

APNIC Training

Internet Routing Registry (IRR)

September 14, 2011 – Pokhara, Nepal

SANOG

This training session is being held as part of SANOG XVIII

Introduction

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Overview

- What is IRR?
- Why use an IRR?
- APNIC database and the IRR
- Using the Routing Registry
- Using RPSL in practice
- Benefit of using IRR

What is a Routing Registry?

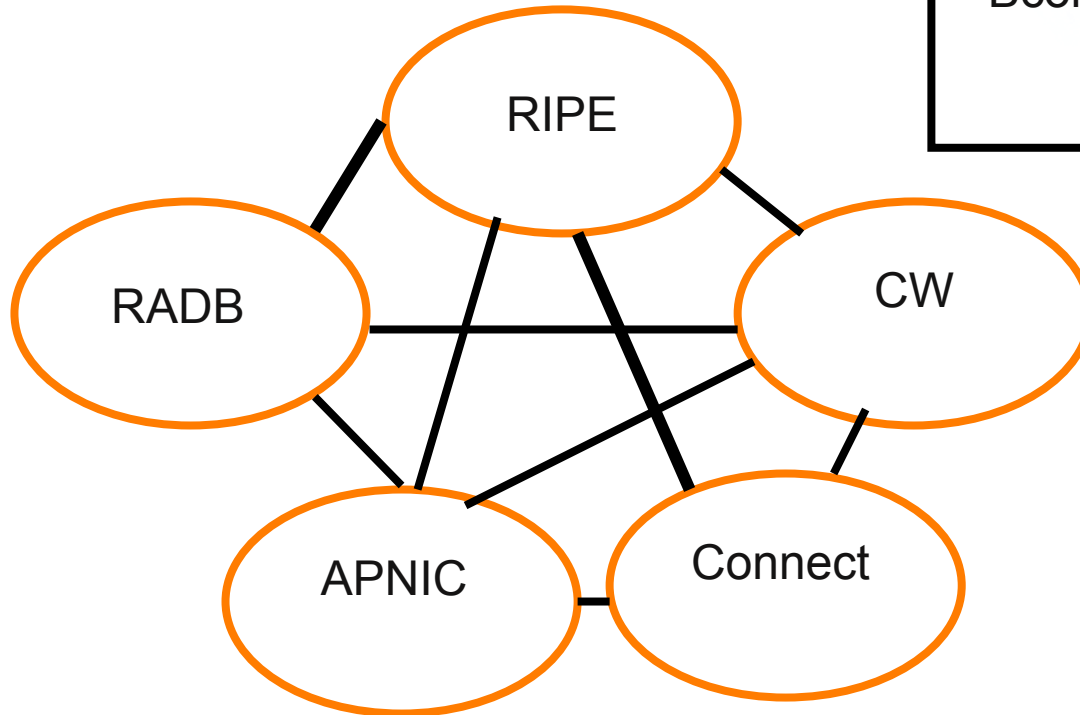
- A repository (database) of Internet routing policy information
 - Autonomous Systems exchanges routing information via BGP
 - Exterior routing decisions are based on policy based rules
 - However BGP does not provides a mechanism to publish/communicate the policies themselves
 - RR provides this functionality
- Routing policy information is expressed in a series of objects

What is a Routing Registry?

- Global Internet Routing Registry database
 - <http://www.irr.net/>
 - Uses RPSL
- Stability and consistency of routing
 - network operators share information
- Both public and private databases
 - These databases are independent
 - but some exchange data
 - only register your data in one database

What is a Routing Registry?

ARIN, ArcStar, FGC, Verio,
Bconnex, Optus, Telstra, ...



IRR = APNIC RR + RIPE DB + RADB + C&W + ARIN + ...

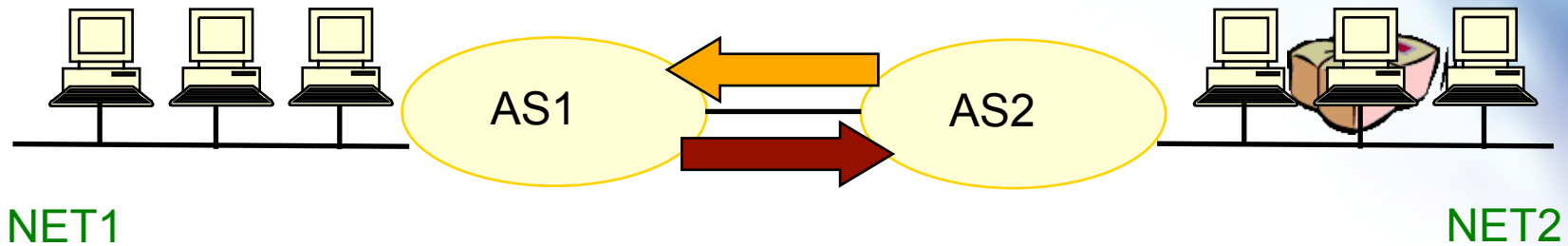
Routing Registry Objects

- Route, aut-num, inet-rtr, peering-set, AS-set, rtr-set, filter-set
 - Each object has its own purpose
 - Together express routing policies
- More details covered later

What is Routing Policy?

- Description of the routing relationship between autonomous systems
 - Who are my BGP peers?
 - Customer, peers, upstream
 - What routes are:
 - Originated by each neighbour?
 - Imported from each neighbour?
 - Exported to each neighbour?
 - Preferred when multiple routes exist?
 - What to do if no route exists?
 - What routes to aggregate?

Representation of Routing Policy



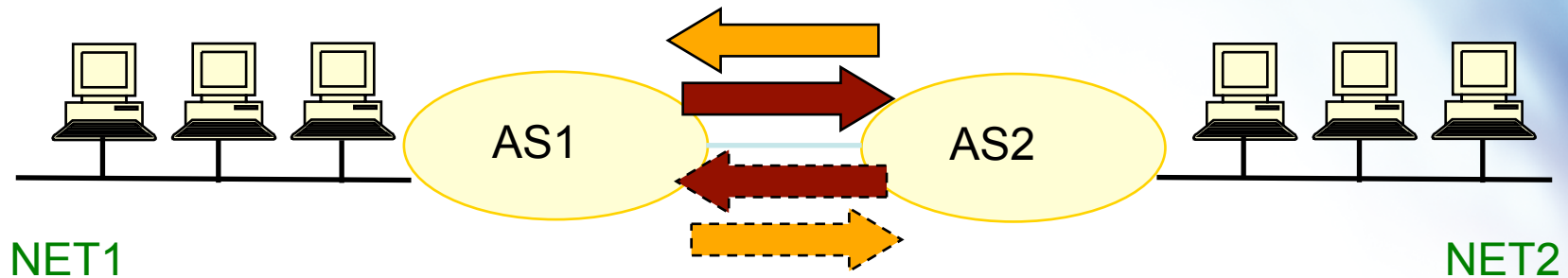
In order for traffic to flow from NET2 to NET1 between AS1 and AS2:

AS1 has to announce NET1 to AS2 via BGP

And AS2 has to accept this information and use it

Resulting in packet flow from NET2 to NET1

Representation of Routing Policy (cont.)



In order for traffic to flow towards from NET1 to NET2:

AS2 must announce NET2 to AS1

And AS1 has to accept this information and use it

Resulting in packet flow from NET 1 to NET2

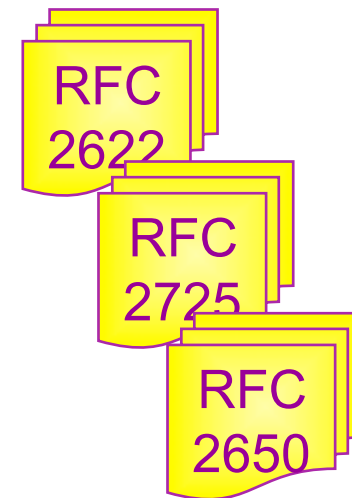
RPSL

- Routing Policy Specification Language
 - Object oriented language
 - Based on RIPE-181
 - Structured whois objects

- Higher level of abstraction than access lists

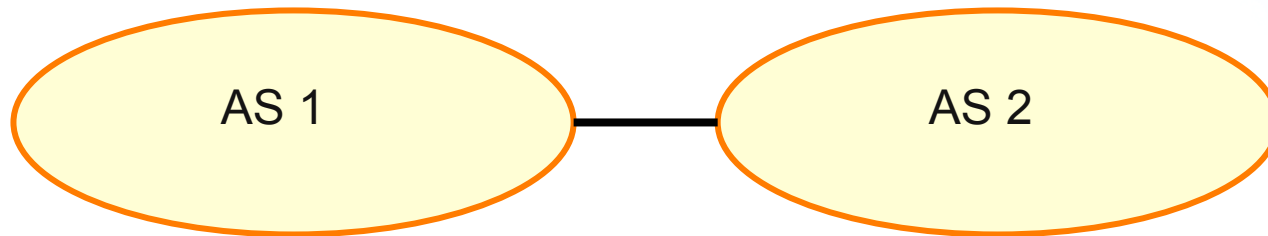
- Describes things interesting to routing policy:
 - Routes, AS Numbers ...
 - Relationships between BGP peers
 - Management responsibility

- Relevant RFCs
 - Routing Policy Specification Language
 - Routing Policy System Security
 - Using RPSL in Practice



