Observatory

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mami

measurement and architecture for a middleboxed internet

measurement | architecture | experimentation

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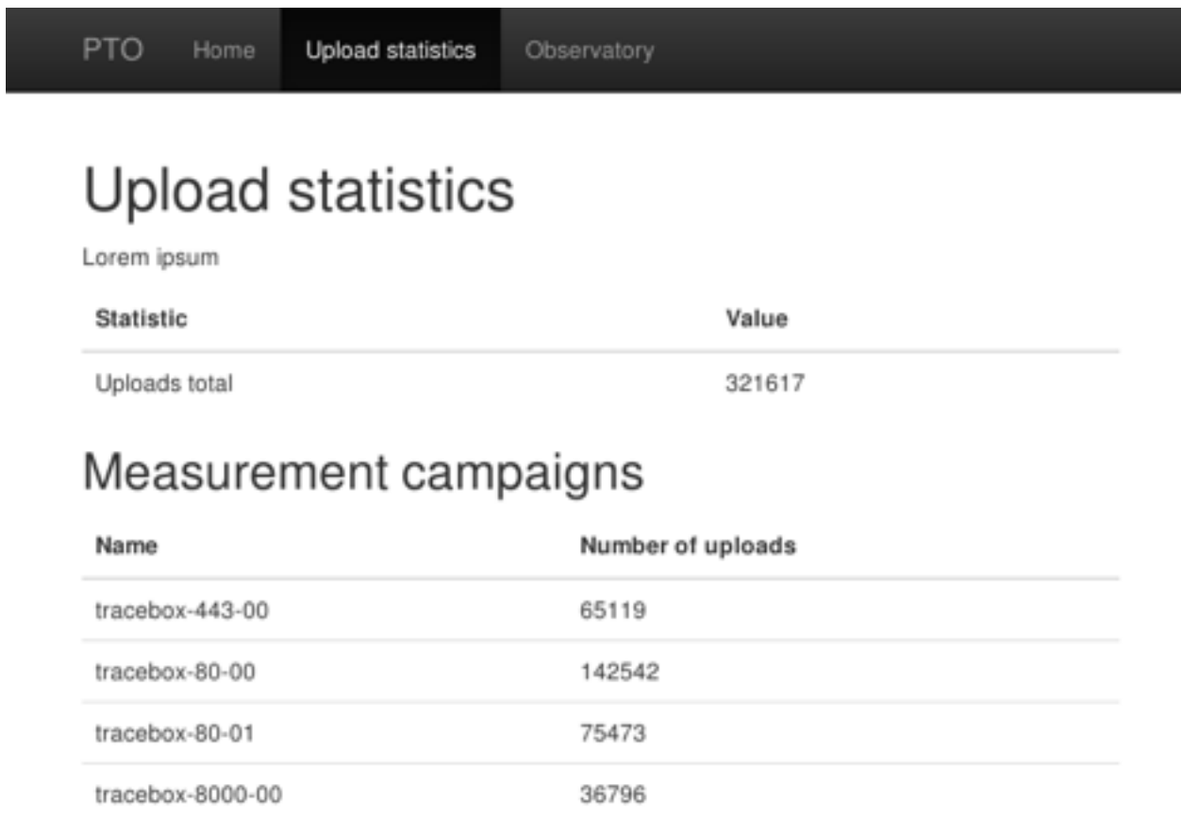
Data Model Overview

- 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

- Upload via REST interface onto HDFS
- Upload speed now: 67 Mbit/s
  - scp about 20% faster
- Reason likely to be HDFS
- As of today, tracebox data
- REST interface documented
- Ready for production use
- (Will be closely supervised)



