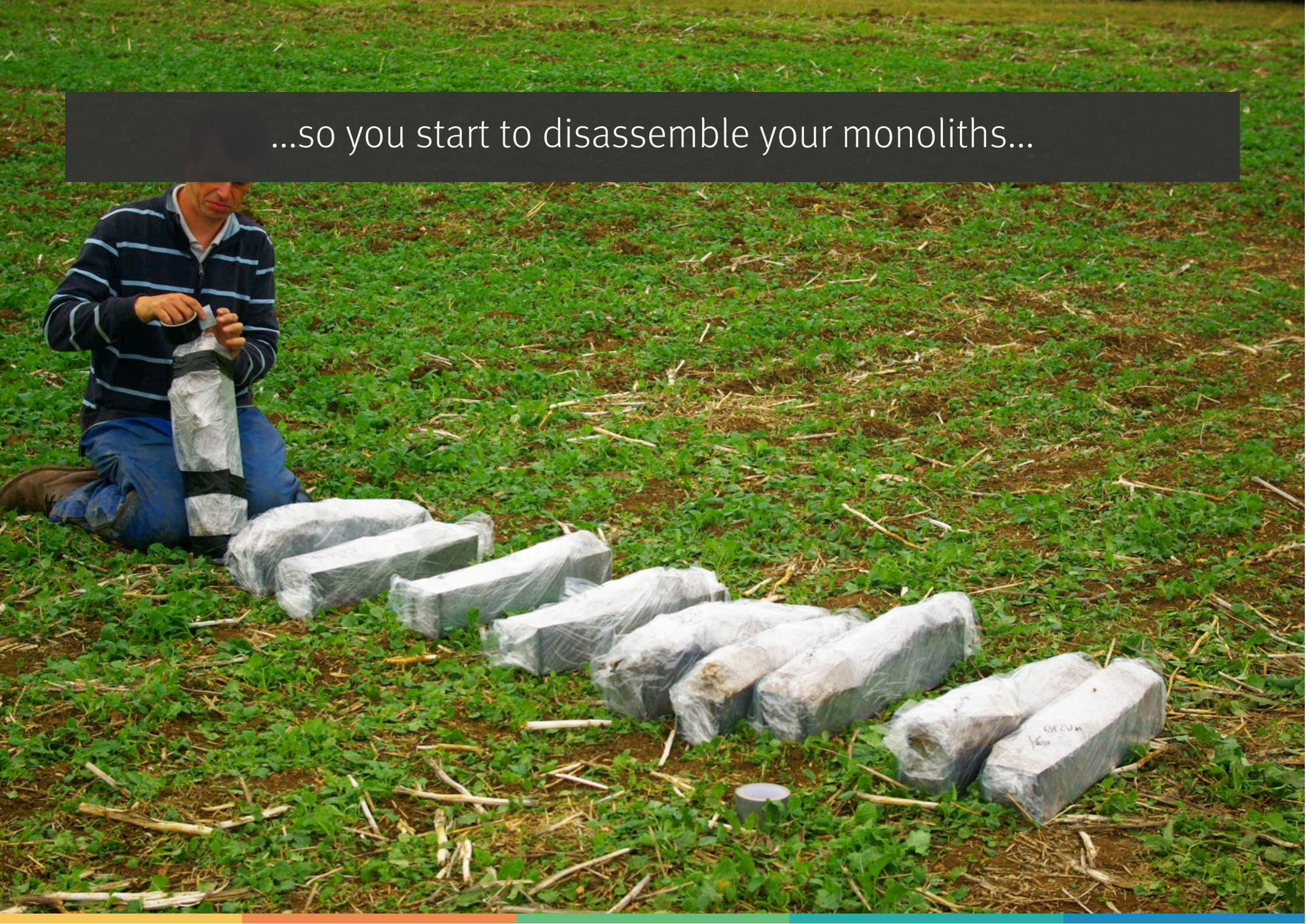
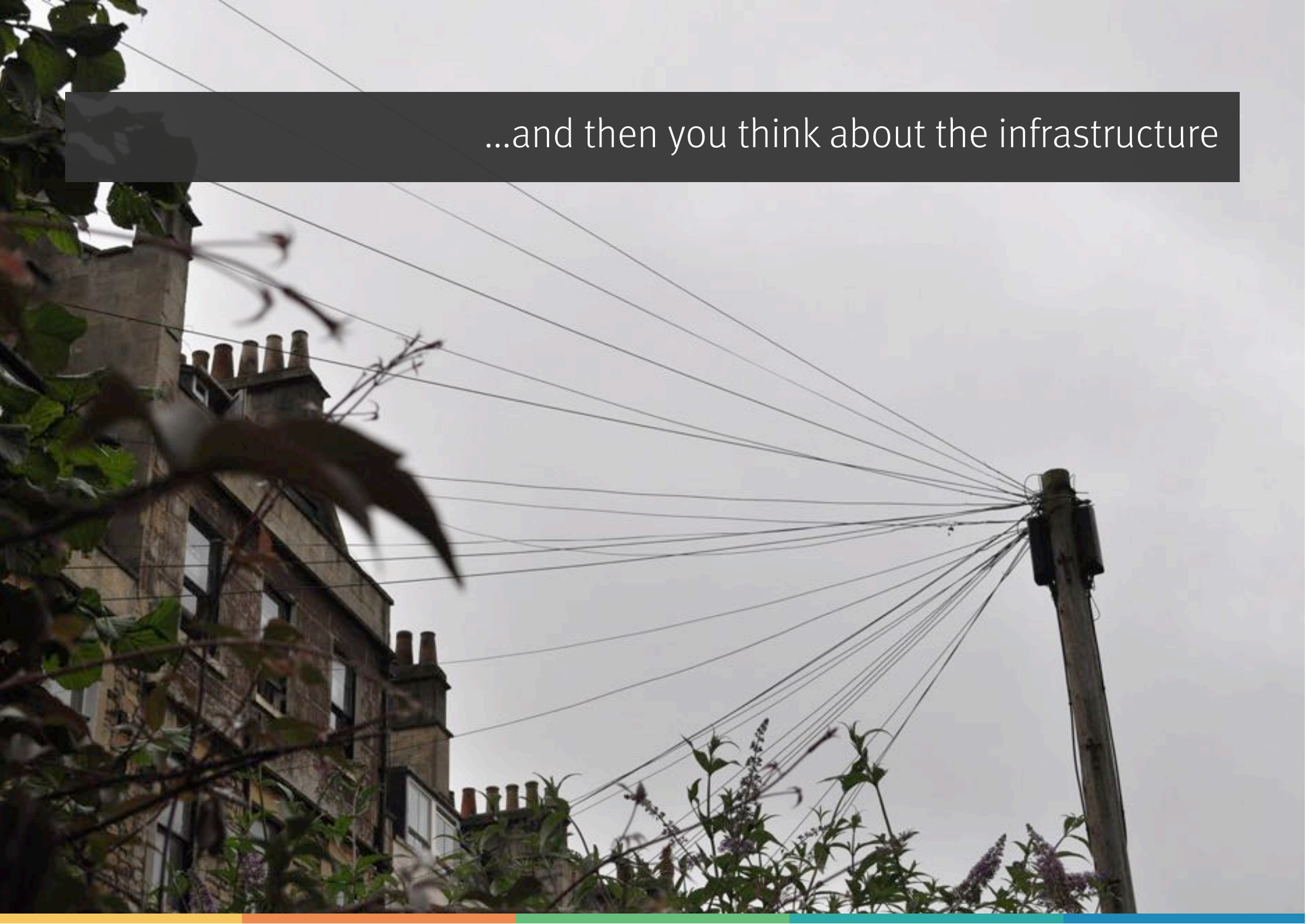
Distributed Metrics and Log Aggregation

