

# Internet Routing Registry (IRR)

APNIC Tutorial in APNIC35

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**APNIC**



# Introduction

- Presenter

**Nurul Islam Roman**  
Senior Training Specialist  
nurul@apnic.net

Specialties:  
Routing & Switching  
MPLS, IPv6  
DNS/DNSSEC  
Internet Resource Management  
Network Security



# What is a Routing Registry?

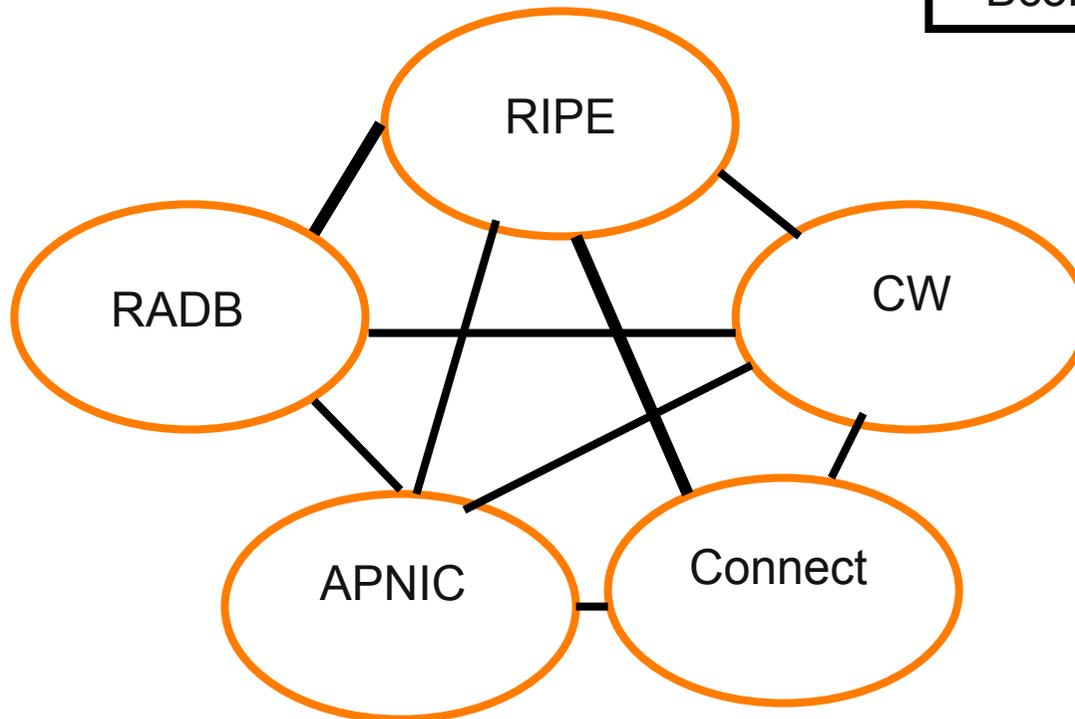
- A repository (database) of Internet routing policy information
  - Autonomous Systems exchanges routing information via BGP
  - Exterior routing decisions are based on policy based rules
  - However BGP does not provides a mechanism to publish/communicate the policies themselves
  - RR provides this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

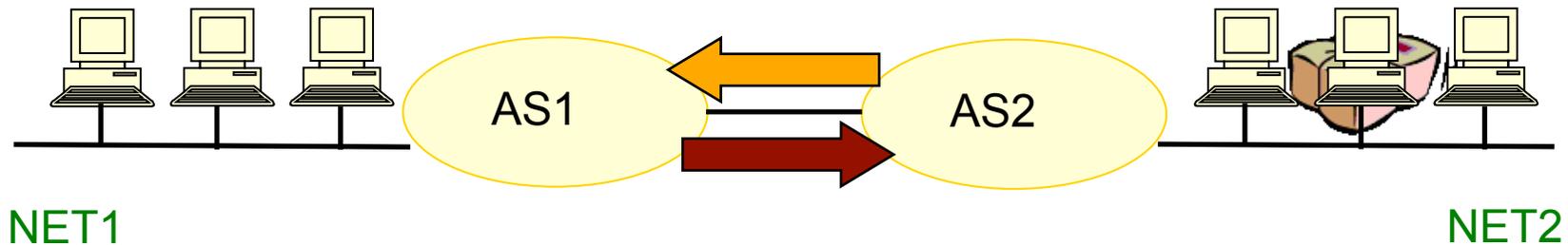
# Routing Registry Objects

- 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



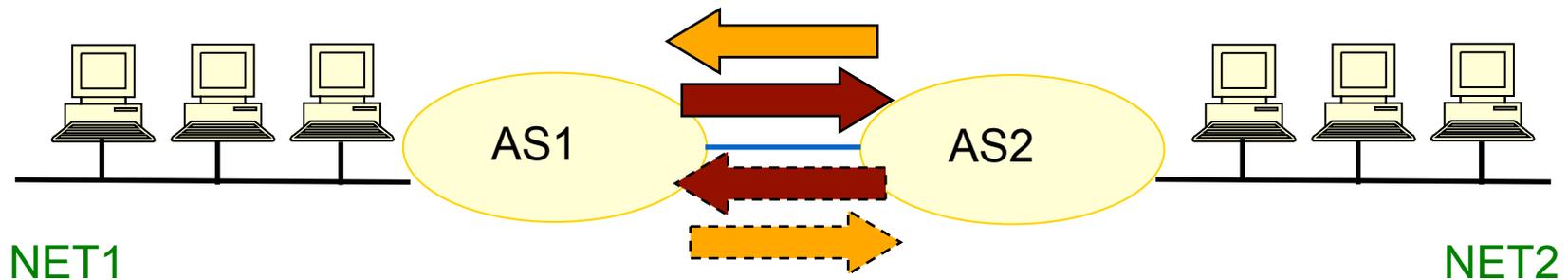
In order for traffic to flow from NET2 to NET1 between AS1 and AS2:

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:

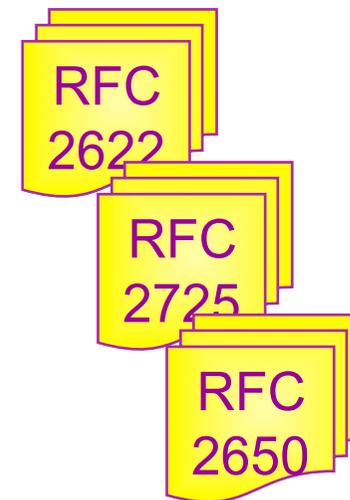
AS2 must announce NET2 to AS1

And AS1 has to accept this information and use it

Resulting in packet flow from NET 1 to NET2

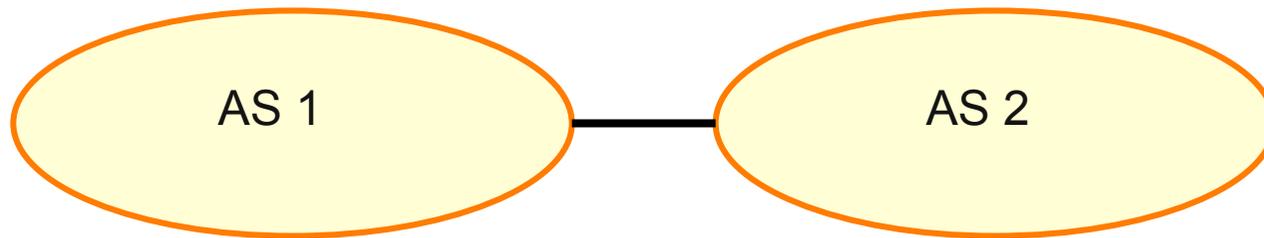
# RPSL

- 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
```

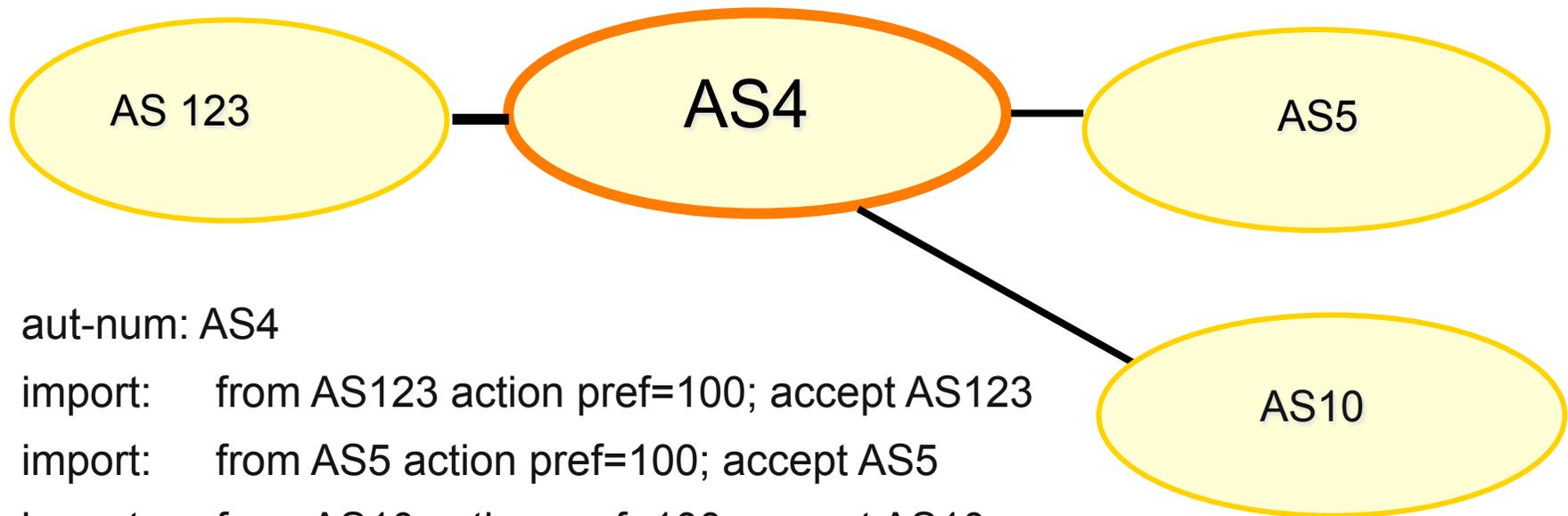
# Routing Policy - Examples



More complex example

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

# Routing Policy - Examples



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

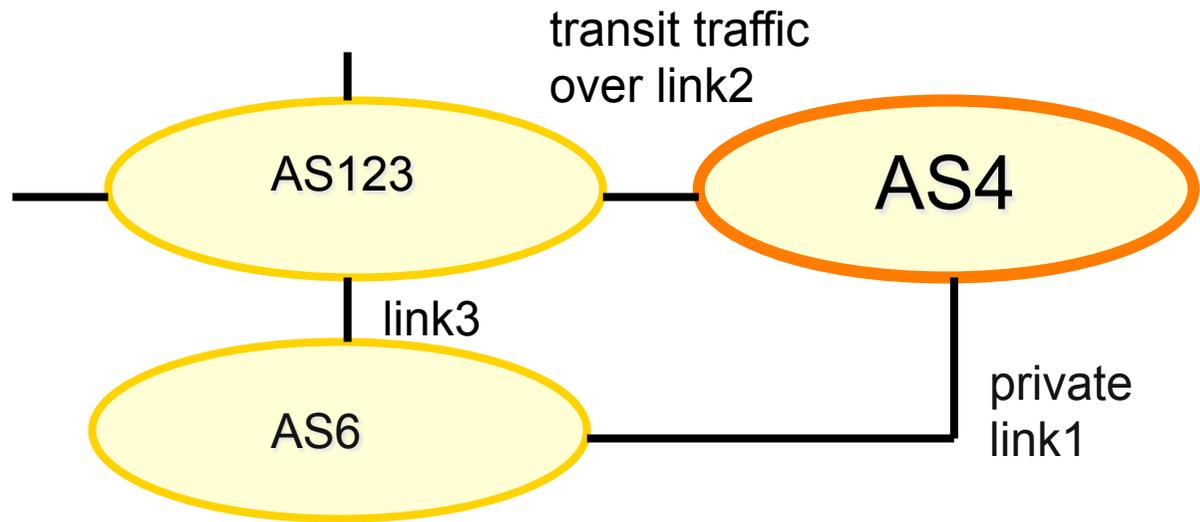
export: to AS123 announce AS4

export: to AS5 announce AS4 AS10

export: to AS10 announce AS4 AS5

← *Not a path*

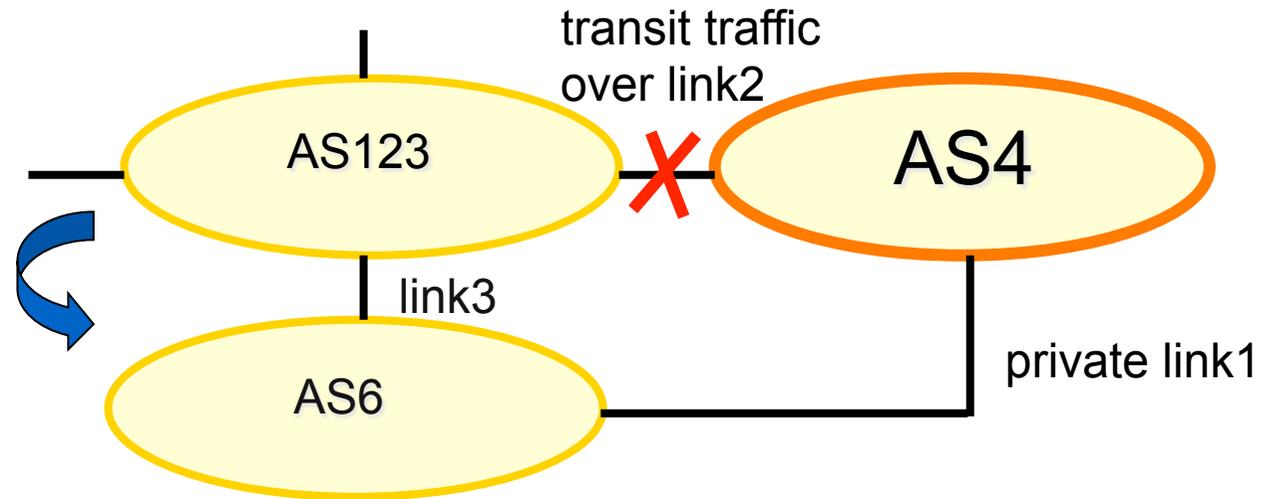