Routing Policy - Examples

Basic concept



*“action pref” - the lower the value,
the 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
```

Why use an IRR?



Network Planning

- Network planning
 - Simulation
 - Changes in policies can be simulated first by changing the registry but not the routers
 - To understand effects of policy changes to the existing networks
 - To make better network planning
 - To make it easier to adjust policies to maximise the performance of the network
 - Route filtering
 - Peering networks
 - A provider and its customer

Router configuration and Network troubleshooting

- Router configuration
 - By using IRRToolSet
 - Extract information from IRR to create a router readable configuration file
 - Vendor independent
 - Verification of Internet routing and Protect against inaccurate routing info distribution
- Network troubleshooting
 - Easier to locate routing problems outside your network

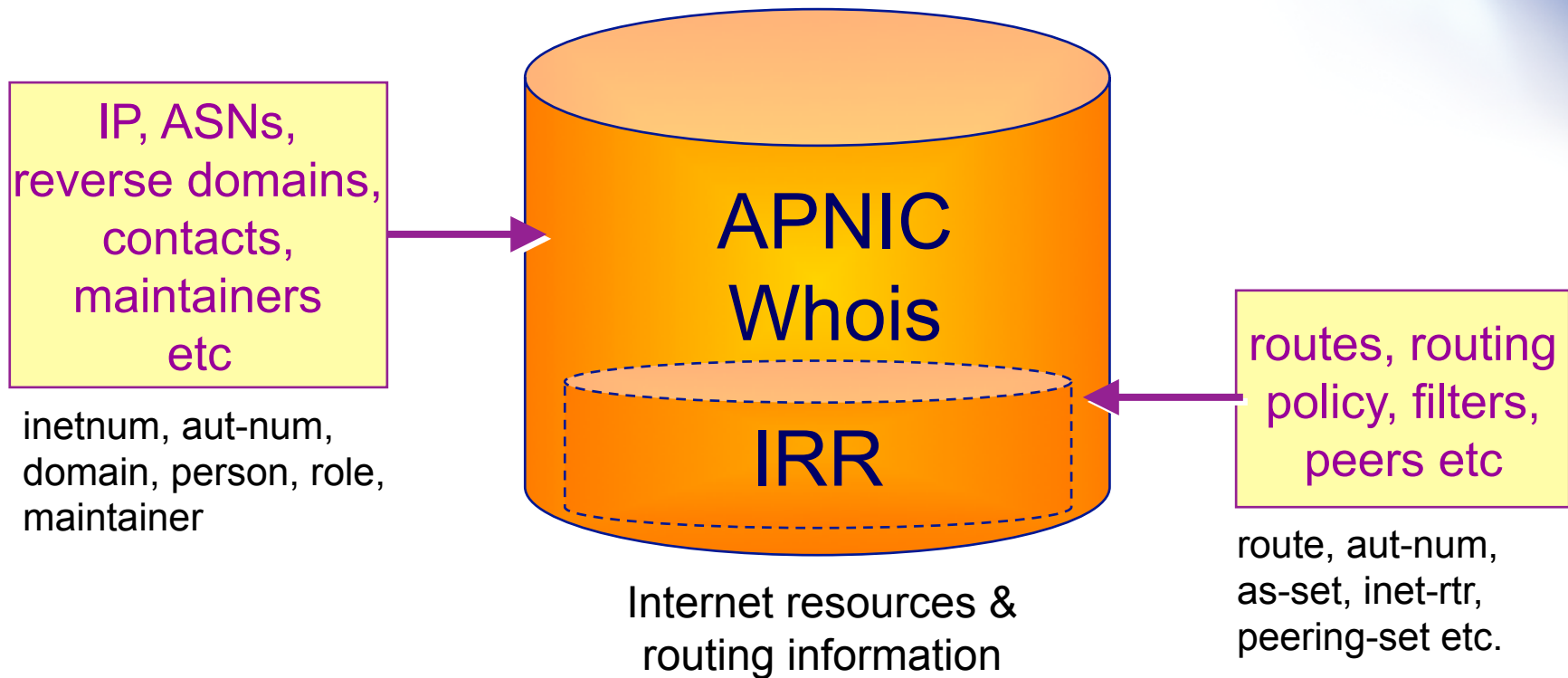
APNIC Database and the IRR

APNIC Database & the IRR

- APNIC whois Database
 - Two databases in one
- Public Network Management Database
 - “whois” info about networks & contact persons
 - IP addresses, AS numbers etc
- Routing Registry
 - contains routing information
 - routing policy, routes, filters, peers etc.
 - APNIC RR is part of the global IRR

Integration of Whois and IRR

- Integrated APNIC Whois Database & Internet Routing Registry

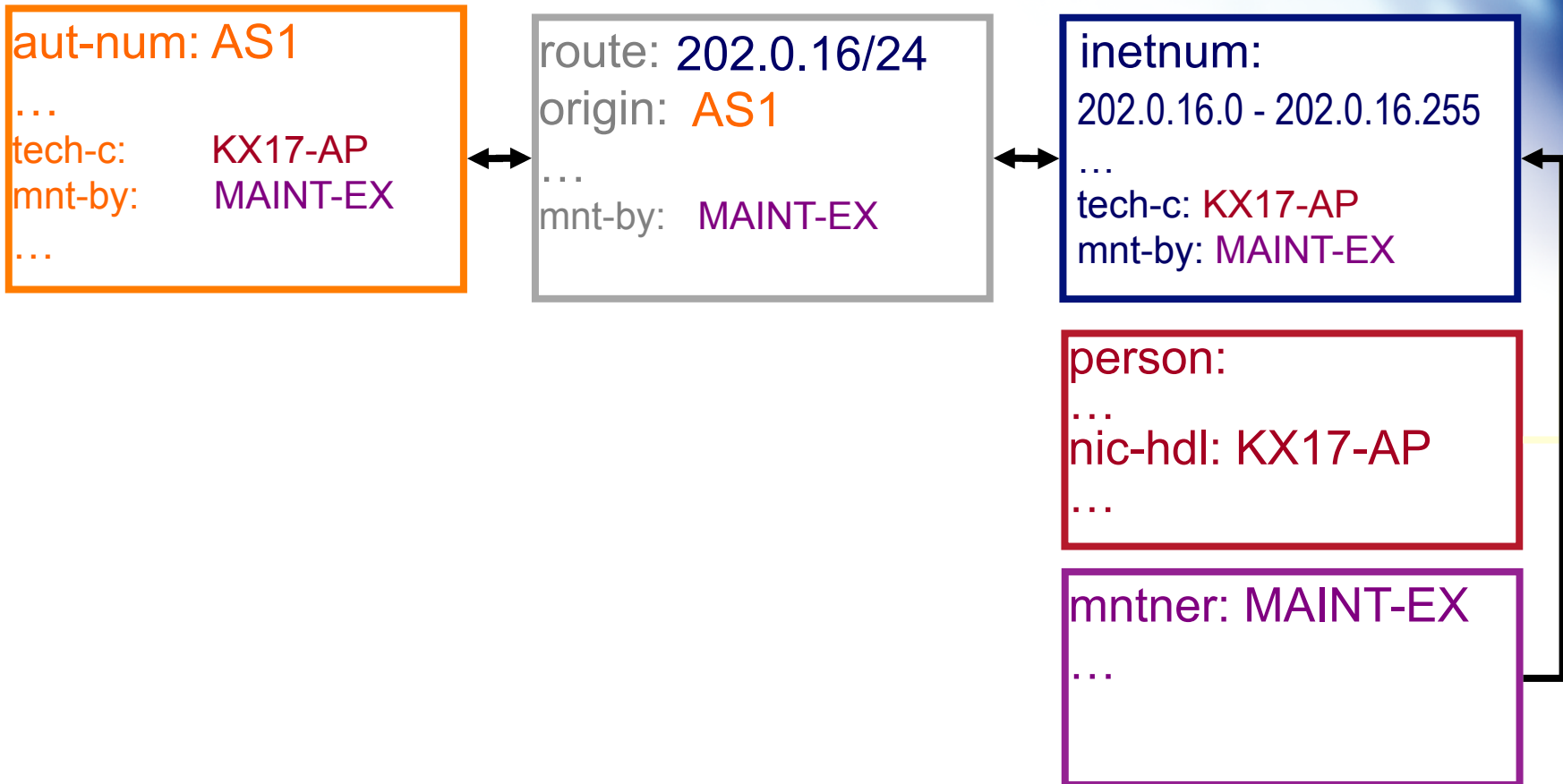


IRR Objects

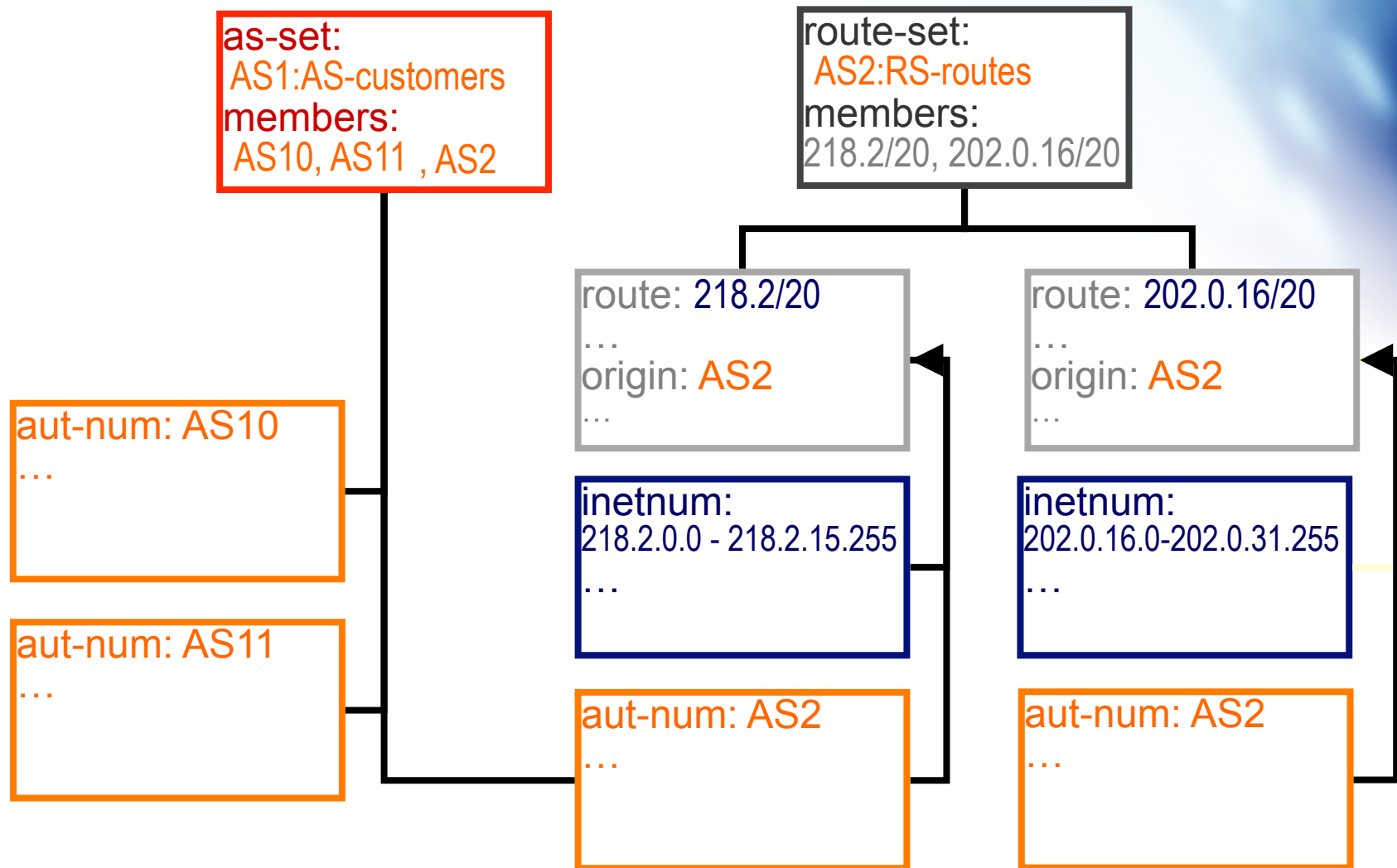
- **route**
 - Specifies interAS routes
- **aut-num**
 - Represents an AS. Used to describe external routing policy
- **inet-rtr**
 - Represents a router
- **peering-set**
 - Defines a set of peerings
- **route-set**
 - Defines a set of routes
- **as-set**
 - Defines a set of **aut-num** objects
- **rtr-set**
 - Defines a set of routers
- **filter-set**
 - Defines a set of routes that are matched by its filter

www.apnic.net/db/ref/db-objects.html

Inter-related IRR Objects



Inter-related IRR Objects



Hierarchical Authorisation

- **mnt-routes**
 - authenticates **creation** of route objects
 - creation of route objects must pass authentication of mntner referenced in the mnt-routes attribute
 - **Format:**
 - `mnt-routes: <mntner>`

In:

inetnum

and
aut-num

objects
route

Authorisation Mechanism