Alexander Heusingfeld & Tammo van Lessen

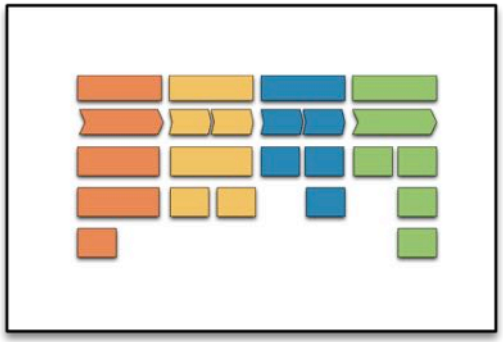

Monolith
Clarendon Boulevard
Rosslyn (VA) 2011


MICROSERVICES...
MICROSERVICES EVERYWHERE
memegenerator.net

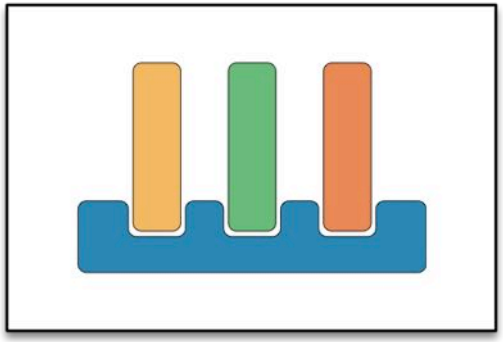

...so you start to disassemble your monoliths...


...and then you think about the infrastructure

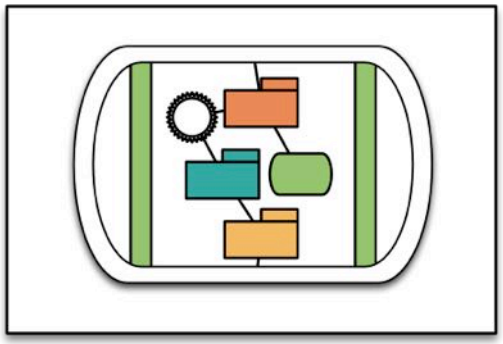
Architectural Decisions



- Domain architecture



- Macro architecture



- Micro architecture

Scenario: Big Shop

That wouldn't have happened with proper logging!

