Route Object processes in WHOIS

George Michaelson, APNIC R&D
## Route Object Template

<table>
<thead>
<tr>
<th>Field</th>
<th>Status</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>route:</td>
<td>mandatory</td>
<td>single</td>
<td>[primary/look-up key]</td>
</tr>
<tr>
<td>descr:</td>
<td>mandatory</td>
<td>multiple</td>
<td></td>
</tr>
<tr>
<td>origin:</td>
<td>mandatory</td>
<td>single</td>
<td>[primary/inverse key]</td>
</tr>
<tr>
<td>holes:</td>
<td>optional</td>
<td>multiple</td>
<td></td>
</tr>
<tr>
<td>country:</td>
<td>optional</td>
<td>single</td>
<td></td>
</tr>
<tr>
<td>member-of:</td>
<td>optional</td>
<td>multiple</td>
<td></td>
</tr>
<tr>
<td>inject:</td>
<td>optional</td>
<td>multiple</td>
<td></td>
</tr>
<tr>
<td>aggr-mtd:</td>
<td>optional</td>
<td>single</td>
<td></td>
</tr>
<tr>
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<td>optional</td>
<td>single</td>
<td></td>
</tr>
<tr>
<td>export-comps:</td>
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<td>single</td>
<td></td>
</tr>
<tr>
<td>components:</td>
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<td>single</td>
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</tr>
<tr>
<td>remarks:</td>
<td>optional</td>
<td>multiple</td>
<td></td>
</tr>
<tr>
<td>notify:</td>
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<td>multiple</td>
<td>[inverse key]</td>
</tr>
<tr>
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</tr>
<tr>
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<td>multiple</td>
<td>[inverse key]</td>
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<tr>
<td>mnt-by:</td>
<td>mandatory</td>
<td>multiple</td>
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</tr>
<tr>
<td>changed:</td>
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Asserts an origin-AS in origin: over the prefixes in route:
ROA Object ASN.1 (RFC6482)

RouteOriginAttestation ::= SEQUENCE {
    version [0] INTEGER DEFAULT 0,
    asID ASID,
    ipAddrBlocks SEQUENCE (SIZE(1..MAX)) OF ROAIPAddressFamily }

ASID ::= INTEGER

ROAIPAddressFamily ::= SEQUENCE {
    addressFamily OCTET STRING (SIZE (2..3)),
    addresses SEQUENCE (SIZE (1..MAX)) OF ROAIPAddress }

ROAIPAddress ::= SEQUENCE {
    address IPAddress,
    maxLength INTEGER OPTIONAL }

IPAddress ::= BIT STRING
ROA Object ASN.1 (RFC6482)

**RouteOriginAttestation ::= SEQUENCE {**
  **version [0] INTEGER DEFAULT 0,**
  asID **ASID,**
  ipAddrBlocks SEQUENCE (SIZE(1..MAX)) OF ROAIPAddressFamily }

**ASID ::= INTEGER**

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**ROAIPAddress ::= SEQUENCE {**
  address IPAddress,
  maxLength INTEGER OPTIONAL }

**IPAddress ::= BIT STRING**

Asserts an origin-AS in asID over the prefixes in ipAddrBlocks with optional maxLength
Observations

• Route objects
  • Simple use, specify origin-as/prefix relationship
  • Complex use, to add route qualifiers/aggregation
• Simple use invokes behavior similar to a ROA
• ROA creation vests with prefix holder only
  • No AS holder input
  • Strong trust in the system to make ROA
• ROUTE: object creation vests in AS and prefix holder
  • Both must countersign a create or update request, if not the same maintainer.
Observations

- Process delays at APNIC
  - Post-final /8 policy, more people present with prefix only, to be routed by ISP/provider
  - But process to get route object countersigned is clumsy, different provisioning paths in ISP
  - APNIC increasingly asked to intervene, adds delay

- Goal: simplify processes and speed up announcement of new prefixes
Route objects in RIPE IRR

- 211,640 route objects
- 6,924 route6 objects
- How may use ‘complex’ substructure?
  - ‘boring’ objects consist only of:
    - 'route', 'descr', 'origin', 'mnt-by', 'notify', 'changed', 'source', 'remarks', 'org', 'holes', 'mnt-lower', 'mnt-routes'
  - ‘boring’ because these are unrelated to AS, or IRR support not related to either inetnum/inet6num or aut-num
- 3,077 objects reference any of pingable, ping-hdl (arguably boring) member-of, inject, export-comps, components, aggr-bndry, aggr-mtd
Non-boring Route/Route6 objects

4 aggr-bndry
7 export-comps
13 components
50 ping-hdl
106 aggr-mtd
111 pingable
145 inject
2995 member-of

1.45% of all route objects
Route objects in APNIC IRR

- 83,312 `route` objects
- 52,919 `route6` objects

- 129 ‘not boring’ 0.15% of all route objects
  - 2 components
  - 2 export-comps
  - 127 member-of
Route objects in APNIC IRR

- 83,312 route objects
- 52,919 route6 objects

Wait. What?
Route objects in APNIC IRR

- 83,312 route objects
- 52,919 route6 objects

Wait. What? 52,000 route6???
Route objects in APNIC IRR

- 83,312 route objects
- 52,919 route6 objects

```
$ zmore apnic.db.route6.gz | \ 
  grep route6 | awk '{print $2}' | cut -d: -f1,2 | \ 
  sort -u | wc
  318   318   3148
$ 
```

Indian /32 holder de-aggregating to /48
Ideas?

• Searching for feedback and suggestions
  • Modest suggestions of our own.
  • Or, what you’d like automated
• Bring RPKI and IRR into alignment
  • “say the same things”
  • Getting a lot to manage
  • Avoid adding to workload

• How about an ‘Automatic ROA’ creation?
  • Match ROA with route objects. Consistent state in both systems
  • If we go down the ‘create a ROA’ path
    • Automatic route object
    • Sensible idea? Worth exploring?
Change WHOIS permissions model for route/route6 objects?

- Change WHOIS permission model to permit simple route: object creation solely on permission of prefix holder.
  - Risk: route objects used for filters, AND used for announcement
    - Problem vests with filters: inetnum holder can’t be seen without a route object, as holder not actively using IRR
    - For IRR user configuring a router route: object can cause injection of routes AS holder doesn’t want to announce.
- Considering HM authorized override with communication to AS maintainer OOB
  - Eg 72h notice of change unless countermanded
Whois Tags?

• Root cause: route: object serves dual purpose
  • Configure filters to accept origin-as
  • Configure routers to define announcement
• If we tag inetnum-authorized only route: objects then by ‘definition’ they are filter-suitable only.
• AS operator can choose to add auth and then invoke local IRRtoolset to make announcement
• Route object will gatekeep filters for origin-AS that do not use IRR