The RouteViews Project: Update

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UNIVERSITY OF OREGON

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Background

- **RouteViews was first started in 1995**
- Now a growing network of 40+ collectors positioned strategically at Internet Exchange Points around the world
- RouteViews collaborates with the Center for Applied Internet Data Analysis (CAIDA) working with NSF grants that support Designing a Global Measurement Infrastructure to Improve Internet Security, GMI3S (OAC-2131987), and an Integrated Library for Advancing Network Data Science, ILANDS (CNS-2120399).
- RouteViews is supported with financial and in-kind donations by multiple organizations

- **RouteViews is based at the University of Oregon and operated by NSRC**
- NSRC supports the growth of global Internet infrastructure by providing engineering assistance, collaborative technical workshops, training, and other resources to university, research & education networks worldwide.
- NSRC is partially funded by the IRNC program of the NSF (OAC-2029309) and Google with other contributions from public and private organizations.
- The University of Oregon is a public research institution in Eugene, Oregon, USA founded in 1876.

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What is RouteViews

- A tool that allows Internet network operators to look at the BGP table from different backbones and locations around the world to troubleshoot and to assess:
  - Reachability, hijacks, bugs, peer visibility, mass withdrawals, RPKI status,…
- Operators who find it a valuable tool also peer to contribute to the value
- RouteViews operates collectors strategically positioned at IXPs around the world.
  - It also hosts a few multi-hop collectors at UO for those operators who are not present at IXPs.

What is RouteViews

- Many free and commercial tools used by network engineers every day include data from RouteViews
  - CAIDA ASRANK
  - CAIDA BGP Reader
  - HE BGP Tools
  - Kentik Market Intelligence
  - Kentik BGP monitoring
  - Catchpoint
  - BGPMon
  - And many more

Make life easier for your NOC

upstream

```
route-views3.routeviews.org# sh ip bg 220.239.64.0
BGP routing table entry for 220.239.64.0/20, version 10370995
Paths: (1 available, best #1, table default)
  Not advertised to any peer
  38001 7473 4804 4804
    202.150.221.33 from 202.150.221.33 (10.11.33.29)
      Origin IGP, valid, external, best (First path received), rpki validation-state: invalid
      Community: 38001:100 38001:3003 38001:8003
      Last update: Sun Nov 10 14:28:09 2024
route-views3.routeviews.org#
```

