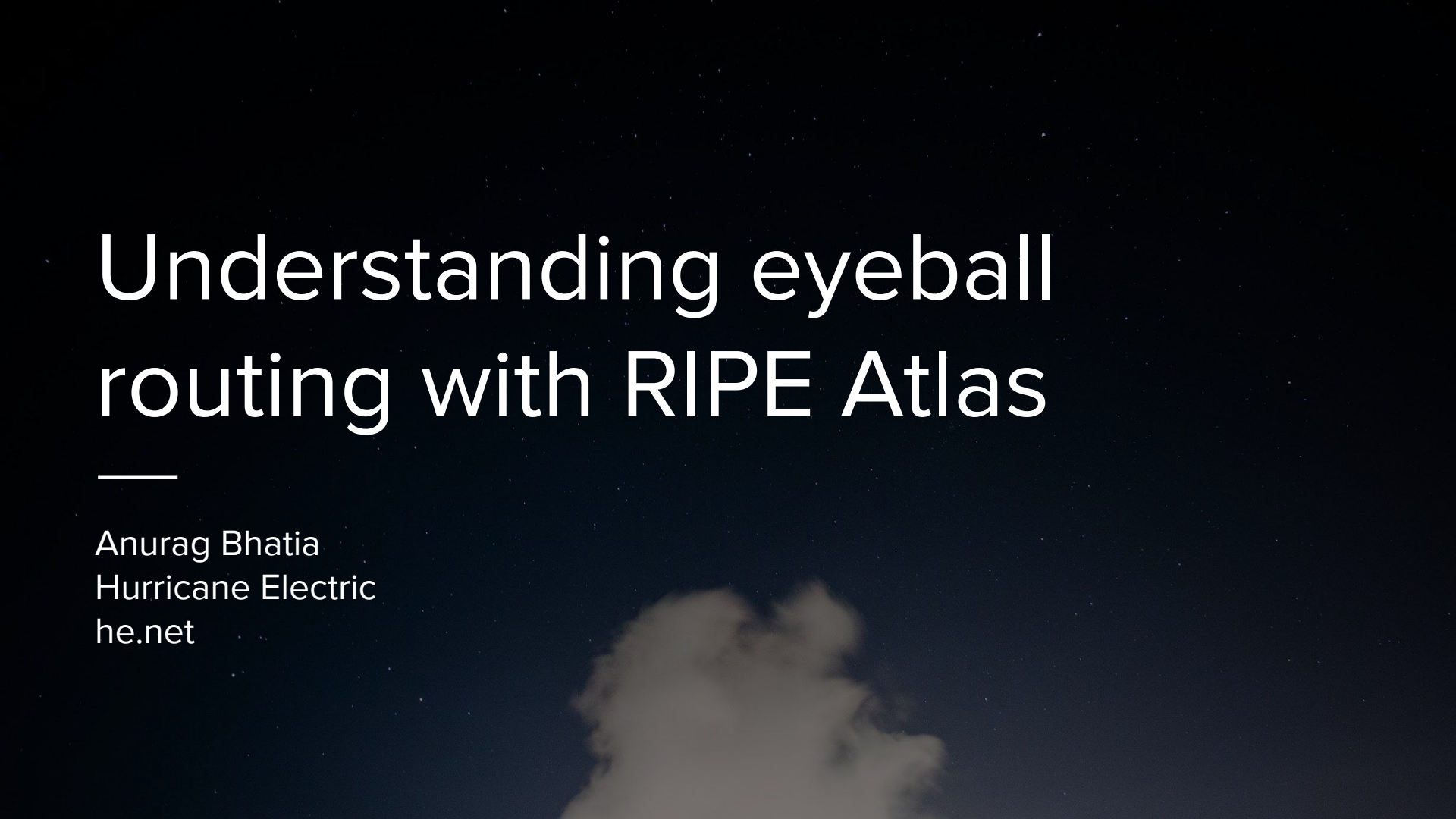
Understanding eyeball routing with RIPE Atlas