What makes good logging?

- What identifies a good log message?
- Which log level should I use when?
- Should I log into files? What format?

Some recommendations

- Log messages should have a uniform style.
- Log violations of assumptions.
- Use markers to make log streams filterable.
- Prefer machine-readable log formats over human-readable.
- Identify correlation tokens and attach them to the log event.
- Collect and store logs in a central repository.

Default Levels

Files? Warn only.

Logstash & Co? Info.

Magic bugs + advanced setup? Debug, or even trace.

- Async Appenders (LMAX, MemoryMappedFileAppender)
- Routing
- Properties
- Reconfiguration (Auto load, JMX,...)
- Audit logs
- Markers / Log levels
- ...

Thread Context

```
ThreadContext.put("loginId", login);
logger.error("Something bad happened!");
ThreadContext.clear();
```

+ Layout:

```
%-5p: [%X{loginId}] %m%n
```

Log:

```
ERROR: [John Doe] Something bad happened!
```

Thread Context (2)

```
ThreadContext.put("loginId", login);
logger.error("Something bad happened!");
ThreadContext.clear();
```

+ JSON Layout:

Log:

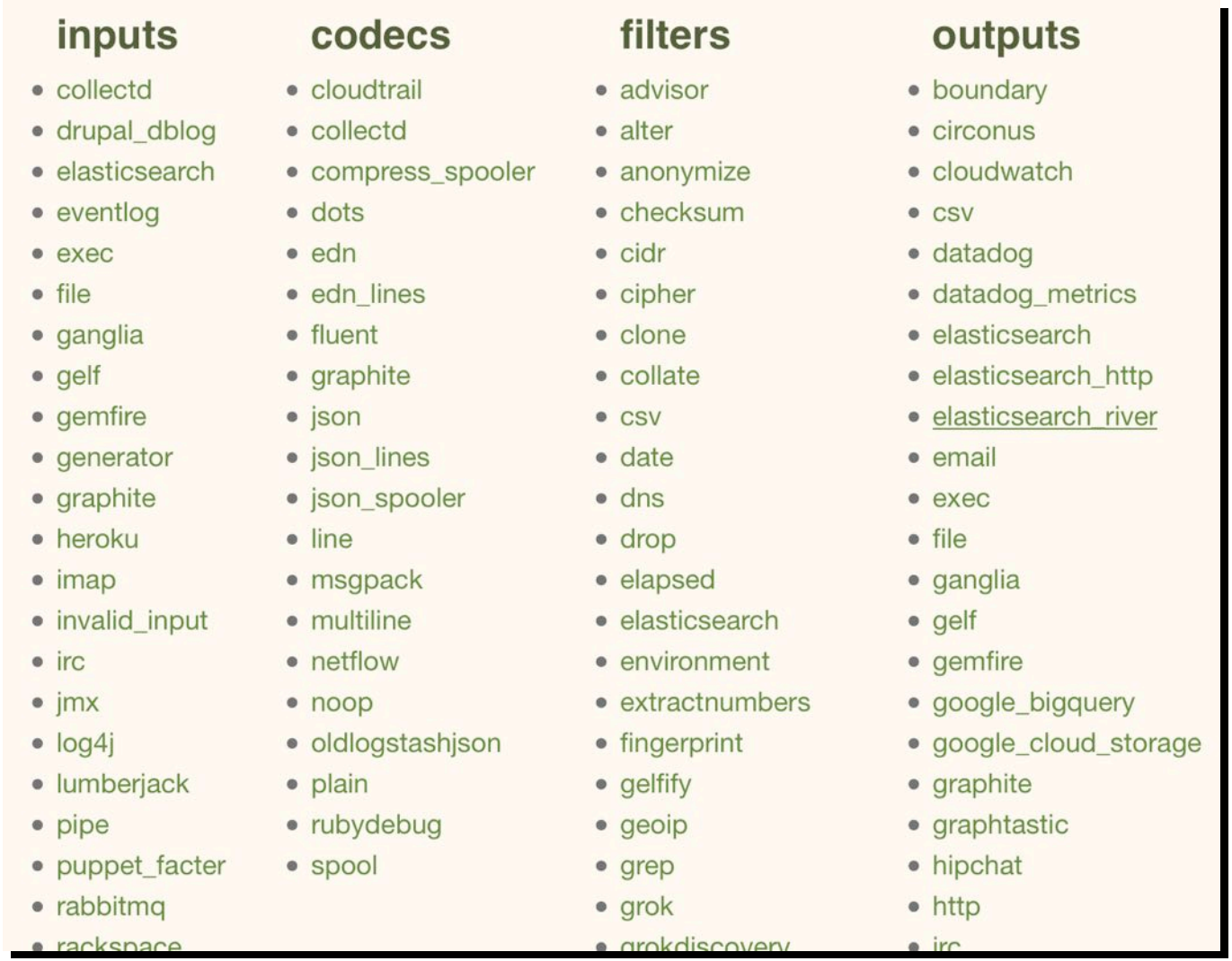
```
{
     "@version" => "1",
   "@timestamp" => "2014-04-29T14:21:14.988-07:00",
       "logger" => "com.example.LogStashExampleTest",
        "level" => "ERROR",
       "thread" => "Test worker",
      "message" => "Something bad happened!",
   "Properties" => {
          "loginId" => "John Doe"
   }
}
```

Requirements in a distributed environment

- Aggregate logs in different formats from different systems.
- Search & Correlate
- Visualize
- Alert on complex correlations.

