Monitoring and Automation of a Global Network

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CloudFlare (a quick background)

- Once a website is part of the CloudFlare community, its web traffic is routed through our global network of 80+ locations
- How big?
  - 4+ million Zones/ Websites
  - Authoritative DNS for ~40% of Alexa top 1 million
  - 43+ billion DNS queries/day
    - Second only to Verisign
- 86+ edge locations globally
  - 40 countries (and growing)

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CloudFlare's Network

- Each Point of Presence is an Island
  - Not interconnected with each other
- Connectivity between PoPs and other parts of the internet relies on Peering and Transit networks
- Replication occurs over internet paths, so must be reliable
- How to Monitor the reliability of the internet?

How to monitor the Internet?

How to monitor the Internet?

- CloudFlare has an advantage:
  - We’re connected to many providers in many locations
  - Easy to conduct tests over provider backbones
- Measure loss between providers
- But how to conduct the tests?

How to monitor the Internet?

- JunOS: RPM

https://www.juniper.net/documentation/en_US/junos12.1x46/topics/concept/security-rpm-overview.html

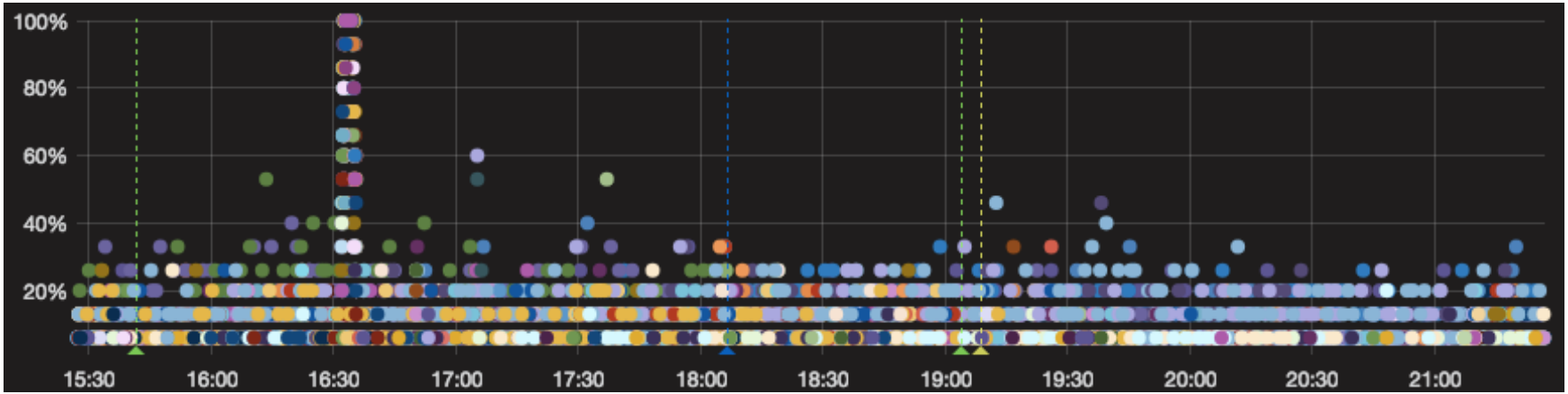
- IOS: IP SLA

http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/ipsla/configuration/15-mt/sla-15-mt-book/sla_icmp_echo.html

How to monitor the Internet?

- Probes run on the the edge devices
- Force exit interface, destination IP Addresses, source IP address
- Using providers Point-to-Point IP address, you can measure just their backbone
- Forcing exit interface, can measure with good reliability, loss between providers
- Polling / collecting data from devices (SNMP, netconf)
- What does it look like?

How to monitor the Internet?



