RESTFUL API

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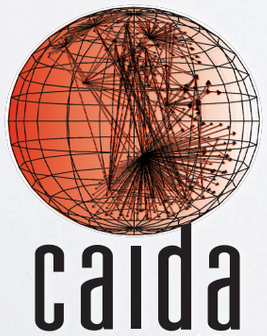
AIMS 2019



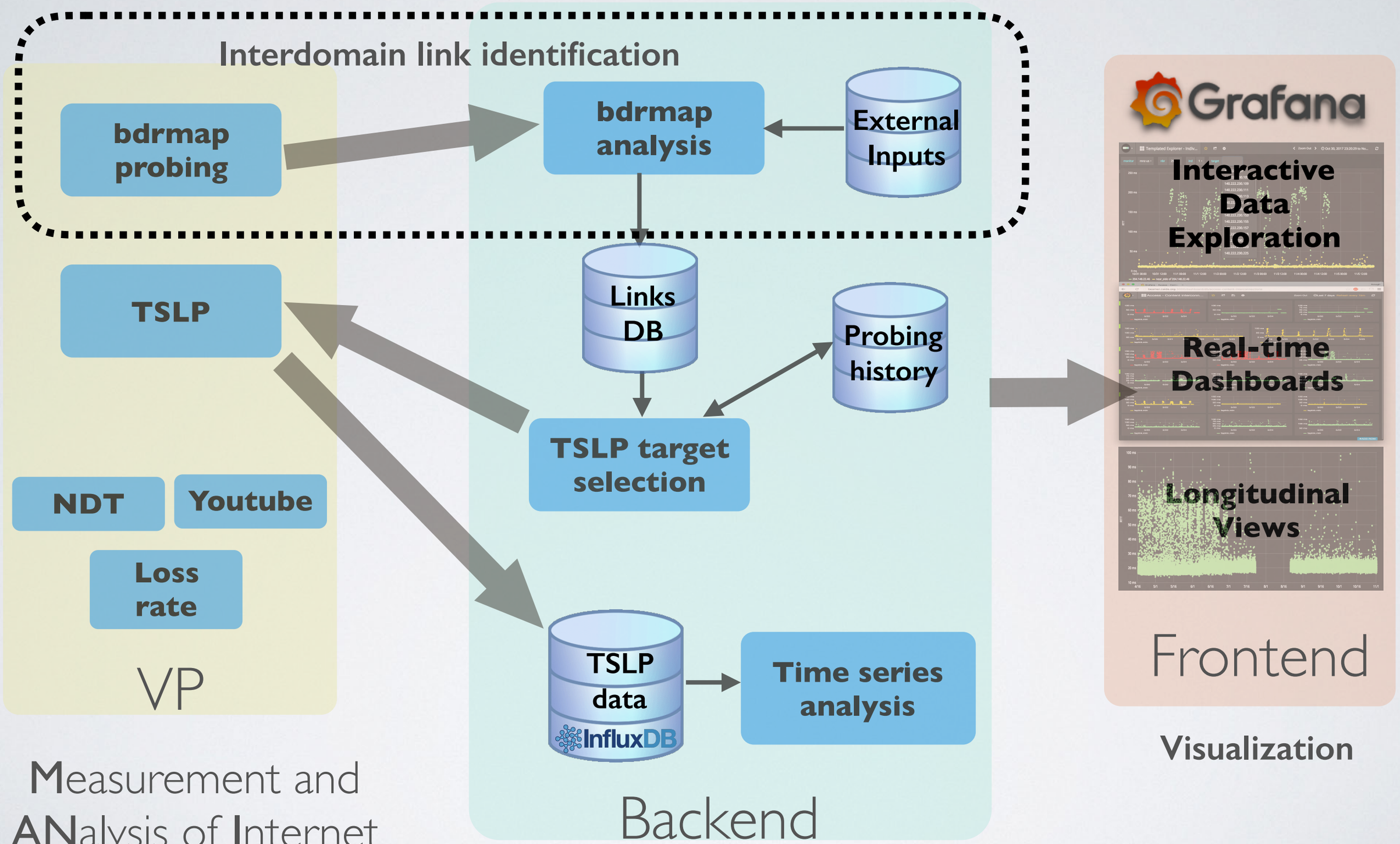
MANIC Project

- **M**easurements and **AN**alysis of **I**nternet **C**ongestion
  - ✓ https://manic.caida.org/

- CAIDA developed the MANIC System prototype
  - ✓ to monitor interdomain links and their congestion state
  - ✓ to provide empirical grounding to debates related to interdomain congestion