# Routing Policy - Examples



More complex example

- AS4 and AS6 private link1
- AS4 and AS123 main transit link2
- backup all traffic over link1 and link3 in event of link2 failure

# Routing Policy - Examples



aut-num: AS4

import: from AS123 action pref=100; accept ANY ← *full routing received*

import: from AS6 action pref=50; accept AS6

import: from AS6 action pref=200; accept ANY

export: to AS6 announce AS4

export: to AS123 announce AS4

*higher cost for backup route*

# APNIC Database and the IRR

APNIC

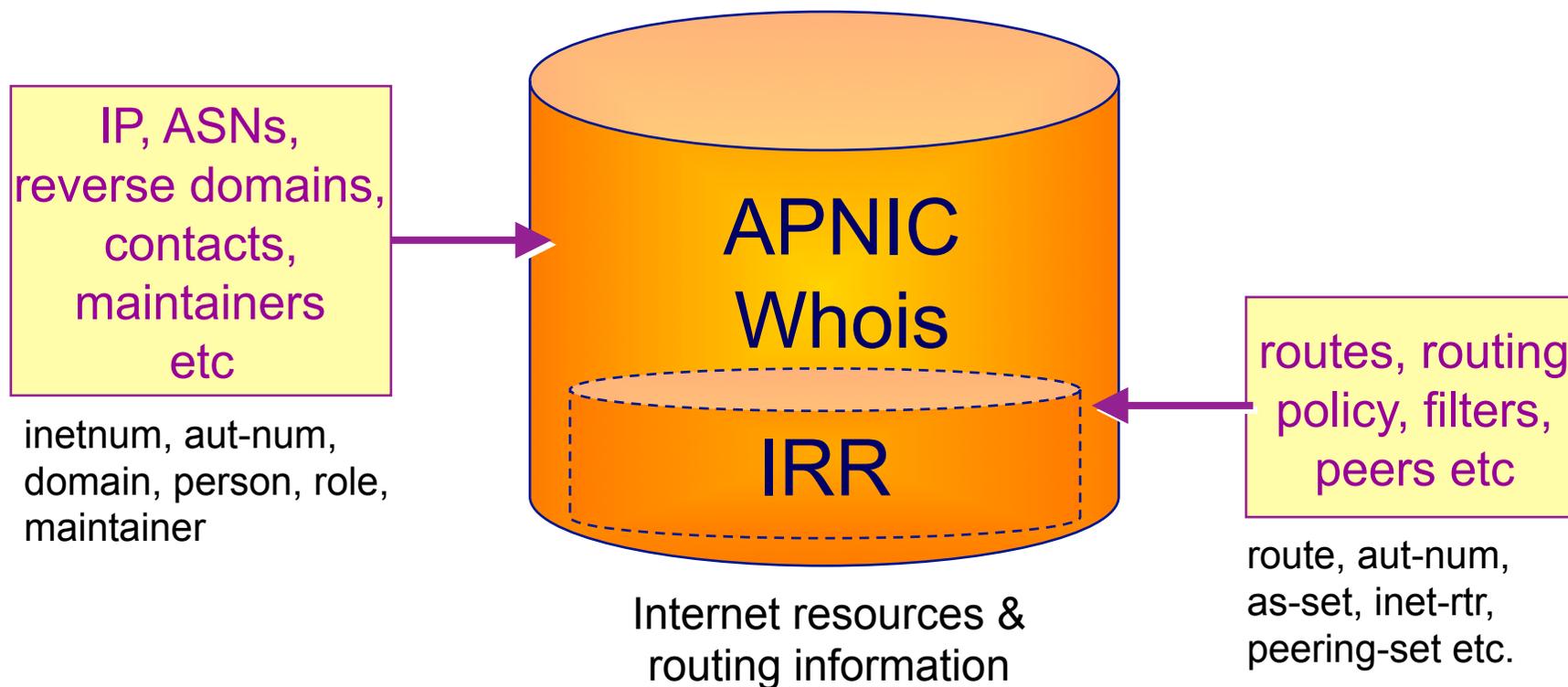


# APNIC Database & the IRR

- 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](http://www.apnic.net/db/ref/db-objects.html)