```
inetnum:      202.137.181.0 - 202.137.196.255
netname:      SPARKYNET-WF
descr:        SparkyNet Service Provider
...
mnt-by:       APNIC-HM
mnt-lower:    MAINT-SPARKYNET1-WF
mnt-routes:   MAINT-SPARKYNET2-WF
```

This object can only be modified by APNIC

Creation of more specific objects (assignments) within this range has to pass the authentication of MAINT-SPARKYNET

Creation of route objects matching/within this range has to pass the authentication of MAINT-SPARKYNET-WF

Creating Route Objects

- Multiple authentication checks:
 - Originating ASN
 - mntner in the mnt-routes is checked
 - If no mnt-routes, mnt-lower is checked
 - If no mnt-lower, mnt-by is checked
 - AND the address space
 - Exact match & less specific route
 - mnt-routes etc
 - Exact match & less specific inetnum
 - mnt-routes etc
 - AND the route object mntner itself
 - The mntner in the mnt-by attribute

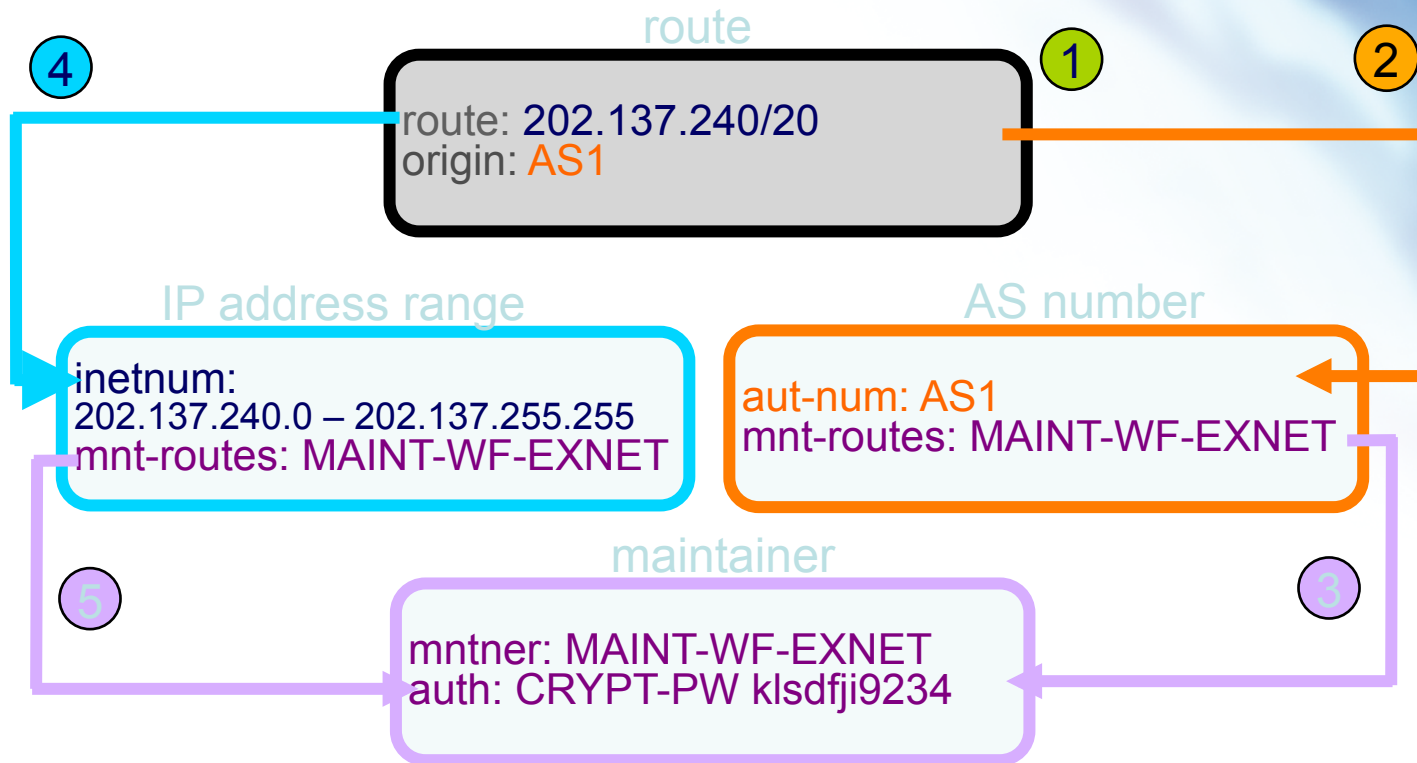
aut-num

inetnum

route

route

Creating Route Objects



1. Create route object and submit to APNIC RR database
2. DB checks aut-num obj corresponding to the ASN in route obj
3. Route obj creation must pass auth of mntner specified in aut-num *mnt-routes* attribute.
4. DB checks inetnum obj matching/encompassing IP range in route obj
5. Route obj creation must pass auth of mntner specified in inetnum *mnt-routes* attribute.

Using the Routing Registry

IRRToolSet

- Set of tools developed for using the Internet Routing Registry (IRR)
- Work with Internet routing policies
 - These policies are stored in IRR in the Routing Policy Specification Language (RPSL)
- The goal of the IRRToolSet is to make routing information more convenient and useful for network engineers
 - Tools for automated router configuration,
 - Routing policy analysis
 - On-going maintenance etc.

IRRToolSet

- Now maintained by ISC:
 - <http://irrtolset.isc.org>
 - Download: <ftp://ftp.isc.org/isc/IRRToolSet/>
 - Installation needs: lex, yacc and C++ compiler

Use of RPSL - RtConfig

- RtConfig v4
 - part of IRRToolSet
- Reads policy from IRR (aut-num, route & -set objects) and generates router configuration
 - vendor specific:
 - Cisco, Bay's BCC, Juniper's Junos and Gated/RSd
 - Creates route-map and AS path filters
 - Can also create ingress / egress filters
 - (documentation says Cisco only)

Why use IRR and RtConfig?

- Benefits of RtConfig
 - Avoid filter errors (typos)
 - Expertise encoded in the tools that generate the policy rather than engineer configuring peering session
 - Filters consistent with documented policy
 - (need to get policy correct though)

Using RPSL in practice

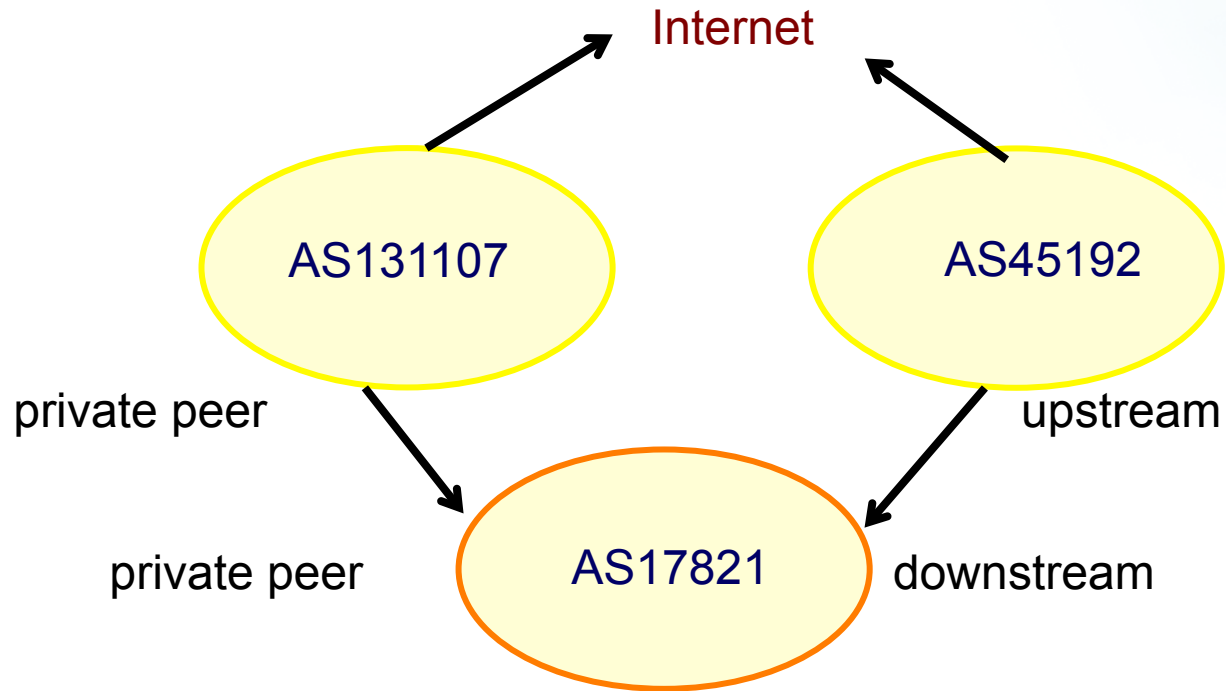
Overview

- Review examples of routing policies expression
 - Peering policies
 - Filtering policies
 - Backup connection
 - Multihoming policies

RPSL - review

- Purpose of RPSL
 - Allows specification of your routing configuration in the public IRR
 - Allows you to check “Consistency” of policies and announcements
 - Gives opportunities to consider the policies and configuration of others

Common Peering Policies



- AS45192 is your upstream provider
- AS131107 is a private peer
- Your AS is AS17821

How to write this in Aut-num

aut-num: AS17821

.....

remarks: AS45192 is your upstream provider

import: from AS45192 action pref=100; accept ANY

export: to AS45192 announce AS17821

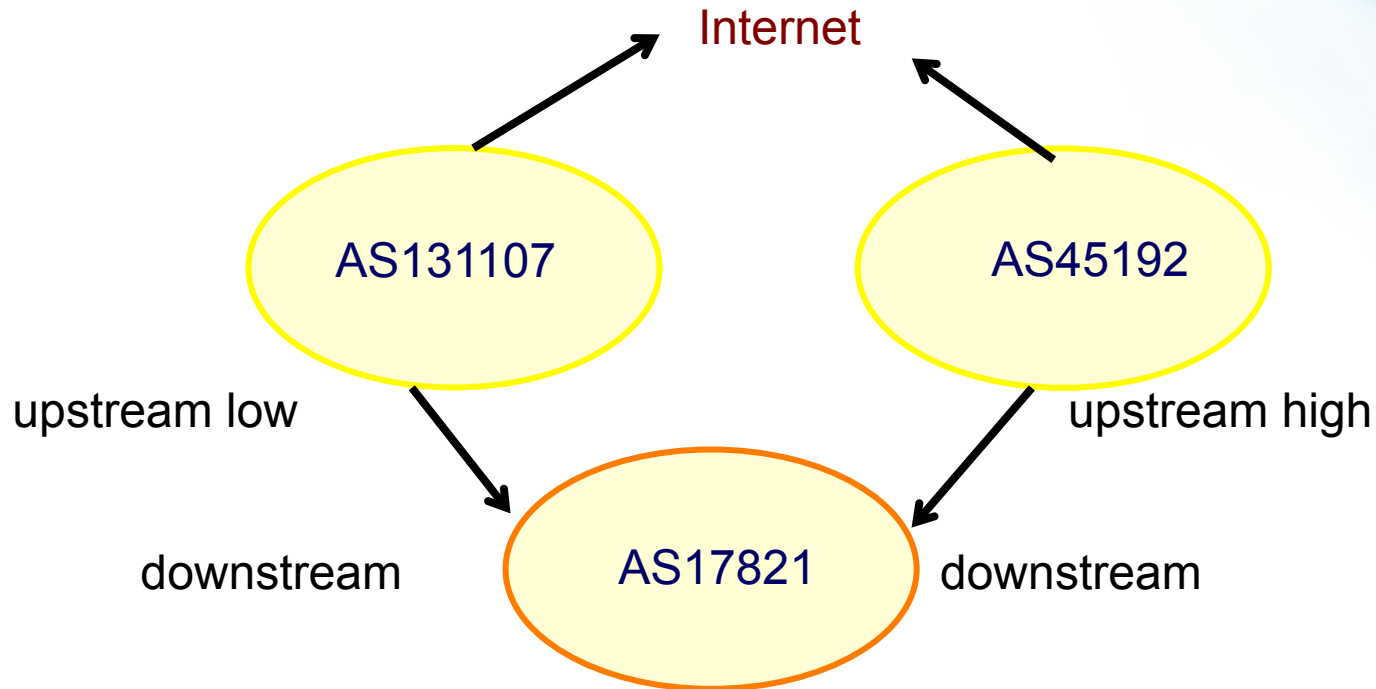
remarks: AS131107 is a private peer

import: from AS131107 action pref=20; accept AS131107

export: to AS131107 announce AS17821

.....

Common Peering Policies



- AS45192 is your preferred upstream provider
- AS131107 is your backup upstream provider
- Your AS is AS17821

How to write this in Aut-num

aut-num: AS17821

.....

remarks: AS45192 is your preferred upstream provider

import: from AS45192 action pref=100; accept ANY

export: to AS45192 announce AS17821

remarks: AS131107 is your backup upstream provider

import: from AS131107 action pref=200; accept ANY

export: to AS131107 action aspath.prepend (AS17821,
AS17821); announce AS131107

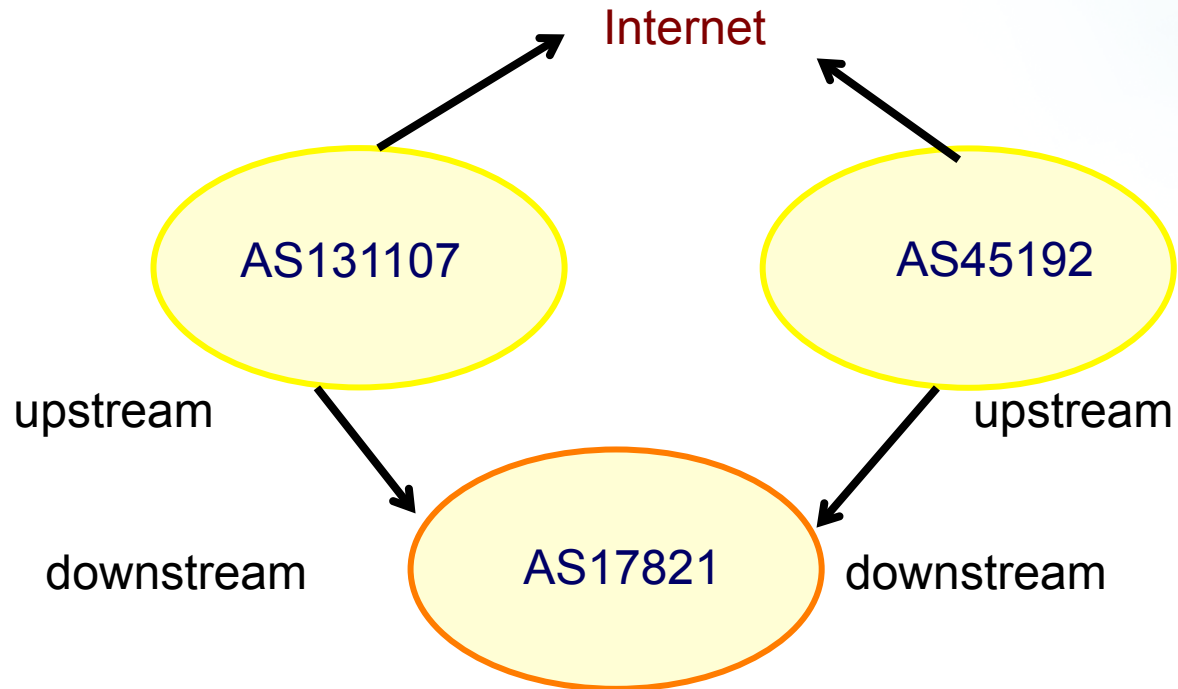
remarks: Optional extra import line to prefer direct

remarks: connection to AS131107 from AS17821

import: from AS131107 action pref=20; accept AS131107

.....

Common Peering Policies



- AS45192 is your upstream provider