Dhamdhere *et al.*, Inferring Persistent Interdomain Congestion, SIGCOMM 2018

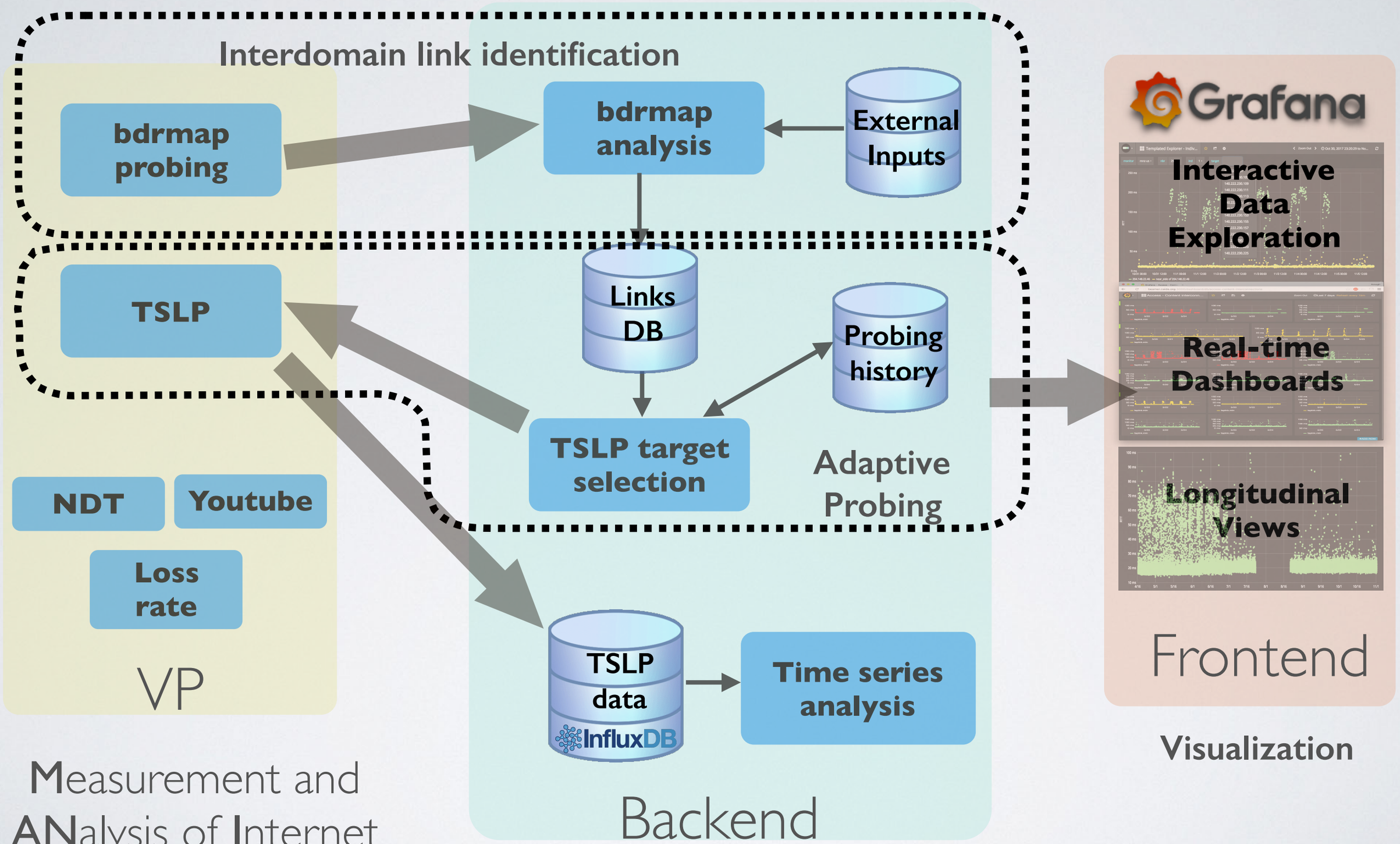
MANIC System



Measurement and **AN**alysis of **I**nternet **C**ongestion*

*Dhamdhere *et al.*, Inferring Persistent Interdomain Congestion, SIGCOMM 2018

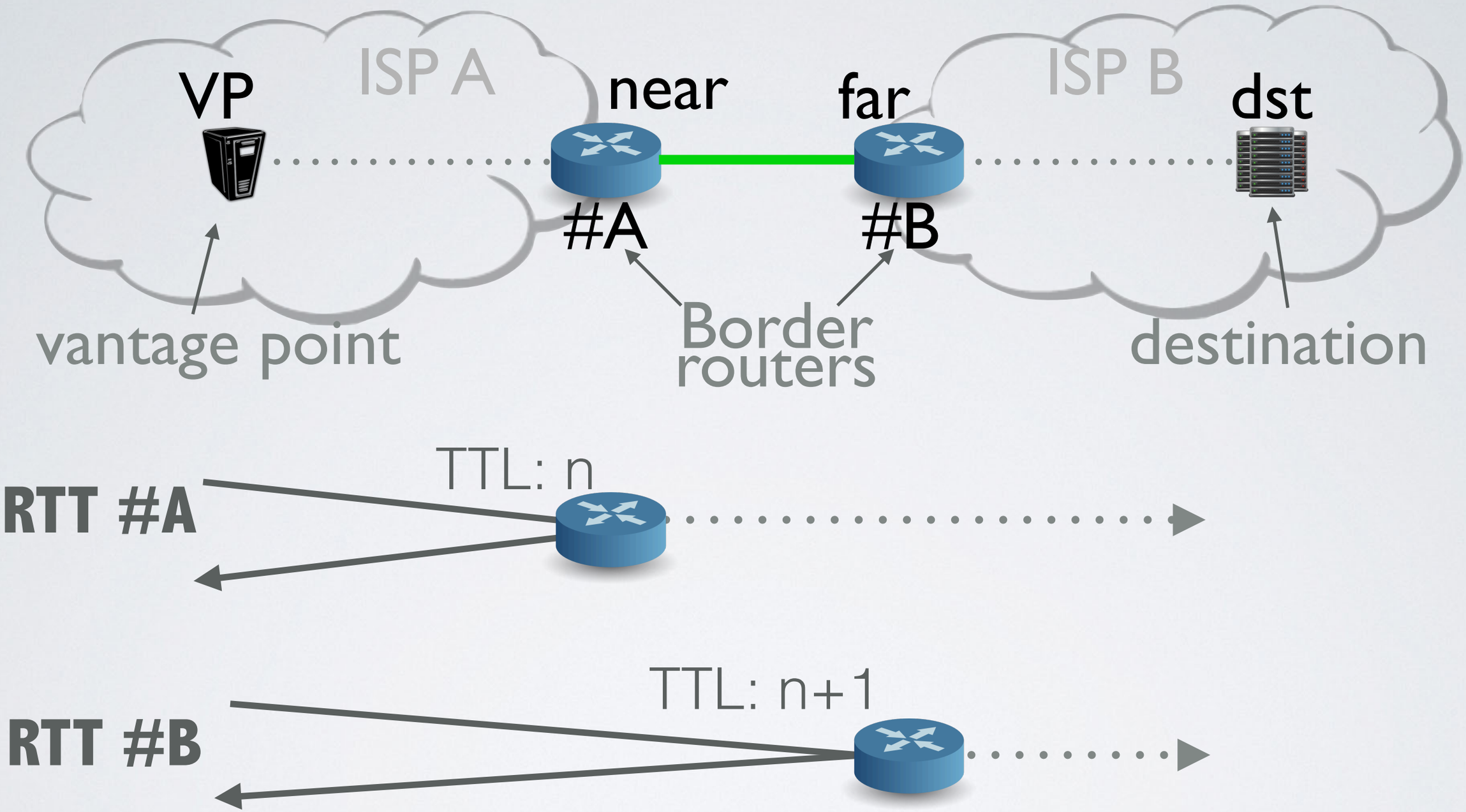
MANIC System



Measurement and **AN**alysis of **I**nternet **C**ongestion*

