Tips for IP-Transit Customers

NANOG91
Who?

Stefan
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• Inter.link TechOps

Inter.link
• Supplier of carrier services
• Carbon neutral 2023
• NetZero in 2025
• IP Transit
• IP Access
• L2 VPNs
• DDoS Protection
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Agenda

What can IP-Transit customers do to protect their service?

- Recap - prefix filter list generation
- Data sources - which source to use for prefix filtering
- Authoritative sources - what data within that source to use
- Trusted sources - how to choose the right source
- Standard format - ensuring others can get your prefix data
Prefix Filters
Customer buys an ASN

$ whois -T aut-num AS48918
aut-num: AS48918
status: ASSIGNED
Customer buys a prefix
Prefix "origin" set to customer's ASN

$ whois -T route6 2a02:c98::/29
route6: 2a02:c98::/29
origin: AS48918
Customer adds ASN to their AS-SET

$ whois -T as-set AS48918:AS-GLOBALWAYS
as-set: AS48918:AS-GLOBALWAYS
members: AS48918
Customer AS-SET "tree"

AS48918:AS-GLOBALWAYS
   --> AS48918
      --> 2a02:c98::/29

$ whois -h whois.ripe.net -T route6 -i origin AS48918
route6: 2a02:c98::/29
Customer orders IP-Transit
Customer AS-SET added to our AS-SET

$ whois -T as-set AS5405:AS-INTERDOTLINK
members: AS48918:AS-GLOBALWAYS
Customer prefix in our AS-SET "tree"

AS5405:AS-INTERDOTLINK
  -->  AS48918:AS-GLOBALWAYS
  -->  AS48918
  -->  2a02:c98::/29
Use **bgpq4** to **probably** get the customer prefixes, then filter route advertisements:

\[ \$ \text{bgpq4} \ -6\ -F\ "\%n/\%l\n" \text{AS48918:AS-GLOBALWAYS} \ 2a02:c98::/29 \]
Customer orders
IP-Transit

Add their AS-SET to our AS-SET

Our AS-cone/Prefix-cone grows
Use `irrtree` to get an idea of the total number of prefixes in an AS-SET:

```
$ irrtree -4 -6 AS5405:AS-INTERDOTLINK
...
AS5405:AS-INTERDOTLINK (6607 ASNs, 46009 pfxs)
```
Data Sources
"Use bgpq4 to probably get the customer prefixes"
"Use irrtree to get an idea of the number of prefixes"

Why am I using the words "probably" and "idea"?
Problem Statement:

Where should I (as your transit provider) get this information from?

• I need to get the name of your AS-SET → **PeeringDB**
• I need to then get the AS-SET data → ?
We need to query all of the IRR DBs to find customer prefix and ASN data

5x RIR operated IRR-DBs (+ delegations):
- AFRINIC
- APNIC
  - APJJ
  - CNNIC
- JPNIC
- KRNIC
- TWNIC
- VNNIC
- IRINN

And many more:
- ARIN
- LACNIC
  - NIC.MX
  - NIC.BR
- RIPE

RIPE 87: Follow Up on a Common BCOP for the Use of IRR DB by IXP Route Servers
Solution:

- We run local `irrd` servers
- We mirror the other IRR DBs locally
- We query our `irrd` servers
- Customer data from all DBs is in one place

$ whois -h irr1-ber2-de 2a02:c98::/29
route6: 2a02:c98::/29
source: RIPE
Customer/peer AS-SET in multiple IRR-DBs

$ whois -h irr1-ber2-de AS-APPLE
as-set:         AS-APPLE
source:         RIPE

as-set:         AS-APPLE
source:         RADB
One AS-SET is empty!

```
$ irrtree -h irr1-ber2-de -4 -6 -l RIPE AS-APPLE
AS-APPLE (2 ASNs, 0 pfxs)
  +-- AS714 (0 pfxs)
  +-- AS6185 (0 pfxs)

$ irrtree -h irr1-ber2-de -4 -6 -l RADB AS-APPLE
AS-APPLE (2 ASNs, 244 pfxs)
  +-- AS714 (195 pfxs)
  +-- AS6185 (49 pfxs)
```
• "AS-SET" squatting across IRR-DBs