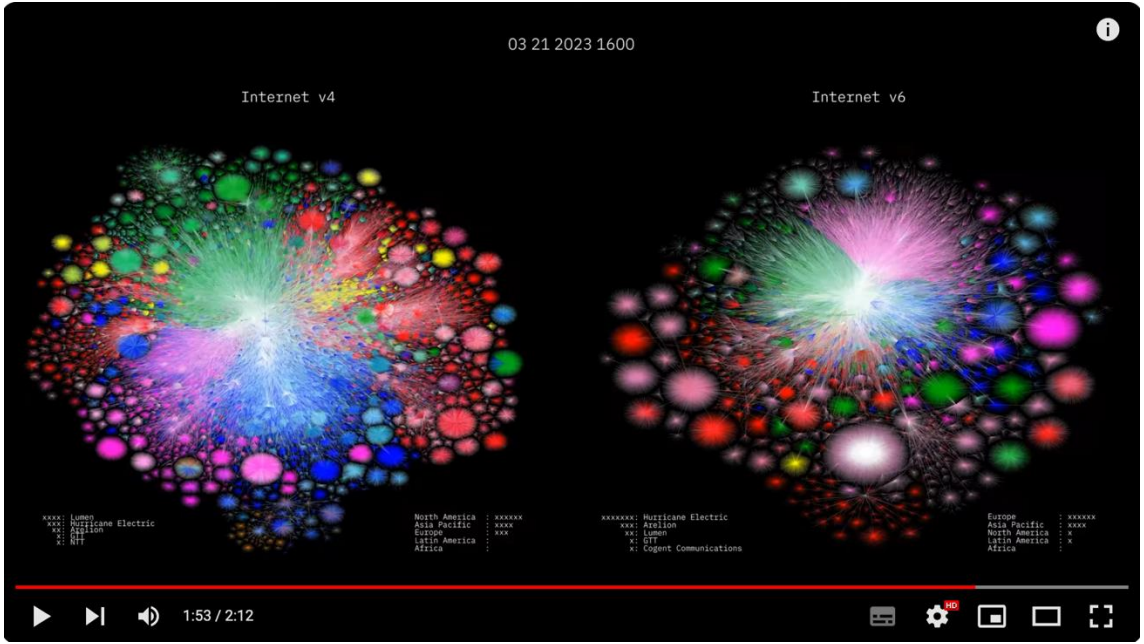
RPKI state

Make life easier for your NOC

upstream

```
route-views3.routeviews.org# sh ip bg 220.239.64.0/19
BGP routing table entry for 220.239.64.0/19, version 9454097
Paths: (25 available, best #24, table default)
  Not advertised to any peer
    9268 4764 1221 7474 4804, (aggregated by 4804 198.142.65.160)
    203.62.187.103 from 203.62.187.103 (203.62.187.103)
      Origin IGP, valid, external, atomic-aggregate, rpki validation-state: valid
      Community: 0:2011 9268:2124
      Last update: Mon Nov  4 04:04:03 2024
    9268 4764 1221 7474 4804, (aggregated by 4804 198.142.65.160)
    203.62.187.102 from 203.62.187.102 (203.62.187.102)
      Origin IGP, valid, external, atomic-aggregate, rpki validation-state: valid
      Community: 0:2011 9268:2124
      Last update: Mon Nov  4 02:34:28 2024
route-views3.routeviews.org#
```

RouteViews Impact



Barrett Lyon: https://www.youtube.com/watch?v=vo5gIK9czIE

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What's happening at RouteViews

ROUTEVIEWS NEWS

RouteViews News

- Collectors:
  - All software collectors use FRR[1] (version 10.2)
  - One Cisco ASR1004 (as a tribute to the original!)
  - Moving collectors from metal to VMs (easier deployment & management)
- Location update:
  - Most recent additions include GetaFIX (Philippines), KINX (Seol, Korea) and Namex (Italy)
  - Several new locations offered; resources required to fulfil those offers