Anurag Bhatia
Hurricane Electric
he.net



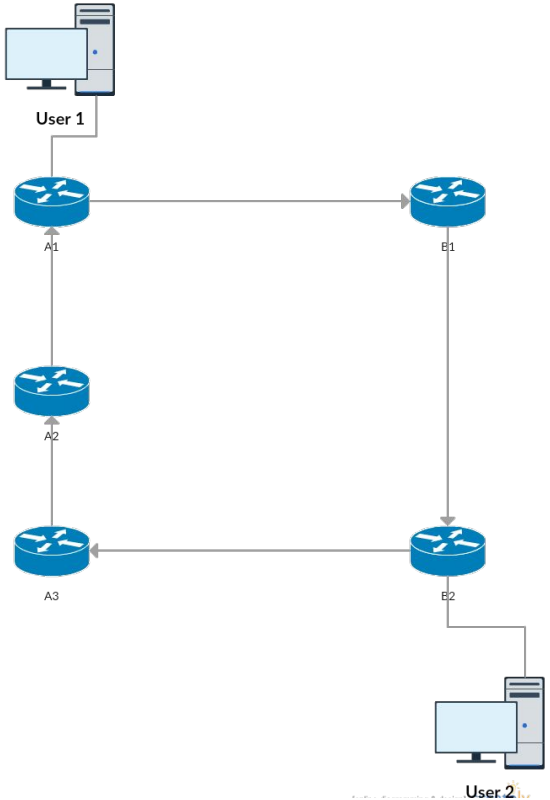
The challenge

What brings the requirement of distributed measurement?

The challenge

- Networks often do “*hot potato routing*” which results in them handing off traffic to “nearest exit point”
- More networks following “hot potato routing” results in asymmetric routing
- Makes it tricky to find the “return path”

Asymmetric routing



What is ASN?

- Referred to as “Autonomous System Number”
- Unique number used by an “autonomous organisation” who wants to connect to more than one network & have it’s own routing policy
- Internet is simply interconnection of various ASNs
- Presently there are 55k ASNs visible global table
- Find an ASN using search box on bgp.he.net

What about traceroutes?

Traceroute

- Creative use of TTL exceeded in TCP/IP
- Send packets with incrementing TTLs and find the IP of devices in the path from the IP returning “TTL exceeded” message.
- Shows **only the forward path**

Solution

The RIPE Atlas Project...

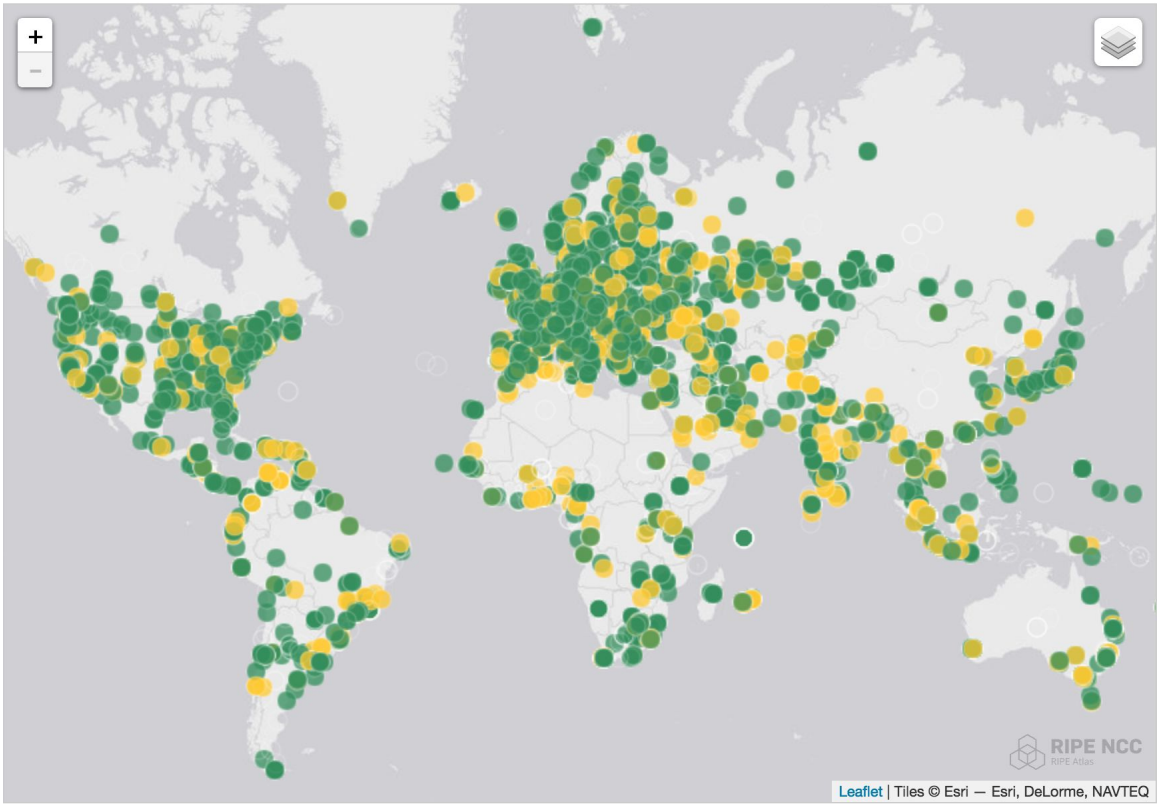
What is RIPE Atlas?

