RPSLng

Routing Policy Specification Language next generation

6DEPLOY. IPv6 Deployment and Support

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Prerequisites / Scope

You should have followed previously the modules:

- 010-IPv6 Introduction
- 020-IPv6 Protocol
- 030-IPv6 Addressing
- 100-IPv6 Routing Protocols

This topic is aimed at organizations managing (or planning to manage) their own Autonomous System (an independent network). If your organization doesn't use BGP (or doesn't have future plans about it) you can skip this presentation.

Agenda

Routing Policy

RPSL

RPSLng

Examples

Conclusion

Routing Policy

What is a «routing policy» ?

- Public description of the relationship between BGP (Border Gateway Protocol) peers
- Routing policies enable route classification for importing and exporting routes
- The goal of routing policies is to control traffic flows
  - The v4 policy may be different from the v6 policy (however, this may not be a best practice)

Routing Policy

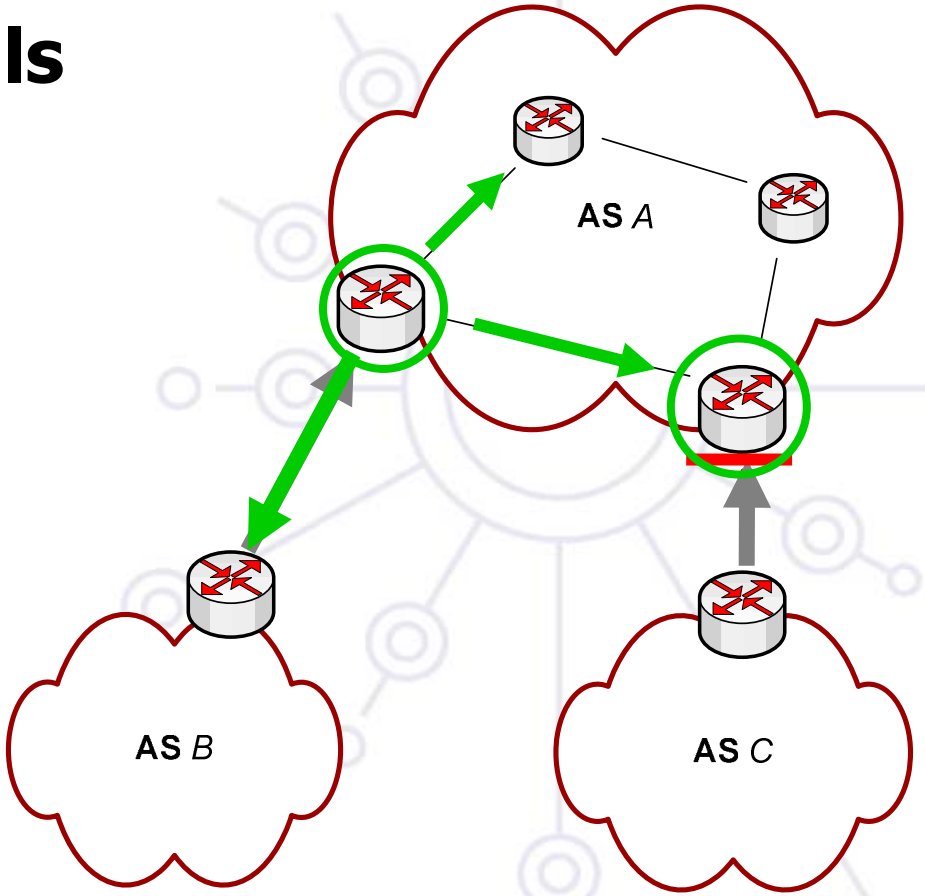
Why define a (public) routing policy ?

- Documentation
  - Recreate your policy in case of loss of hardware/administrators
- Allows automatic generation of router configurations
- Provides routing security
  - Which routes to accept from each peer?
- Helps in a BGP troubleshooting process

Routing Policy - Example

Reflects the AS' goals

- Which routes to accept from other AS's
- How to manipulate the accepted route
- How to propagate routes through network
- How to manipulate routes before they leave the AS
- Which routes to send to third-party AS's



AS = Autonomous System

Routing Policy

Each Autonomous System has its own routing policy towards other Networks

Each policy affects the way the global network (i.e. Internet) behaves

Which means:

- It's very useful to know external policies
- A place to publish them is needed!
- You can automatically configure border routers from that info, if you can rely on the quality of information

RPSL

RPSL stands for Routing Policy Specification Language

Replacement for the language previously known as RIPE-181

A tool to describe Inter-Domain Policies, it affects:

- People doing Local Internet Registry work
- People dealing with border routers, BGP, ...