[1]FRRouting Project: https://frrouting.org/

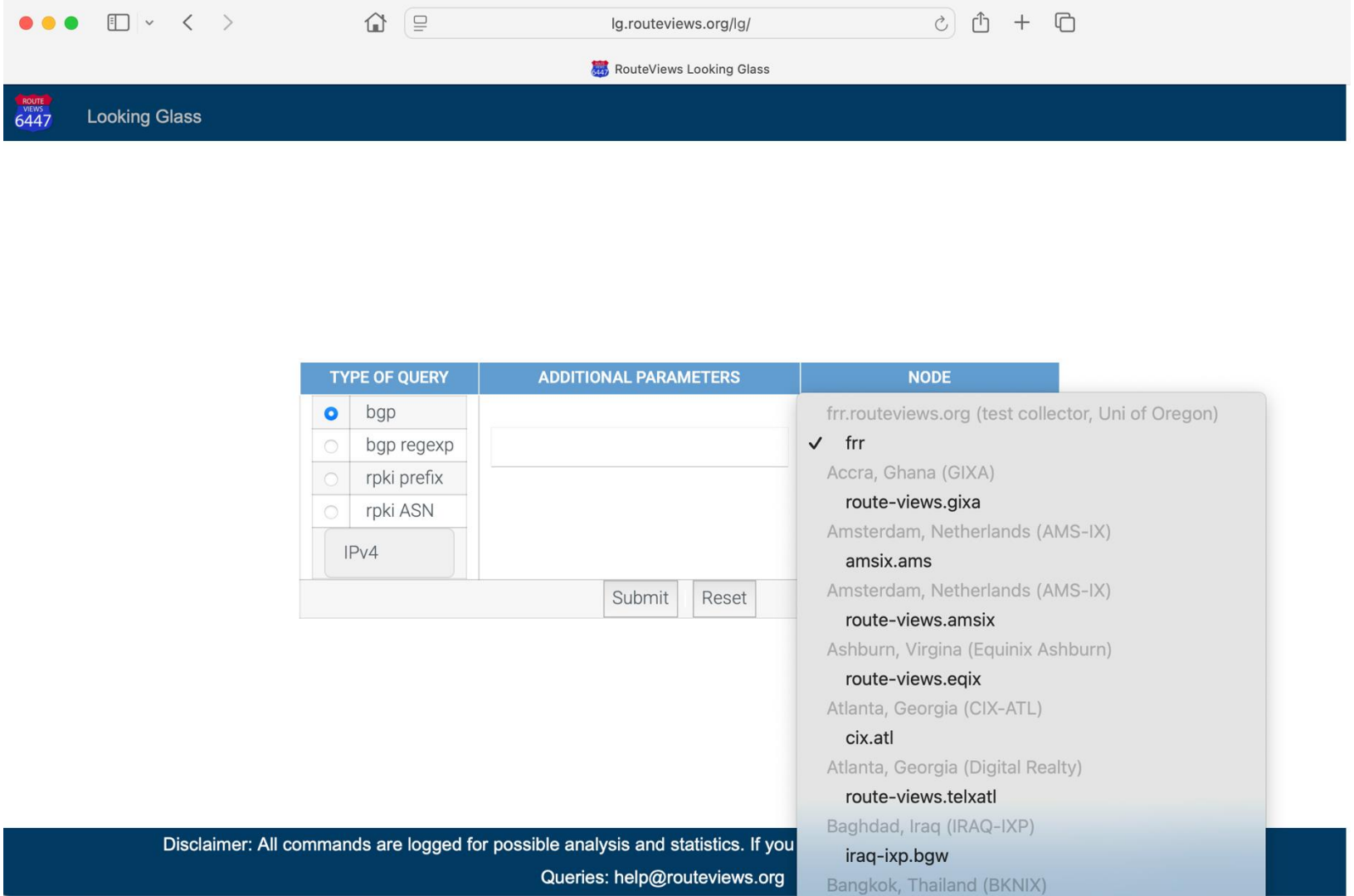
RouteViews Development Projects: API

- API allows programmatic access to live RouteViews data
  - (our collectors currently allow telnet access, which 1000s of automated scripts hammer daily)
- Two access levels:
  - Unauthenticated for casual (infrequent queries)
  - Authenticated access (using verified PeeringDB users) for more serious research
- API currently supports ten collectors
  - More will be added as resources become available
- Please consult the docs on how to use the API
  - https://api.routeviews.org/docs/

Exchange	collector
AMS-IX Amsterdam, Netherlands	route-views.amsix.routeviews.org
LINX, London, United Kingdom	route-views.linx.routeviews.org
NAPAfrica, Johannesburg, South Africa	route-views.napafrica.routeviews.org
Equinix SG1, Singapore, Singapore	route-views.sg.routeviews.org
Equinix SYD1, Sydney, Australia	route-views.sydney.routeviews.org
SAOPAULO (PTT Metro, NIC.br), Sao Paulo, Brazil	route-views2.saopaulo.routeviews.org
Multi-hop at U of Oregon	route-views3.routeviews.org
Multi-hop at U of Oregon	route-views4.routeviews.org
Multi-hop at U of Oregon	route-views5.routeviews.org
Multi-hop at U of Oregon	route-views6.routeviews.org