# Using the Routing Registry

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# 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://irrtoolset.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?

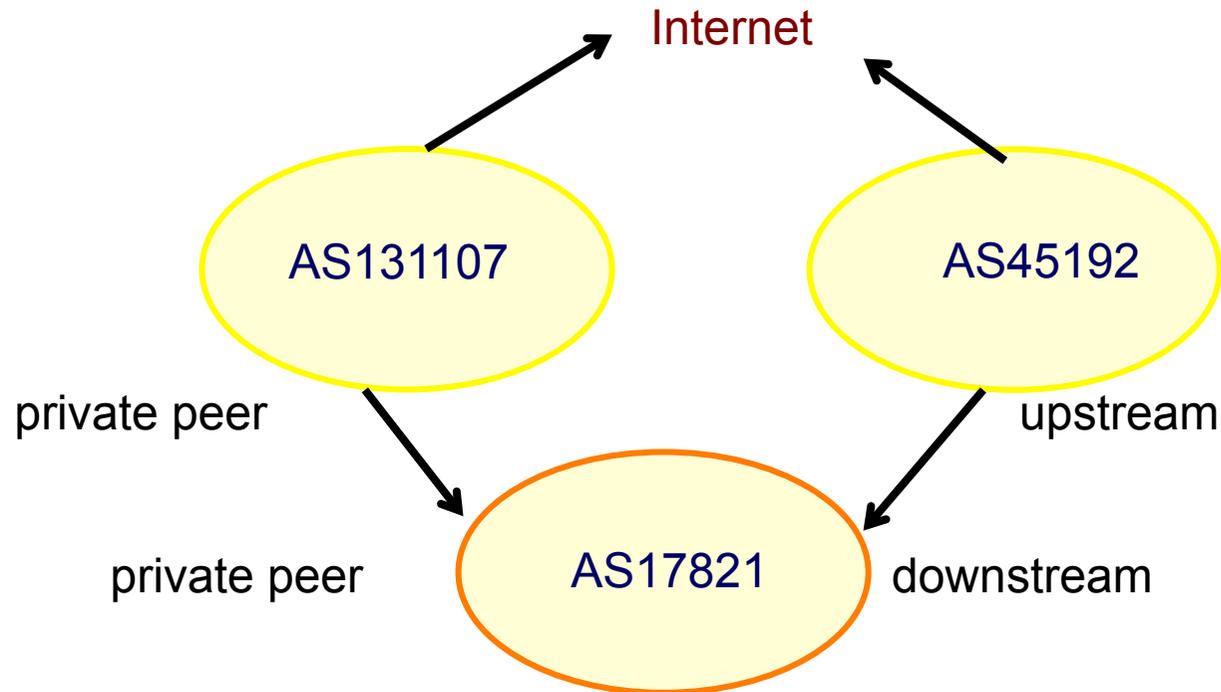
- Benefits of RtConfig
  - Avoid filter errors (typos)
  - Expertise encoded in the tools that generate the policy rather than engineer configuring peering session
  - Filters consistent with documented policy
    - (need to get policy correct though)

# Using RPSL in practice

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# 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

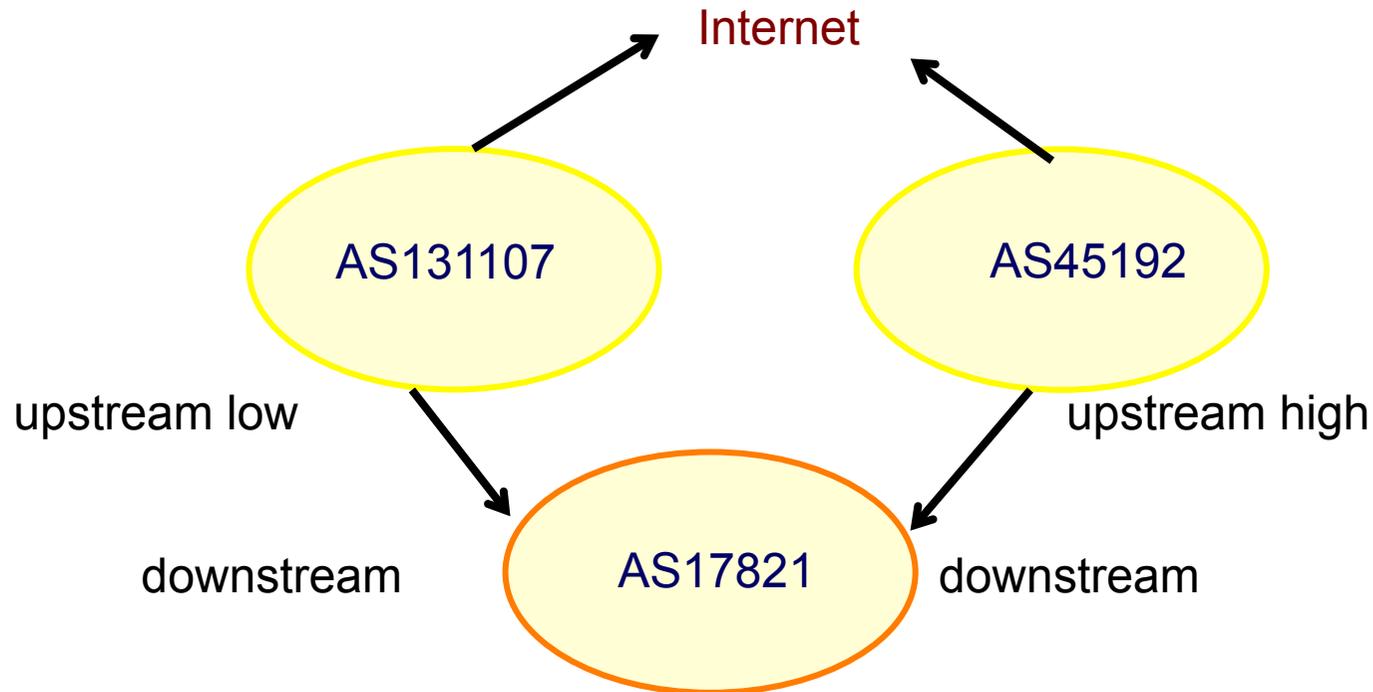
remarks: AS131107 is a private peer

