IPv6 /48 Filtering

Data-plane effects as seen by RIPE Atlas

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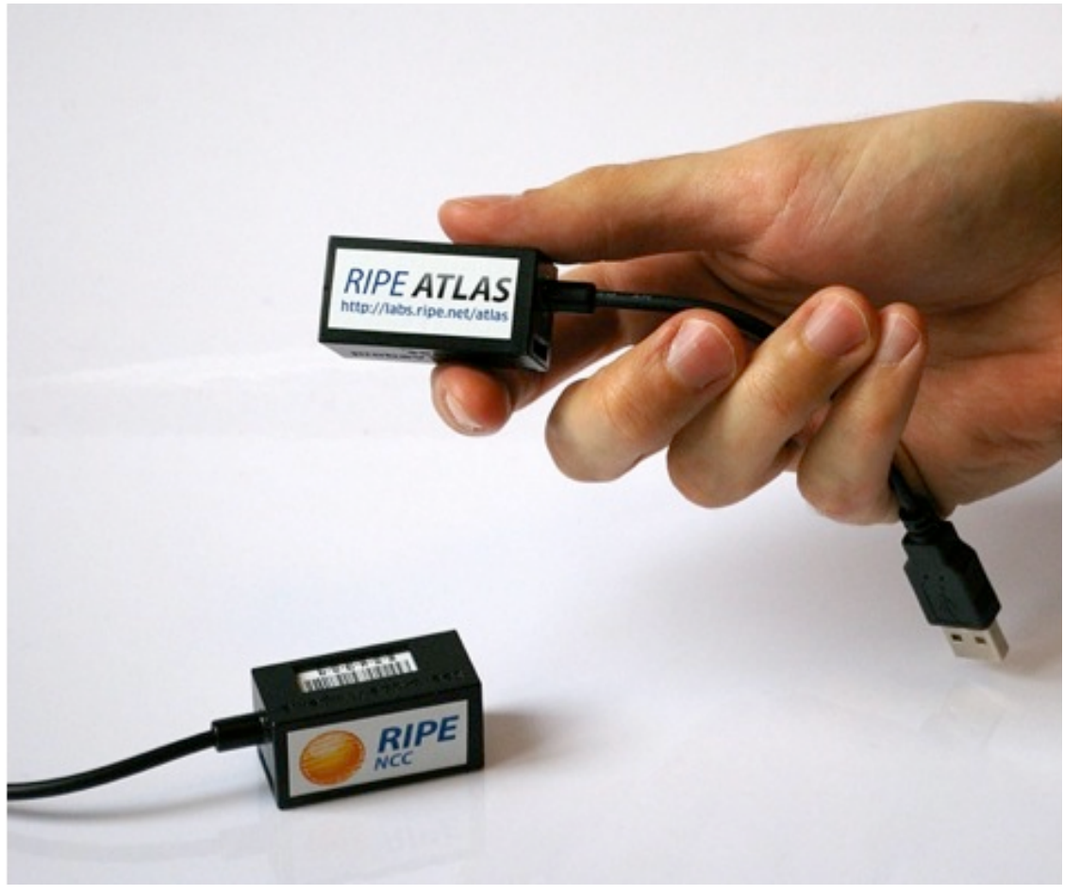
Route Filtering

- IPv4: Up to /24 considered routable
- IPv6: /32 - /48 ??
- RIPE-532: It is suggested that prefix filters allow for prudent subdivision of an IPv6 allocation. **The operator community will ultimately decide what degree of subdivision is supportable**, but the majority of ISPs accept prefixes up to a length of /48 within PA space.
- Recent discussion on *ipv6-ops* mailing list sparked by use of a /48-out-of-PA space without covering prefix
- So what is the community currently deciding?
  - Are /48s filtered?
  - /48s out of IPv6 PA space?

Measure Data-Plane with RIPE Atlas

- 600+ IPv6 enabled RIPE Atlas probes
- Measures the effect on the data-plane, not the control-plane filtering itself
- traceroute6
  - every 15mins for 2hrs
    - /32 PA
    - /48 PI
    - naked /48 out-of-PA



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What do we measure?

- Total of:
  - Failures due to route-filtering
  - Other failures (temporary, ICMP rate limiting ...)
- Key: Difference between baseline (/32 PA, /48 PI) vs. naked /48-out-of PA
- Earlier article on this:

  https://labs.ripe.net/Members/emileaben/ripe-atlas-a-case-study-of-ipv6-48-filtering

- Repeat experiment results in next slides

Methodology

- Only consider probes that were used in all 4 experiments
- Filter out trivially not-useful traceroute results
  - No responding hops
  - < 3 Hops (broken gateways/tunnels)
  - All hops are the same IP address

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Result (2012-09-07): Number of Probes

Target is in:	unusable	target reached	fail	fail with N!
/32 PA space (ipv6.google.com)	57	573	1 (0.2%)	1 (0.2%)
/48 PI space (ns.ripe.net)	53	576	2 (0.4%)	1 (0.2%)
/48 out of PA space * (cloudflare.com)	55	567	9 (1.6%)	4 (0.7%)
/48 out of PA space (www.rtl.de)	58	565	8 (1.4%)	6 (1.0%)

* this network has a covering /12

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Only 5 probes overlap

* this network has a covering /12

Result (2012-09-07): ASes Seen

Target is in:	dest AS reached	dest AS not reached	mixed
/32 PA space (ipv6.google.com)	422	6 (1.4%)	4 (0.9%)
/48 PI space (ns.ripe.net)	425	3 (0.7%)	5 (1.2%)
/48 out of PA space * (cloudflare.com)	419	8 (1.8%)	9 (2.1%)
/48 out of PA space (www.rtl.de)	417	9 (2.1%)	5 (1.2%)

* this network has a covering /12

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Raw Data

- RIPE Atlas UDMs 1003965 - 1003968 available from the ‘Public measurements’ tab at https://atlas.ripe.net/atlas/udm.html (page 32)

1003965	emile.aben@ripe....	Traceroute6	**Area**:WW(1001)	ns.ripe.net	s48exp ns.ripe.net	1001 / 0 / 0	Stopped	2012-09-07 12:00	2012-09-07 14:00
1003966	emile.aben@ripe....	Traceroute6	**Area**:WW(1001)	ipv6.google.com	s48exp ipv6.google.com	1001 / 0 / 0	Stopped	2012-09-07 12:00	2012-09-07 14:00
1003967	emile.aben@ripe....	Traceroute6	**Area**:WW(1001)	www.cloudflare.com	s48exp cloudflare.com	1001 / 0 / 0	Stopped	2012-09-07 12:00	2012-09-07 14:00
1003968	emile.aben@ripe....	Traceroute6	**Area**:WW(1001)	www.rtl.de	s24exp www.rtl.de	1001 / 0 / 0	Stopped	2012-09-07 12:00	2012-09-07 14:00

Conclusion

- In the part of the network that we measure:
  - In order of 1% difference between /48-out-of-PA and baseline (/32 PA, /48 PI). Noise?
- We don't exactly know how representative RIPE Atlas is for the IPv6 Internet at large
  - ~435 ASes (7% of IPv6 ASes)
  - My guess: RIPE Atlas biased towards networks of ops that make a conscious decision about whether to filter

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