RIPE Atlas measurements analysis

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3rd June 2018

About RIPE Atlas

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RIPE Atlas

- active Internet measurements system
- developed since 2010
- hardware probes hosted by volunteers
- 10000 probes world-wide (250 in CZ)
- built-in and user defined measurements
- measuring the lowest-level of IP network functions
  - ping
  - traceroute
  - DNS

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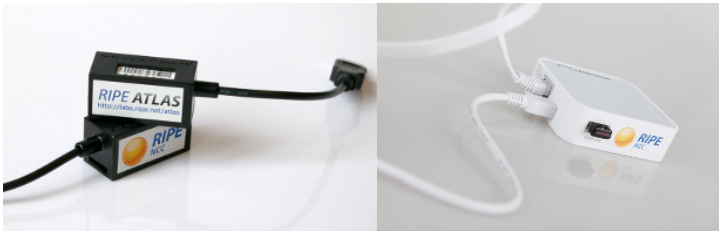
RIPE atlas probe

- hardware used considering low power consumption and price
- USB powered, 10/100Mbps Ethernet
- no controls, no web interface, no open port
- can be hosted behind NAT
- communicates with C&C servers hosted by RIPE NCC
- conducts measurements and uploads reports



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Probes version 1 and 2

- based on Lantronics Xport Pro
- MMU-less CPU, uClinux
- Busybox-based measuring software
- production stopped in 2012

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Probes version 3

- based on TP-Link MR3020
- cheaper and powerful
- firmware based na OpenWRT
- USB flash drive for OS a data
- no support for builtin Wi-Fi

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Atlas Anchor probes

- powerful probes for datacenters, bought by hosts for cca. 770 €
- act as a target for measurements by small probes
- based on
  1. Dell PowerEdge servers (pilot only)
  2. Soekris Net6501-70 (until 2017)
  3. PC Engines APU2 (current)
  4. virtual appliances (pilotting)
- 333 anchors world-wide, 7 in CZ

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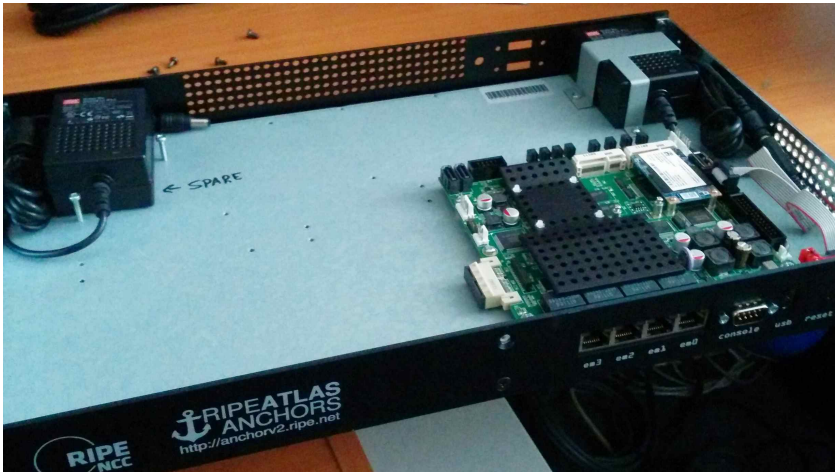
Inside Atlas Anchor



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Atlas Anchor services

Authoritative DNS server

```
$ dig 512.4.dns.cz-prg-as2852.anchors.atlas.ripe.net txt
"XXXXXXXXXXXXXXXXXXXXXXXXXXXXX…
…XXXXXXXXXXXXXXXXXXXXXXXXXXXXX"
```

HTTP(S) server

```
$ curl http://cz-prg-as2852.anchors.atlas.ripe.net/3
{
      "anchor": "cz-prg-as2852.anchors.atlas.ripe.net",
      "client": "2001:718:1:6::134:196",
      "payload": "AAA"
}
```

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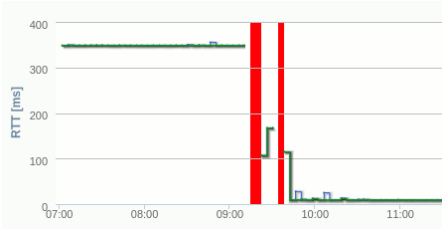
What do probes measure