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 AS17821

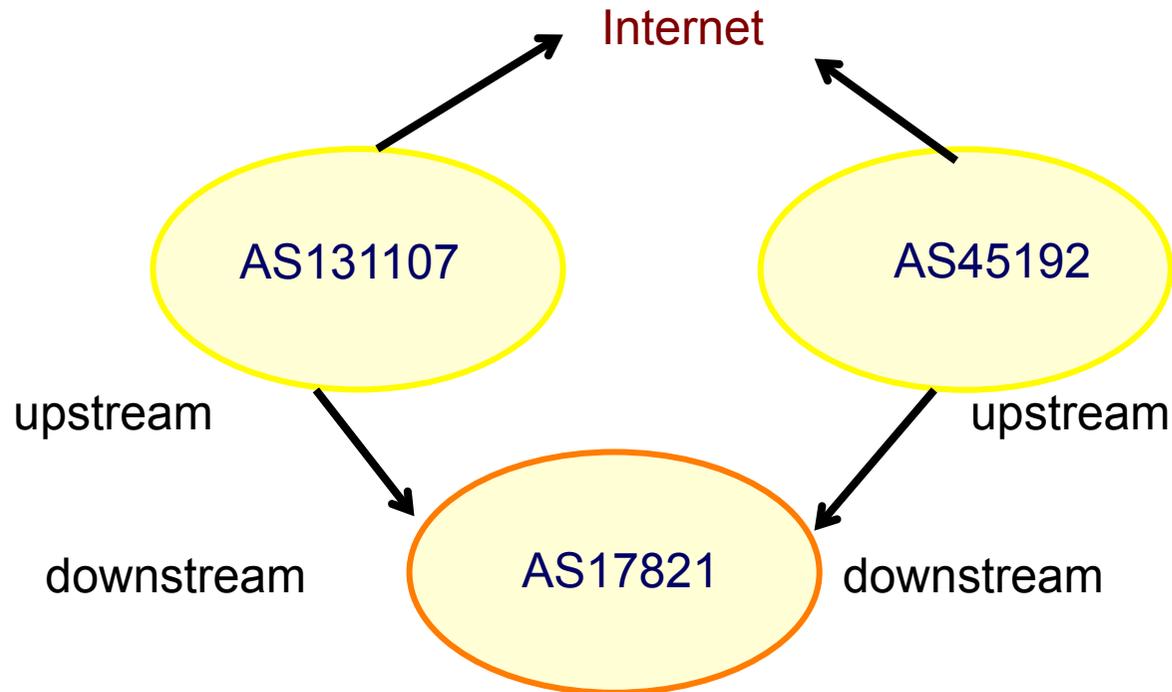
remarks: Optional extra import line to prefer direct

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

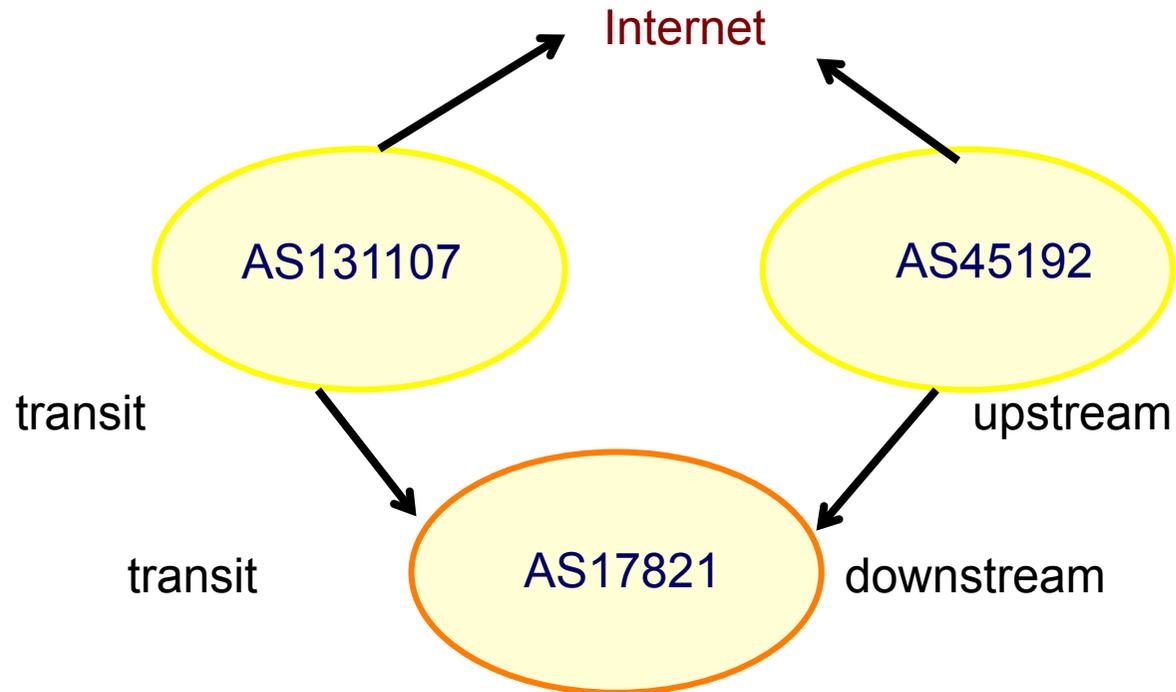
import: from AS131107 action pref=100; accept ANY

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

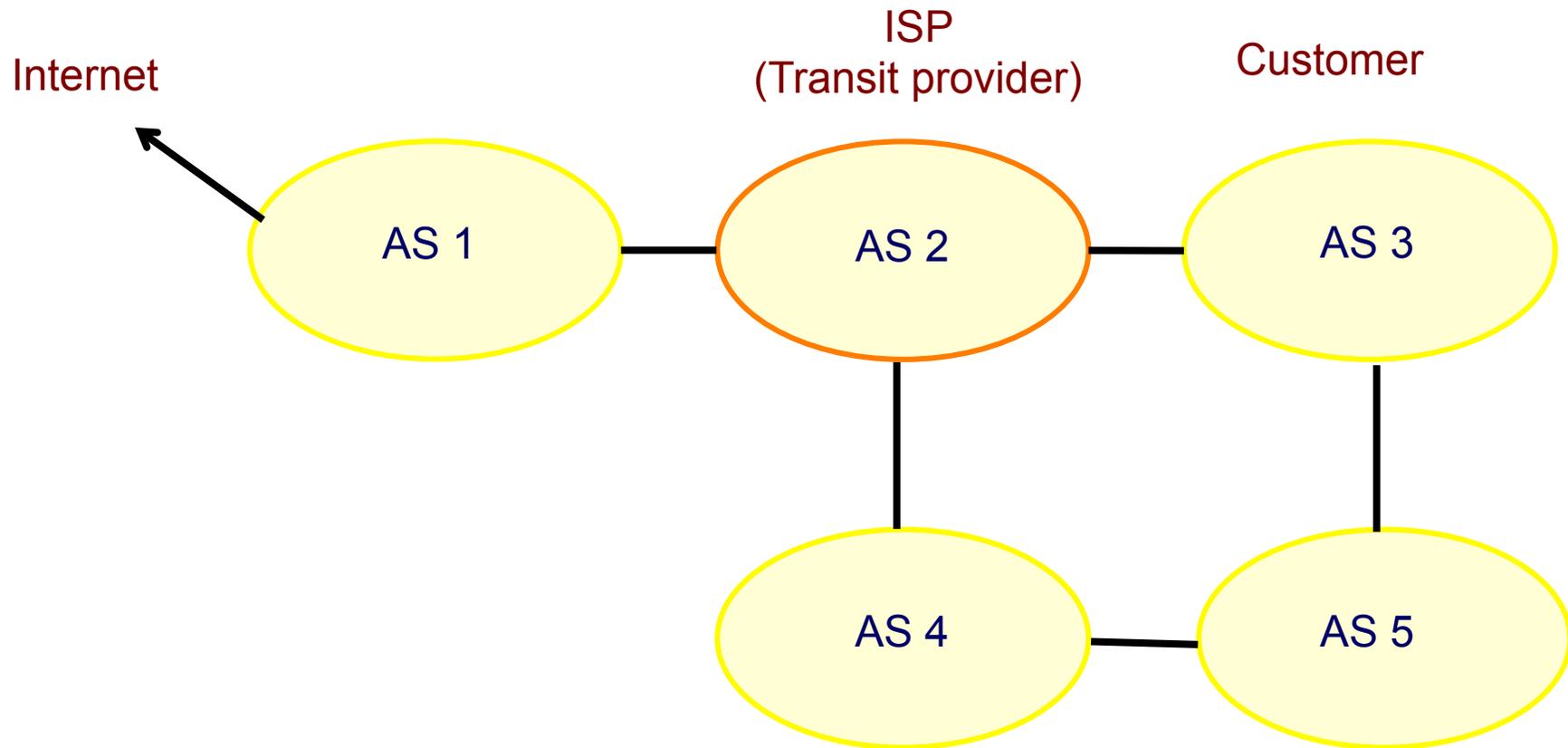
import: from AS131107 action pref=100; accept ANY

export: to AS131107 announce ANY

remarks: the pref is optional here

.....

# Common Peering Policies



- Peering policies of an AS
  - Registered in an aut-num object

# Common Peering Policies

- Policy for AS3 in the AS2 aut-num object