*Dhamdhere *et al.*, Inferring Persistent Interdomain Congestion, SIGCOMM 2018

Time **S**eries **L**atency **P**robes (**TSLP**)



(repeat to obtain a timeseries)

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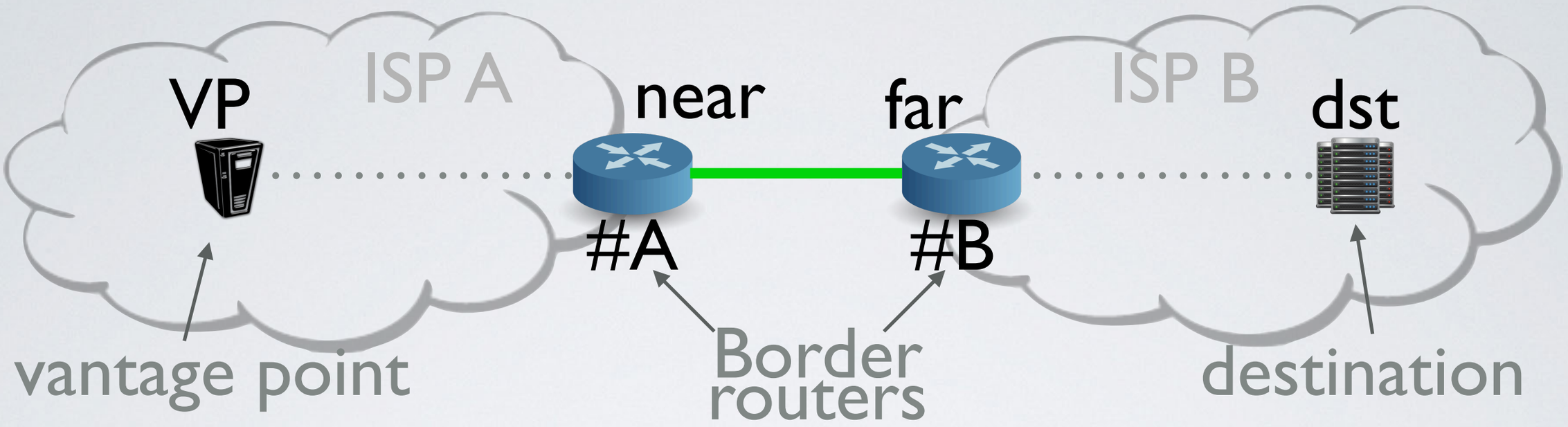
Time **S**eries **L**atency **P**robes (**TSLP**)



Latency elevation on the "far" time series,
but no elevation on the "near" time series