It is used for Internet network management.

It is NOT about Internal Routing!

RPSL

Object oriented language

- So … it has classes used to defined the various objects

Uses RIR database style (whois) objects.

- Each Object is a list of "attribute-value" pairs displayed in plain text.
  - person, maintainer, role
  - route
  - as-set, route-set
  - …

Person Object - Example

person: **Miguel Baptista**
address: **Example street Lisbon, Portugal**
phone: **+351 123 456 789**
e-mail: **miguel.bap@example.org**
nic-hdl: **MB10-TEST**
mnt-by: **EXAMPLE-MNT**
remarks: **********
remarks: **This object is only an example!**
remarks: **********
changed: **carlos.friacas@example.org 20060228**
source: **TEST**

RPSLng is...

RPSL *next generation*

Yet another easy thing to have in place

- one more item in the check-list ;)

Yet another tool to help IPv6 development in an «orderly» fashion;

Yet another way of showing people IPv6 is not that much complex than IPv4.

RFC4012

Backward Compatibility Changes:

- New dictionary attribute – AFI
- New predifined dictionary type
- New protocol dictionary specification
- New policy attributes
- New route6 class
- New attribute in route-set class
- New attribute in filter-set class
- New attribute in peering-set class
- New attribute in inet-rtr class
- New attribute in rtr-set class

RPSL and RPSLng, Some Differences

	IPv4	IPv6
Networks	**inetnum**	**inet6num**
Routes	**route**	**route6**
Policies *(aut-num)*	**import export**	**mp-import mp-export**

Evolution…

RIPE/NCC and APNIC already have a RPSLng compliant Whois service.

- Other RIRs (ARIN,AFRINIC,LACNIC) will follow.

LIR admins are rewriting <u>their own</u> routing policies, to include:

- IPv4 Unicast;
- IPv4 Multicast;
- IPv6 Unicast;
- IPv6 Multicast (very, very few)

Objects - Examples #1

Route6

route6: 2001:0760::/32
descr: GARR-IPv6
origin: AS137
mnt-by: GARR-LIR …

Peering-set

peering-set: prng-ebgp-peers
descr: TopneT IPv6 ebgp peers
…
mp-peering: AS12533 2001:15A8:A:1:FFFF:FFFF:FFFF:2 at 2001:15A8:A:1:FFFF:FFFF:FFFF:3
mp-peering: AS5609 3FFE:1001:1:F036::1 at 3FFE:1001:1:F036::2
mp-peering: AS5602 2001:15A8:A:1:FFFF:FFFF:FFFF:5 at 2001:15A8:A:1:FFFF:FFFF:FFFF:4
…
mp-peering: AS6939 2001:470:1F01:FFFF::224 at 2001:470:1F01:FFFF::225

Objects - Examples #2

Aut-Num

aut-num: AS1853
as-name: ACOnet
descr: ACOnet Backbone
descr: AT
remarks: ==========
remarks: #upstream: Sprint.net
import: from AS1239 action pref=100; accept ANY
export: to AS1239 announce AS-ACONET AND AS-SANET
mp-import: afi **ipv6.unicast** from AS6175 accept ANY
mp-export: afi **ipv6.unicast** to AS6175 announce AS-ACONET-V6
remarks: #upstream: GEANT.net
import: from AS20965 action pref=100; accept ANY
export: to AS20965 announce AS-ACONET AND AS-UNREN AND AS-ACOSERV
mp-import: afi **ipv6.unicast** from AS20965 accept ANY
mp-export: afi **ipv6.unicast** to AS20965 announce AS-ACONET-V6
remarks: ==========
...

Objects - Examples #3

Inet-rtr

inet-rtr: BR1.mucI.baycix.net
local-as: AS12657
ifaddr: 212.72.95.1 masklen 32
interface: 2001:1578:0:FFFF::1 masklen 128
interface: 2001:1578:0:FF::1 masklen 112
peer: BGP4 212.72.95.3 asno(AS12657)
peer: BGP4 212.72.72.197 asno(AS29317)
mp-peer: MPBGP 2001:1578:0:FFFF::2 asno(AS12657)
...