- A small device which is connected to end user CPE
- Does built-in & user defined measurements and shares with RIPE Atlas Platform
- Works on the “credit model”

RIPE NCC

- One of 5 regional internet registries (APNIC, ARIN, LACNIC, AFRINIC etc)
- Responsible for IP address & ASN allocation in Europe, Eurasia & Middle East
- Responsible for K root DNS server (one of 13 roots)
- Puts various interesting projects like RIPE Atlas, RIPE Stats, BGP Play, RIPE RIS raw dumps etc

RIPE Atlas Coverage



RIPE Atlas Coverage Overview

- 9751 active probes globally
- 39 active probes in India
- Running 13k measurements
- Putting 4500 results per seconds

(data as on 6th May 2017)

RIPE Atlas Probe Hardware

Type of measurements

1. Ping
2. Traceroute
3. DNS
4. HTTP
5. NTP
6. SSL Cert

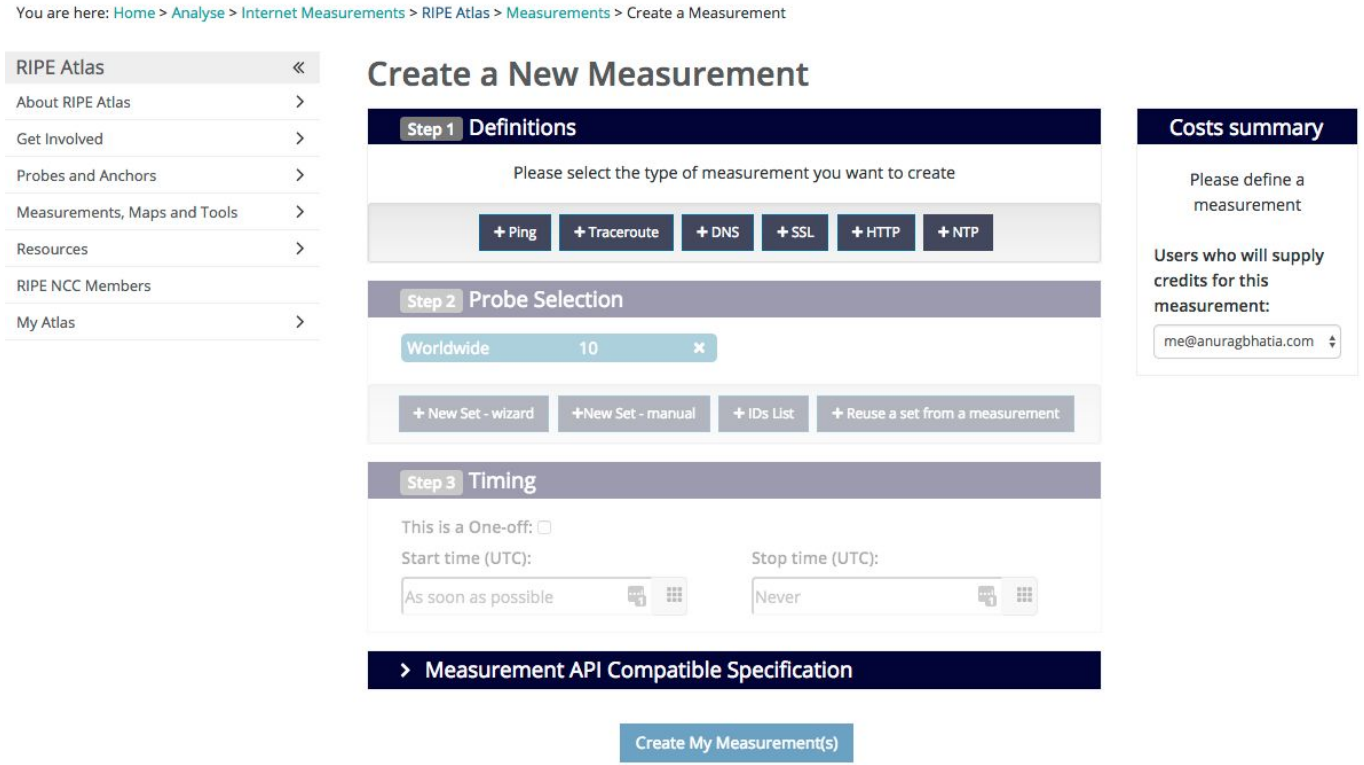
Features for measurements

- Can be triggered via Web UI and CLI tools
- REST APIs available
- Measurements can be one off as well as periodic
- Probes can be selected based on location, ISP (via ASN), area and directly by probe IDs.
- Measurements results in JSON

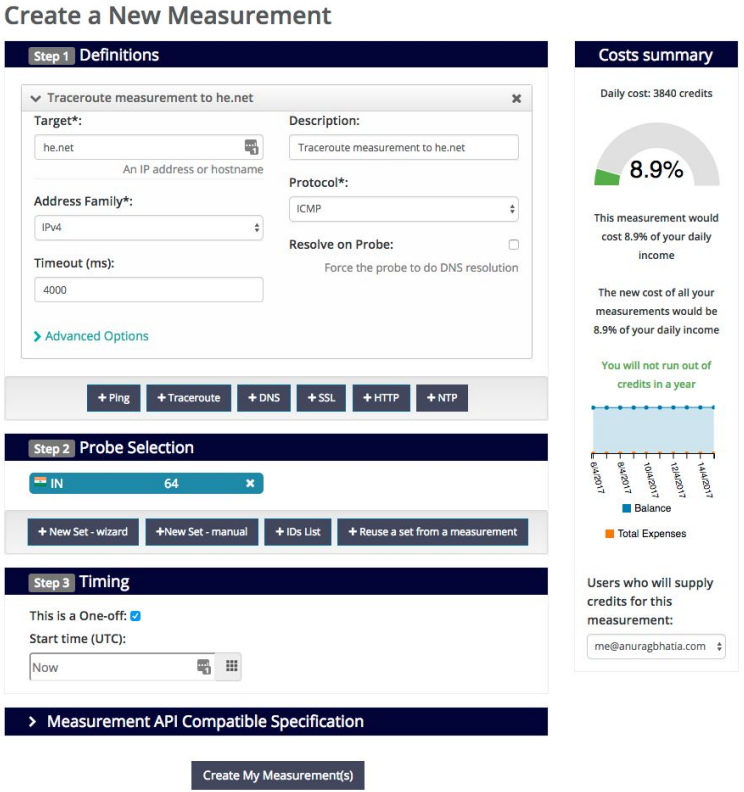
Built in measurements

- Ping and traceroutes to root DNS servers in IPv4 and IPv6
- Data available for pre-defined measurements based on standard measurement IDs
- Helpful in finding failures, issues or bad routing for root dns anycast instances