- AS131107 is your upstream provider
- Your AS is AS17821

How to write this in Aut-num

aut-num: AS17821

.....

remarks: AS45192 is your upstream provider

import: from AS45192 action pref=100; accept ANY

export: to AS45192 announce AS17821

remarks: AS131107 is your upstream provider

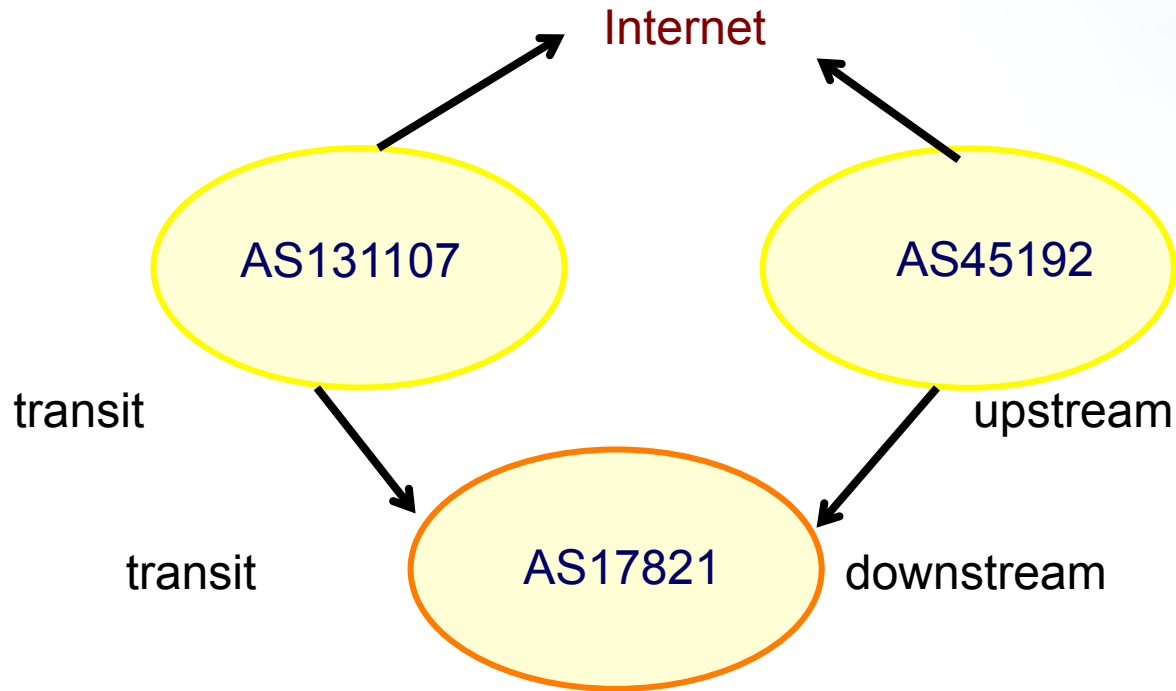
import: from AS131107 action pref=100; accept ANY

export: to AS131107 announce AS131107

remarks: the pref is optional here

.....

Common Peering Policies



- AS45192 is your upstream provider
- AS131107 gives you transit AND you give AS131107 transit as well
- Your AS is AS17821

How to write this in Aut-num

aut-num: AS17821

.....

remarks: AS45192 is your upstream provider

import: from AS45192 action pref=100; accept ANY

export: to AS45192 announce AS17821

remarks: AS131107 is your transit provider

import: from AS131107 action pref=100; accept ANY

export: to AS131107 announce ANY

remarks: the pref is optional here

.....

New Initiative

RIRs have been developing a new service for their members

- APNIC has now launched Resource Certification for the AP region
- Improves the security of inter-domain routing and augmenting the information published in the APNIC Whois Database

Terminology

Resource holders include:

- Regional Internet Registries (RIRs)
- Local Internet Registries (LIRs)
- Internet Service Providers (ISPs)
- End-user organizations

Internet resources are:

- IPv4 and IPv6 address blocks
- Autonomous System (AS) numbers

Resource Certification Benefits

- Routing information corresponds to properly delegated address resources
- Resource Certification gives resource holders proof that they hold certain resources
- Resource holders can attest to those resources when distributing them

Benefits (Cont.)

Resource users can 'sign' information with a digital signature, which essentially 'freezes' that information

- Any effort to alter that information results in the signature being invalidated
- Only resource holders with a properly delegated 'right of use' can generate a signature

Benefits (cont.)

Routing advertisements are made with the explicit agreement of the current 'right of use' holder of the addresses being advertised.

How Does It Work?

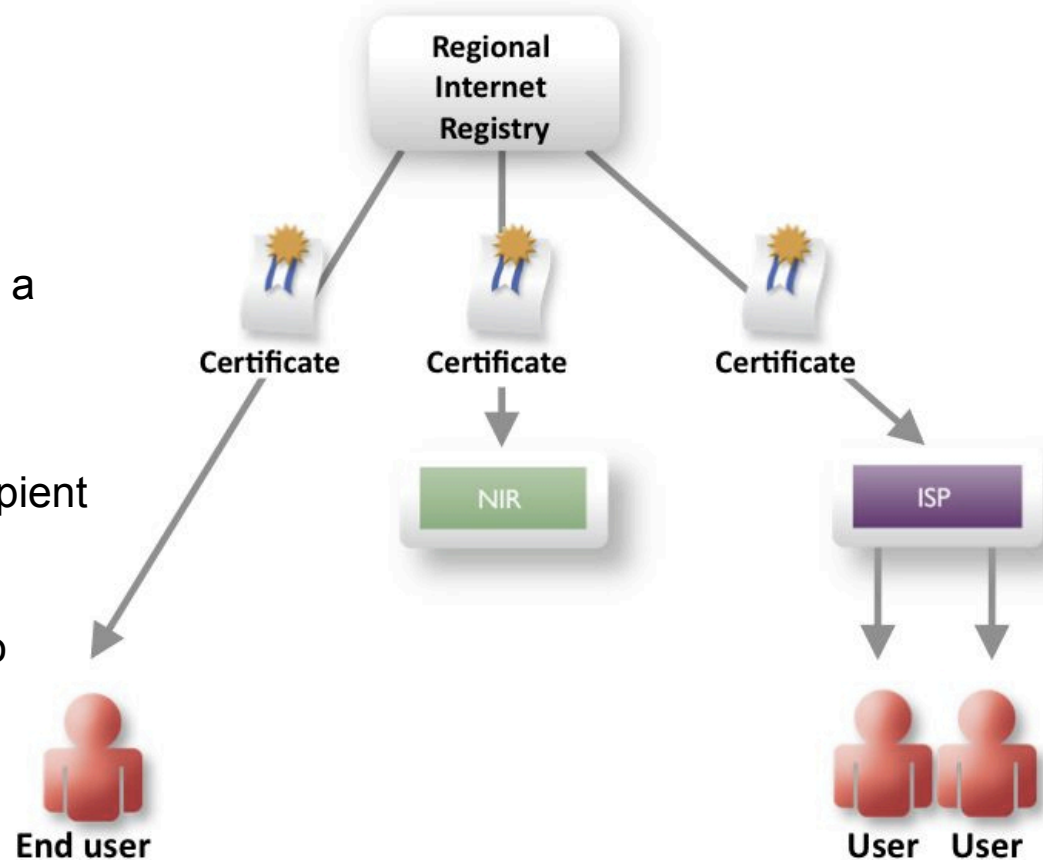
Resource Holder (NRO)

Internet Address Allocation and Resource Certification

APNIC is a “trusted certificate authority”, also known as a Trust Anchor

A block of data is signed using a resource holder's private key


The data is verified by the recipient using the signer's public key, traceable through the chain of interlocking certificates back to the Trust Anchor




Current Stage of ResCert

- Origin validation code is engineering now, could deploy in next few years but requires production RPKI
- Path validation is still research
- Filter validation is still research

MyAPNIC Home Page



Joe [APNICTRAINING-AU] | [Contacts and Users](#) | [My Profile](#) | [Log out](#)



Home
Resources
Administration
Training
Tools

Home

Welcome to MyAPNIC

Hello Joe!

[My Profile](#)

[Contacts and Users](#)

[User Registrations](#)

Membership details

Account: **APNICTRAINING-AU**

Expiry: **2020-04-30** [Renew](#)

Tier: **medium**

Kickstart IPv6!

(2010-02-09 14:00:00)

APNIC Members holding IPv4 addresses but no IPv6 addresses can now obtain an IPv6 address block easily. Eligible Members can see a "Get your IPv6 addresses" icon on the bottom left-hand corner of this page. To take advantage of this new policy, simple click on that icon.

For more information, see [Kickstart IPv6](#).

What can I do?

- View and update your [resource information](#) for IPv4, IPv6, AS numbers, Whois updates and [Resource certification](#)
- View and update your [Member details](#) and [Contact details](#). You may also track your [Billing history](#)
- Use the [Training](#) section to view training and events history
- Use the [APNIC looking glass](#) or generate a prefix report

News

10-02-2010 [New APNIC policies now active](#)

27-01-2010 [IPv6 indicator to business leaders](#)

21-01-2010 [Global recovery to pressure IP address pool](#)

20-01-2010 [APNIC supports JANOG 25](#)

20-01-2010 [IANA IPv4 pool less than 10%](#)

11-01-2010 [EC Nominations now open](#)

- [More news...](#)

Useful links

[MyAPNIC features](#)

[How do I create a Route object?](#)

