

Observatory

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measurement and architecture for a middleboxed internet

measurement

architecture

experimentation

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Data Model Overview

- Upload consists of raw data, stored in HDFS
- Raw data is fed through analysis modules
- Analysis modules produce observations, stored in Mongo
 - analysis module and raw data used
 - path and time at which the observation was made
 - conditions found to be true at the given time on the given path (e.g., `ecn.connectivity.works`)
- Potential problem: some conditions have no value: can't distinguish between “c was false” and “c wasn't computed”

Raw Data Management





Raw Data Management

PTO

Home

Upload statistics

Observatory

Upload statistics

Lorem ipsum

Statistic	Value
Uploads total	321617

Measurement campaigns

Name	Number of uploads
tracebox-443-00	65119
tracebox-80-00	142542
tracebox-80-01	75473
tracebox-8000-00	36796

Path Transparency Observatory (PTO) Core





Sample Query

Rough SQL equivalent:

```
SELECT COUNT(*) FROM observation
WHERE
  valid = True
  AND CONTAINS(path, $dip)
  AND sip = $sip
GROUP BY dip;
```

Mongo query:

```
pipeline = [
  {'$match' : {'action_ids.0.valid' : True}},
  {'$match' : {'path' : dip}},
  {'$unwind' : '$conditions'},
  {'$project' : {'_id' : 1, 'conditions' : 1, 'sip' : { '$arrayElemAt': ['$path',0] },
                  'dip' : { '$arrayElemAt' : ['$path', -1]}}},
  {'$match' : sip_match},
  {'$match' : {'dip': dip}},
  {'$group' : {'_id' : { 'condition' : '$conditions', 'dip' : '$dip'}, 'count' : {'$sum' : 1}}},
  {'$group' : {'_id' : '$_id.dip',
                'data' : {'$addToSet' : { 'condition' : '$_id.condition', 'count' : '$count'}}}}
]
```



PTO Web

Observatory

Show conditions for an endpoint. Startpoint can be left blank.

Startpoint (optional)

Enter an IPv4 or IPv6 address.

Endpoint (required)

Enter an IPv4 or IPv6 address.

Query data

Endpoint	Condition	Occurences #
104.24.104.13	ecnspider.basic	2
104.24.104.13	ecn.connectivity.works	3
104.24.104.13	ecn.negotiated	3

Show total condition counts.

Condition name

Enter the name of a condition. Use comma to separate multiple conditions.

Query data

Condition	Occurences #
ecn.connectivity.works	1923141
ecn.connectivity.broken	708



Observatory

Lorem ipsum.

Startpoint

Enter an IPv4 or IPv6 address.

On path

Enter IPv4 or IPv6 addresses that should be contained within the path. Use comma to separate multiple addresses.

Endpoint

Enter an IPv4 or IPv6 address.

Query data

Path	Conditions
188.166.3.245 * 1.1.115.70	ecnspider.basic
188.166.146.182 * 1.1.115.70	ecnspider.basic
188.166.146.182 * 1.1.115.70	ecn.connectivity.works ecn.not_negotiated



PTO Web (Work in Progress)

Observatory

Path criteria

Specify which paths you want to include. You may leave field blanks to indicate that no filtering for the field should be done.

Startpoint

Enter an IPv4 or IPv6 address.

On path

Enter IPv4 or IPv6 addresses that should be contained within the path. Use comma to separate multiple addresses.

Endpoint

Enter an IPv4 or IPv6 address.

Condition criteria

Specify filter criteria for path conditions.

Criterion 1

Combinator
<input type="text" value="MUST"/>
Operator
<input type="text" value="equals"/>
Select an operator.
Condition
<input type="text"/>
Enter the name of a condition.
Value
<input type="text"/>
Enter a value.

Path

(no data to show)

Conditions

(no data to show)



PTO Web: Future Work(?)

- Query language based on LISP-like SEXPs:

```
(or (== ecn.connectivity.works) (> ping 500))
```

- compile to Mongo query (relatively simple):

```
{ $or : [{ ecn.connectivity.works : { $eq : true } },  
          { ping : { $gt : 500 } } ] }
```

- Would have to go through all rows (expensive)
- Optimisations are possible