```
aut-num:      AS2
as-name:      SAMPLE-NET
dsescrip:     Sample AS
import:       from AS1 accept ANY
import:       from AS3 accept <^AS3+$>
export:       to AS3 announce ANY
export:       to AS1 announce AS2 AS3
admin-c:      CW89-AP
tech-c:       CW89-AP
mtn-by:       MAINT-SAMPLE-AP
changed:      sample@sample.net
```

# Filter List- Regular Expression

- Like Unix regular expressions
  - . Match one character
  - \* Match any number of preceding expression
  - + Match at least one of preceding expression
  - ^ Beginning of line
  - \$ End of line
  - \ Escape a regular expression character
  - \_ Beginning, end, white-space, brace
  - | Or
  - () Brackets to contain expression
  - [] Brackets to contain number ranges

# ISP Customer – Transit Provider Policies

- Policy for AS3 and AS4 in the AS2 aut-num object

```
aut-num:      AS2
import:       from AS1 accept ANY
import:       from AS3 accept <^AS3+$>
import:       from AS4 accept <^AS4+$>
export:       to AS3 announce ANY
export:       to AS4 announce ANY
export:       to AS1 announce AS2 AS3 AS4
```

# AS-set Object

- Describe the customers of AS2

```
as-set:      AS2:AS-CUSTOMERS
members:     AS3 AS4
changed:     sample@sample.net
source:      APNIC
```

# 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

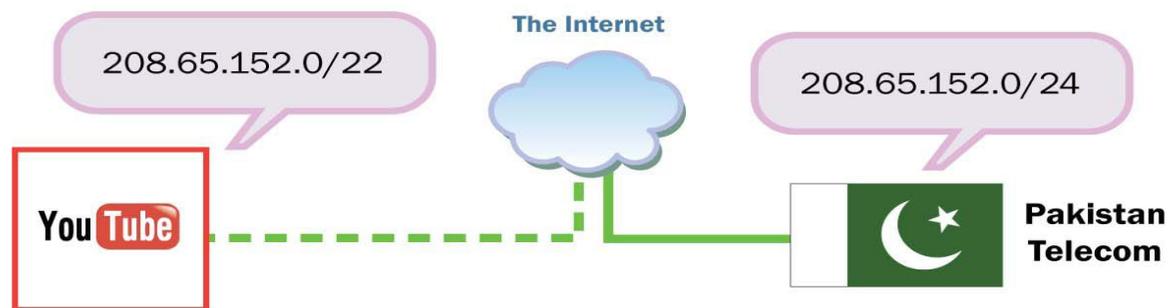
- Any effort to alter that information results in the signature being invalidated
- Only resource holders with a properly delegated 'right of use' can generate a signature

## Benefits (cont.)

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

# What is RPKI?

- Designed to secure the Internet's routing infrastructure
- Only the legitimate holder can advertise their prefix to the Internet
- Prevent those incidence of route hijacking (sometime by mistake)

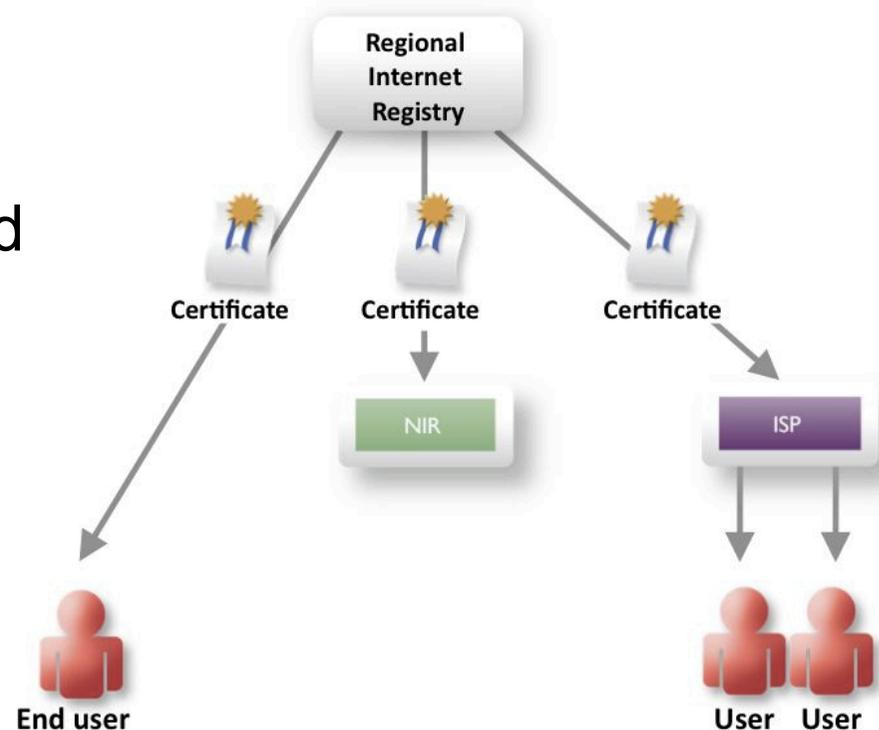


# How It Works?

- Initially each RIR issued a self-signed trust anchors to the address they received from IANA
- Contains all resources from a **single trust anchor** managed by the RIR
- It was irrespective of their source

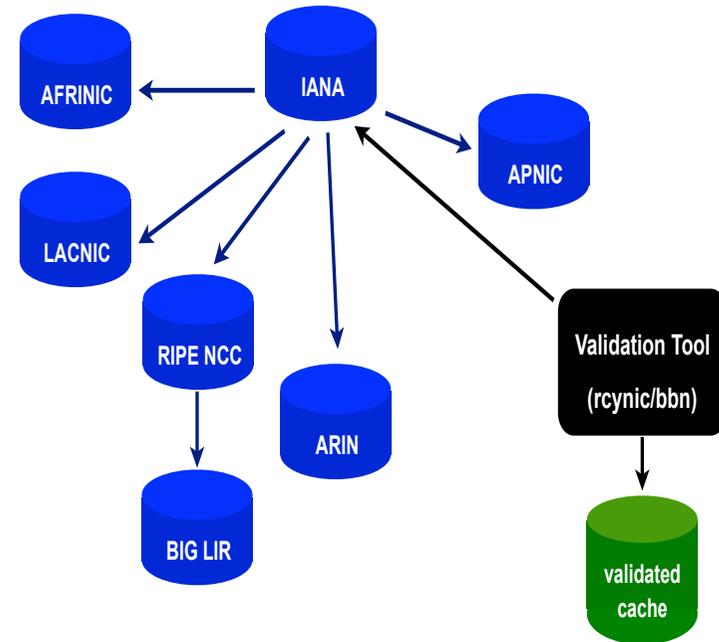
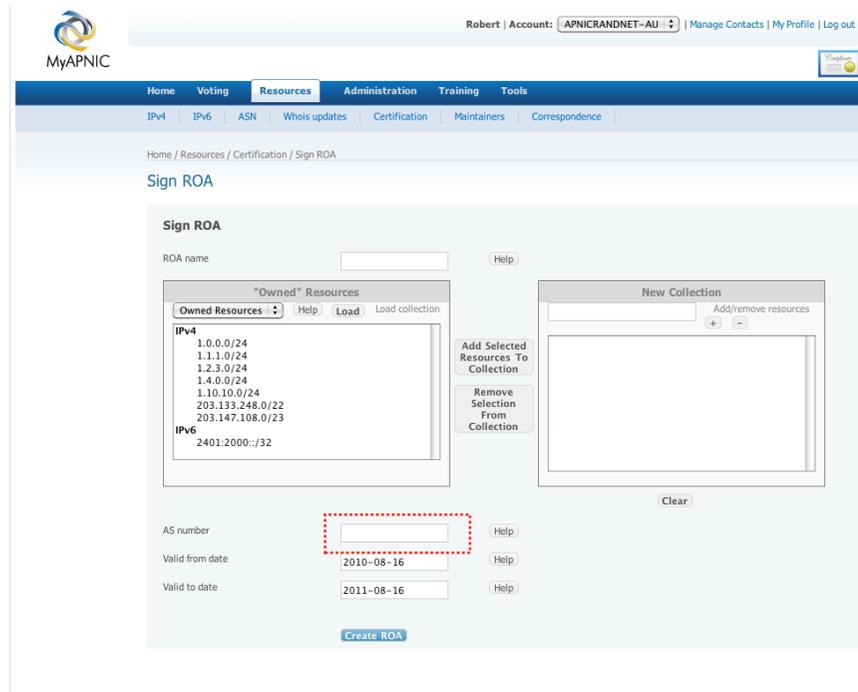
## Resource Holder (NRO)

*Internet Address Allocation and Resource Certification*



# How It Works?

## RPKI Validation: Distributed Repository



# How It Works?

RPKI Validation: RPKI-RTR protocol



```
router bgp 65000  
bgp log-neighbor-changes  
bgp rpki server tcp 198.180.150.1 port 42420 refresh 60
```

How does it look in **BGP** table then?

# BGP Table

## RPKI Validation: RPKI-RTR protocol

```
router1#sh bgp ipv4 unicast
BGP table version is 45, local router ID is 203.176.189.15
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, x best-external, f RT-Filter, a additional-path
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
```

Network	Next Hop	Metric	LocPrf	Weight	Path
V0.0.0.0	0.0.0.0		0	i	
*> N67.21.36.0/24	199.238.113.10			0 3130 2914 293 3970	e
*> V85.118.184.0/21	199.238.113.10			0 3130 2914 174 29485 29485 57785	i
*> I98.128.0.0/24	199.238.113.10	0		0 3130	i
*> V98.128.0.0/16	199.238.113.10	0		0 3130	i
*> N98.128.1.0/24	199.238.113.10	0		0 3130	i
*> N98.128.2.0/24	199.238.113.10	0		0 3130	i

```
route-map validity-0
  match rpki-invalid
  drop
route-map validity-1
  match rpki-not-found
  set localpref 50
  // Valid defaults to 100
```