Web UI for creating custom measurements



Demo of measurement to he.net from India



Traceroute to he.net from India

Traceroute measurement to he.net

General Information | Probes | Map | TraceMON (beta) | OpenIPMap Prototype | Results

Probe	ASN (IPv4)	ASN (IPv6)	Time (UTC)	RTT	Hops	Success
305	24560		2017-05-06 11:30	311.087	15	✔
385	10029		2017-05-06 11:30	275.711	11	✔
6107	33480	33480	2017-05-06 11:30	241.806	11	✔
11832	24560	6939	2017-05-06 11:30	327.219	10	✔
11978	38457		2017-05-06 11:30	265.164	12	✔
13558	24560					No recent report available
17011	132933	58901	2017-05-06 11:30	309.750	10	✔
17013	9498		2017-05-06 11:30	312.956	12	✔
17590	24560		2017-05-06 11:30	256.391	11	✔
21538	10199		2017-05-06 11:30	316.449	15	✔
23697	17625		2017-05-06 11:30	279.900	13	✔
24887	24309		2017-05-06 11:30	281.335	12	✔
24916	133661		2017-05-06 11:30	293.946	15	✔
25093	9829		2017-05-06 11:30	287.538	11	✔
25111	9829	9829	2017-05-06 11:30	251.902	11	✔
25144	23860		2017-05-06 11:30	279.107	11	✔
25160	4755		2017-05-06 11:30	317.777	7	✔
25161	58457		2017-05-06 11:30	270.762	11	✔
25164	24560		2017-05-06 11:30	324.655	10	✔
25189	45582		2017-05-06 11:30	332.952	15	✔
25250	132952		2017-05-06 11:30	257.123	20	✔
25280	135260		2017-05-06 11:30	286.363	11	✔
25373	132933		2017-05-06 11:30	281.754	10	✔
25375	9430		2017-05-06 11:30	293.956	10	✔
25387	132933		2017-05-06 11:30	283.611	10	✔
25845	24309		2017-05-06 11:30	265.968	12	✔
27480	55824		2017-05-06 11:30	260.770	14	✔
28176	24560		2017-05-06 11:30	255.539	12	✔
28878	17439		2017-05-06 11:30	260.615	11	✔
29694	9829		2017-05-06 11:30	411.571	13	✔
29814	58405		2017-05-06 11:30	472.052	12	✔
29902	24309		2017-05-06 11:30	284.894	12	✔
29959	9829		2017-05-06 11:30	283.471	14	✔
29983	9829		2017-05-06 11:30	307.342	13	✔
30276	24309		2017-05-06 11:30	261.885	12	✔
31242	134053	134053	2017-05-06 11:30	280.690	10	✔
31996	23860		2017-05-06 11:30	276.779	12	✔
31999	55352		2017-05-06 11:30	264.088	12	✔
32001	23860		2017-05-06 11:30	349.910	13	✔

