

Router Geolocation

emile.aben@ripe.net
RIPE67

Router Geolocation?

- What?
 - “normal” IP geolocation looks only at the edge
 - router geolocation = figuring out the rest
- Why?
 - Detect hairpinning
 - Does a forward path traverse a specific country/region
 - In case of events?
 - Structurally?

Example - Hurricane Sandy (2012)

- Tons of interesting RIPE Atlas traceroutes
 - Naive router geolocation: Use Maxmind (or any other geoloc DB): Doesn't work!
 - Ended up using a few regexes on hostnames:
`/nyc|nyk|newyork|jfk|lga/i`
`/ash|abn|ashburn|dca|iad|washington/i`
- Next event: Can we do better?

Idea

- Find ways to geolocate Internet infrastructure better
- Ask the experts (you!) to participate
- Make collected data publicly available
 - so also for geoloc providers
- **Not** a competing service to existing geoloc
 - their data can be enhanced with router geoloc

Prior Art (#rule 11)

- Existing router geoloc bits-and-pieces
 - rocketfuel (undns), IXmaps, ...
 - problem: unmaintained and/or limited scope
- ‘Visual traceroute’
 - Typically use edge geolocation service
- IETF draft-google-self-published-geofeeds
 - complementary

Proposed Method

- Combine data-sources:
 - Existing edge geolocation
 - Hostnames from reverse DNS
 - 1.13 billion reverse DNS records in IPv4
 - Users could tag naming schemes
 - RTTs allow for some triangulation / speed-of-light constraints
 - IXP IPs/prefixes (when not remote-peering)
- Probabilistic answer: ie. 95% Athens,GR

Proposed Method - Crowdsource

- Combine data-sources:
 - Existing edge geolocation
 - Hostnames from reverse DNS
 - 1.13 billion reverse DNS records in IPv4
 - Users could tag naming schemes
 - RTTs allow for some triangulation / speed-of-light constraints
 - IXP IPs/prefixes (when not remote-peering)
- Probabilistic answer: ie. 95% Athens,GR

Prototype - Hairpins

Firefox File Edit View History Bookmarks Tools Window Help Mozilla Firefox http://sg.prepdev.ripe.net/georipe/map Smart Bookmarks Whoisn RDQ RIPE Labs IPv4/IPv6 meas... Atlas Google APIs Con... IPv6 statistics RIPE Atlas News

GeoRIPE map

MSM: 1007091 Probe: 16 OK

Key: Origin City level, IXP City level, DNS based City level, Maxmind Country level, IXP Country level, DNS based Country level, Maxmind

use city+country locations (radio button selected) use only city locations

enable IXP info (checkbox checked) enable DNS hints (checkbox checked) enable Maxmind geoloc (checkbox checked)

HopNo	IP	DNS name	RTT	GeoIXP	GeoDNS	GeoLoc
1		[private]	1.551	-	-	-
2		[private]	8.758	-	-	-
3	212.142.62.65	-	11.866	-	-	NL
4	84.116.244.81	nl-ams05a-rd2-ae-80-2370.aorta.net.	92.749	-	NL/Amsterdam	AT
5	84.116.136.158	-	94.453	-	-	AT
6	84.116.137.194	-	97.384	-	-	AT
7	4.78.132.93	xe-4-1-0.edge1.NewYork1.Level3.net.	86.288	-	US/New York	US/C
8	4.68.111.46	COGENT-COMM.edge1.NewYork1.Level3.net.	87.396	-	US/New York	US
9	154.54.3.97	te0-1-0-5.mpd21.jfk02.atlas.cogentco.com.	86.887	-	US/New York	US
10	154.54.46.110	te0-7-0-11.mpd21.par01.atlas.cogentco.com.	158.101	-	FR/Paris	US
11	154.54.36.181	te0-1-0-5.ccr21.mrs01.atlas.cogentco.com.	170.536	-	FR/Marseille	US
12	130.117.3.98	te2-1.ccr01.mil01.atlas.cogentco.com.	241.261	-	IT/Milan	EU
13	149.6.152.74	-	101.689	-	-	US
14	213.254.0.19	po1.Rumba-Monster.edge.TRN.itgate.net.	191.113	-	-	IT
15	213.212.129.68	it-trn-as12779.anchors.atlas.ripe.net.	117.09	-	IT/Torino	IT