[IP address calculator](#)

[Reverse DNS troubleshooting](#)


[Training](#)

[FAQs](#)

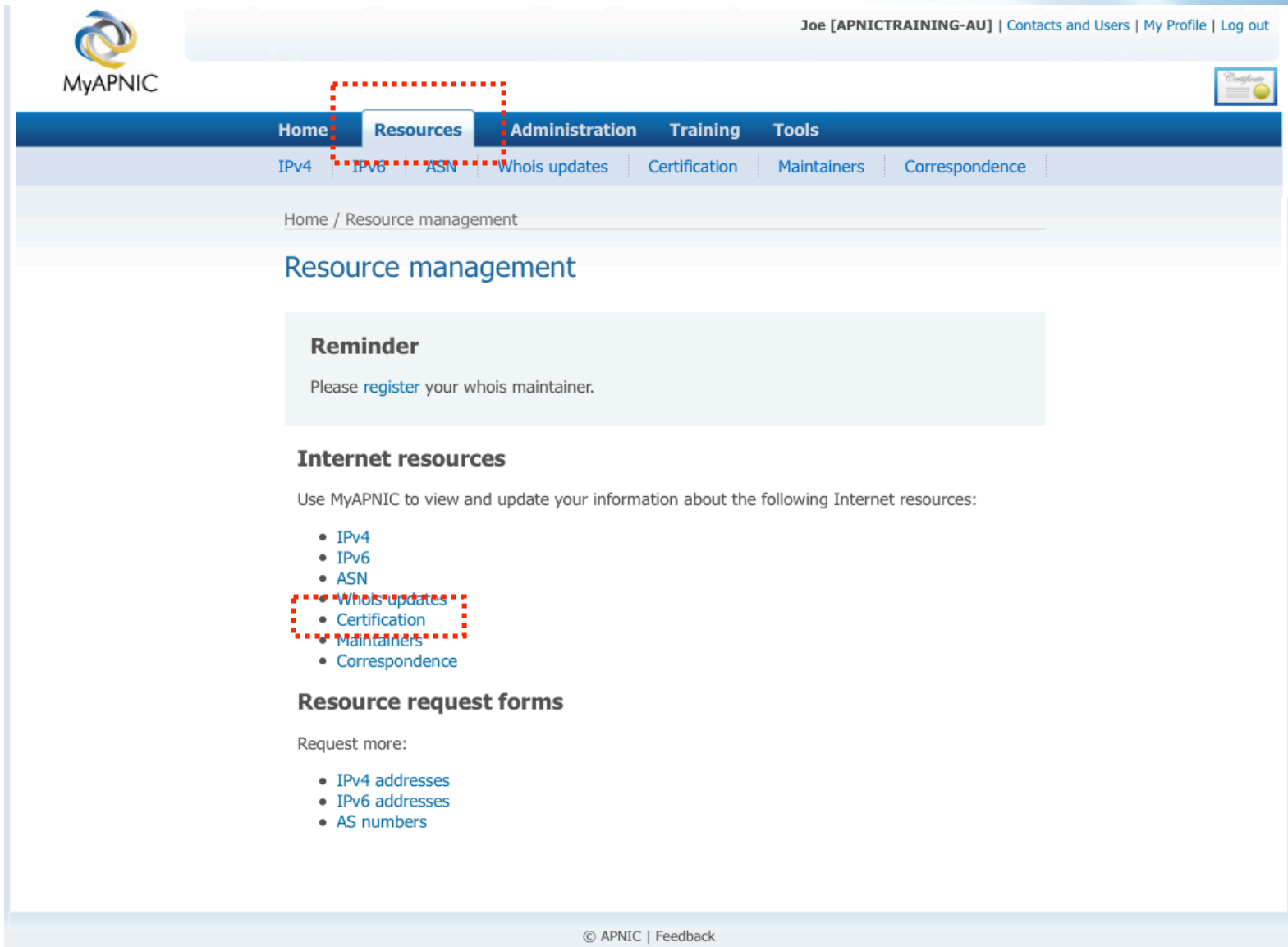
[Annual membership fees calculator](#)

APNIC Helpdesk Chat

Online

Click here to chat 

Resources Management



The screenshot shows the MyAPNIC website interface. At the top left is the MyAPNIC logo. The top right shows the user name 'Joe [APNICTRAINING-AU]' and links for 'Contacts and Users', 'My Profile', and 'Log out'. A navigation bar contains 'Home', 'Resources', 'Administration', 'Training', and 'Tools'. Below this, a sub-menu lists 'IPv4', 'IPv6', 'ASN', 'Whois updates', 'Certification', 'Maintainers', and 'Correspondence'. The main content area is titled 'Resource management' and includes a 'Reminder' box, 'Internet resources' section with a bulleted list, and 'Resource request forms' section with a bulleted list. A red dashed box highlights the 'Resources' menu item and the 'Whois updates', 'Certification', and 'Maintainers' items in the sub-menu and list.

MyAPNIC

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Home Resources Administration Training Tools

IPv4 IPv6 ASN Whois updates Certification Maintainers Correspondence

Home / Resource management

Resource management

Reminder

Please [register](#) your whois maintainer.

Internet resources

Use MyAPNIC to view and update your information about the following Internet resources:

- [IPv4](#)
- [IPv6](#)
- [ASN](#)
- [Whois updates](#)
- [Certification](#)
- [Maintainers](#)
- [Correspondence](#)

Resource request forms

Request more:

- [IPv4 addresses](#)
- [IPv6 addresses](#)
- [AS numbers](#)

© APNIC | [Feedback](#)

Activate Certification



Joe [APNICTRAINING-AU] | [Contacts and Users](#) | [My Profile](#) | [Log out](#)



[Home](#) | [Resources](#) | [Administration](#) | [Training](#) | [Tools](#)

[IPv4](#) | [IPv6](#) | [ASN](#) | [Whois updates](#) | [Certification](#) | [Maintainers](#) | [Correspondence](#)

[Home](#) / [Resources](#) / [Certification](#)

Resource Certification

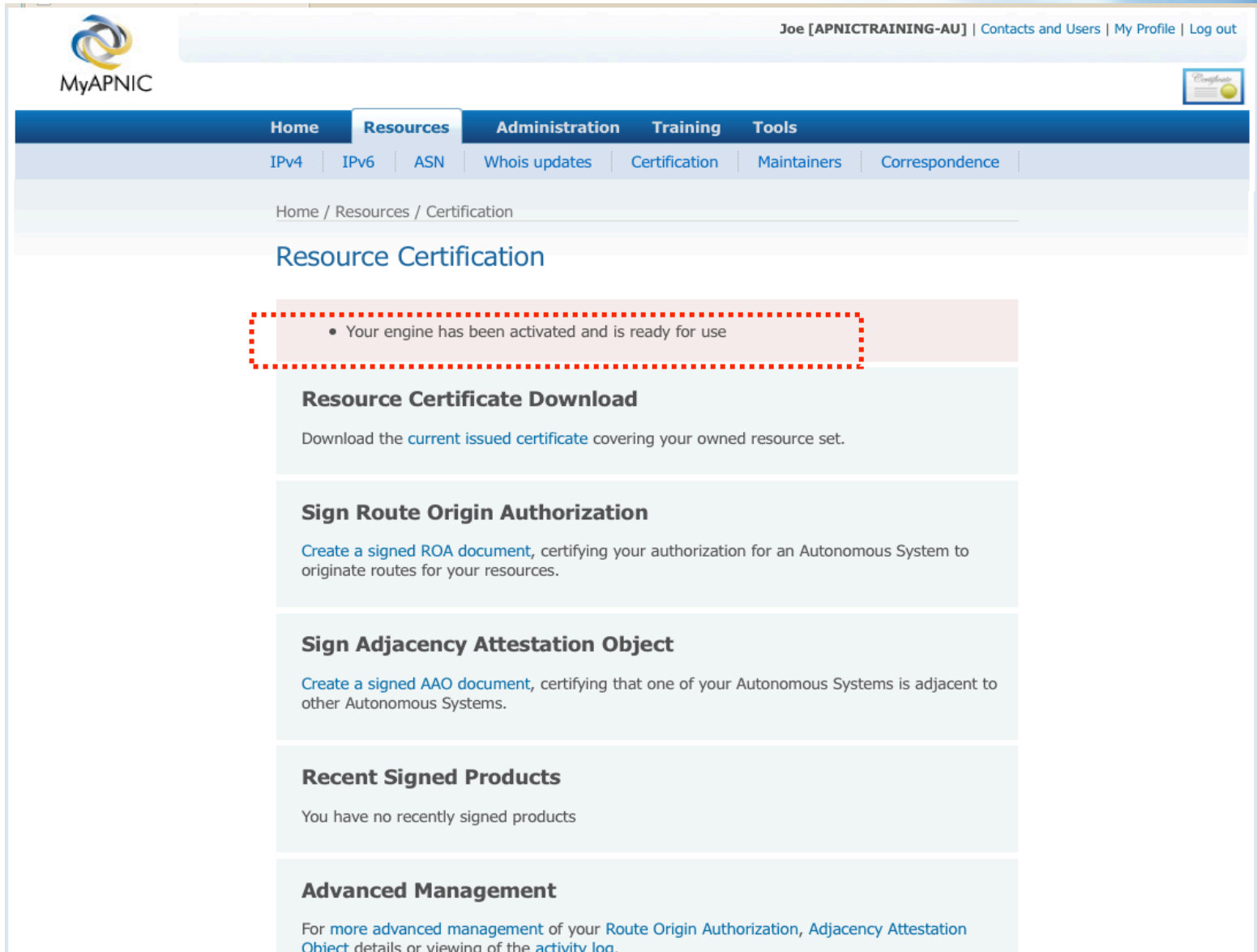
Activation

Your service is not yet activated. To activate the service click the button below.

NOTE: This process may take a couple of minutes. Please be patient.

[Activate Service](#)

Service Activated



The screenshot shows the MyAPNIC user interface. At the top left is the MyAPNIC logo. At the top right, the user is identified as 'Joe [APNICTRAINING-AU]' with links for 'Contacts and Users', 'My Profile', and 'Log out'. A navigation bar contains 'Home', 'Resources', 'Administration', 'Training', and 'Tools'. Below this, a secondary navigation bar lists 'IPv4', 'IPv6', 'ASN', 'Whois updates', 'Certification', 'Maintainers', and 'Correspondence'. The breadcrumb trail reads 'Home / Resources / Certification'. The main heading is 'Resource Certification'. A red dashed box highlights a message: 'Your engine has been activated and is ready for use'. Below this are sections for 'Resource Certificate Download', 'Sign Route Origin Authorization', 'Sign Adjacency Attestation Object', 'Recent Signed Products', and 'Advanced Management'.

MyAPNIC

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Home Resources Administration Training Tools

IPv4 IPv6 ASN Whois updates Certification Maintainers Correspondence

Home / Resources / Certification

Resource Certification

- Your engine has been activated and is ready for use

Resource Certificate Download

Download the [current issued certificate](#) covering your owned resource set.

Sign Route Origin Authorization

Create a [signed ROA document](#), certifying your authorization for an Autonomous System to originate routes for your resources.

Sign Adjacency Attestation Object

Create a [signed AAO document](#), certifying that one of your Autonomous Systems is adjacent to other Autonomous Systems.

Recent Signed Products

You have no recently signed products

Advanced Management

For [more advanced management](#) of your [Route Origin Authorization](#), [Adjacency Attestation Object](#) details or viewing of the [activity log](#).

Create Route Origin Authorization



Robert | Account: APNICRANDNET-AU | [Manage Contacts](#) | [My Profile](#) | [Log out](#)



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[IPv4](#) | [IPv6](#) | [ASN](#) | [Whois updates](#) | [Certification](#) | [Maintainers](#) | [Correspondence](#)