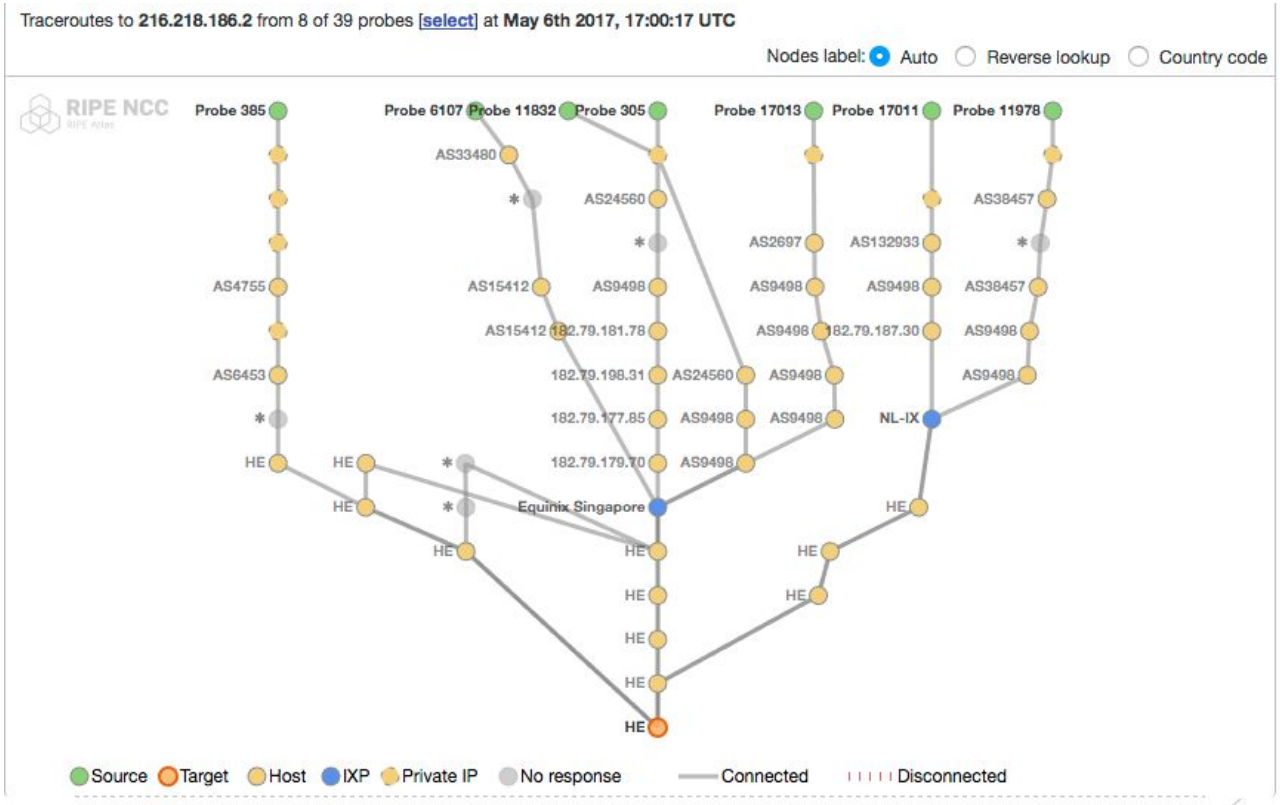
Latest Traceroute Result for Measurement #8484550

2017-05-06 11:30 UTC

Traceroute to 216.218.186.2 (216.218.186.2), 48 byte packets

1	192.168.1.1	7.544ms	1.624ms	1.553ms		
2	122.160.220.72	abts-north-static-072.220.160.122.airtelbroadbband.in	AS24560	41.053ms	42.396ms	43.024ms
3	* * *					
4	* * *					
5	59.144.176.85	abts-north-static-085.176.144.59.airtelbroadband.in	AS9498	41.067ms	40.158ms	41.434ms
6	182.79.181.78	41.692ms	40.497ms	43.281ms		
7	182.79.198.31	90.637ms	90.265ms	91.086ms		
8	182.79.177.85	94.334ms	94.701ms	100.757ms		
9	182.79.179.70	122.931ms	123.779ms	154.239ms		
10	27.111.228.81	6939.sgw.equinix.com	123.377ms	125.76ms	122.544ms	
11	184.105.64.254	100ge13-2.core1.tyo1.he.net	AS6939	192.384ms	195.822ms	190.725ms
12	184.105.213.117	100ge8-1.core1.sea1.he.net	AS6939	300.502ms	329.348ms	301.071ms
13	184.105.223.217	100ge11-1.core1.sjc2.he.net	AS6939	320.641ms	316.166ms	324.868ms
14	72.52.92.109	10ge1-1.core1.fmt1.he.net	AS6939	322.568ms	342.412ms	322.068ms
15	216.218.186.2	he.net	AS6939	311.087ms	312.25ms	310.969ms

Tracemon output



What about CLI?