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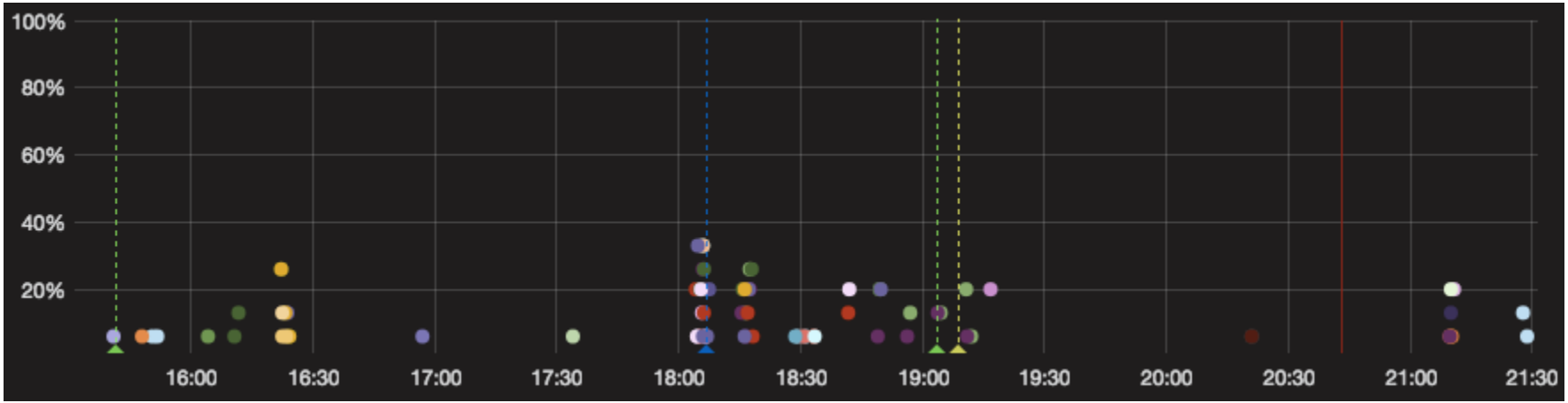
How to monitor the Internet?

WOW

How to monitor the Internet?

- That might’ve been a little unfair
- Previous graph was looking at trans-network paths
- Let’s look at a single Tier-1 Backbone instead

How to monitor the Internet?



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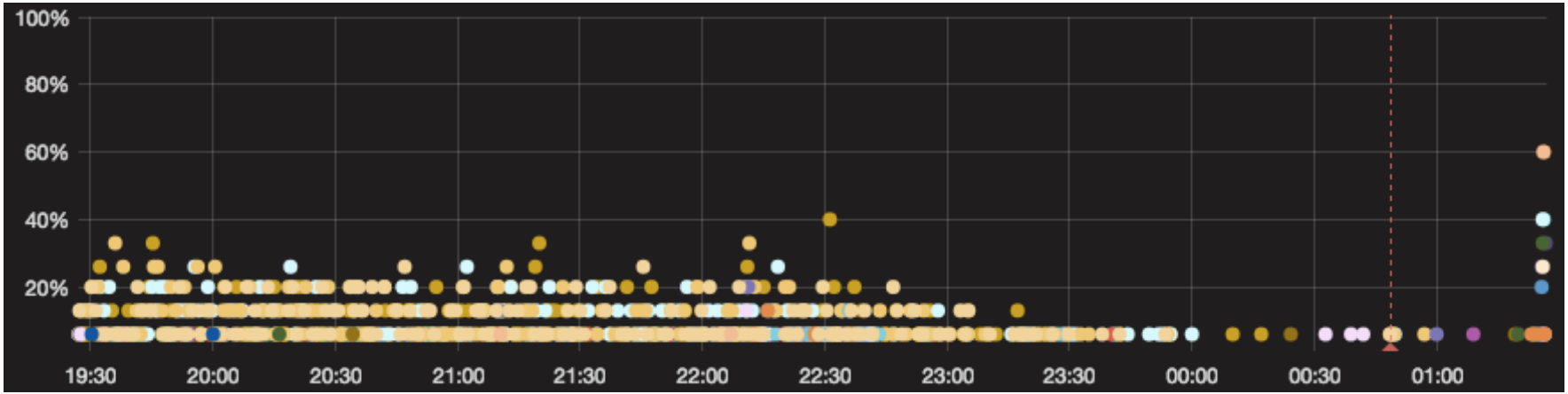
How to monitor the Internet?