Route-set

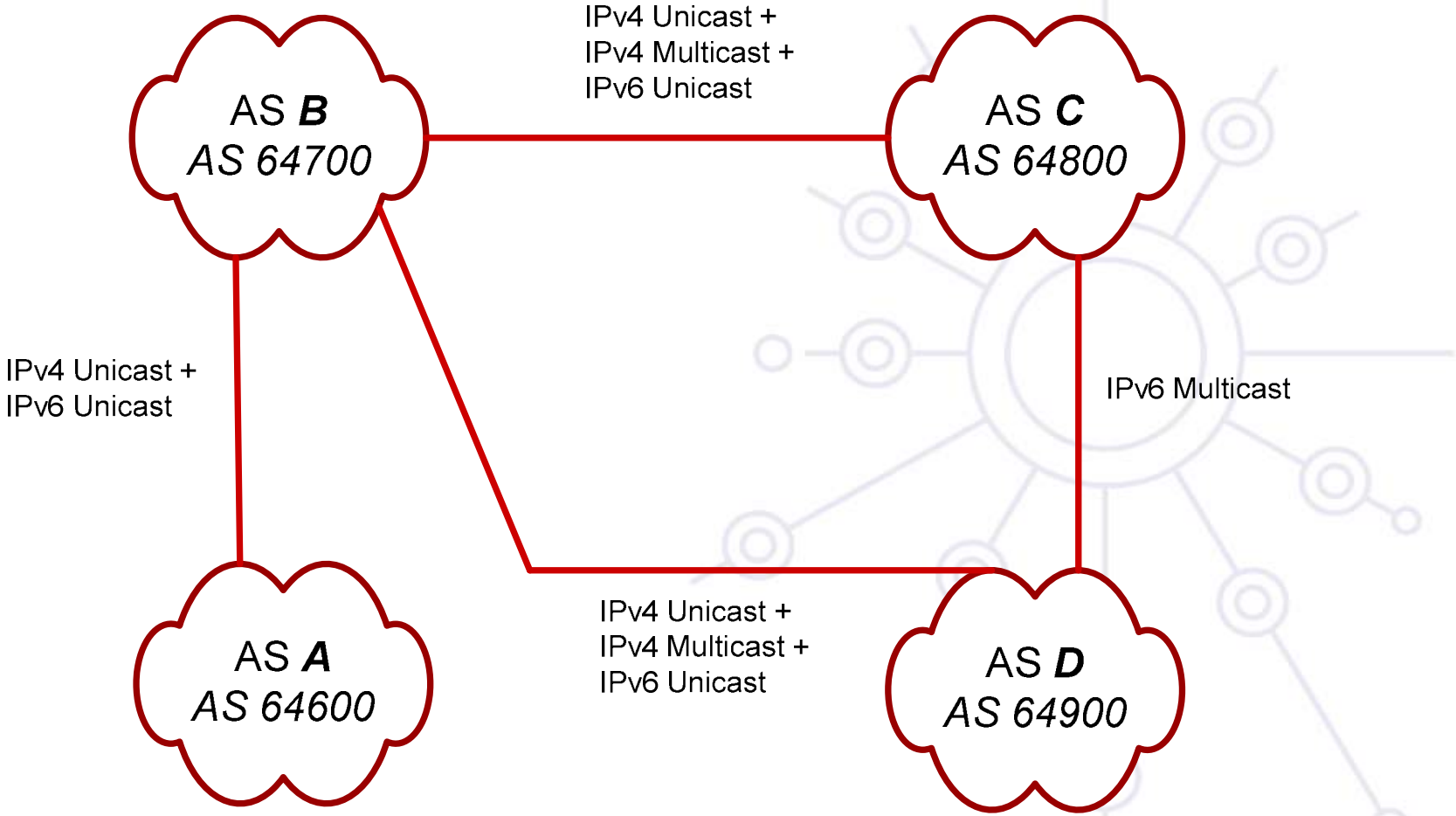
route-set: AS29670:RS-IN-BERLIN
descr: Individual Network Berlin e.V.
org: ORG-INBE1-RIPE
mp-members: 192.109.21.0/24
mp-members: 217.197.80.0/20
mp-members: 2001:bf0:c000::/35
...

Objects - Examples #4

Filter-set

filter-set: AS12817:fltr-BOGONS
descr: Generic IPv4/IPv6 Prefix & AS filter
mp-filter: { 10.0.0.0/8^+,
127.0.0.0/8^+,
169.254.0.0/16^+,
192.168.0.0/16^+,
0.0.0.0/0^25-32 }
AND
{ 2001:db8::/32^+,
0000::/8^+,
fe00::/9^+,
ff00::/8^+,
0::/0^49-128 }
AND
<[AS64512-AS65534]>
...