[Home](#) / [Resources](#) / [Certification](#)

Resource Certification

Resource Certificate Download

Download the [current issued certificate](#) covering your owned resource set.

Sign Route Origin Authorization

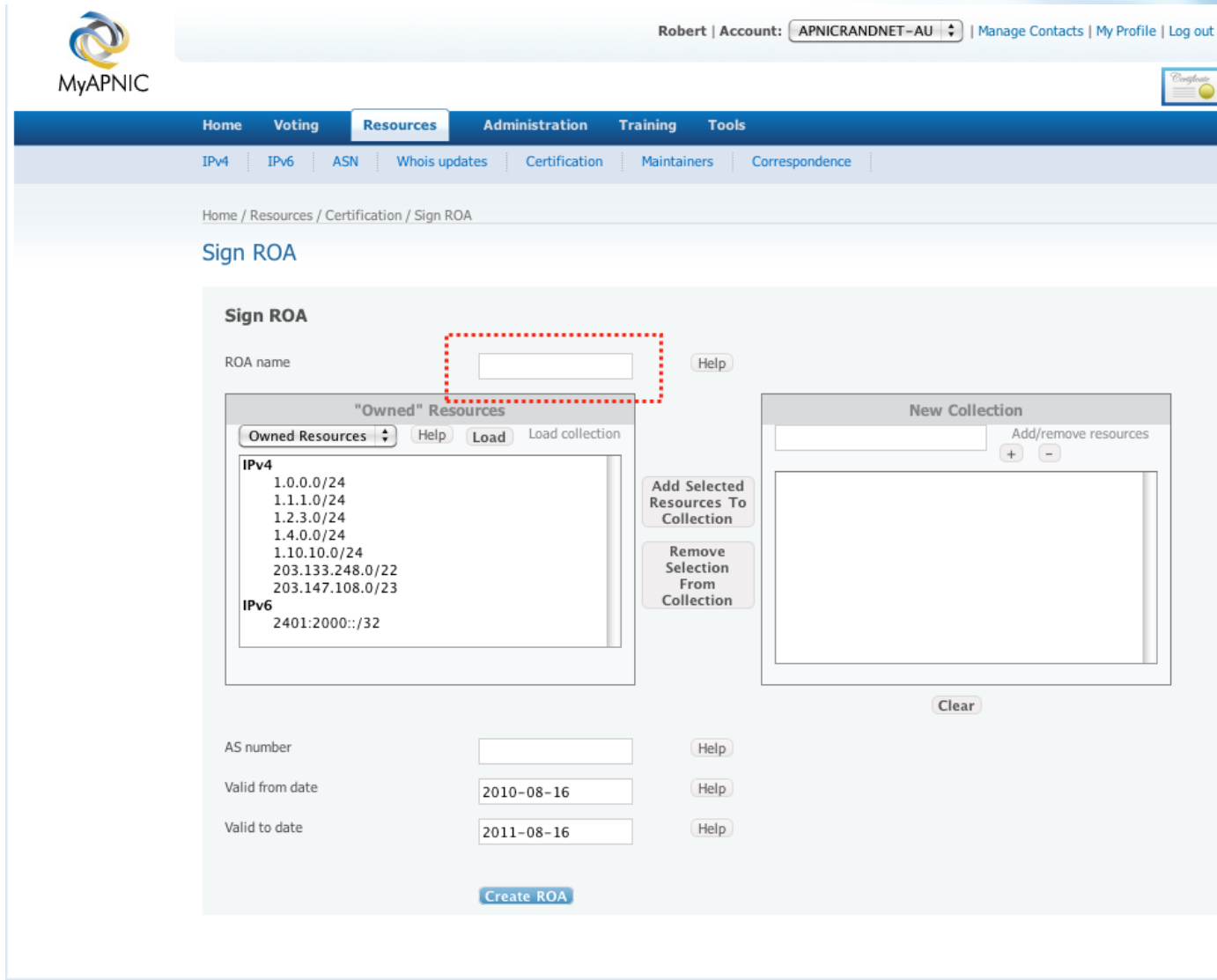
[Create a signed ROA document](#), certifying your authorization for an Autonomous System to originate routes for your resources.

Sign Adjacency Attestation Object

[Create a signed AAO document](#), certifying that one of your Autonomous Systems is adjacent to other Autonomous Systems.



Name ROA



The screenshot shows the MyAPNIC web interface for creating a Name ROA. At the top, the user is logged in as Robert with account APNICRANDNET-AU. The navigation menu includes Home, Voting, Resources, Administration, Training, and Tools. The breadcrumb trail is Home / Resources / Certification / Sign ROA. The main content area is titled "Sign ROA" and contains several form fields and panels:

- ROA name:** A text input field with a red dashed box around it and a "Help" button.
- "Owned" Resources:** A panel with a dropdown menu set to "Owned Resources", a "Help" button, and a "Load" button. Below is a list of resources:
 - IPv4:** 1.0.0/24, 1.1.1.0/24, 1.2.3.0/24, 1.4.0/24, 1.10.10.0/24, 203.133.248.0/22, 203.147.108.0/23
 - IPv6:** 2401:2000::/32
- New Collection:** A panel with an "Add/remove resources" input field, "+" and "-" buttons, and a "Clear" button at the bottom.
- AS number:** A text input field with a "Help" button.
- Valid from date:** A date input field with the value "2010-08-16" and a "Help" button.
- Valid to date:** A date input field with the value "2011-08-16" and a "Help" button.
- Create ROA:** A blue button at the bottom of the form.



Add Resources



Robert | Account: APNICRANDNET-AU | Manage Contacts | My Profile | Log out



Home | Voting | **Resources** | Administration | Training | Tools

IPv4 | IPv6 | ASN | Whois updates | Certification | Maintainers | Correspondence

Home / Resources / Certification / Sign ROA

Sign ROA

Sign ROA

ROA name

Help

Owned Resources

Owned Resources | Help | Load | Load collection

IPv4

- 1.0.0/24
- 1.1.1.0/24
- 1.2.3.0/24
- 1.4.0/24
- 1.10.10.0/24
- 203.133.248.0/22
- 203.147.108.0/23

IPv6

- 2401:2000::/32

Add Selected Resources To Collection

Remove Selection From Collection

New Collection

Add/remove resources

+ -

Clear

AS number

Help

Valid from date

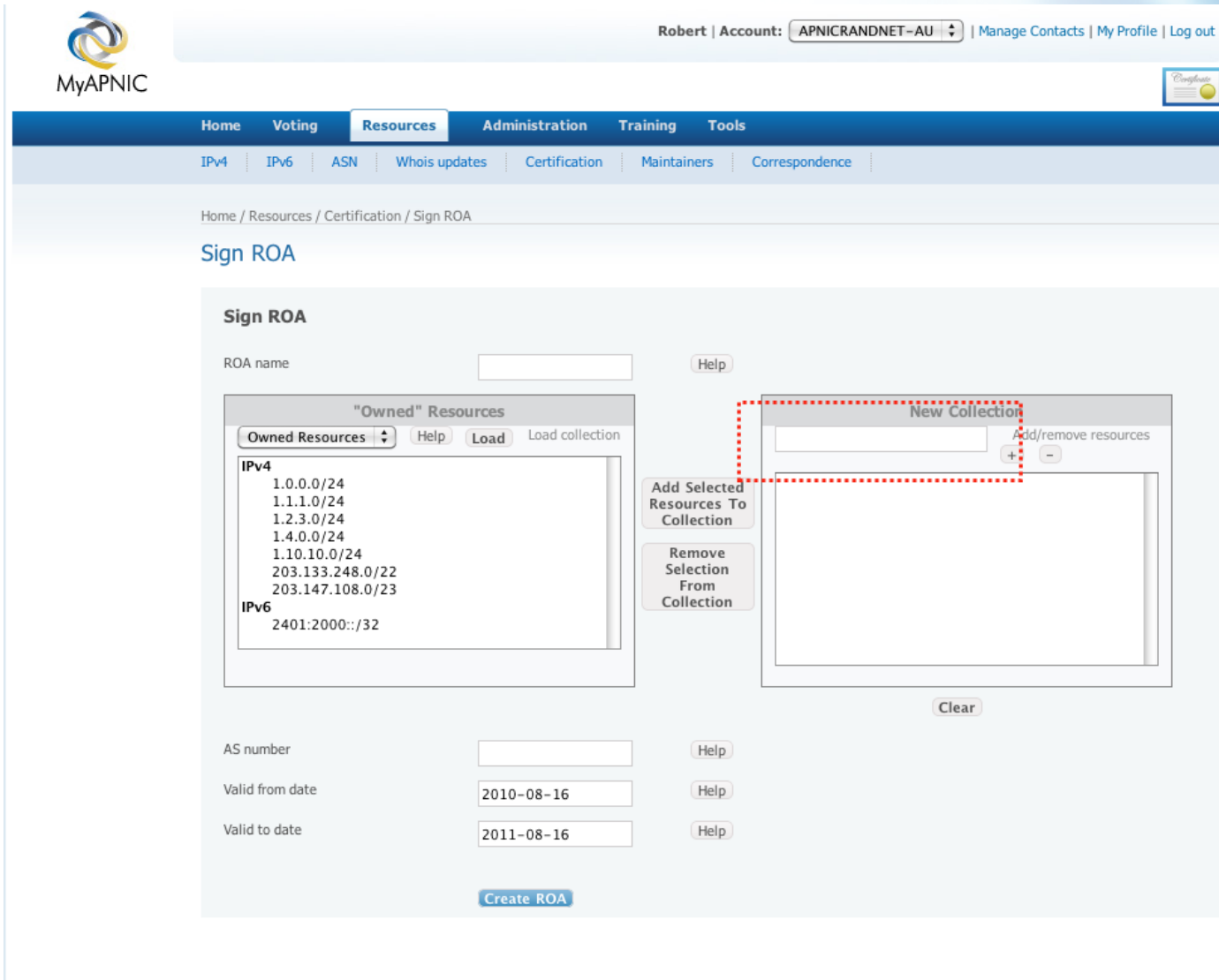
Help

Valid to date

Help

Create ROA

Add Resources



MyAPNIC

Robert | Account: APNICRANDNET-AU | Manage Contacts | My Profile | Log out

Home | Voting | **Resources** | Administration | Training | Tools

IPv4 | IPv6 | ASN | Whois updates | Certification | Maintainers | Correspondence

Home / Resources / Certification / Sign ROA

Sign ROA

ROA name [Help](#)

"Owned" Resources

Owned Resources Load collection

IPv4

- 1.0.0.0/24
- 1.1.1.0/24
- 1.2.3.0/24
- 1.4.0.0/24
- 1.10.10.0/24
- 203.133.248.0/22
- 203.147.108.0/23

IPv6

- 2401:2000::/32

New Collection

Add/remove resources

AS number [Help](#)

Valid from date [Help](#)

Valid to date [Help](#)

Add AS



Robert | Account: APNICRANDNET-AU | [Manage Contacts](#) | [My Profile](#) | [Log out](#)



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[IPv4](#) | [IPv6](#) | [ASN](#) | [Whois updates](#) | [Certification](#) | [Maintainers](#) | [Correspondence](#)

[Home](#) / [Resources](#) / [Certification](#) / [Sign ROA](#)

Sign ROA

Sign ROA

ROA name [Help](#)

"Owned" Resources

[Owned Resources](#) | [Help](#) | [Load](#) | [Load collection](#)

IPv4

- 1.0.0.0/24
- 1.1.1.0/24
- 1.2.3.0/24
- 1.4.0.0/24
- 1.10.10.0/24
- 203.133.248.0/22
- 203.147.108.0/23

IPv6

- 2401:2000::/32

Add Selected Resources To Collection

Remove Selection From Collection

New Collection

[Add/remove resources](#)

[+](#) [-](#)

[Clear](#)

AS number [Help](#)

Valid from date [Help](#)

Valid to date [Help](#)

[Create ROA](#)

Advanced Management



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Resource Certification

Resource Certificate Download

Download the [current issued certificate](#) covering your owned resource set.

Sign Route Origin Authorization

[Create a signed ROA document](#), certifying your authorization for an Autonomous System to originate routes for your resources.