Raw Data Management

PTO Home **Upload statistics** Observatory

Upload statistics

Lorem ipsum

Statistic	Value
Uploads total	321617

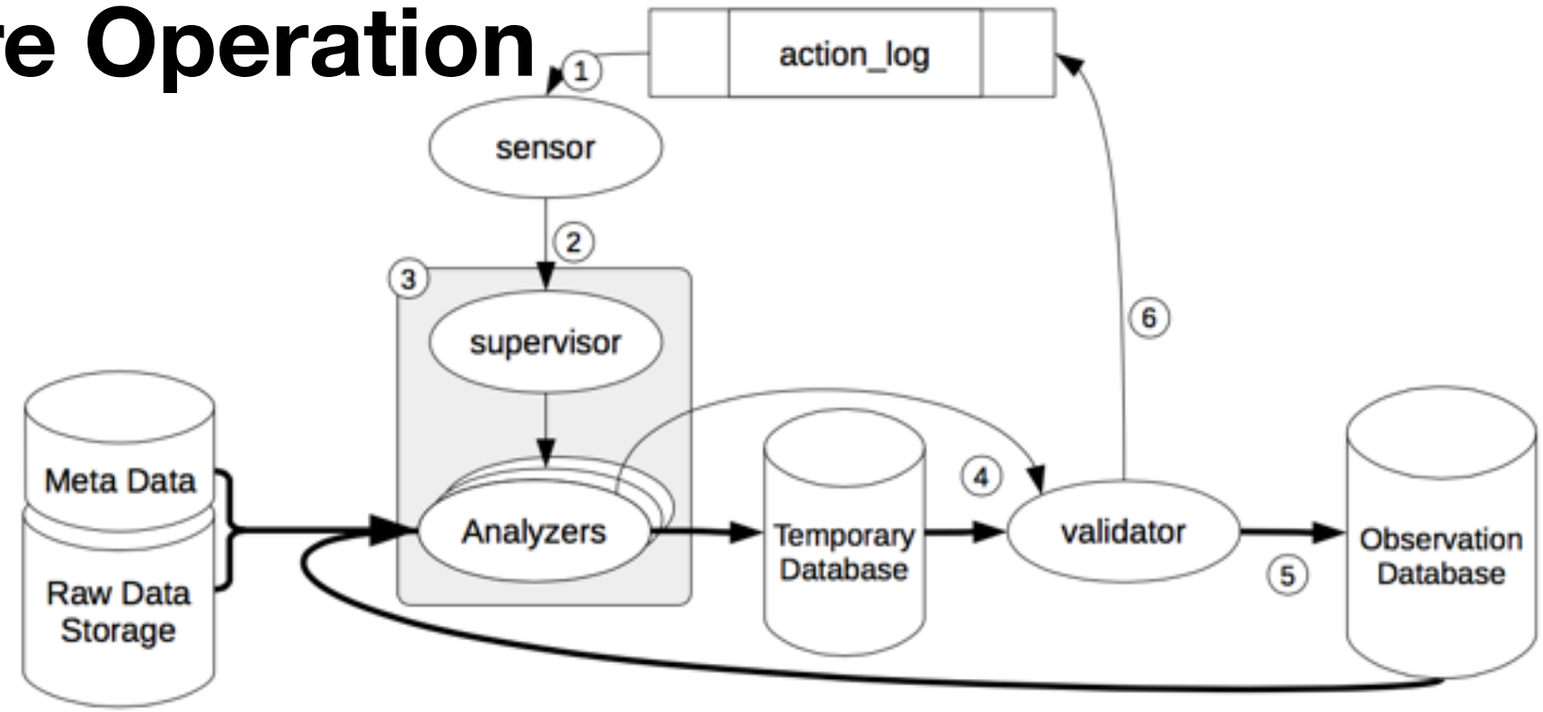
Measurement campaigns

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

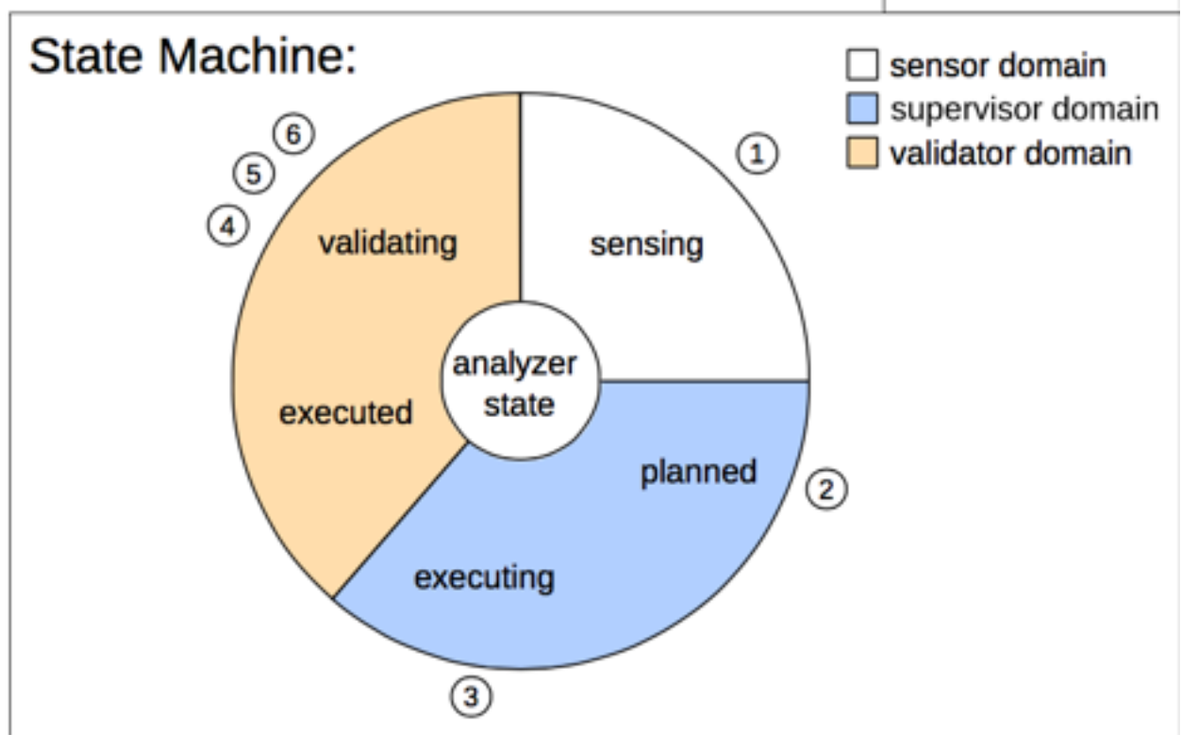
Path Transparency Observatory (PTO) Core

- Key requirement: Minimise the amount of data to be processed
- Aim: Execute analyser module on subset of data, get same result as if the entire data set had been analyzed
- Example for selecting isolated subset: Compare Measurements that happened roughly at the same time (+/-12h).
- Method heavily dependent on analysis requirements (aggregation, yearly comparison)
- Status: Alpha version deployed on MAMI servers filled with about 1.2M observations. Currently developing analysers for ECN measurement and improving pto-core.

PTO Core Operation



1. recent actions affect analyzer?
   no blocked outputs or unstable inputs?
2. order execution
3. run analyzer
   - determine affected time spans
   - generate observations
4. validate generated data
5. commit to observatory
6. add 'analyze' action



Sample Query

Rough SQL equivalent:

```
SELECT dip, COUNT(condition), condition
  FROM observations
  WHERE valid = True
    AND sip = $sip
    AND dip = $dip
  GROUP BY dip, condition;
```

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)

104.24.104.13

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

ecn.connectivity.works, ecn.connectivity.broken

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

Query data

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

PTO Web

Observatory

Lorem ipsum.

Startpoint

Enter an IPv4 or IPv6 address.

On path

1.1.115.70

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

MUST

Operator

equals

Select an operator.

Condition

Enter the name of a condition.

Value

Enter a value.

Query data | Add criterion

Path	Conditions
(no data to show)	(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