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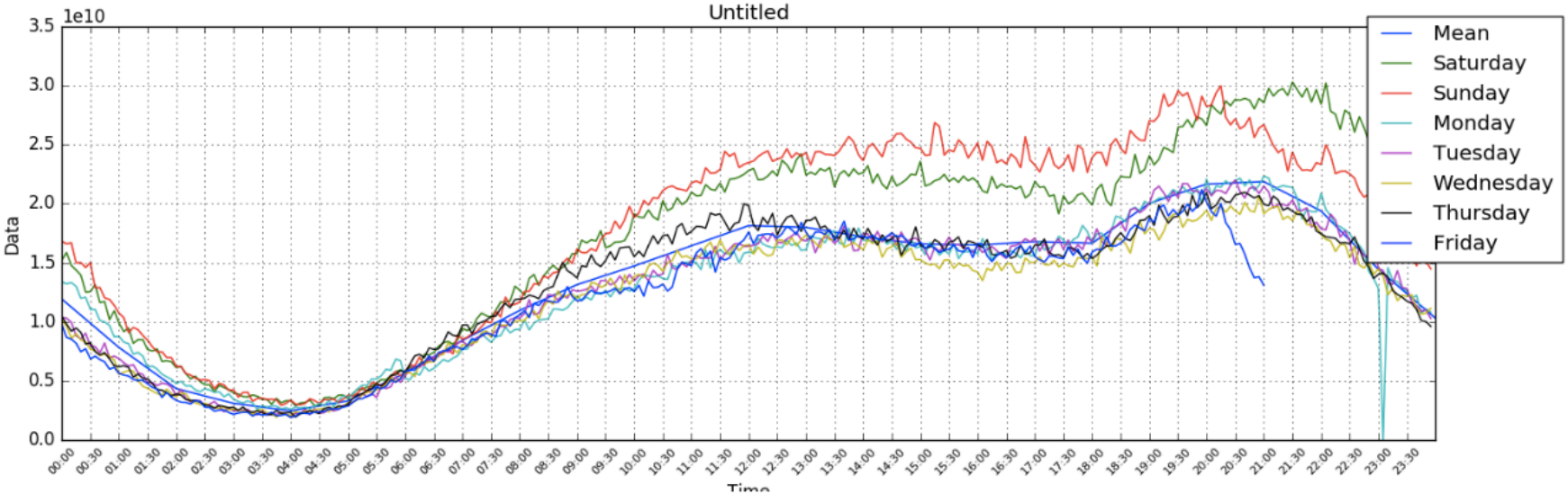
How to monitor the Internet?

- So, even “reliable” networks often see issues.
- These transient issues cause reachability issues.
- CloudFlare Edge locations may not be able to connect to customer origin servers
- Replication of data between CloudFlare PoPs could be broken
- User performance suffers

How to monitor the Internet?

- How about monitoring Eyeballs?
- Already monitoring interconnection points between providers, but how to check network degradation beyond that point?

How to monitor the Internet?