Features of RIPE Atlas CLI

- Available on github “RIPE Atlas CLI Tools”
- Gives URL of measurement which can be used to view results on web UI along with printing of output in CLI
- Can be used for pulling (streaming) measurements output in CLI
- Comes with “bash autocomplete” script <-- *Very useful!*

CLI Tools Examples

Finding Probe:

Based on specific network: (E.g BSNL)

```
anurag@devops1:~$ ripe-atlas probe_search --asn 9829 --status 1

Filters:
 Status: 1
ASN: 9829

ID    Asn_v4 Asn_v6 Country Status
==========================================
25093 9829           in    Connected
25111 9829   9829    in    Connected
25444 9829           in    Connected
29694 9829           in    Connected
29959 9829           in    Connected
29983 9829           in    Connected
==========================================
            Showing 6 of 6 total probes
```

CLI Tools Examples

Pinging from probe:

```
anurag@devops1:~$ ripe-atlas measure ping --from-probes 25093 --target he.net --packets 5
Looking good!  Your measurement was created and details about it can be found here:
 https://atlas.ripe.net/measurements/8484554/

Connecting to stream...
48 bytes from probe #25093 117.239.144.82  to 216.218.186.2 (216.218.186.2): ttl=56 times:288.054, 287.687, 287.476, 287.46,  287.529,
Disconnecting from stream

You can find details about this measurement here:
 https://atlas.ripe.net/measurements/8484554/


anurag@devops1:~$
```

Use cases

1. Study of performance of root DNS anycast across the world - https://goo.gl/qp2gXg

2. Are Dutch Internet Paths Local - https://www.slideshare.net/ripencc/are-dutch-internet-paths-local-a-measurement-study-using-ripe-atlas

3. A case study of AAAA filtering - https://labs.ripe.net/Members/emileaben/ripe-atlas-case-study-of-aaaa-filtering

4. Measuring Countries and IXPs with RIPE Atlas - https://www.slideshare.net/ripencc/measuring-countries-and-ix-ps-with-ripe-atlas

How credit System Works?

- Each hosts gets credit for hosting probe: 21,600 per day
- Probe sponsor as well as RIPE Atlas anchor earns credits
- Tests typically costs 10-20 units/execution depending on tests & protocol (TCP/UDP)
- Overall system is designed to avoid intentional or unintentional (D)DoS attacks on targets and add a fair use policy

How to get involved?

Getting involved

- Host a RIPE Atlas probe at your home or office networks. All it needs is a access to internet (NAT is OK!) and USB power

  If in India apply for probe from my blog - http://link.anuragbhatia.com/ripe
  If outside apply via RIPE directly - https://atlas.ripe.net/apply/

- If running a datacenter, apply for a RIPE Atlas anchor - https://atlas.ripe.net/about/anchors/

- Create account on ripe.net & ask me for credit to test!

What if you do not have fixed broadband?

- RIPE Atlas Probe needs connectivity via hardwire ethernet port
- If you have mobile/hotspot only setup, it cannot be directly connected
- Possibility to do wifi-wired conversion using some external device is possible (we requested couple of Jio users for it for visibility of Jio network)
- RIPE NCC is actively exploring option to offer probe as VM though fundamentally project is designed to stay around eyeball networks

References

1. RIPE Atlas Project - https://atlas.ripe.net
2. RIPE Atlas API Manual - https://atlas.ripe.net/docs/api/v2/manual/
3. Built-in measurements & measurement IDs - https://atlas.ripe.net/docs/built-in/
4. RIPE Atlas CLI Tools - https://github.com/RIPE-NCC/ripe-atlas-tools
5. Tracemon - https://atlas.ripe.net/docs/tools-tracemon/
6. RIPE Atlas Credit System - https://atlas.ripe.net/docs/credits/

Questions?

Anurag Bhatia
anurag@he.net
Twitter: @anurag_bhatia
he.net

PGP Key Fingerprint: 3115 677D 2E94 B696 651B 870C C06D D524 245E 58E2