Sign Adjacency Attestation Object

[Create a signed AAO document](#), certifying that one of your Autonomous Systems is adjacent to other Autonomous Systems.

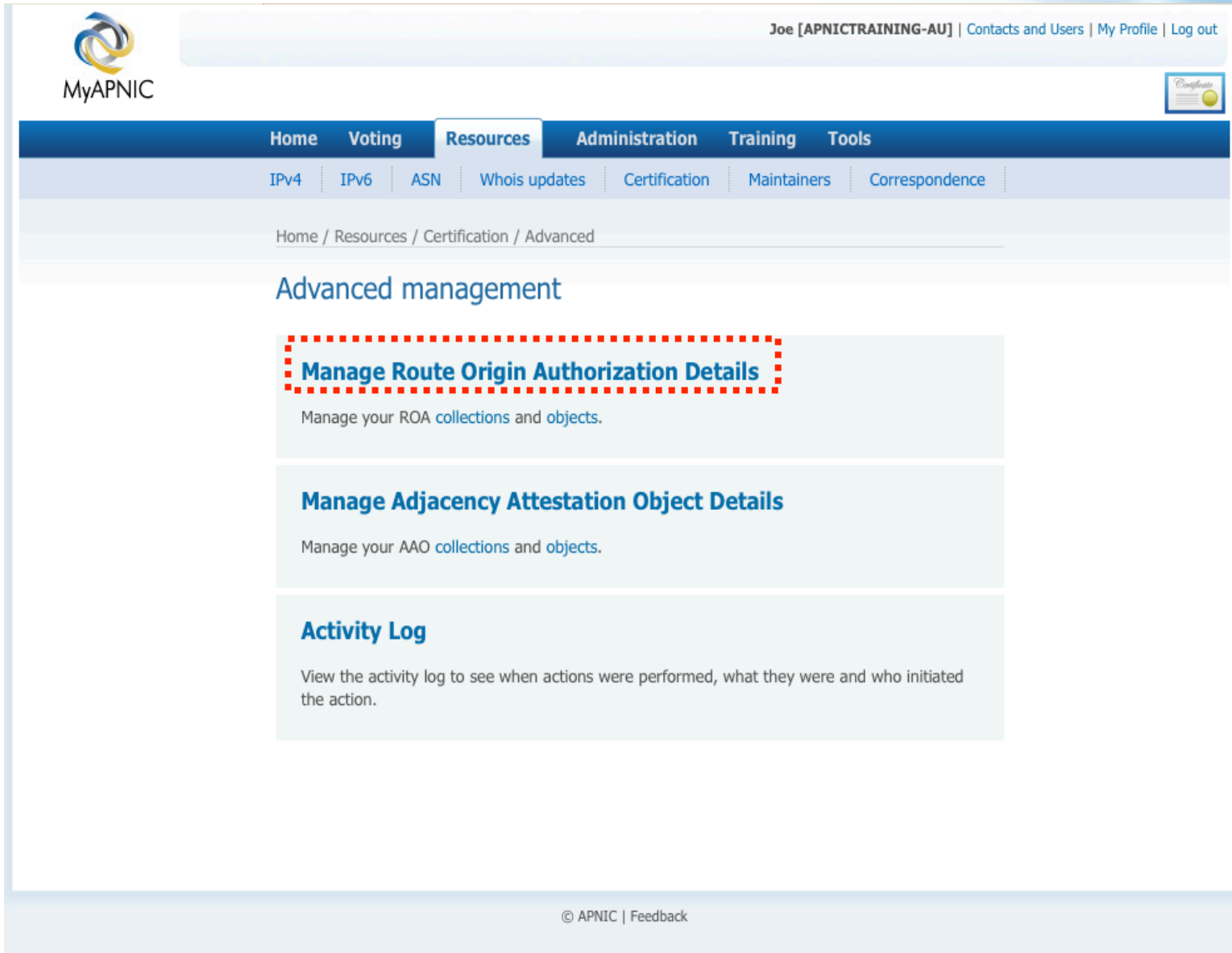
Recent Signed Products

You have no recently signed products

Advanced Management

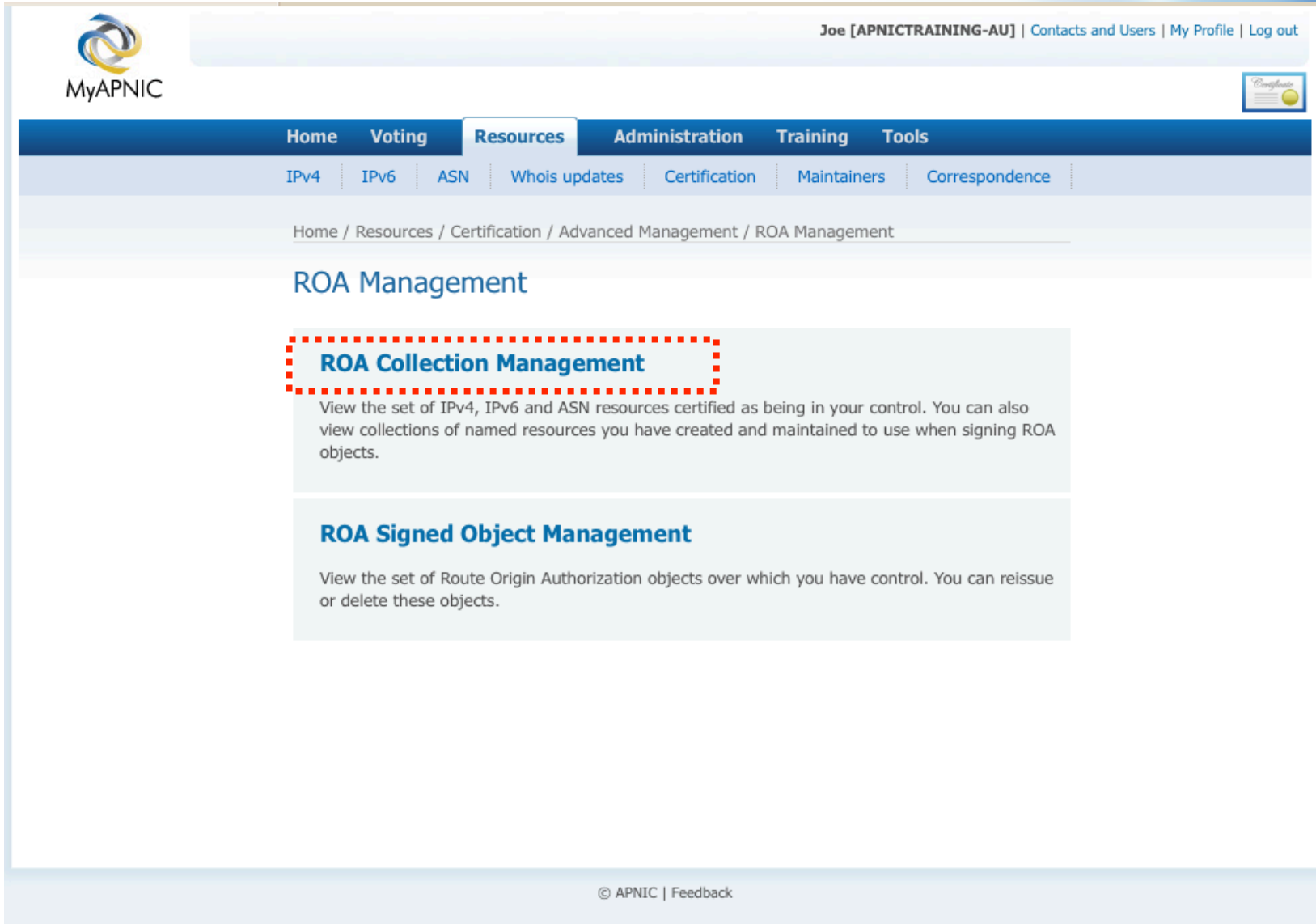
For more advanced management of your [Route Origin Authorization](#), [Adjacency Attestation Object](#) details or viewing of the [activity log](#).

Route Origin Authorization (ROA)



The screenshot shows the MyAPNIC user interface. At the top left is the MyAPNIC logo. At the top right, the user is identified as 'Joe [APNICTRAINING-AU]' with links for 'Contacts and Users', 'My Profile', and 'Log out'. A navigation bar contains 'Home', 'Voting', 'Resources', 'Administration', 'Training', and 'Tools'. Below this, a secondary menu lists 'IPv4', 'IPv6', 'ASN', 'Whois updates', 'Certification', 'Maintainers', and 'Correspondence'. A breadcrumb trail reads 'Home / Resources / Certification / Advanced'. The main content area is titled 'Advanced management' and contains three sections: 'Manage Route Origin Authorization Details' (highlighted with a red dashed box), 'Manage Adjacency Attestation Object Details', and 'Activity Log'. The footer contains the copyright notice '© APNIC | Feedback'.

ROA Collection Management



The screenshot shows the MyAPNIC website interface. At the top left is the MyAPNIC logo. At the top right, the user is identified as Joe [APNICTRAINING-AU] with links for Contacts and Users, My Profile, and Log out. A navigation bar contains tabs for Home, Voting, Resources, Administration, Training, and Tools. Below this, a secondary navigation bar lists IPv4, IPv6, ASN, Whois updates, Certification, Maintainers, and Correspondence. A breadcrumb trail reads: Home / Resources / Certification / Advanced Management / ROA Management. The main content area is titled "ROA Management" and features two sections: "ROA Collection Management" (highlighted with a red dashed border) and "ROA Signed Object Management".

MyAPNIC

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Home Voting Resources Administration Training Tools

IPv4 IPv6 ASN Whois updates Certification Maintainers Correspondence

Home / Resources / Certification / Advanced Management / ROA Management

ROA Management

ROA Collection Management

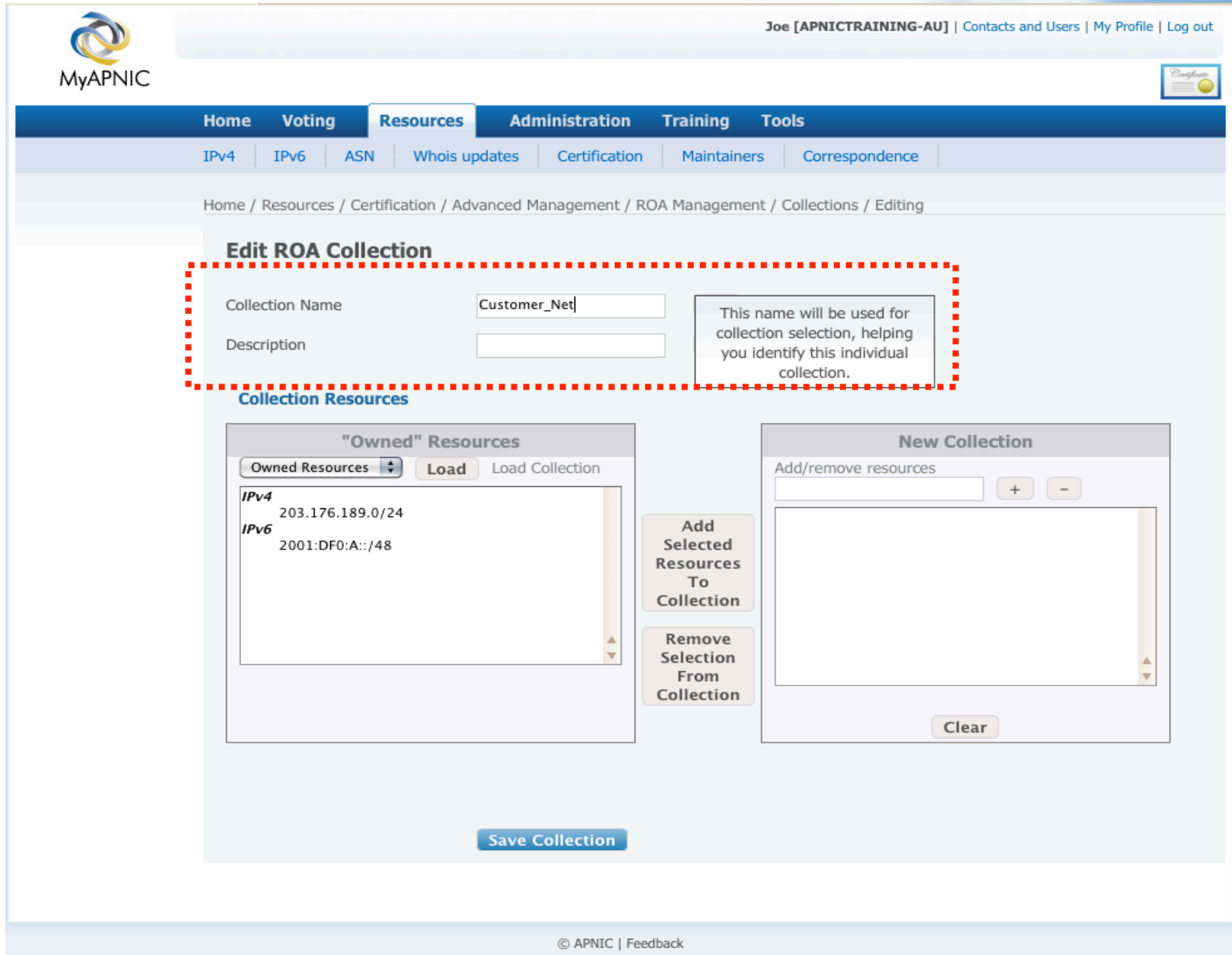
View the set of IPv4, IPv6 and ASN resources certified as being in your control. You can also view collections of named resources you have created and maintained to use when signing ROA objects.

ROA Signed Object Management

View the set of Route Origin Authorization objects over which you have control. You can reissue or delete these objects.

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Add ROA Collection



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Home / Resources / Certification / Advanced Management / ROA Management / Collections / Editing

Edit ROA Collection

Collection Name: This name will be used for collection selection, helping you identify this individual collection.

Description:

Collection Resources

"Owned" Resources

Owned Resources Load Collection

IPv4	203.176.189.0/24
IPv6	2001:DF0:A::/48

New Collection

Add/remove resources

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Add ROA Collection

The screenshot shows the MyAPNIC web interface. At the top, there is a navigation bar with tabs for Home, Voting, Resources, Administration, Training, and Tools. Below this is a secondary navigation bar with links for IPv4, IPv6, ASN, Whois updates, Certification, Maintainers, and Correspondence. A breadcrumb trail indicates the current path: Home / Resources / Certification / Advanced Management / ROA Management / Collections / Editing.

The main content area is titled "Edit ROA Collection". It contains two form fields: "Collection Name" with the value "Customer_Net" and "Description" with the value "My customer net". Each field has a "Help" button next to it. This entire form area is enclosed in a red dashed box.

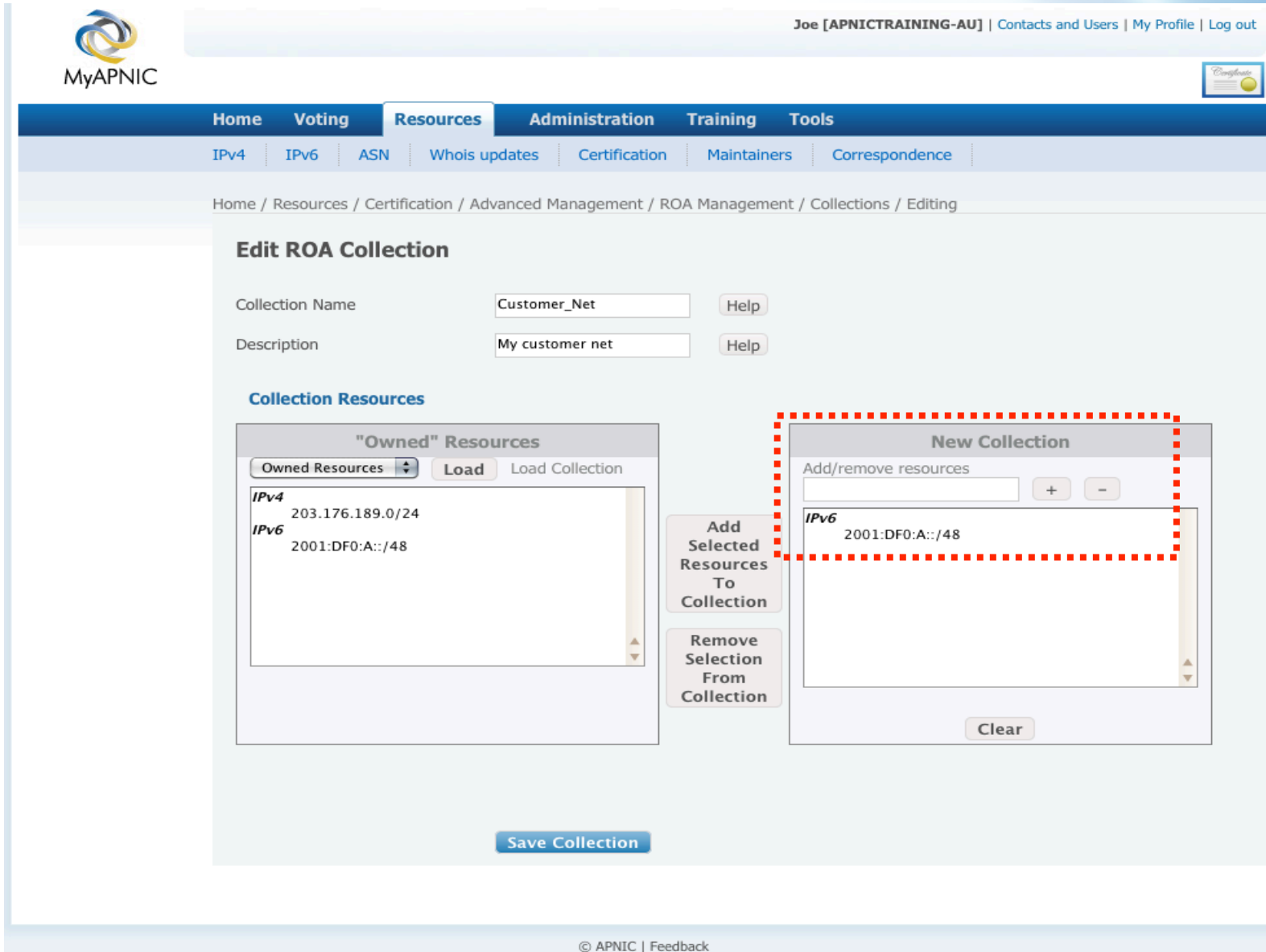
Below the form is a section titled "Collection Resources". It is divided into two panels: "Owned" Resources and "New Collection".