Tools of Trade

Logstash Architecture



inputs

- collectd
- drupal_dblog
- elasticsearch
- eventlog
- exec
- file
- ganglia
- gelf
- gemfire
- generator
- graphite
- heroku
- imap
- invalid_input
- irc
- jmx
- log4j
- lumberjack
- pipe
- puppet_facter
- rabbitmq
- rackspace

codecs

- cloudtrail
- collectd
- compress_spooler
- dots
- edn
- edn_lines
- fluent
- graphite
- json
- json_lines
- json_spooler
- line
- msgpack
- multiline
- netflow
- noop
- oldlogstashjson
- plain
- rubydebug
- spool

filters

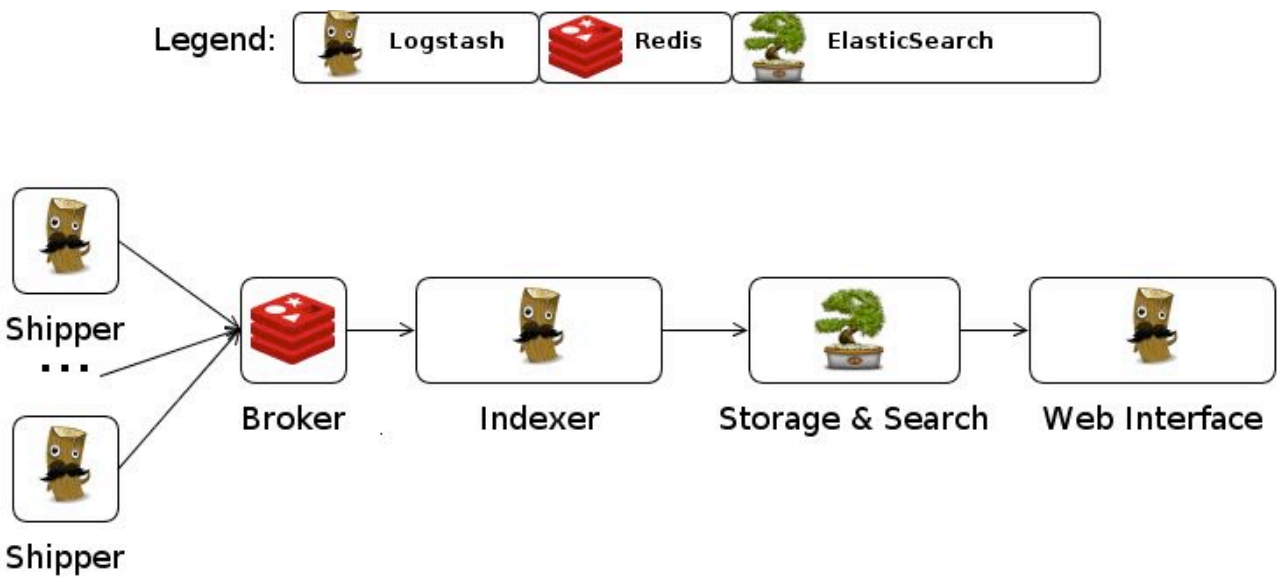
- advisor
- alter
- anonymize
- checksum
- cidr
- cipher
- clone
- collate
- csv
- date
- dns
- drop
- elapsed
- elasticsearch
- environment
- extractnumbers
- fingerprint
- gelfify
- geoip
- grep
- grok
- grokdiscovery

outputs

- boundary
- circonus
- cloudwatch
- csv
- datadog
- datadog_metrics
- elasticsearch
- elasticsearch_http
- elasticsearch_river
- email
- exec
- file
- ganglia
- gelf
- gemfire
- google_bigquery
- google_cloud_storage
- graphite
- graphtastic
- hipchat
- http
- irc

Logstash – Hands on!

A Logstash Cluster



From the Logstash docs

… and there are others, too!

Apache Flume (ASL 2.0)

FluentD (ASL 2.0)

Graylog 2 (GPL)

Loggly (commerical)

Splunk (commerical)


Logging is cool.
And I can use it to collect metrics as well, right?