- Ping selected targets
- Traceroute to selected targets
- DNS queries to root servers
- HTTP requests to `ripe.net`
- SSL connection to `ripe.net`
- User-defined measurements



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User-defined measurements

- you can run your measurements on the whole network
- payment by a virtual currency
- credits awarded for hosting a probe
- JSON REST API
- oficial Python libraries

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How to measure

- not necessary to host a probe (unless you live in a not yet covered area)
- create a RIPE NCC Access accunt `https://access.ripe.net`
- ask someone for credits
- use the results that are already available

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Interesting results

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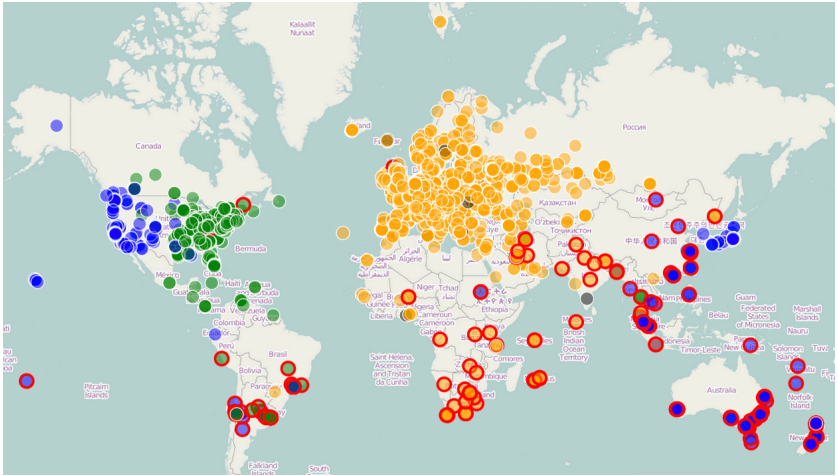
Wikipedia CDN analysis



Amsterdam Ashburn San Francisco

source

DNS hijack in Turkey ①

21. 3. 2014 blocked Twitter on ISPs' DNS servers
25. 3. 2014 blocked Google Public DNS and similar
28. 3. 2014 fake DNS server on hijacked 8.8.8.8

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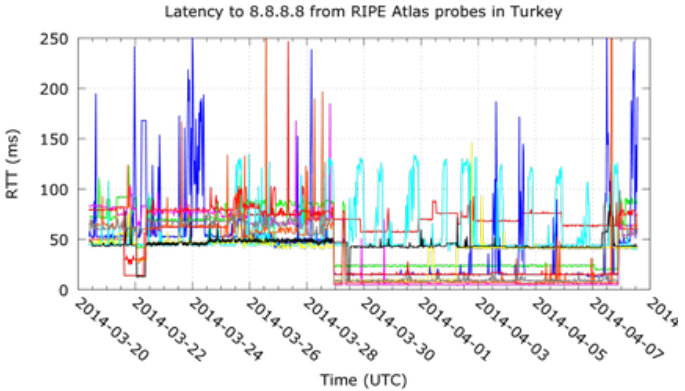
DNS hijack in Turkey ②