target link likely congested

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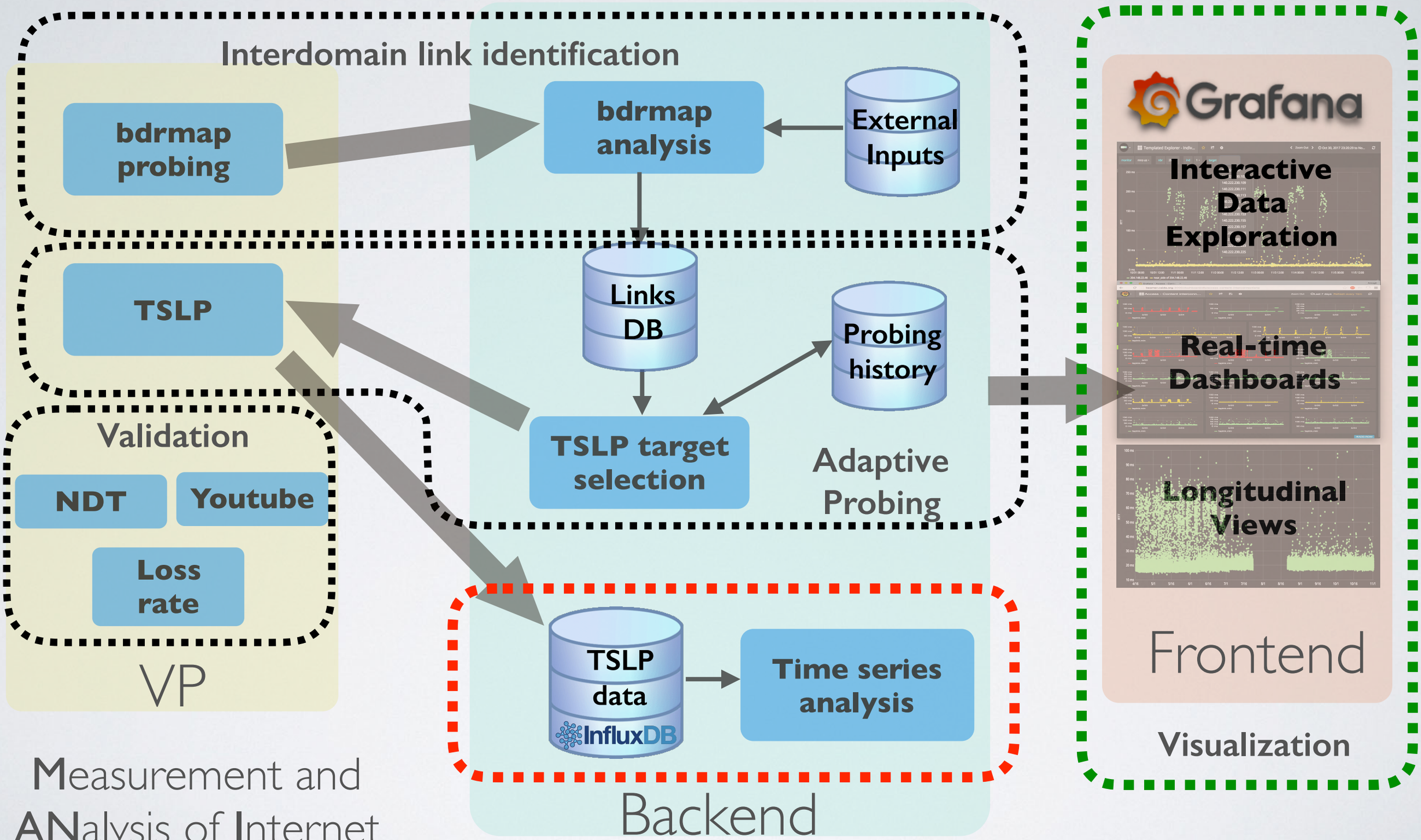
MANIC System



Measurement and ANalysis of Internet Congestion [1]

Goal: Make TSLP measurements publicly available

MANIC Dataset Description

Which data are we making accessible?

- Coverage: from March 2016 to present
- List of **V**antage **P**oints (**VP**s) running TSLP measurements and their related infos
- ASNs discovered as neighbors (far ASNs) of VP hosts (near ASNs)
- Interconnections links between near and far ASNs
- RTTs to both ends of those links every 5min/15min
- Inference of evidence of congestion based on time series analysis, etc.

Motivation to build API

Why is MANIC API needed ?

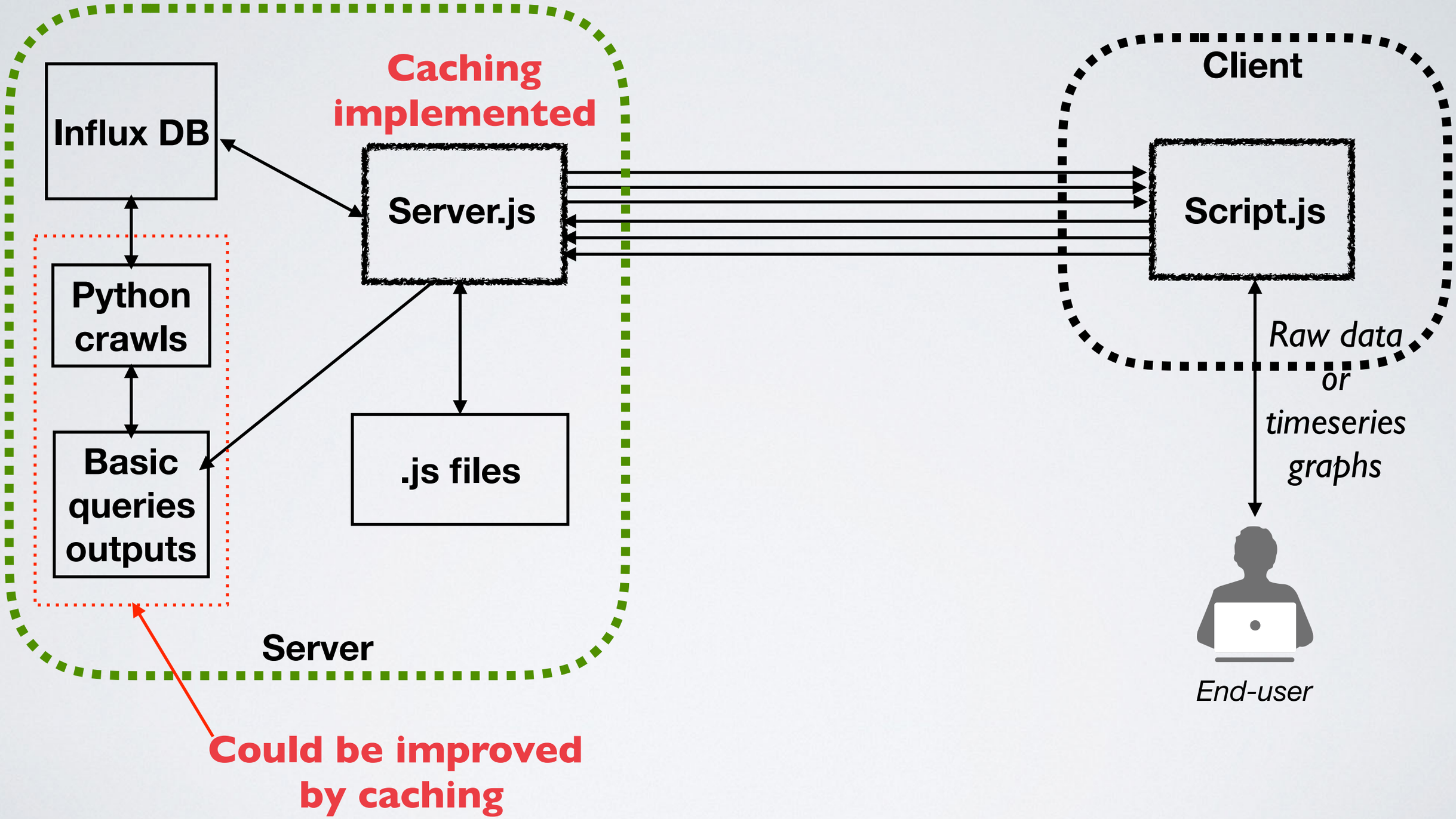
- Facilitate re-use of the data by researchers and others
- Enable integration of MANIC system with other CAIDA systems (AS rank, IODA, HI-CUBE etc.)
- Build a platform for easily investigating measurement-related questions in the context of **PANDA** project (**P**latform for **A**pplied **N**etwork **D**ata **A**nalysis)
- Add to Grafana front end new plugins that use the API