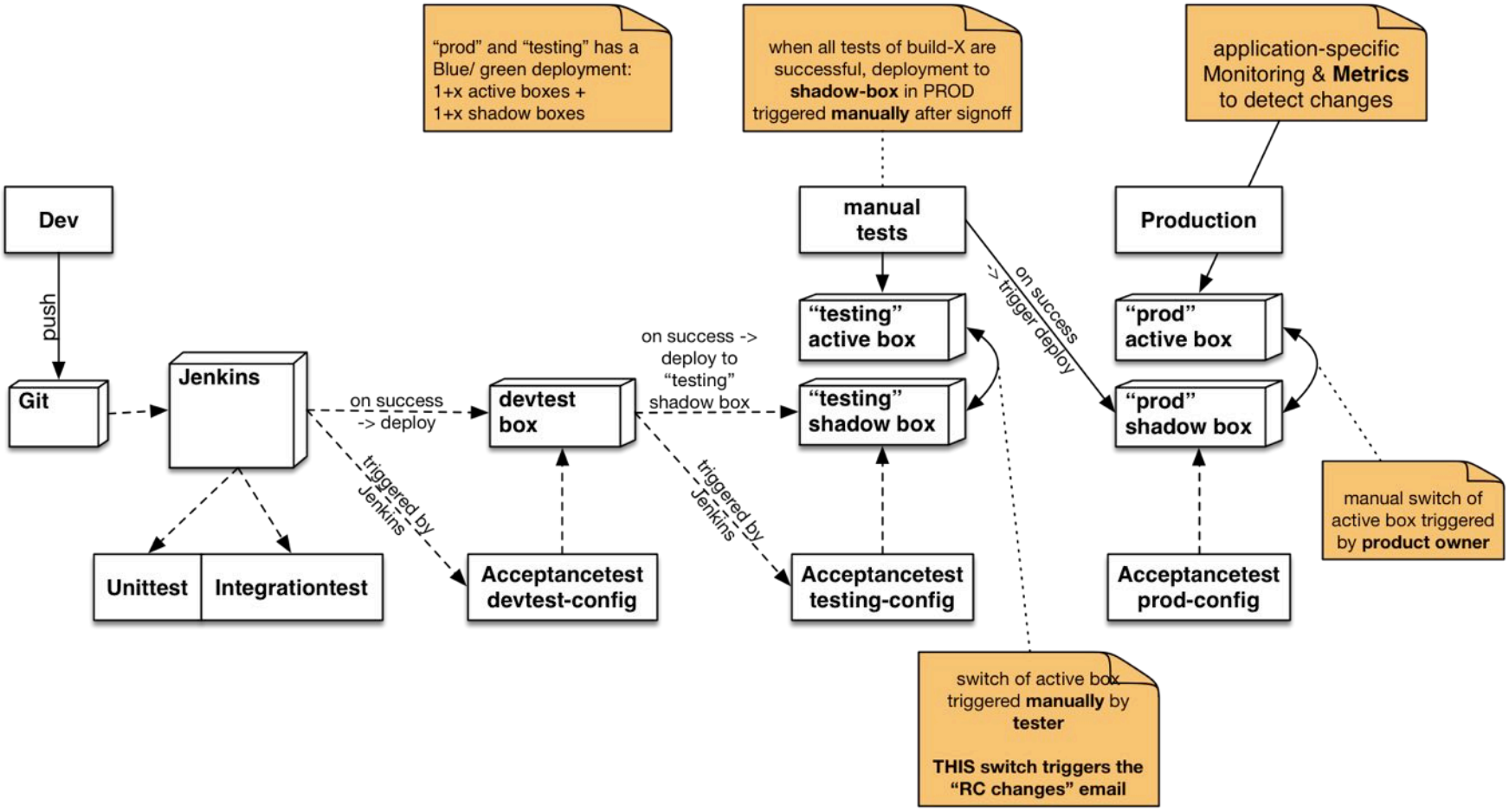
Yes, you can!

