RIPE NCC

RIPE Network Coordination Centre

The Routing Registry

A brief introduction

RIPE NCC

RIPE Network Coordination Centre

Overview

- Autonomous Systems
  - AS Number Assignments
  - Guidelines and Procedures
- Routing Registry
  - European Routing Registry
  - Internet Routing Registry
  - Routing Registry Components
  - How to use it

RIPE NCC

RIPE Network Coordination Centre

Autonomous Systems

Definition:

"a group of IP networks run by one or more network operators which has a single & clearly defined routing policy"

ASN Guidelines

When do I need one?

- different routing policy to external peers
- multi-homed network
- one single and clearly defined routing policy

ASN Guidelines

Factors that don't count

- Transition
- Future-proofing
- History
- Router Manuals

How do I get an ASN ?

- As end-user:
  - contact your local IR or ISP
- As local IR
  - send completed Autonomous System Number Application Form to <hostmaster@ripe.net>

    `ftp://ftp.ripe.net/ripe/forms/as-application.txt`
- Routing policy mandatory!

Recommended Reading

- Guidelines for creation, selection and registration of an Autonomous System

<ftp://ftp.ripe.net/rfc/rfc1930.txt>

Routing Registry

ASN assignment → participation in the RIPE Routing Registry

What is a Routing Registry?

A repository of information:

- routing policy details
- routes and their aggregates
- local topology between Ases
- network components such as routers

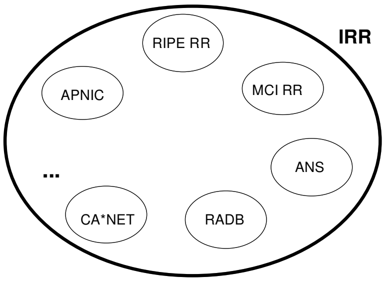
Separates Routing information from other information

- allocation information
- others (domains, etc.)...

RIPE NCC

RIPE Network Coordination Centre

Internet Routing Registry



RIPE NCC

RIPE Network Coordination Centre

Benefits of IRR

Informational

- provides a map of global routing topology
- shows routing policy between any two Ases

Configuration

- allows simulation of routing policy effects (prpath)
- supports policy configuration (prconfig, rtconfig)

Operational Support

- supports inconsistency checking (prcheck)
- supports problem diagnosis (prpath, prtraceroute)
- provides contact information (whois)

RIPE NCC

RIPE Network Coordination Centre

RIPE Routing Registry

RR for Europe

- developed in PRIDE Project at the RIPE NCC
- based on the RIPE database architecture
- subset of information in RIPE database
- final document ripe-181

  `ftp://ftp.ripe.net/ripe/docs/ripe-181`

Success of IRR concept

- global acceptance of RR concept
- ripe-181 became informational rfc1786

  `ftp://ftp.ripe.net/ripe/rfc/rfc1786`

RIPE NCC

RIPE Network Coordination Centre

The AS Object

An example:

```
aut-num: AS3347
descr: Europe Online S.A.
descr: Luxembourg
as-in: from AS3215 100 accept ANY
as-in: from AS2602 50 accept AS2602
as-in: from AS2602 200 accept ANY
as-out: to AS3215 announce AS3347
as-out: to AS2602 announce AS3347
default: AS3215 100
admin-c: PWM1-RIPE
tech-c: LR9
mnt-by: AS3347-MNT
changed: lrei@eo.net 950518
source: RIPE
```

Policy

RIPE NCC

RIPE Network Coordination Centre

Route Object

```
route:    193.112.0.0/13
descr:    EUNETGB-112-AGG
origin:   AS1290
mnt-by:   AS1290-MNT
changed:  jhma@britain.eu.net 941201
source:   RIPE
```

- represents a "route" in the Internet
- contains all "membership" information
- this route is originated in AS1290
- only one origin possible

RIPE NCC

RIPE Network Coordination Centre

The AS-Macro Object

```
as-macro:     AS-ACONET
descr:        ACONET AS Macro
descr:        Ases served by SUNET
as-list:      AS-UDNVIE AS1853 AS1205 AS2131
guardian:     domain-admin@univie.ac.at
admin-c:      WK42
tech-c:       EJ63
tech-c:       CP8-RIPE
mnt-by:       AS1853-MNT
changed:      Panigl@cc.univie.ac.at 950516
source:       IPE
```

- Contains no policy information, only provides additional information for communities networks can belong to
- describes "other grouping"

RIPE NCC

RIPE Network Coordination Centre

PRIDE Tools

- problem diagnosis
  - prpath, prtraceroute
- determine potential and actual connectivity
  - (prconn)
- simulation of policy changes
  - prpath
- consistency checking
  - prcheck
  - prpath
- **Sources: `ftp://ftp.ripe.net/pride/tools`**