Background & Challenges

- Data Structure
  - ✓ 540G of TSLP measurements data are stored in the time series database Influx DB
  - ✓ They are structured into *measurements* (tables)

- Design challenges
  - ✓ Selecting endpoints to support
  - ✓ Selecting output formats
  - ✓ Consistency with other existing and emerging CAIDA APIs
  - ✓ Should APIs have a layered structure or directly access one another's DB?

Operational Architecture



Technical choices & API Specification

- Documented at https://api.manic.caida.org/v1/
- Languages: NodeJS, Javascript, HTML, Python, Plotly
- Output pagination retained
- Endpoints supported: /asns; /monitors; /iplinks; /rtt; /asrt; /group_ids
- Users can refine queries using documented parameters: ?near_org_asn; ?far_asn; ?start; ?end; ?page, etc.

Demo

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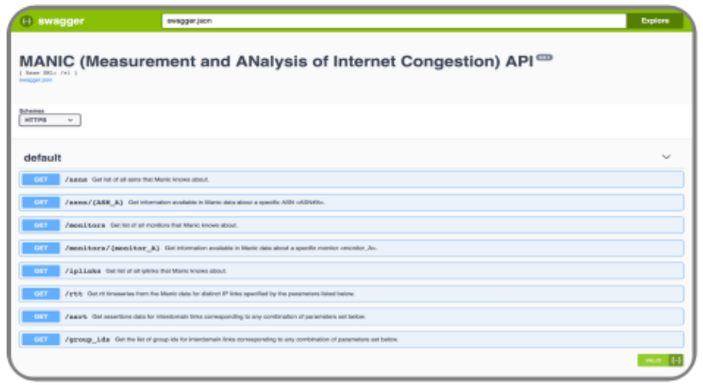
BETA

Measurement and ANalysis of Internet Congestion

Time series front end

This Grafana front end contains dashboards depicting latency time series to the endpoints of interdomain links collected as part of the TSLP measurements. For access to the dashboards, contact manic-info@caida.org

Manic API Documentation



This webpage presents the Manic-API documentation implemented with Swagger, which allows users to experiment with queries through the API.

Support for this work is provided by the National Science Foundation (NSF) grants NSF CNS-1414177, NSF OAC-1724853, NSF CNS-1513283, and Department of Homeland Security S&T HHSP 233201600012C and FA8750-18-2-0049

Use cases

- [Early Jan, 2019] CableLabs checks whether TSLP-based congestion indicators correlate with link utilization

- [Ongoing] UCSD grad student (Ben Du) geolocating both sides of interconnection links of MANIC

- [Ongoing] IMT Atlantique applying method for statistical characterization of RTT series [5, 6]. We hope to compare to our 2018 approach of detection of evidence of congestion*

*Mouchet, et al., Statistical Characterization of Round-Trip Times with Nonparametric Hidden Markov Models. AnNet 2019.

Example of API Usage (1)

- Scenario1: Collect TSLP measurements outputs for IP links between Comcast-CableLabs during the previous month; compare them to those of Comcast-Netflix.

  ✓ RTT to both sides of the IP links between AS7922 (Comcast) - AS20381 (CableLabs-LV)

  - https://api.manic.caida.org/v1/rtt?near_org_asn=7922&far_asn=20381&start=now-2m&end=now-1m

  ✓ RTT to both sides of the IP links between AS7922 (Comcast) - AS2906 (Netflix)

  - https://api.manic.caida.org/v1/rtt?near_org_asn=7922&far_asn=2906&start=now-2m&end=now-1m

Example of API Usage (2)

- Scenario 2: Fetch the list of far ASNs and IP links discovered and measured by Manic

  ✓ List of far ASNs observed from monitor bed-us in the last 7 days
  - https://api.manic.caida.org/v1/asns?observed_from_monitor=bed-us&is_far_asn=true&start=now-7d

  ✓ List of far ASNs observed from monitor bed-us through the far IP 96.87.11.70 during the last 7 days
  - https://api.manic.caida.org/v1/asns?observed_from_monitor=bed-us&far_ip=96.87.11.70&is_far_asn=true

  ✓ IP links whose sides were measured during diverse periods
  - https://api.manic.caida.org/v1/iplinks
  - https://api.manic.caida.org/v1/iplinks?observed_from_monitor=san4-us&start=now-3m&end=now-2m

Showcase of the API Usage (3)