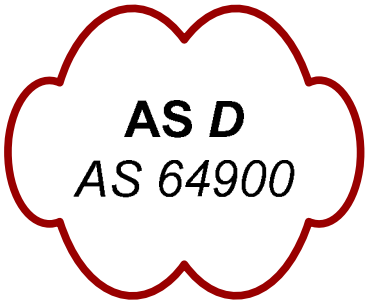
Example


AS B
AS 64700
IPv4 Unicast +
IPv4 Multicast +
IPv6 Unicast
AS C
AS 64800
IPv4 Unicast +
IPv6 Unicast
IPv6 Multicast
AS A
AS 64600
IPv4 Unicast +
IPv4 Multicast +
IPv6 Unicast
AS D
AS 64900

Example – AS *A* Policy

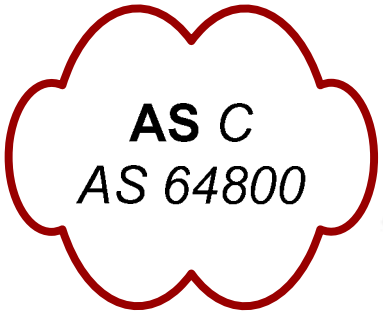
aut-num: AS *64600*
as-name: AS A
descr: This is AS A
mp-import: afi ipv4.unicast,ipv6.unicast from AS64700 action pref=106; accept ANY;
mp-export: afi ipv4.unicast,ipv6.unicast to AS64700 announce AS-A;

Example – AS *D* Policy



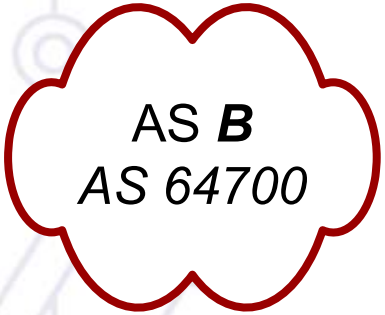
aut-num: AS64900
as-name: AS D
descr: This is AS D
mp-import: afi ipv4.unicast,ipv4.multicast,ipv6.unicast from AS64700
action pref=106;
accept ANY;
mp-import: afi ipv6.multicast from AS64800
action pref=110;
accept AS-C
mp-export: afi ipv4.unicast,ipv4.multicast,ipv6.unicast to AS64700
announce AS-D;
mp-export: afi ipv6.multicast to AS64800 announce AS-D

Example – AS *C* Policy



aut-num: AS64800
as-name: AS C
descr: AS C, This is AS C
import: from AS64700 action pref=106; accept ANY
mp-import: afi ipv4.multicast,ipv6.unicast from AS64700
action pref=106;
accept ANY;
mp-import: afi ipv6.multicast from AS D action pref=110; accept AS D
export: to AS64700 announce AS C
mp-export: afi ipv4.multicast,ipv6.unicast to AS64700 announce AS C;
mp-export: afi ipv6.multicast to AS64900 announce AS C

Example – AS *B* Policy




```
aut-num:     AS64700
as-name:     AS B
descr:       AS B, This is AS B
import:       from AS64800    action pref=106; accept AS-C;
import:       from AS64900    action pref=106; accept AS-D;
import:       from AS64800    action pref=106; accept AS-A;
mp-import:   afi ipv4.multicast,ipv6.unicast from AS64800 action pref=106;
             accept AS-C;
mp-import:   afi ipv4.multicast,ipv6.unicast from AS64900 action pref=106;
             accept AS-D;
mp-import:   afi ipv6.unicast from AS64600 action pref=106; accept AS-A;
export:      to AS64800      announce ANY;
export:      to AS64900      announce ANY;
export:      to AS64600      announce ANY;
mp-export:   afi ipv4.multicast,ipv6.unicast to AS64800 announce ANY;
mp-export:   afi ipv4.multicast,ipv6.unicast to AS64900 announce ANY;
mp-export:   afi ipv6.unicast to AS64600 announce ANY
```

Conclusions

RPSL is needed to coordinate global IPv4 routing policies. RPSLng is needed for the same purpose, but over IPv6.

It's rather simple, and someone already dealing with RPSL will easily start to use RPSLng when starting to route IPv6 packets.

Questions?

Extra Slides

RPSLng Tools

WHOISd

- Free
- ftp://ftp.ripe.net/ripe/dbase/software
- Managed by RIPE

IRRd

- Free
- http://www.irrd.net
- Managed by MERIT

RPSLng Tools

RIPE's RPSLng Registry

- IPv4 address -> inetnum, route, inet-rtr
- IPv6 address -> inet6num, route6, inet-rtr
- Inverse queries for aut-num -> route + route6
- Production Routing Policies

IRRToolSet

- Suite of policy analysis tools
- Possible usage: Updating BGP routing configurations
- Managed by ISC: ftp://ftp.isc.org/isc/IRRToolSet/