- The "Owned" Resources panel has a dropdown menu set to "Owned Resources" and a "Load" button. It contains a list of resources: "IPv4 203.176.189.0/24" and "IPv6 2001:DF0:A::/48". The IPv6 resource is highlighted in green.
- The "New Collection" panel has an "Add/remove resources" input field with "+" and "-" buttons. It contains a large empty list area and a "Clear" button at the bottom.

Between the two panels are two buttons: "Add Selected Resources To Collection" and "Remove Selection From Collection". At the bottom of the "Owned" Resources panel is a "Save Collection" button.

At the top right of the page, there is a user profile section for "Joe [APNICTRAINING-AU]" with links for "Contacts and Users", "My Profile", and "Log out". There is also a "Configure" button with a gear icon.

Add ROA Collection



MyAPNIC

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IPv4 IPv6 ASN Whois updates Certification Maintainers Correspondence

Home / Resources / Certification / Advanced Management / ROA Management / Collections / Editing

Edit ROA Collection

Collection Name [Help](#)

Description [Help](#)

Collection Resources

"Owned" Resources

Owned Resources Load Collection

IPv4	203.176.189.0/24
IPv6	2001:DF0:A::/48

New Collection

Add/remove resources

IPv6	2001:DF0:A::/48
------	-----------------

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Add/Remove Resources

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Home / Resources / Certification / Advanced Management / ROA Management / Collections / Editing

Edit ROA Collection

Collection Name: [Help](#)

Description: [Help](#)

Collection Resources

"Owned" Resources

Owned Resources Load Collection

IPv4	203.176.189.0/24
IPv6	2001:DF0:A::/48

New Collection

Add/remove resources

IPv6	2001:DF0:A:100::/56
	2001:DF0:A:200::/56



View & Update Collections

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IPv4 IPv6 ASN Whois updates Certification Maintainers Correspondence

Home / Resources / Certification / Advanced Management / ROA Management / Collections

Route Origin Authorization Collections

[View Certificate](#)

OWNED

Owned Resources

IPV4

203.176.189.0/24

IPV6

2001:DF0:A::/48

ASN

45192
131107

[Edit](#) | [Delete](#)

Customer_Net

My customer net

IPV6

2001:DF0:A::/56
2001:DF0:A:200::/55

Create New Collection

You can [create a new collection](#) of IP addresses to be used when signing ROA objects. You can only create a new collection with the resources you already have.

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Download Certificate



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[IPv4](#) | [IPv6](#) | [ASN](#) | [Whois updates](#) | [Certification](#) | [Maintainers](#) | [Correspondence](#)

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Download Certificate

MyAPNIC

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IPv4 IPv6 ASN Whois updates Certification Maintainers Correspondence

Home / Resources / Certification / Resource Certificate

Resource Certificate

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Version:	3
Serial Number:	23:B8
Issuer:	/CN=APNIC Production-CVPQSGUkLy7pOXdNeVWGvnFX_0s
Not Valid Before:	Mar 20 2009 8:35:43 GMT
Not Valid After:	Jul 30 2020 0:00:00 GMT
Subject:	/CN=A91E170B

Authority Key Identifier
keyid: 09:53:D0:4A:05:24:2F:2E:E9:39:77:4D:79:55:86:BE:71:57:FF:4B

Subject Key Identifier
87:87:D3:F3:87:17:97:95:7F:BA:69:5B:1B:EB:B7:0E:92:8C:2C:BB

Key Usage *CRITICAL*
Certificate Signing, CRL Signing

Basic Constraints *CRITICAL*
ca: TRUE

CRL Distribution Points
rsync://rpki.apnic.net/repository/A3C38A24D60311DCAB08F319798DBE39
/CVPQSGUkLy7pOXdNeVWGvnFX_0s.crl

Certificate Policies *CRITICAL*
1.3.6.1.5.5.7.14.2

Authority Information Access
caIssuers - rsync://rpki.apnic.net/repository/8BDFC7DED5FD11DCB14CF4B1A703F9B7
/CVPQSGUkLy7pOXdNeVWGvnFX_0s.cer

Subject Information Access
caRepository - rsync://rpki.apnic.net/member_repository/A91E170B
/7065DCFAA35C11DD977174C51F86D636/
rpkiManifest - rsync://rpki.apnic.net/member_repository/A91E170B
/7065DCFAA35C11DD977174C51F86D636/h4FT84cXISV_umibG-u3DpKMLs.mft

SBGP AS Identifiers *CRITICAL*
Autonomous System Numbers
45192 131107

SBGP IP Address Families *CRITICAL*
IPv4
203.176.189.0/24
IPv6
2001:0df0:000a::/48

[Download this Certificate](#)

Questions?



Thank you! 😊

