NetViews: Real Time Visualization of Internet Path Dynamics for Network Management

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Visualization Motivation

Internet Topology mapping and visualization attempts to graphically represent Internet Architecture.

Why visualize Internet topology in real-time?

• Monitor reachability of a network.
• Identify anomalous de-peerings.
• Identify route hijacking & misconfigurations quickly.
Next Generation Route Monitoring

- We have been developing the next-generation routing monitoring software for high data completeness, integrity, scalability and accessibility.
  - BGPMon – Real time light weight BGP monitor with over 70 peers.
  - NetViews – Visualizes both control plane paths (via BGP updates) and forwarding paths (via active probing).
Route Monitoring Setup

NetViews Server Detail

Subscription Server

Client

Overlay

IR Databases

BGP Mon

NetViews Portal

BGPMon

Data Broker

GeoCoder

Probe Manager

IP Crawler

Internet
Server Component Interaction

1. Peer sends BGP update to BGPMon
2. Forwarded to NetViews
3a. Data Broker forwards to client through Overlay
3b. Probe Manager
4b. LG Server initiates traceroute
5b. Traceroute results returned to Probe Manager
6b. Traceroute results forwarded to client
BGP Event Timeline

00:00
BGP Update for 141.225/16.
Event Started.
New Probe Initiated.

00:13
BGP Update for 141.225/16.
Suppressed due to rate limiting.

03:11
BGP Update for 141.225/16.
Initiate New Probe.
Extend BGP Event Window

02:00
Periodic Probe. Occurs every Two minutes

04:00
Periodic Probe. Occurs every Two minutes

06:00
Periodic Probe. Occurs every Two minutes

07:13
No Activity. End of Event

00:00 - 00:46
Probing

02:00 - 02:26
Probing

03:11 - 03:51
Probing

04:00 - 04:36
Probing

06:00 - 06:40
Probing

00:00 - 00:20
No Probes

02:00 - 02:20
No Probes

03:11 - 03:31
No Probes

04:00 - 04:20
No Probes

06:00 - 06:20
No Probes

00:00 - 04:00
BGP Event Window

03:13 - 07:13
BGP Event Window extended
Browsing and Searching

Prefixes and ASN's can be quickly searched.

Path of 66.216.10/24 for each peer vantage point.
Internet backbone with associated links between backbone networks are viewable. Visualization is based on degree of neighbors of each AS.
Live View

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Conclusion

- **Features**
  - Real time Visualization of control plane paths
  - Status of forwarding paths during route change events.

- **Future Work**
  - Correlate forwarding and routing dynamics in order to create a classification model for Internet paths.
  - Add scalability by having clients run traceroute jobs in a P2P fashion.
  - Give client users the ability to communicate with each other.
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BGP Monitoring System

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