Metrics

- Business Metrics
- Application Metrics
- System Metrics

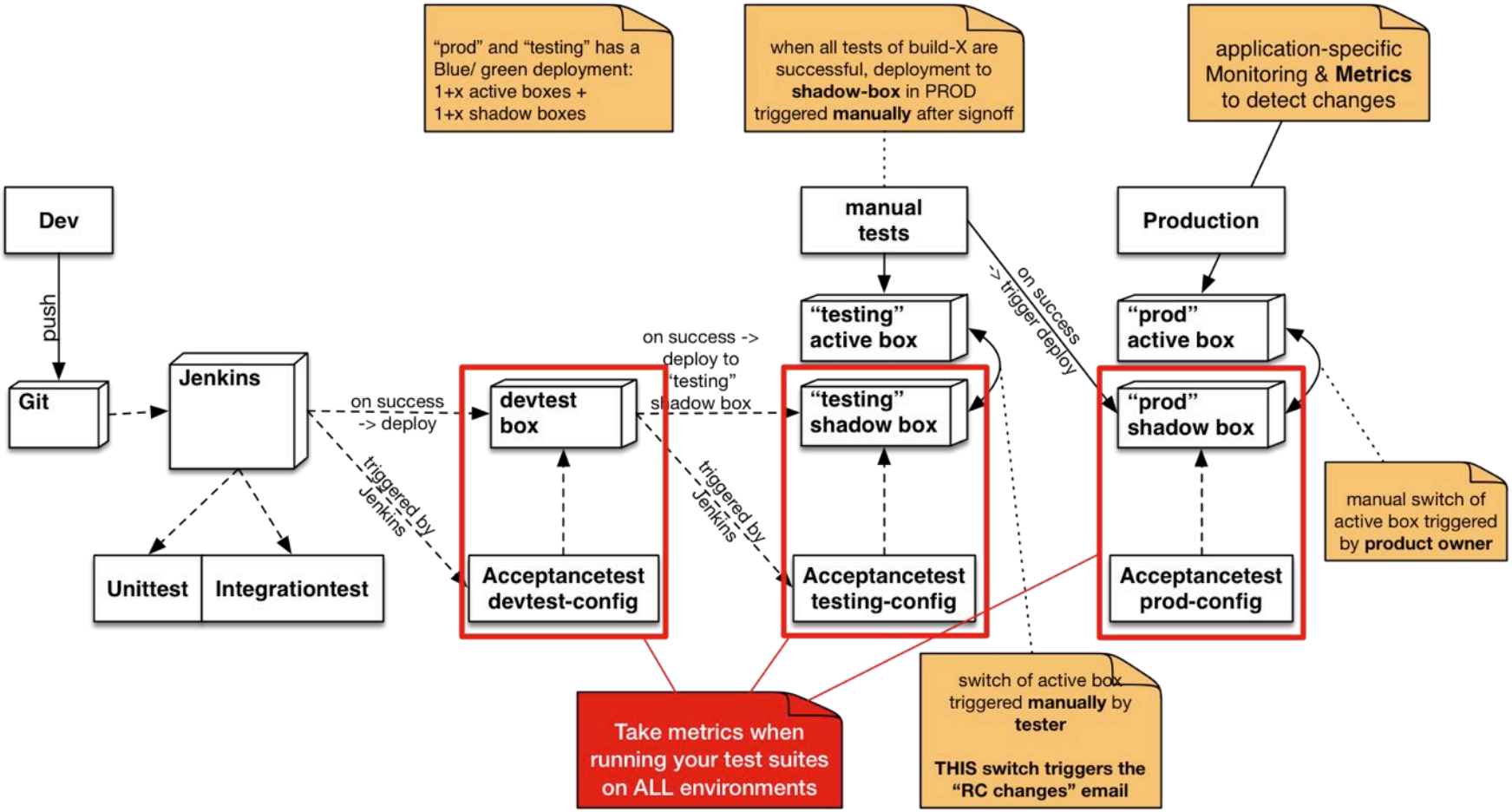