RouteViews Development Projects: LG

- telnet access is unsustainable
  - Gives open access to the collector command line interface to run “show” commands
- Looking Glass will soon become the default access for each collector
  - Permits the most commonly used BGP diagnostic commands
  - telnet remains available on route-views.routeviews.org (the Cisco ASR1004) for legacy access
- Looking Glass has completed internal testing and is now available for general use
  - telnet access will be removed after due notice to the community


lg.routeviews.org/lg/
RouteViews Looking Glass
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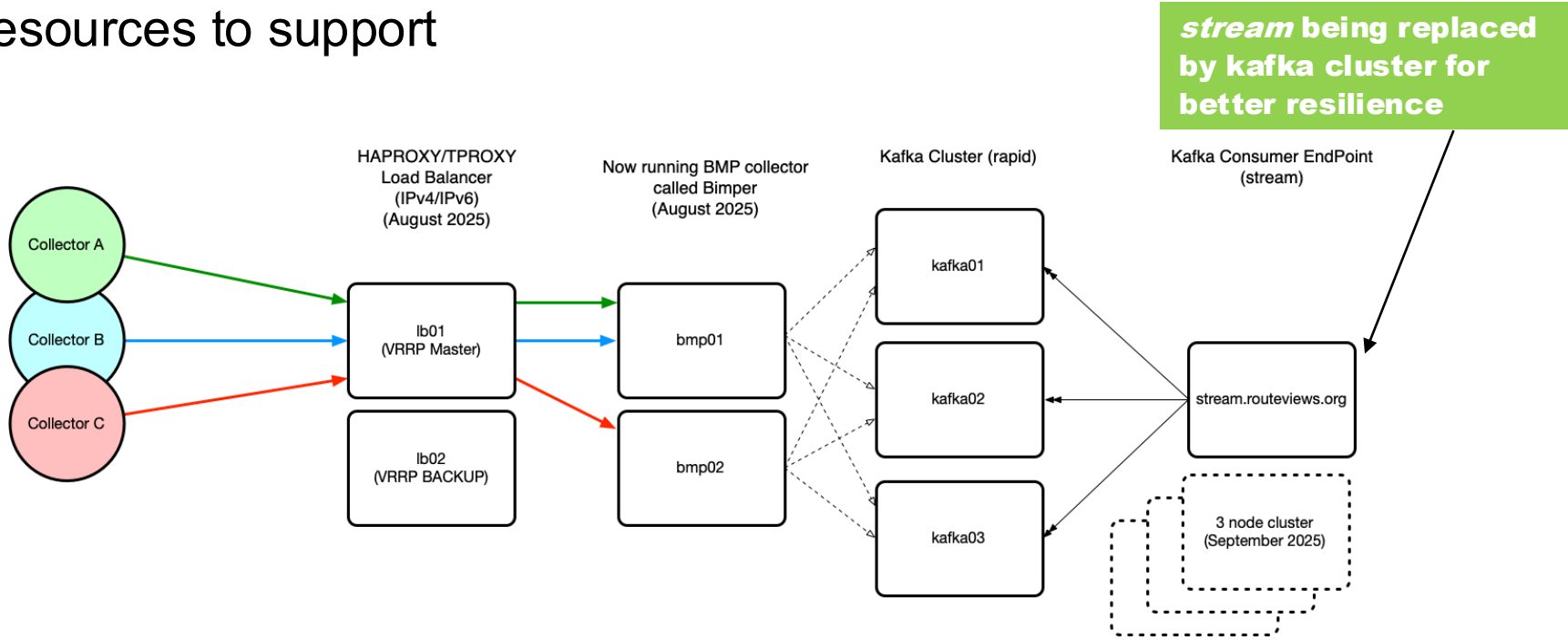
Looking Glass
TYPE OF QUERY
ADDITIONAL PARAMETERS
NODE
bgp
bgp regexp
rpki prefix
rpki ASN
IPv4
Submit
Reset
frr.routeviews.org (test collector, Uni of Oregon)
frr
Accra, Ghana (GIXA)
route-views.gixa
Amsterdam, Netherlands (AMS-IX)
amsix.ams
Amsterdam, Netherlands (AMS-IX)
route-views.amsix
Ashburn, Virgina (Equinix Ashburn)
route-views.eqix
Atlanta, Georgia (CIX-ATL)
cix.atl
Atlanta, Georgia (Digital Realty)
route-views.telxatl
Baghdad, Iraq (IRAQ-IXP)
iraq-ixp.bgw
Bangkok, Thailand (BKNIX)
Disclaimer: All commands are logged for possible analysis and statistics. If you
Queries: help@routeviews.org

