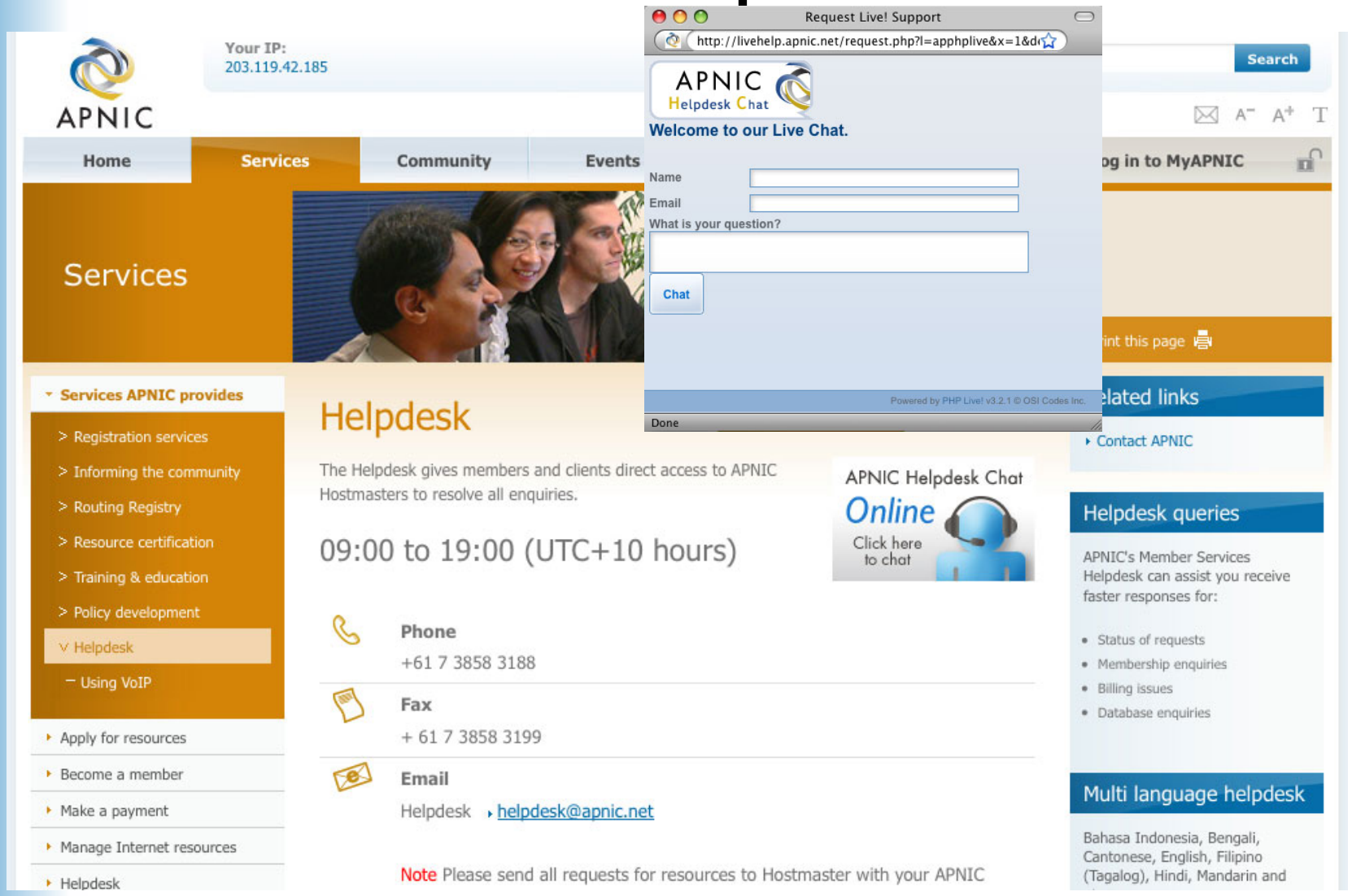
Helpdesk hours

9:00 am - 7:00 pm (AU EST, UTC + 10 hrs)