- Scenario 3: Fetch RTT to both sides of IP links between:
  - ✓ AS7922(Comcast) - AS15169(Google) seen from monitor bed-us during Jan 31- Dec 31, 2017
    - https://api.manic.caida.org/v1/rtt?near_org_asn=7922&observed_from_monitor=bed-us&far_asn=15169&start=20170131&end=20171231&far_ip=23.30.206.122&page=1
  - ✓ AS22773(Cox) - AS15169(Google) seen from monitor san2-us during Jan 1- April 10, 2019
    - https://api.manic.caida.org/v1/rtt?near_org_asn=22773&observed_from_monitor=san2-us&far_ip=98.182.1.86&far_asn=15169&start=20190110&end=20190410
  - ✓ AS22773(Cox) - AS32934(Facebook) during Jan 1- April 10, 2019 with a 15min granularity
    - https://api.manic.caida.org/v1/rtt?near_org_asn=22773&agg=15&start=20190110&end=20190410

Planned: Add congestion data to AS rank

ARank About Ranking Search Contact Data
unknown

ASN name or number search go to

1 2

AS Rank ▲	Organization		Num. of ASNs	AS cone size ▽	number of neighbors with assertions
1	Level 3 Parent, LLC		10	32913	1
4	NTT America, Inc.		7	24578	
6	TELECOM ITALIA SPARKLE S.p.A.		1	15131	1
8	Hurricane Electric LLC		1	14527	1
13	MCI Communications Services, Inc. d/b/a Veriz...		31	4668	40
14	Qwest Communications Company, LLC		8	4595	51
19	AT&T Services, Inc.		7	3059	28
21	Telstra Global - Customer AS Number		2	2774	1
22	Comcast Cable Communications, LLC		39	2652	56
24	Orange S.A.		15	2152	1
30	Liberty Global Operations B.V.		2	1818	1
49	Time Warner Cable Internet LLC		13	866	35
56	Optus Vision		24	665	
72	Cox Communications Inc.		2	544	29
88	Charter Communications		7	399	29
90	C48 Okhla Industrial Estate, New Delhi-110020		1	389	1
93	Fastweb SpA		1	378	1
104	British Telecommunications plc		2	345	1
116	SEACOM Limited		1	296	1

Support for this work is provided by the U.S. Department of Homeland Security's Science and Technology Directorate (Project N66001-08-C-2029), the National Science Foundation

200 @manic_ranking 12 ms 4.0 MB 1 5 in 0.22 ms 2 ms

congestion data available per AS link

Planned: Integration with AS rank

Organization	ASN (Organization)
Comcast Cable Communications, LLC	6453 (AS6453)
customer cone: 2652	14688
rank: 22	7
transit AS degree: 1511	822
number of monitors: 12	0
number of far IPs clusters: 18 (total)	% assertion data with evidence of congestion: 40%

RTT values from 2018-05-13 to 2018-05-20 update

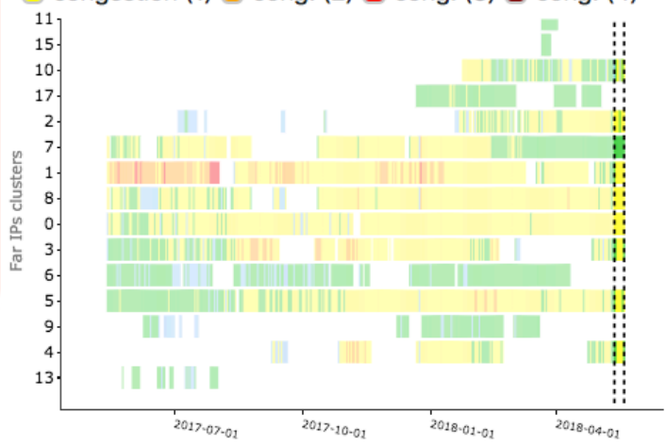
only links with evidence of congestion within : do not filter

Detailed information about the interdomain link

e-plotted.

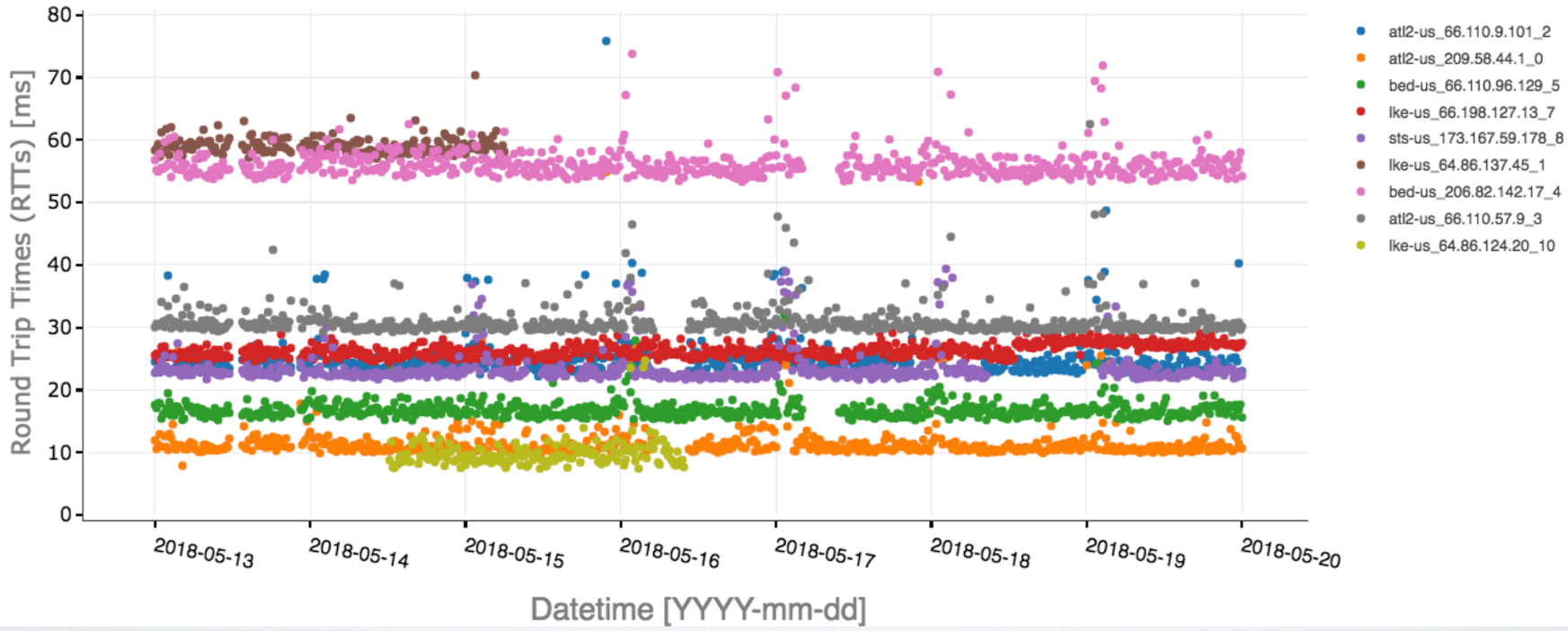
Legend (congestion - cong. - assertions)