Images: 14/14 Loaded: 135 KB Speed: 77.50 KB/s Time: 1.743

Prototype - Other Fun Shapes

Firefox File Edit View History Bookmarks Tools Window Help Mozilla Firefox http://sg.prepdev.ripe.net/georipe/map Smart Bookmarks WholsIn RDQ RIPE Labs IPv4/IPv6 meas... Atlas Google APIs Con... IPv6 statistics RIPE Atlas News

GeoRIPE map

MSM: 1006445 : Probe: 25 OK

use city+country locations use only city locations

enable IXP info enable DNS hints enable Maxmind geoloc

Key: Origin City level, IXP City level, DNS based City level, Maxmind Country level, IXP Country level, DNS based Country level, Maxmind

Map Satellite

HopNo	IP	DNS name	RTT	GeoIXP	GeoDNS	GeoMaxmind
1	[private]		3.325	-	-	-
2	213.181.206.28	core2.businesstelecom.hu.	221.268	-	-	-
3	149.11.10.13	te3-7.ccr01.bud03.atlas.cogentco.com.	287.799	-	HU/Budapest	-
4	130.117.48.225	te0-1-0-5.ccr21.bud01.atlas.cogentco.com.	37.706	HU/Budapest	EU	
5	130.117.51.173	te0-1-0-3.ccr22.bts01.atlas.cogentco.com.	42.786	SK/Bratislava	EU	
6	154.54.39.5	te0-3-0-2.ccr22.muc01.atlas.cogentco.com.	52.824	DE/Munich	US	
7	130.117.50.245	te0-2-0-2.ccr22.fra03.atlas.cogentco.com.	156.638	DE/Frankfurt	EU	
8	130.117.14.90	telia.fra03.atlas.cogentco.com.	179.489	DE/Frankfurt	-	
9	213.155.132.210	ffm-bb2-link.telia.net.	391.848	DE/Frankfurt	-	
10	213.155.133.51	prag-bb1-link.telia.net.	262.925	CZ/Prague	EU	
11	213.155.133.67	win-b4-link.telia.net.	160.727	-	-	
12	213.248.89.102	gtsdananet-ic-127740-win-b4.c.telia.net.	104.134	-	-	
13	195.39.208.146	teng-1-4.skbra2.gtsce.net.	239.995	-	-	
14	62.168.110.133	TenG-2-3.skbra.gtsce.net.	225.649	-	-	
15	62.168.110.54	sanet-gw.sk.gtsce.net.	221.164	-	-	
16	194.160.8.148	UMB-Banska-Bystrica.sanet2.sk.	232.707	-	-	
17	194.160.223.106	sk-bts-as2607.anchors.atlas.ripe.net.	232.344	SK/Bratislava	-	

Map data ©2013 Basarsoft, GeoBasis-DE/BKG (©2009), Google, basado en BCN IGN España Terms of Use Report a map error

Images: 10/10 Loaded: 20 KB Speed: 103.63 KB/s Time: 0.195

Further Improve: Crowdsource

- What you give:
 - Info on your network
 - Info on other networks
- What you get back:
 - Better router geolocation for everybody

Cooperation

- CAIDA are running a related project
 - Thinking of data exchange format
- If you have related projects
 - Talk with us!



Conclusion

- We'd like to explore this idea further because:
 - Could give you better tools/viz in RIPE Atlas
 - Could give you data to build your own tools on
 - Could give geolocation providers data to make their data better
- Let us know what you think!

Questions?