```
route-map validity-0
  match rpki-unknown
  set metric 50
route-map validity-1
  match rpki-invalid
  set metric 25
route-map validity-2
  set metric 100
```

**Use route-map to accept RPKI validated route**

# What Is The New Challenge?

- Inter RIR transfer process is implemented now
- It requires an efficient way to reflect the changes to an RIR's resource holding
- Without revoking and reissuing the affected RIR trust anchor
- The split anchor model allows more granular updates, affecting only the certification path that covers the transferred resources

# New Split Anchor Model

- APNIC has published five new self-signed certificates
- One for those address space given by IANA for this region
- Four for other self-signed certificates for resource acquired from each other RIR

# What Changes For Operational Network?

- Organizations that RPKI origin validation on their router software need to make updates to their routing configuration
- If you already have the APNIC trust anchor you should refresh this with the complete new set of five
- Take note of any required configuration changes in your software

# Find More.....

- APNIC to Upgrade to Split Trust Anchor RPKI:  
<http://www.apnic.net/publications/news/2012/apnic-to-upgrade-to-split-trust-anchor-rpki>
- Resource Public Key Infrastructure (RPKI) FAQ:  
<http://www.apnic.net/services/services-apnic-provides/helpdesk/faqs/rpki/>
- Resource certification  
<http://www.apnic.net/services/services-apnic-provides/resource-certification>

# 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

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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](#).

### 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 

### 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...](#)

# Resources Management



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## 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](#)

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# Activate Certification



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## 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.

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# Service Activated



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## 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



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# Name ROA



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## 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  
1.4.0.0/24  
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

2010-08-16

Help

Valid to date

2011-08-16

Help

Create ROA



# Add Resources



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## 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 Resources



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](#)



# Add AS



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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](#)

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

Empty collection area

[Clear](#)

AS number

[Help](#)

Valid from date

[Help](#)

Valid to date

[Help](#)

[Create ROA](#)



# Advanced Management



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

[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.

### Recent Signed Products

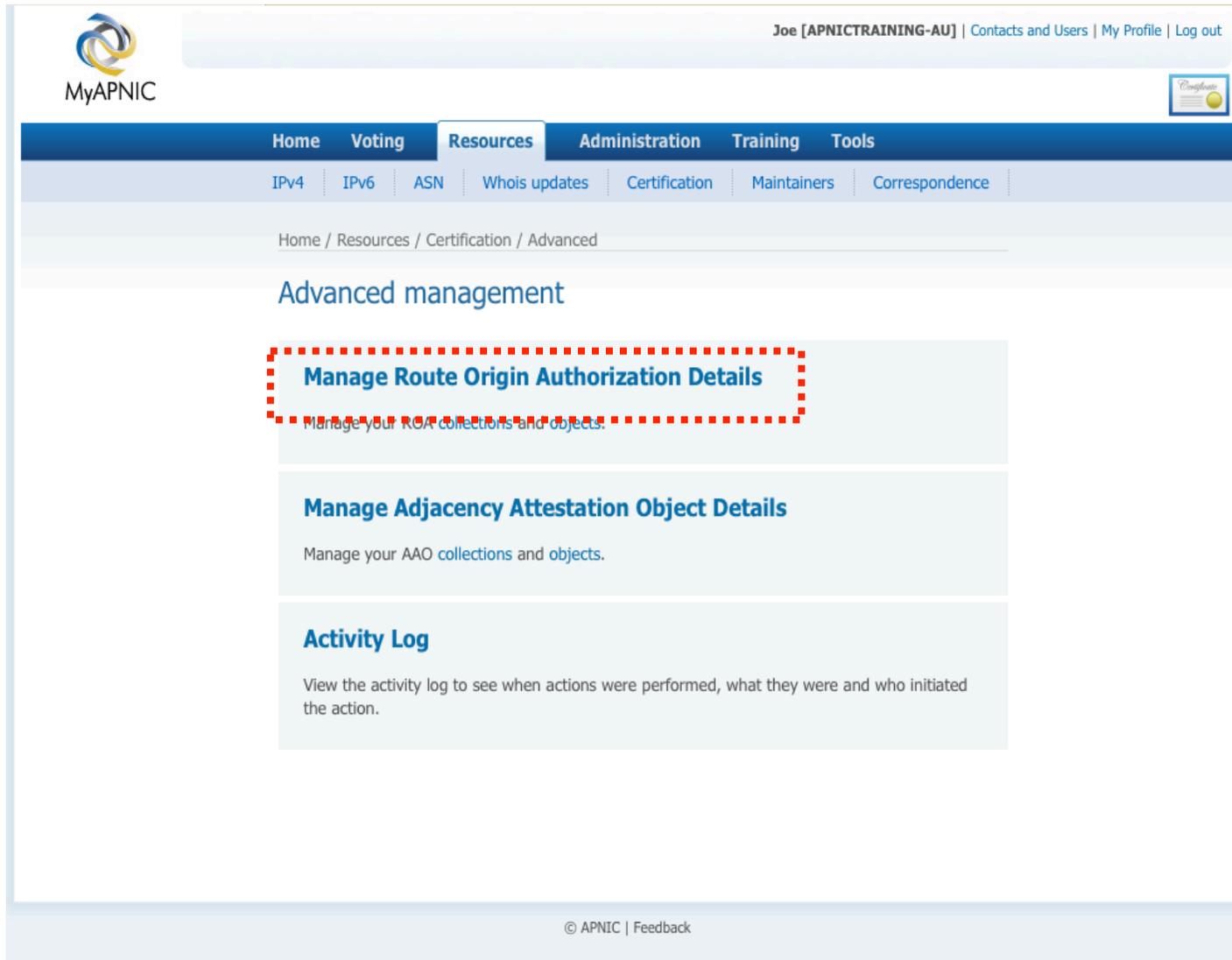
You have no recently signed products

### 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 displays the MyAPNIC user interface. At the top left is the MyAPNIC logo. The top right shows the user name 'Joe [APNICTRAINING-AU]' and navigation links for 'Contacts and Users', 'My Profile', and 'Log out'. A main navigation bar includes 'Home', 'Voting', '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 / 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'.

MyAPNIC

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

Home Voting Resources Administration Training Tools

IPv4 IPv6 ASN Whois updates Certification Maintainers Correspondence

Home / Resources / Certification / Advanced

## Advanced management

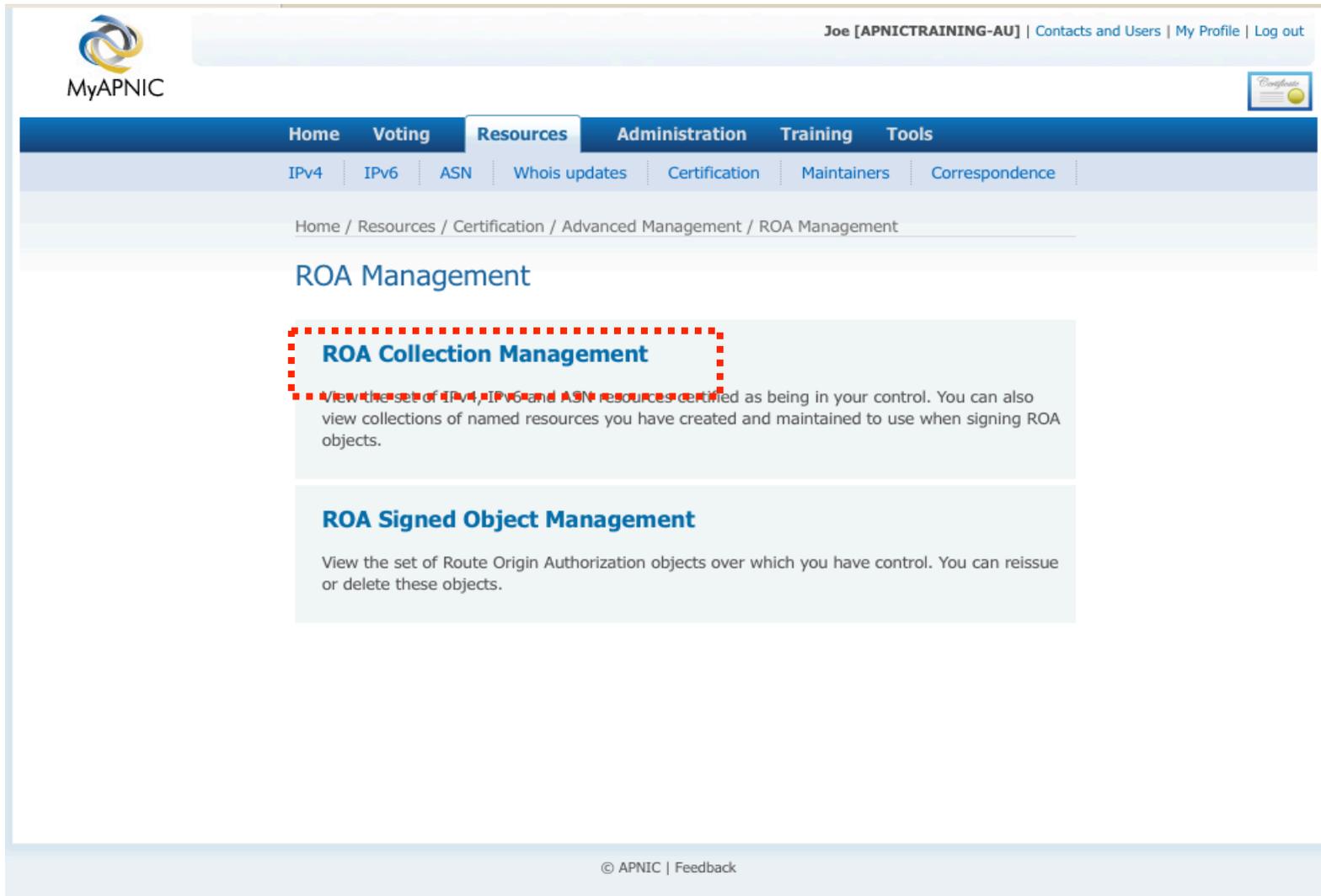
**Manage Route Origin Authorization Details**  
Manage your ROA collections and objects.