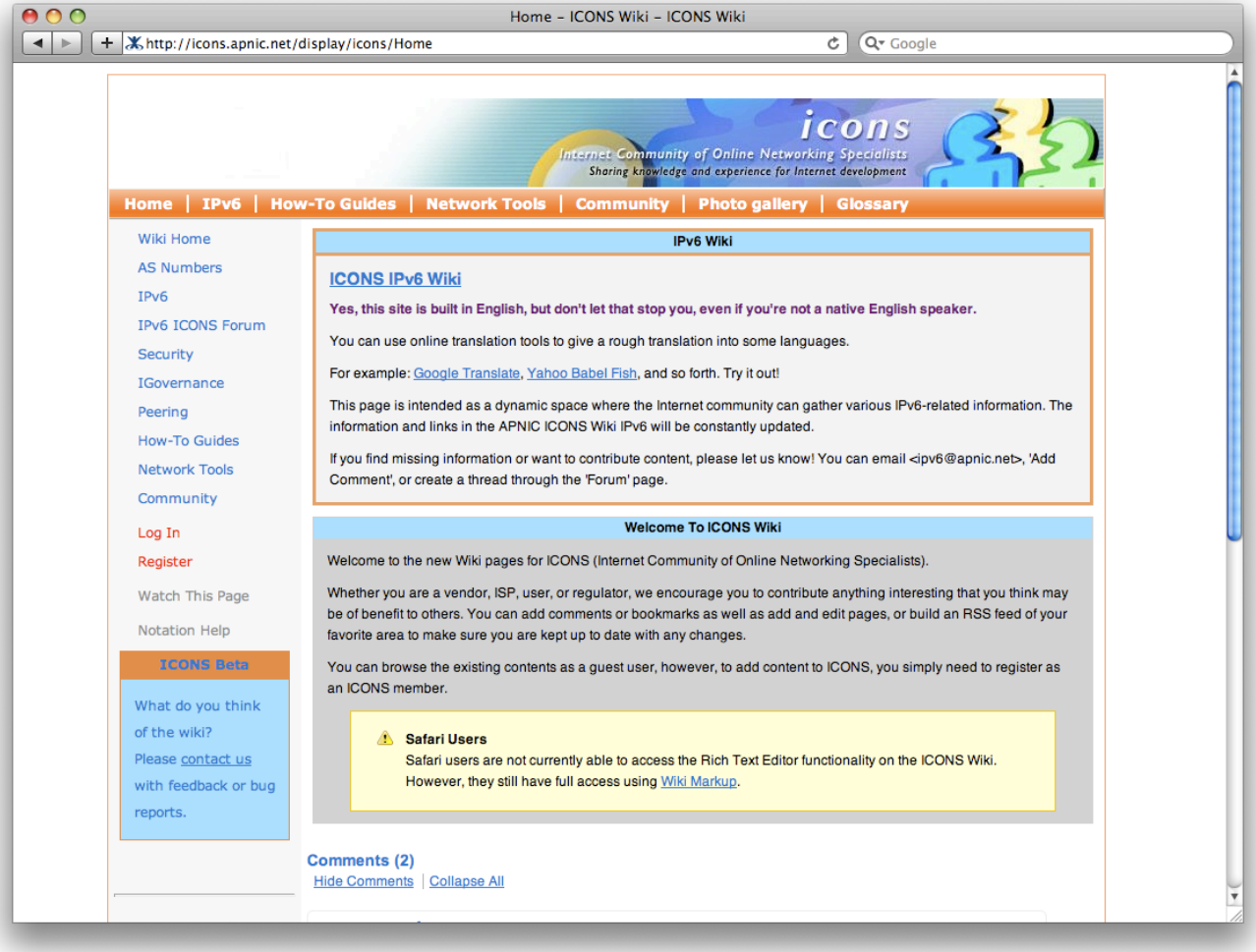
ph: +61 7 3858 3188 **fax: 61 7 3858 3199**

- ***More personalised service***
  - Range of languages:
    Cantonese, Filipino, Mandarin, Thai, Vietnamese 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



ICONS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You can use online translation tools to give a rough translation into some languages.
For example: Google Translate, Yahoo Babel Fish, and so forth. Try it out!
This page is intended as a dynamic space where the Internet community can gather various IPv6-related information. The information and links in the APNIC ICONS Wiki IPv6 will be constantly updated.
If you find missing information or want to contribute content, please let us know! You can email <ipv6@apnic.net>, 'Add Comment', or create a thread through the 'Forum' page.
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Welcome to the new Wiki pages for ICONS (Internet Community of Online Networking Specialists).
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Questions?

Thank you!