4. 4. 2014 unblocked Twitter and YouTube
7. 4. 2014 DNS server hijack ended

nobody made any statement about the hijack



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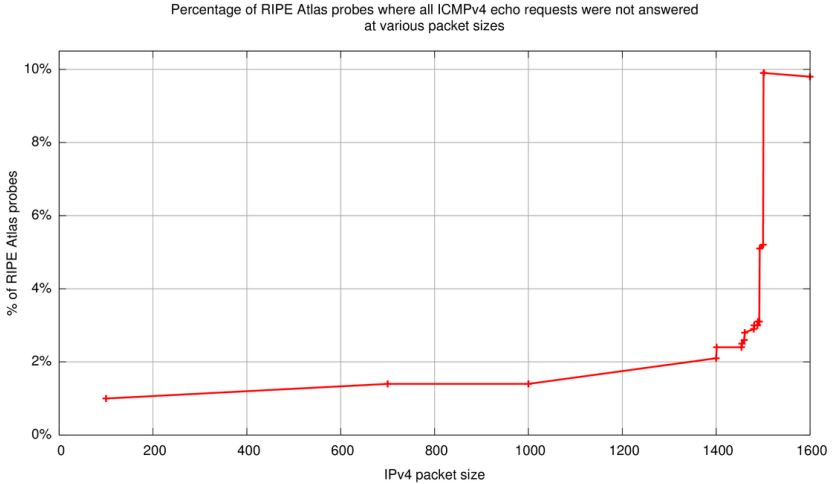
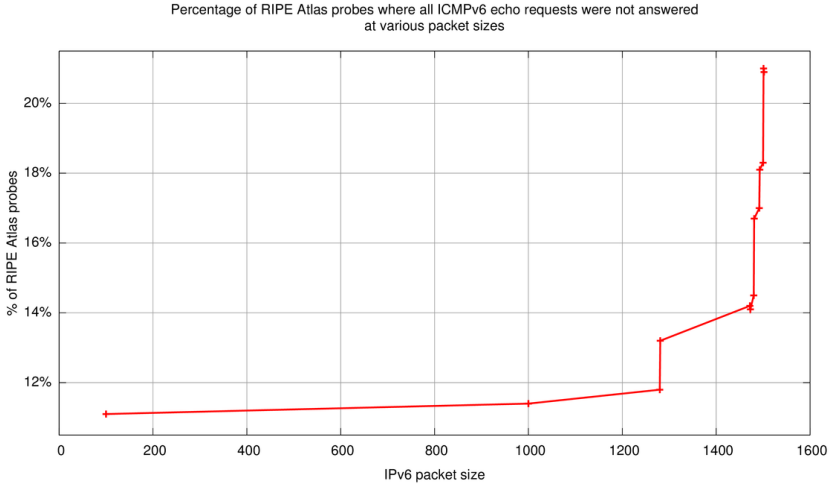
IPv4 MTU problems



source

IPv6 MTU problems



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Are all IP addresses equal?

- classful routing legacy
- adresses ending `.0` nebo `.255` can be considered network/broadcast addresses
- 2 – 4 % probes is not able to ping address ending `.0`
- much bigger issue in former C-class block (`192.*` – `223.*`)

source

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Working with results

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Official Python libraries

Sagan	parsing of results
Cousteau	control of RIPE Atlas
Magellan	CLI tools

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Workshop agenda

- set-up Magellan
- look into the renderers
- try to improve them!

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Magellan installation

- we use GitHub version
- install into Pythonu 3 virtual environment
  - `python3 -m venv venv`
  - `virtualenv -p python3 venv`
  - `mkvirtualenv atlas`
  - `pipenv`
- install in the developer mode `pip install -e`

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Magellan installation

```
$ mkdir atlas
$ cd atlas
$ python3 -m venv venv
$ source venv/bin/activate
(venv) $ git clone https://github.com/RIPE-NCC/ripe-atlas-tools
(venv) $ pip install -e ripe-atlas-tools
(venv) $ ripe-atlas stream 1695916
```

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Home directory installation

```
$ mkdir -p ~/.config/ripe-atlas-tools/renderers
$ touch ~/.config/ripe-atlas-tools/renderers/__init__.py
$ cat > ~/.config/ripe-atlas-tools/renderers/my_renderer.py <<EOF
from ripe.atlas.tools.renderers.base import Renderer as BaseRenderer
class Renderer(BaseRenderer):
    RENDERS = [BaseRenderer.TYPE_PING]
    def on_result(self, result):
        return "Ping from {r.probe_id}\n".format(r=result)
EOF
(venv) $ ripe-atlas stream 1695916 --renderer my_renderer
```

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Editting inside the Magellan package

```
$ cd ripe-atlas-tools/ripe/atlas/tools/renderers/
$ cp ping.py my_ping.py
(venv) $ ripe-atlas stream 1695916 --renderer my_ping
```

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What can we try to hack

- add ping stats at the end
- add colours to the output (they are already in DNS measurements)
- add network operators name to the traceroute

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Thank you!

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Slides are already online.