**Manage Adjacency Attestation Object Details**  
Manage your AAO collections and objects.

**Activity Log**  
View the activity log to see when actions were performed, what they were and who initiated the action.

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# ROA Collection Management



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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

Description

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

#### 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

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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 / 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

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# Add ROA Collection

The screenshot shows the MyAPNIC web interface for editing an ROA collection. The page title is "Edit ROA Collection". The collection name is "Customer\_Net" and the description is "My customer net".

**Collection Resources**

**"Owned" Resources**

Owned Resources	Load	Load Collection
<b>IPv4</b> 203.176.189.0/24		
<b>IPv6</b> 2001:DF0:A::/48		

**New Collection**

Add/remove resources

<b>IPv6</b> 2001:DF0:A::/48
--------------------------------

Buttons: Add Selected Resources To Collection, Remove Selection From Collection, Clear

Save Collection

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# Add/Remove Resources

MyAPNIC

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

Home Voting Resources Administration Training Tools

IPv4 IPv6 ASN Whois updates Certification Maintainers Correspondence

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

### Edit ROA Collection

Collection Name

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

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

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# View & Update Collections

MyAPNIC

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

Home Voting Resources Administration Training Tools

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

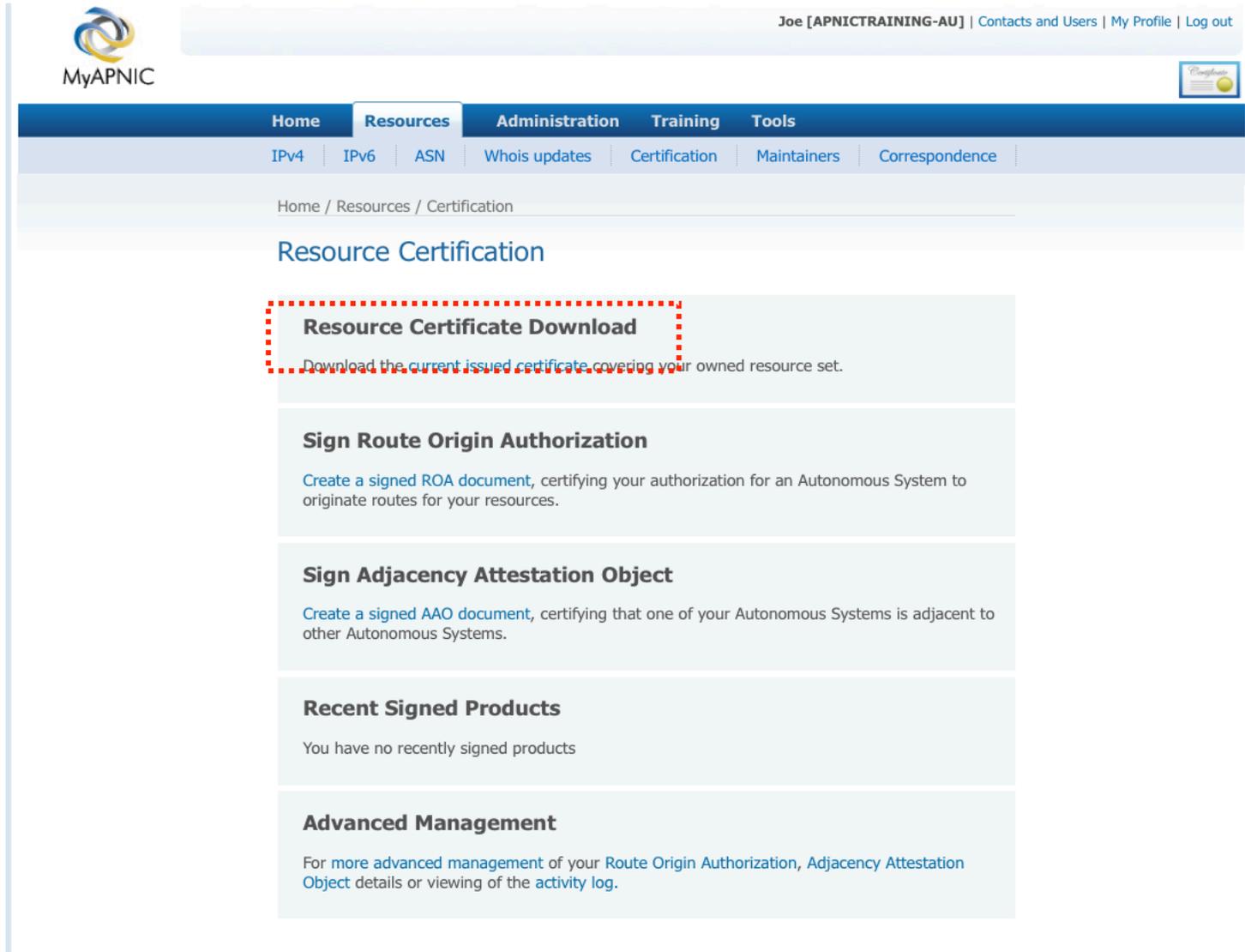
**Create New Collection**

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



The screenshot shows the MyAPNIC website interface. At the top left is the MyAPNIC logo. At the top right, there is a user profile section for 'Joe [APNICTRAINING-AU]' with links for 'Contacts and Users', 'My Profile', and 'Log out'. Below this is a navigation menu with tabs for 'Home', 'Resources', 'Administration', 'Training', and 'Tools'. Under the 'Resources' tab, there are sub-links for 'IPv4', 'IPv6', 'ASN', 'Whois updates', 'Certification', 'Maintainers', and 'Correspondence'. The breadcrumb trail reads 'Home / Resources / Certification'. The main heading is 'Resource Certification'. The 'Resource Certificate Download' link is highlighted with a red dashed box. Below it are sections for 'Sign Route Origin Authorization', 'Sign Adjacency Attestation Object', 'Recent Signed Products', and 'Advanced Management'.

MyAPNIC

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

**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](#).

# Download Certificate

MyAPNIC

Home Voting Resources Administration Training Tools

IPv4 IPv6 ASN Whois updates Certification Maintainers Correspondence

Home / Resources / Certification / Resource Certificate

## Resource Certificate

[Download this Certificate](#)

Version:	3
Serial Number:	23:88
Issuer:	/CN=APNIC Production-CVPQSGUkLy7pOXdNeVWGvFX_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/A3C38A24D60311DCAB08F31979BDBE39/CVPQSGUkLy7pOXdNeVWGvFX\_0s.crl

---

**Certificate Policies** \*CRITICAL\*  
1.3.6.1.5.5.7.14.2

---

**Authority Information Access**  
caIssuers - rsync://rpki.apnic.net/repository/8BDFC7DED5FD11DCB14CF481A703F9B7/CVPQSGUkLy7pOXdNeVWGvFX\_0s.cer

---

**Subject Information Access**  
caRepository - rsync://rpki.apnic.net/member\_repository/A91E170B/7065DCFAA35C11DD977174C51F86D636/rpkiManifest - rsync://rpki.apnic.net/member\_repository/A91E170B/7065DCFAA35C11DD977174C51F86D636/h4fT84cXl5V\_umlbG-u3DpKMLLs.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! 😊

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