no data | no congestion | uncorrelated congestion | congestion (1) | cong. (2) | cong. (3) | cong. (4)



An overview of the observed IP links seen between CCCS-ARIN and 6453.

RTT Timeseries to the far-sides of interdomain links aggregated every 15mn bin



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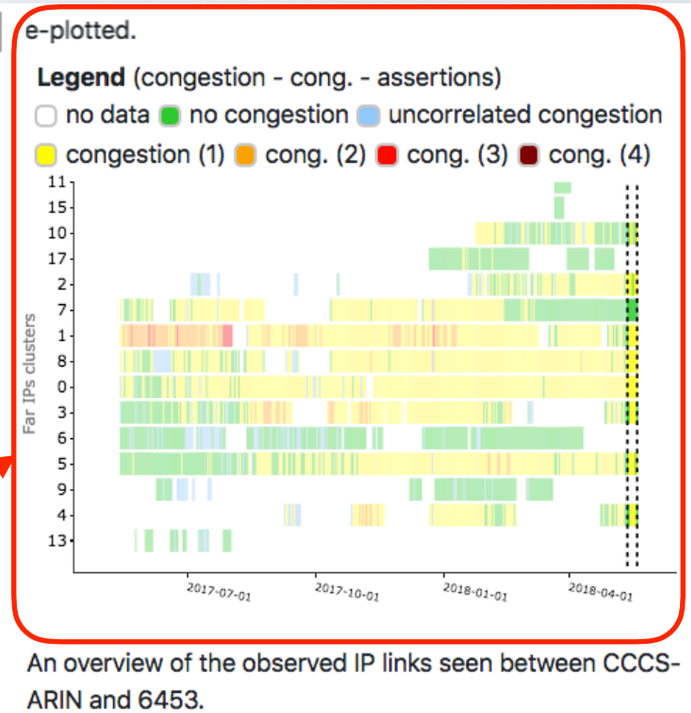
Interactive congestion heat map



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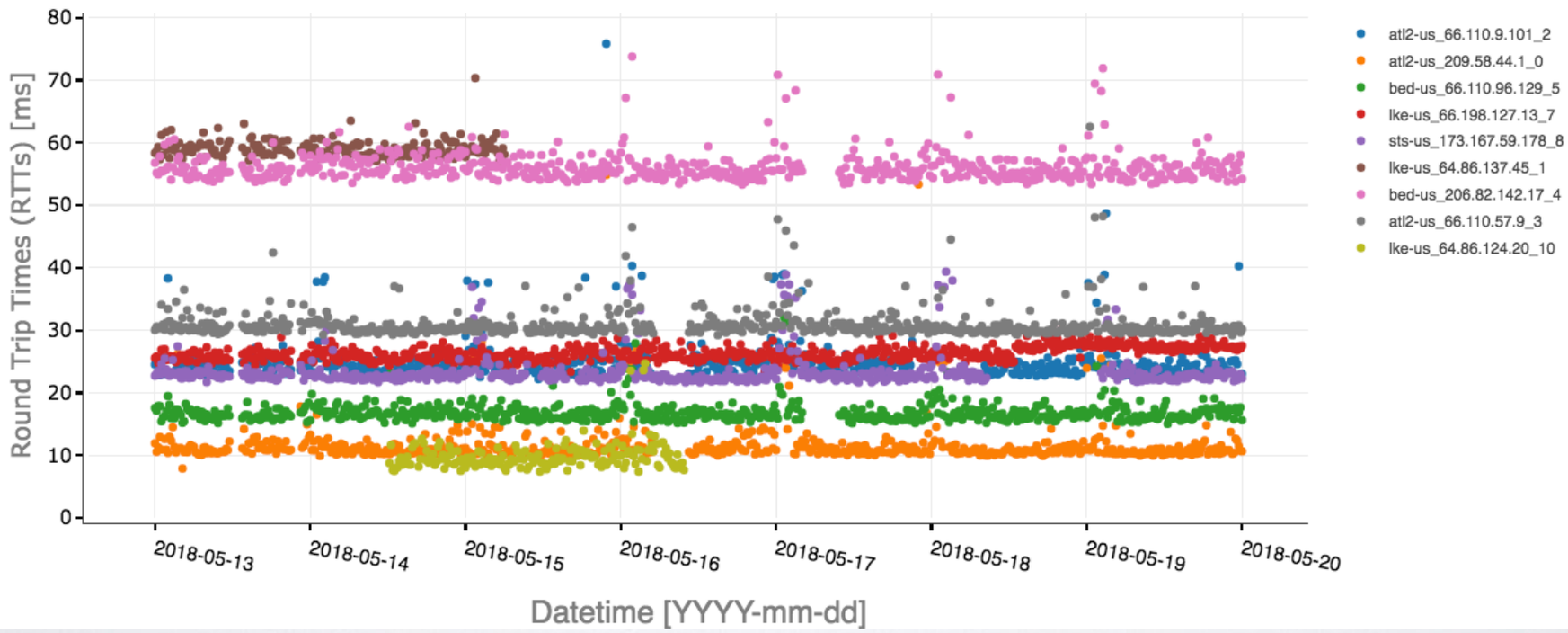