• Example, squatting AS-AMAZON

<table>
<thead>
<tr>
<th>By Maintainer (Amazon)</th>
<th>NOT by Maintainer</th>
</tr>
</thead>
<tbody>
<tr>
<td>as-set: AS-AMAZON</td>
<td>as-set: AS-AMAZON</td>
</tr>
<tr>
<td>descr: Amazon ASNs</td>
<td>tech-c: DUMY-RIPE</td>
</tr>
<tr>
<td>members: AS-AMAZON-NA, AS-AMAZON-AP, AS-AMAZON-EU</td>
<td>admin-c: DUMY-RIPE</td>
</tr>
<tr>
<td>AP, AS-AMAZON-EU</td>
<td>created: 2022-10-23T19:05:59Z</td>
</tr>
<tr>
<td>admin-c: AC6-ORG-ARIN</td>
<td>last-modified: 2022-10-23T19:05:59Z</td>
</tr>
<tr>
<td>tech-c: AC6-ORG-ARIN</td>
<td>source: RIPE</td>
</tr>
<tr>
<td>notify: <a href="mailto:noc@amazon.com">noc@amazon.com</a></td>
<td>changed: <a href="mailto:noc@amazon.com">noc@amazon.com</a> 20151027</td>
</tr>
<tr>
<td>mnt-by: MAINT-AS16509</td>
<td>#17:32:13Z</td>
</tr>
<tr>
<td>source: RADB</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 — The Amazon as-set shown in RADB (left) and RIPE (right) databases.

Without going into the details of whether it was/is a malicious attempt to create routing problems for Amazon, this is something that must not be allowed.

Thanks to the efforts of Job Snijders, Ben Cox, Nick Hilliard (MANRS Steering Committee Member), and many others, the community has moved quickly and proposed a change to its Whois policy.

How to plug one of many holes in the IRR: from community proposal https://t.co/8UyY61ChHL to testing https://t.co/OASXXira36 to deployment https://t.co/3792nzQZ1 in 29 days. Kudos to the @ripecc database team!

— Job Snijders (@JobSnijders) December 13, 2022

And on 13 December 2022, RIPE implemented the change in its production database. Now, non-hierarchical as-set creation is not possible in the RIPE Whois.
### Apple Inc.

<table>
<thead>
<tr>
<th>Unternehmen</th>
<th>Apple Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auch bekannt als</td>
<td>Apple CDN AS6185</td>
</tr>
<tr>
<td>Vollständiger Name</td>
<td></td>
</tr>
<tr>
<td>Unternehmenswebsite</td>
<td><a href="https://www.apple.com">https://www.apple.com</a></td>
</tr>
<tr>
<td>ASN</td>
<td>714</td>
</tr>
<tr>
<td>IRR as-set/route-set</td>
<td>AS-APPLE</td>
</tr>
</tbody>
</table>

### Google LLC

<table>
<thead>
<tr>
<th>Unternehmen</th>
<th>Google LLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auch bekannt als</td>
<td>Google, YouTube (for)</td>
</tr>
<tr>
<td>Vollständiger Name</td>
<td></td>
</tr>
<tr>
<td>Unternehmenswebsite</td>
<td><a href="https://about.google/services/terms">https://about.google/services/terms</a></td>
</tr>
<tr>
<td>ASN</td>
<td>15169</td>
</tr>
<tr>
<td>IRR as-set/route-set</td>
<td>RADB::AS-GOOGLE</td>
</tr>
</tbody>
</table>
"::" is the dominant notation

- RIPE::AS-EXAMPLE
- AS-EXAMPLE@RIPE
Tip!