RouteViews Development Projects: BMP

- Live feed from collectors for BGP data consumers
- Challenge is to make this scale and provide the infrastructure resources to support



RouteViews Behind the Scenes Projects

- Upgrading archive infrastructure and storage
  - RouteViews stores BGP data from 1997 – around 50 TBytes (compressed)
- Tooling
  - Automation tools for managing the whole infrastructure and deploying new peers
- Collector OS (from CentOS to Ubuntu)
  - CentOS end-of-life – half the collectors still running CentOS
- FRR performance
  - Tuning Linux TCP parameters to improve BGP peer performance
    - https://fasterdata.es.net/host-tuning/linux/
  - “Badly behaving peers” (*aka* slow and/or noisy peers)

RouteViews Future Planning

- Collectors & hosts in new locations outside North America
  - Large IXPs with dense interconnection
  - Unique or specialist environments (e.g. R&E exchanges)
- Scalable and diverse archiving
- Improved community support
  - Running this infrastructure costs money!
  - We hugely appreciate our generous supporters
    - https://www.routeviews.org/routeviews/index.php/supporters/
- Your recommendations are welcome! 🙏

Consumers of RouteViews data

If you use RouteViews data for your products or services:

- Please acknowledge the source!
  - Your product or service likely would not work without our data!
- Please do *NOT* send your customers of your products or services to us for technical support:
  - We simply collect what is seen in the global routing table
  - We cannot fix mistakes made by network operators
  - We cannot fix bugs in BGP implementations
  - We cannot remove BGP announcements we receive
  - We cannot change what is seen in the global routing table

For Peering Coordinators

PEERING WITH ROUTEVIEWS

Peering with RouteViews

- RouteViews has a Selective peering policy
  - PeeringDB: https://www.peeringdb.com/asn/6447
- We require all peers to have a PeeringDB entry
  - Our tools build peering options (for IXP based collectors) and configurations from PeeringDB
- Peering:
  - Over IPv4 (for IPv4 prefixes) and IPv6 (for IPv6 prefixes)
  - We want to receive the entire BGP table (if operationally possible)
  - We do not send you any prefixes (please don't ask)

RouteViews Peering Policy

General requirements:

- Peer must operate stable equipment - RouteViews will shutdown BGP sessions that disturb the stability of the RouteViews platform
- Peer must have a routable ASN
- Peer must not be a hobby network
- Peer's full view of the global routing table is preferred
- Routes should be aggregated as much as possible (no longer than /24 for IPv4 and /48 for IPv6)
- Peer must be present with up-to-date information in PeeringDB - including the NOC email address
- Peer must filter RFC6890 space
- RouteViews does not accept addpath-RX or TX
- Peers must not send default routes

IXP peering:

- We happily accept everyone's routes from the route servers.
- We will set up bilateral sessions with anyone who meets the general requirements and will send us their full table.
- We will peer at all mutual exchanges if requested.

Multihop peering:

- We will accept multihop peers who are not on any mutual IXPs.
- Peers must provide their full view of the Internet as they see it.
- We accept two sessions for redundancy; more than two sessions can be set up if the feeds are sufficiently different.

Why a Selective Peering policy?