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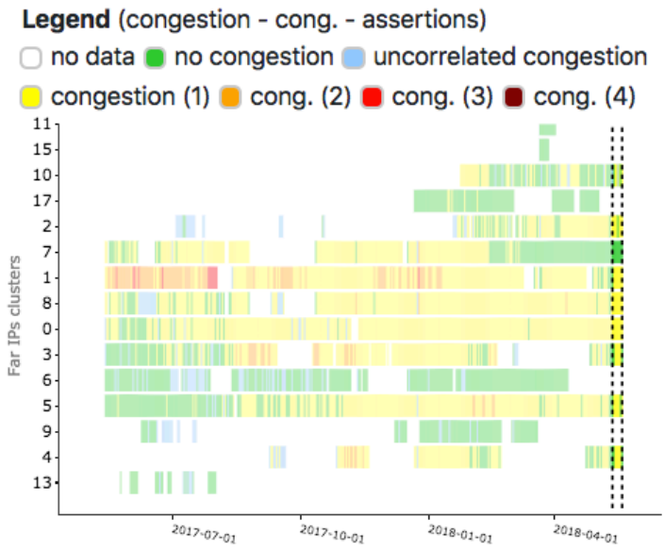

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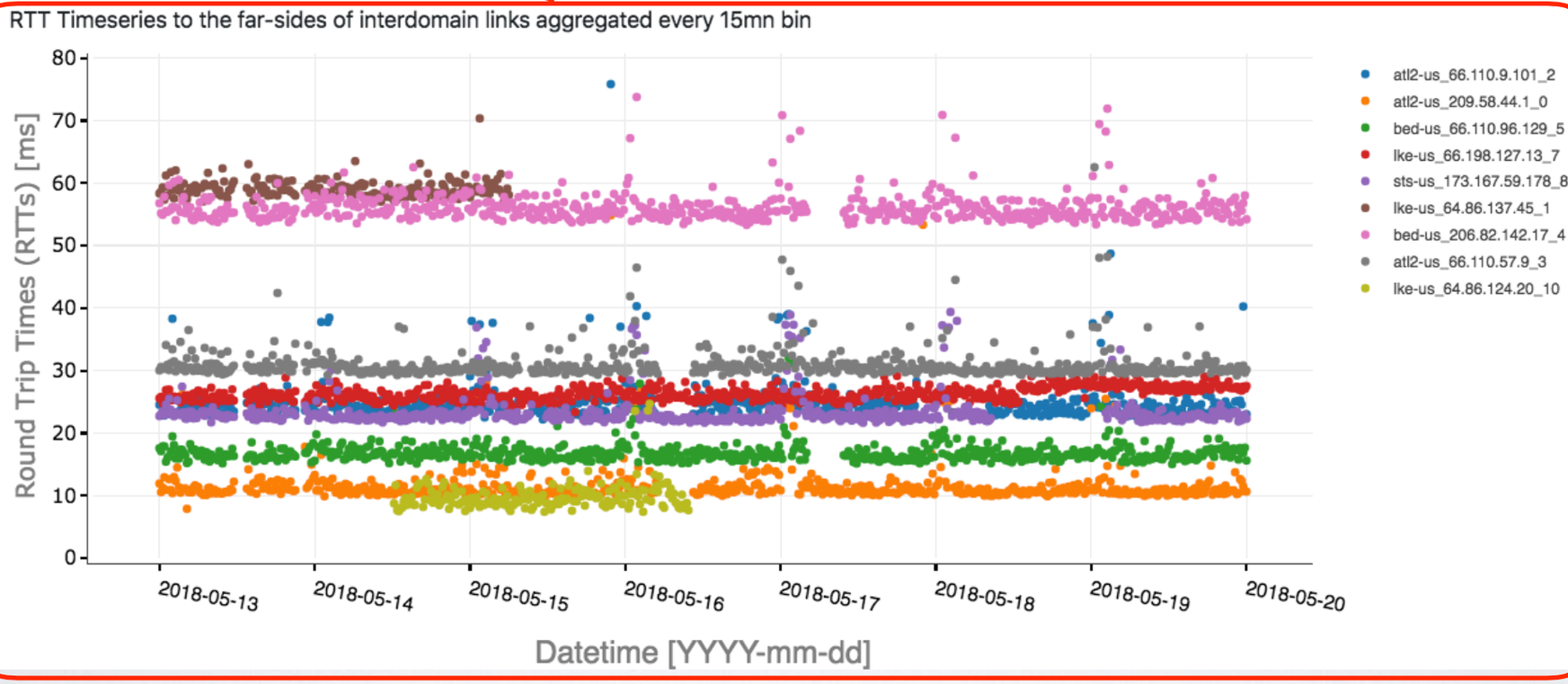
Interactive RTT timeseries graph



Questions ?

For access to the Grafana dashboard or more details about the API, please contact

manic-info@caida.org