Add an IRR-DB source to PeeringDB

- AS-EXAMPLE ✗
- RIPE::AS-EXAMPLE ✓
Authoritative Sources
"AS-SET" squatting within IRR-DBs

$ whois -h whois.ripe.net AS-INTERDOTLINK
mnt-by: INTERDOTLINK-MNT

$ whois -h whois.ripe.net AS5405:AS-INTERDOTLINK
mnt-by: INTERDOTLINK-MNT
### RIRs enforcing heirarchical AS-SET names in their IRR-DBs

<table>
<thead>
<tr>
<th>RIR</th>
<th>Enforced</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRINIC</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>APNIC</td>
<td>Yes</td>
<td><a href="https://www.apnic.net/community/policy/proposals/prop-151/">https://www.apnic.net/community/policy/proposals/prop-151/</a></td>
</tr>
<tr>
<td>ARIN</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>LACNIC</td>
<td>Yes</td>
<td>Job did it</td>
</tr>
<tr>
<td>RIPE</td>
<td>Yes</td>
<td><a href="https://www.ripe.net/ripe/mail/archives/db-wg/2022-November/007680.html">https://www.ripe.net/ripe/mail/archives/db-wg/2022-November/007680.html</a></td>
</tr>
<tr>
<td>ASN</td>
<td>714</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>IRR as-set/route-set</td>
<td>AS-APPLE</td>
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<td>RADB::AS-GOOGLE</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ASN</th>
<th>5405</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRR as-set/route-set</td>
<td>RIPE::AS5405:AS-INTERDOTLINK</td>
</tr>
</tbody>
</table>
Tip!

Create a hierarchical AS-SETs.
Update PeeringDB with.

RIPE::AS-EXAMPLE

×

RIPE::AS64496:AS-EXAMPLE

✓
Trusted Sources
Non-RIR DBs might have no authentication

# 2024-03-07 11:59:38

$ irr_dbs=$(sqlite3 peeringdb.sqlite3 "select irr_as_set from peeringdb_network where irr_as_set like '%::AS%' AND irr_as_set NOT LIKE '% %';" | awk -F "::" '{print $1}' | sort | uniq)

$ sqlite3 peeringdb.sqlite3 "select count(irr_as_set) from peeringdb_network where irr_as_set like 'ALTDB::%' or irr_as_set like 'BBOI::%' or irr_as_set like 'IDNIC::%' or irr_as_set like 'JPIRR::%' or irr_as_set like 'LEVEL3::%' or irr_as_set like 'NTTCOM::%' or irr_as_set like 'RADB::%' or irr_as_set like 'TC::%';"

534
Tip!

Move your AS-SET into one of the RIR maintained IRR-DBs

MY WORK HERE
IS DONE
Standard Format
Multiple AS-SETs: Comma vs space in PeeringDB

# 2024-03-07 11:59:38

sqlite> SELECT count(irr_as_set) FROM peeringdb_network WHERE irr_as_set LIKE "%,%";
5

sqlite> SELECT count(irr_as_set) FROM peeringdb_network WHERE irr_as_set LIKE "% %";
260
"-V6" to differentiate
RIPE::AS-TELIANET  RIPE::AS-TELIANET-V6

"6" to differentiate
AS-GBXS  AS-GBXS6

Two completely different AS-SETS
RADB::AS-PACNET  RADB::AS-ANC

Different AS-SETs for customers and non-customers?
AS-NEXELLENT  AS-NEXELLENT-CUST
• Route-Sets and AS-SETs
  RS-FLRNET-CONNECTORS-V4
  RS-FLRNET-CONNECTORS-V6
  AS-FLRNET-AGGREGATE

• IXP route servers have an AS-SET per LAN
  AS-ECIX-BER  AS-ECIX-DUS
  AS-ECIX-FRA  AS-ECIX-HAM
  AS-ECIX-MUC

• The same AS-SET with and without a database source
  AS-ASPA@RIPE  RIPE::AS-ASPA  AS-ASPA
Tip!

Consolidate your PeeringDB record to a single AS-SET
Review
• Create a hierarchical AS-SET: "AS23456:AS-FOO"

• Add a source to your AS-SET in PeeringDB: "RIPE::AS64496:AS-FOO"
  • Use a provider who honours these values!

• Move your AS-SET into one of the RIR maintained IRR-DBs

• Consolidate your PeeringDB record to a single AS-SET
Questions?

• Create a hierarchical AS-SET: "AS23456:AS-FOO"

• Add a source to your AS-SET in PeeringDB: "RIPE::AS64496:AS-FOO"
  • Use a provider who honours these values!

• Move your AS-SET into one of the RIR maintained IRR-DBs

• Consolidate your PeeringDB record to a single AS-SET

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