RIPE NCC

RIPE Network Coordination Centre

Routing Registry Tools

- prtraceroute

```
% prtraceroute -lv ftp.germany.eu.net
traceroute with AS and policy additions [Jun 20 11:15:33UTC]
          from AS3333 mellow.ripe.net (193.0.0.133)
          to AS1270 ftp.germany.eu.net (192.76.144.75)

1 AS3333  insomnia            193.0.0.142        [I]       2 2 2    ms
2 AS3333  Amsterdam           193.0.0.222        [I]       23 4 3   ms
3 AS286   Amsterdam1.NL.EU.net192.87.4.20        [E1]      44 19 8  ms
4 AS286   Amsterdam6.NL.EU.net134.222.32.2       [I]       25 10 6  ms
5 AS1270  Dortmund3.DE.EU.net 134.222.1.2        [E1]      51 27 28 ms
6 AS1270  ftp.Germany.EU.net  192.76.144.75      [I]       55 37 41 ms

AS Path followed: AS3333 AS286 AS1270

AS3333 = RIPE NCC
AS 286 = Eunet Backbone AS
AS1270 = Eunet/DE
```

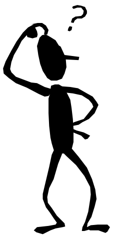

RIPE NCC

RIPE Network Coordination Centre

Routing Arbiter Tools

- Route Object Editor
  - roe
- AS Object Editor
  - aoe
- Configuration
  - rtconfig
- Aggregation optimisation
  - CIDR Advisor
- Visualisation Tool
  - ASExplorer
- **Sources: `http://www.isi.edu/ra/*`**

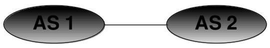
Questions?



THE END

Representation of AS

Basic idea




```
aut-num: AS1
<administrivia go here>
as-out: to AS2 announce AS1
as-in: from AS2 accept AS2

aut-num: AS2
<administrivia go here>
as-out: to AS1 announce AS2
as-in: from AS1 accept AS1
```

RIPE NCC

RIPE Network Coordination Centre

Representation of AS

A simple example


```
aut-num: AS1
as-out: to AS2 announce AS1
as-in: from AS2 accept AS2 Or AS3

aut-num: AS2
as-out: to AS1 announce AS2 AS3
as-in: from AS1 accept AS1
as-out: to AS3 announce AS2 AS1
as-in: from AS3 accept AS3

aut-num: AS3
as-out: to AS2 announce AS3
as-in: from AS2 accept AS1 or AS2
```

NOT A PATH!!

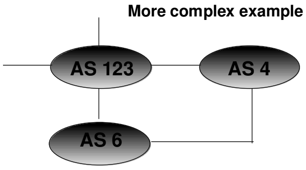
“OR” is implicit

RIPE NCC

RIPE Network Coordination Centre

Representation of AS

More complex example



1. AS4 <-> AS6 traffic ONLY over As4-AS6 link, backup through AS123, AS4-AS6 link not used for transit from AS123
2. same as 1, but AS4-AS6 link can be used for backup to AS4 and AS6

RIPE NCC

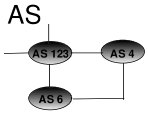
RIPE Network Coordination Centre

Representation of AS

```
aut-num: AS4
as-in: from AS123 100 accept ANY
as-in: from AS6 99 accept AS6
as-out: to AS123 announce AS4
as-out: to AS6 announce AS4

aut-num: AS123
as-in: from AS4 100 accept AS4
as-in: from AS6 100 accept AS6
as-out: to AS4 announce ANY
as-out: to AS6 announce ANY

aut-num: AS6
as-in: from AS123 20 accept ANY
as-in: from AS4 10 accept AS4
as-out: to AS123 announce AS6
as-out: to AS4 announce AS6
```



Possibility 1

Costs are relative per AS

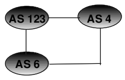
The cost is used here to show routing policy
The lower the cost value the **more preferred** the route is

Representation of AS

```
aut-num: AS4
as-in:   from AS123 100 accept ANY
as-in:   from AS6 99 accept AS6
as-out:  to AS123 announce AS4 or AS6
as-out:  to AS6 announce ANY

aut-num: AS123
as-in:   from AS4 100 accept AS4
as-in:   from AS4 200 accept AS6
as-in:   from AS6 100 accept AS6
as-in:   from AS6 200 accept AS4
as-out:  to AS4 announce ANY
as-out:  to AS6 announce ANY

aut-num: AS6
as-in:   from AS123 2 accept ANY
as-in:   from AS4 1 accept AS4
as-in:   from AS4 3 accept ANY
as-out:  to AS123 announce AS6 OR AS4
as-out:  to AS4 announce ANY
```



Possibility 2

Costs are relative per AS