- Balancing operational overhead, scale and information from the data
- Hobby Networks
- Full View of the Internet
- What makes a peering interesting?
  - Networks in regions where we have limited visibility
  - Networks demonstrating new interconnection patterns
  - Networks using innovative routing practices
  - Networks that help us understand emerging market dynamics
  - Or maybe something we haven't thought about yet

For potential hosts of collectors

HOSTING ROUTEVIEWS

Hosting RouteViews

- RouteViews is interested in new locations
  - Especially in regions or economies we have no collector
  - Where there are IXPs with large numbers of peers (>100)
- Hosting a RouteViews collector
  - Hosts can be IXPs themselves
  - Hosts can be members of IXPs
  - Hosts sponsor the IXP port and the (~10Mbps) transit required
  - Hosts sponsor the VM needed for the collector
    - Physical hardware is less preferred due to being harder to manage
    - VMs sometimes may not be possible due to operational requirements

Collector Specifications

- Virtual Machine:
  - 16GB RAM min (prefer 32GB)
  - 100GB disk
  - 4 vCPUs
  - 1 transit interface (management and public CLI access, low traffic)
  - 1 peering interface on the IX
- Physical Hardware:
  - 32GB – 64GB RAM
  - 400GB – 1TB SSD
  - 4+ CPUs
  - Ethernet port for transit interface (1Gbps is enough)
  - Ethernet port for IX peering (10Gbps is the standard now)

Collector Software

- Ubuntu 24.04 is RouteViews standard OS
  - We require a minimal Ubuntu Server install
  - Our deployment scripts do the rest

- Routing daemon we install is FRR
  - MRT[1] used for BGP RIBs (archived every 2 hours) and BGP updates (archived every 15 minutes)

[1] Multi-Threaded Routing Toolkit: https://datatracker.ietf.org/doc/html/rfc6396

Collector Host

- Acknowledged on RouteViews website as a sponsor
- Contact details kept up to date with RouteViews team
  - An up-to-date PeeringDB entry helps 😀

How you can help

SUPPORTING ROUTEVIEWS

Supporting RouteViews

- The project was started in 1995 because network operators wished to see what their BGP announcements looked like from an external viewpoint
  - Thousands of network operators & researchers all around the world now rely on RouteViews
  - Many everyday tools we all rely on use RouteViews data
  - Many commercial products and services rely on RouteViews data

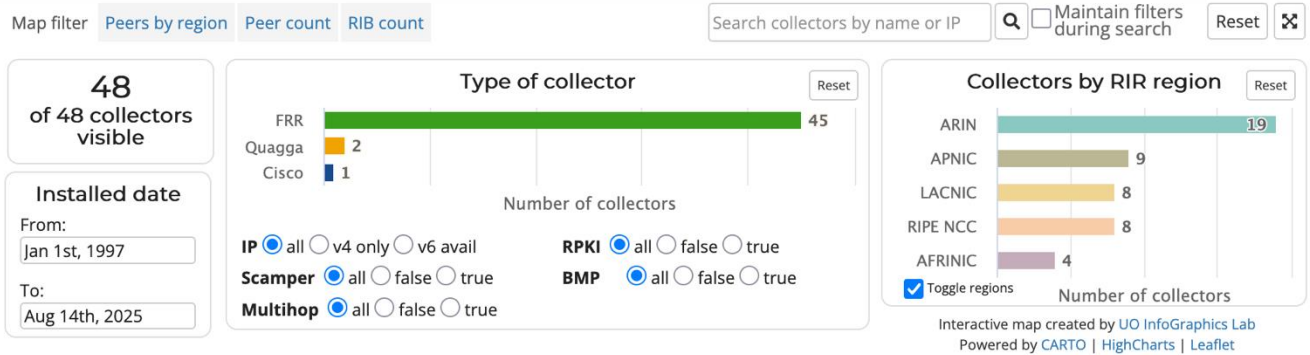
Supporting RouteViews

Please consider supporting RouteViews:

- By peering with one of our collectors
- By publicly acknowledging the value of the information we have collected
  - For citations, our DOI is *10.7264/1y7v-2d90*
- If your product or service is commercially successful, we look forward to receiving your support to keep your product or service that way!
- In any other way that helps keep this community service going

RouteViews Collector Map

https://www.routeviews.org/routeviews/map/



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Thank you!