Continuous Delivery & Metrics?

Sample of a deployment-pipeline



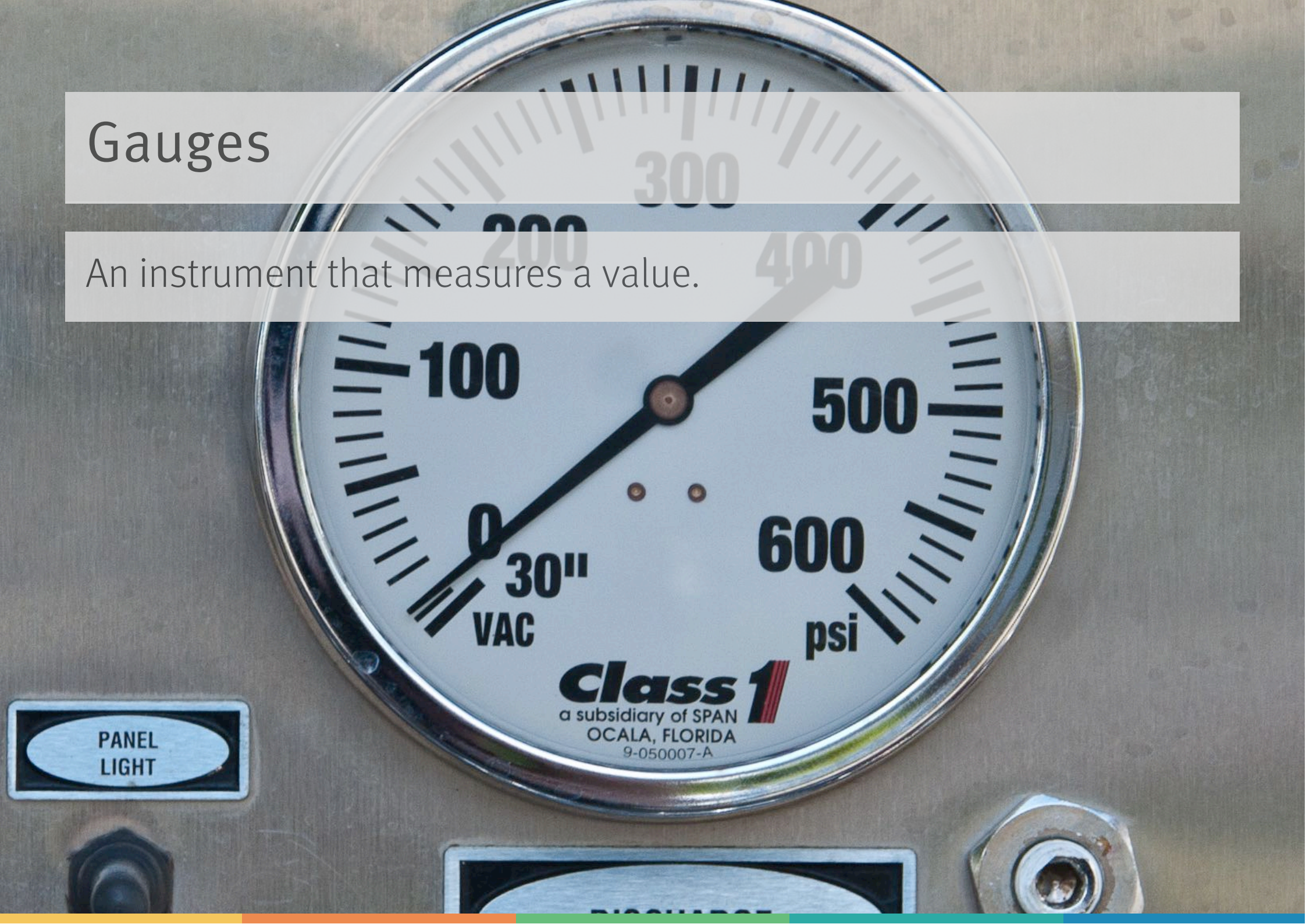
Continuous Delivery & Metrics?