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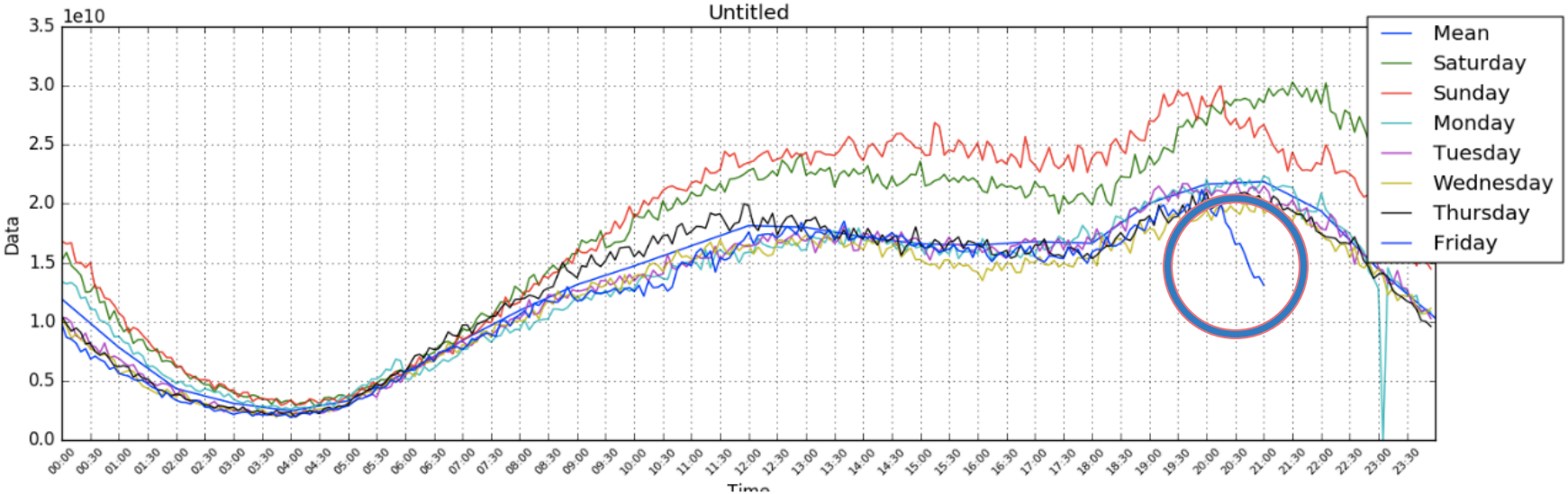
How to monitor the Internet?



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How to monitor the Internet?

- During 2016 Turkish coup d'état attempt, there was rumors of censorship of internet access.
- Traffic started deviating from standard pattern range
- Alerts for this traffic deviation came up

So, now we can monitor what's happening…

…what do you want to automate?

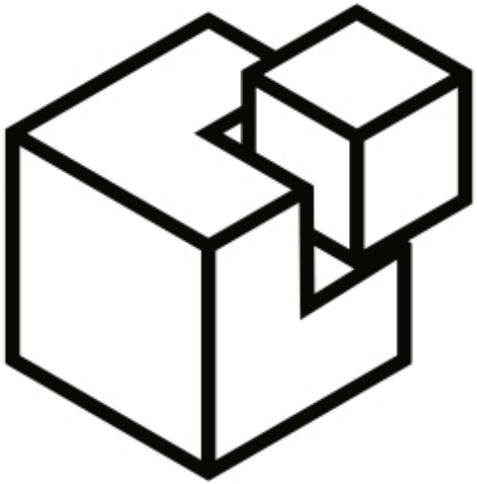
Automation

- What do we want to achieve?
  - Deploy new PoPs
  - Reduce Human Error
  - Complete the monitoring mentioned earlier
  - Take care of many day-to-day operations
  - Improve restoration

Automation

- Our needs?
  - Scalable
  - Works concurrently
  - Easily configurable and customizable
  - Config validation and enforcement

Automation



SALTSTACK

Automation

- CloudFlare's infrastructure uses Salt heavily across it's infrastructure
- But, Salt was forgotten for network devices
- We decided to continue using the same tool for network automation as was already in use for our service / servers infrastructure
- Many missing pieces:

Automation

Automation

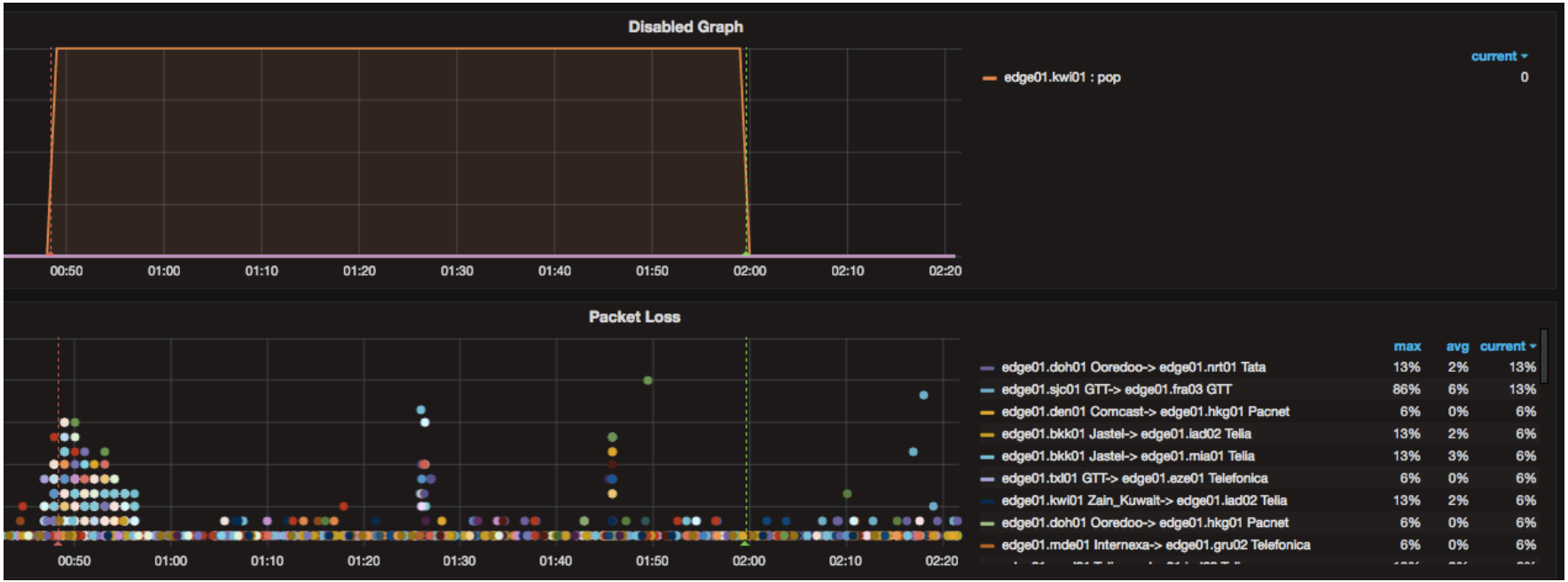
- Execution Modules:
  - NET
  - BGP
  - NTP
  - Probes
- States:
  - NTP
  - Probes

- https://github.com/napalm-automation/napalm-salt
- Up to date modules on GitHub

Automation

- salt “edge*” net.traceroute 8.8.8.8
- salt -G “os:junos” net.cli “show version”
- salt -C “sw* and G@os:nxos” net.arp
- salt -G “os:iosxr and version:5.3.3” net.mac
- salt -G “model:MX480” probes.results
- salt -I “type:router” ntp.set_peers 10.1.130.10 10.1.130.18 10.1.130.22

Automation



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Automation

- How can you use it?

apt-get install salt-master (install guide)
pip install napalm

Examples: https://github.com/napalm-automation/napalm-salt

Automation

- Our Monitoring detected issues with many paths, which we couldn’t route away from
- System drained and re-routed traffic away from that POP
- After 1 Hour of stability, we restored traffic

Automation

- Contribution?

NAPALM Automation:

https://github.com/napalm-automation

SaltStack:

https://github.com/saltstack/salt

Automation

- Join https://networktocode.herokuapp.com/ rooms: #saltstack #napalm

  By email:

  - Mircea Ulinic: mircea@cloudflare.com

Questions / Comments?

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