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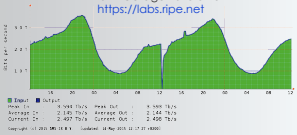
DETECTING ANOMALIES AT COLOCATION FACILITIES USING RIPE ATLAS

1. MOTIVATION

- Terabits of traffic are exchanged on an hourly basis through Internet eXchange Points, located at colocation facilities
- In the case of power failure or malfunction at colocation routers, major traffic outages can take place
- Most outages remain unreported

This work focuses on data plane measurements to shed more light on affected facilities.

AMS-IX Outage 2015-5-13
https://labs.ripe.net



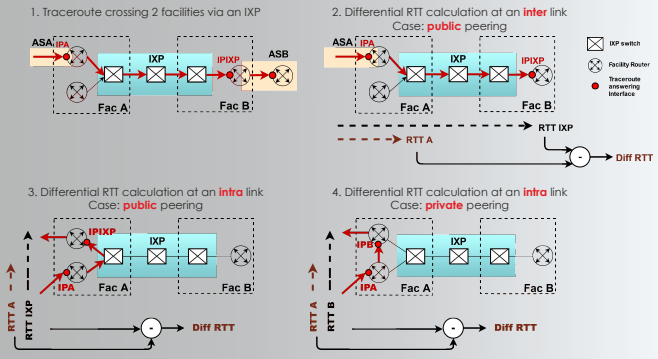
2. METHODOLOGY

1. Find IXP-facing routers within the traceroute data

Datasets used:
- RIPE Atlas 2015 IPv4 traceroute measurements [1]
- PeeringDB [2]
- CAIDA's IP-to-Alias resolution [3]

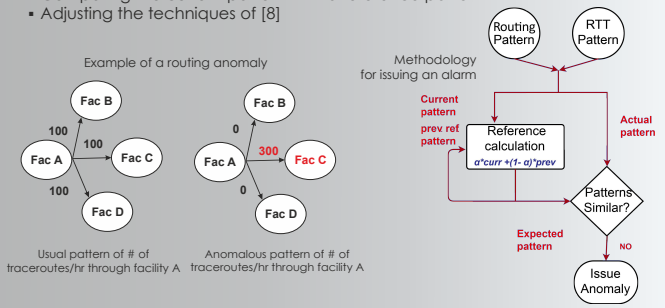
2. Detect the router facilities

Datasets used: Routeviews prefix-to-AS mapping [4]
Methodology used: Facility detection algorithm [5]



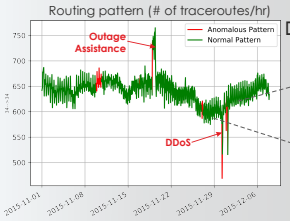
Assumptions
- Routers reply to traceroutes from their inbound interface
- The IXP-IP and the next hop-IP belong to the same AS
- PeeringDB [2] offers sufficient facility/IXP-level information for the ASes included in the traceroutes

3. Detect routing and RTT anomalies at inter and intra facility links by:
- Comparing the current pattern with a reference pattern
- Adjusting the techniques of [8]



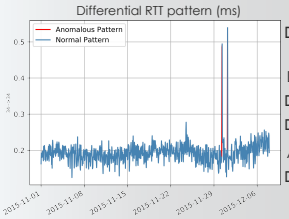
3. RESULTS

1. Intra-facility link outage:
Telehouse London (Docklands North)



Detected: Telehouse London assisting in the mitigation of Sovereign House Outage[6]

Sovereign - Telehouse Distance = 1.46Km

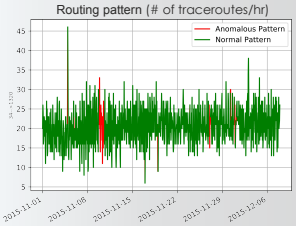


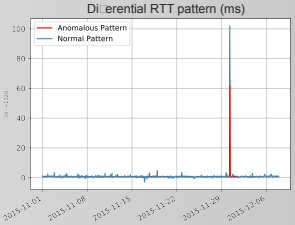
Detected: Telehouse London affected by Nov 30 DDoS attack [7]

Dates/times reported by **DNS Root servers:**
- Nov 30, 2015 at 06:50 UTC
- Dec 1, 2015 at 05:10 UTC

Additionally reported by **our system:**
- Nov 30, 2015 at 23: 00 UTC

2. Inter-facility link outage during the DDoS period:
Telehouse London → Equinix Amsterdam (AM3)
Observed only by delay change





4. FUTURE WORK

Facility detection improvements:
- Merge with additional IXP/facility databases to improve accuracy and coverage
- Use additional traceroute datasets (e.g., CAIDA's Ark)

Further Improvements on alarm detection:
- Locate the source of the alarm:
  1. Facility router
  2. Colocated IXP
  3. Facility

Migration to RIPE Atlas live streaming for real-time monitoring

REFERENCES
[1] RIPE Atlas, https://atlas.ripe.net
[2] PeeringDB, www.peeringdb.com
[3] CAIDA UCSD Internet Topology Data Kit - <2015-08>, http://www.caida.org/data/internet-topology-data-kit
[4] CAIDA UCSD Routeviews IPv4 Prefix-to-AS mappings Datasets (pfx2as) - <2015>, https://www.caida.org/data/routing/routeviews-prefix2as.xml
[5] Giotsas et al. "Mapping peering interconnections to a facility", Proc. of CoNEXT, ACM, 2015
[6] Sovereign House outage https://www.theregister.co.uk/2015/11/18/telecity_outage_fix_failed/
[7] November 30, 2015 DDoS attack report http://www.root-servers.org/news/events-of-20151130.txt
[8] Fontugne et al. "Pinpointing Delay and Forwarding Anomalies Using Large-Scale Traceroute Measurements", Proc. of IMC, ACM, 2017

RESEARCH TEAM
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