Sample of a deployment-pipeline



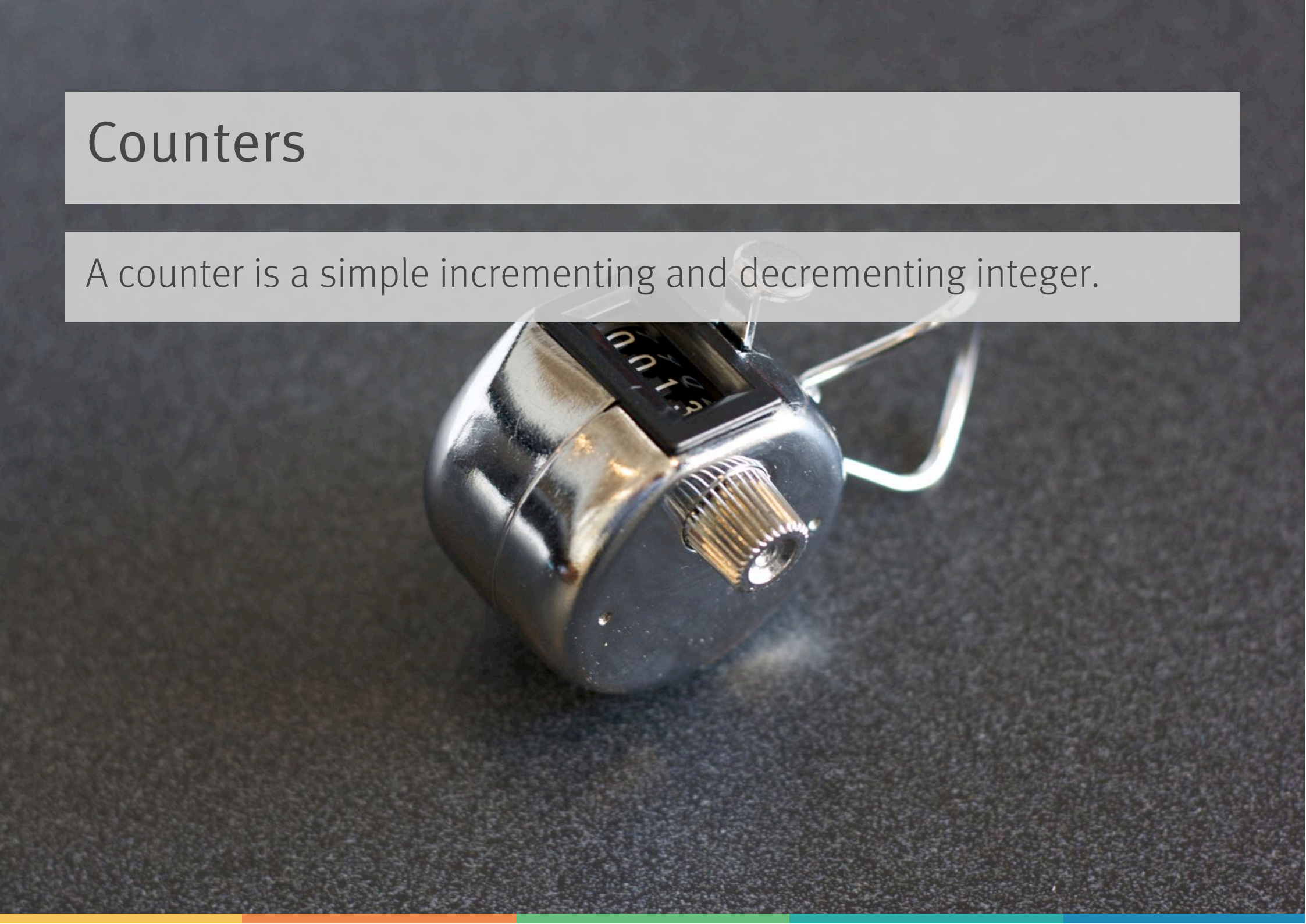
Gauges

An instrument that measures a value.



Counters

A counter is a simple incrementing and decrementing integer.

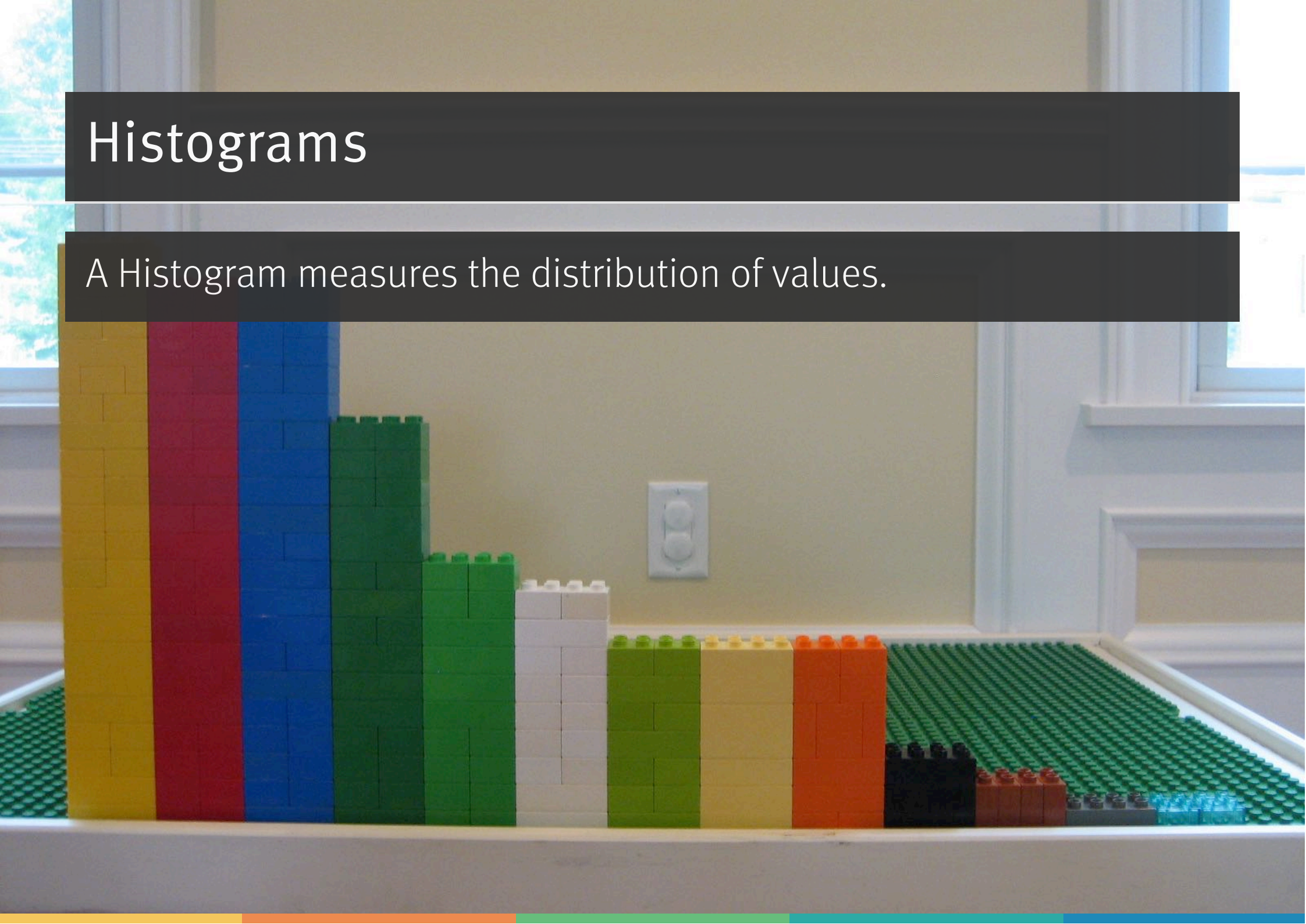


Meters

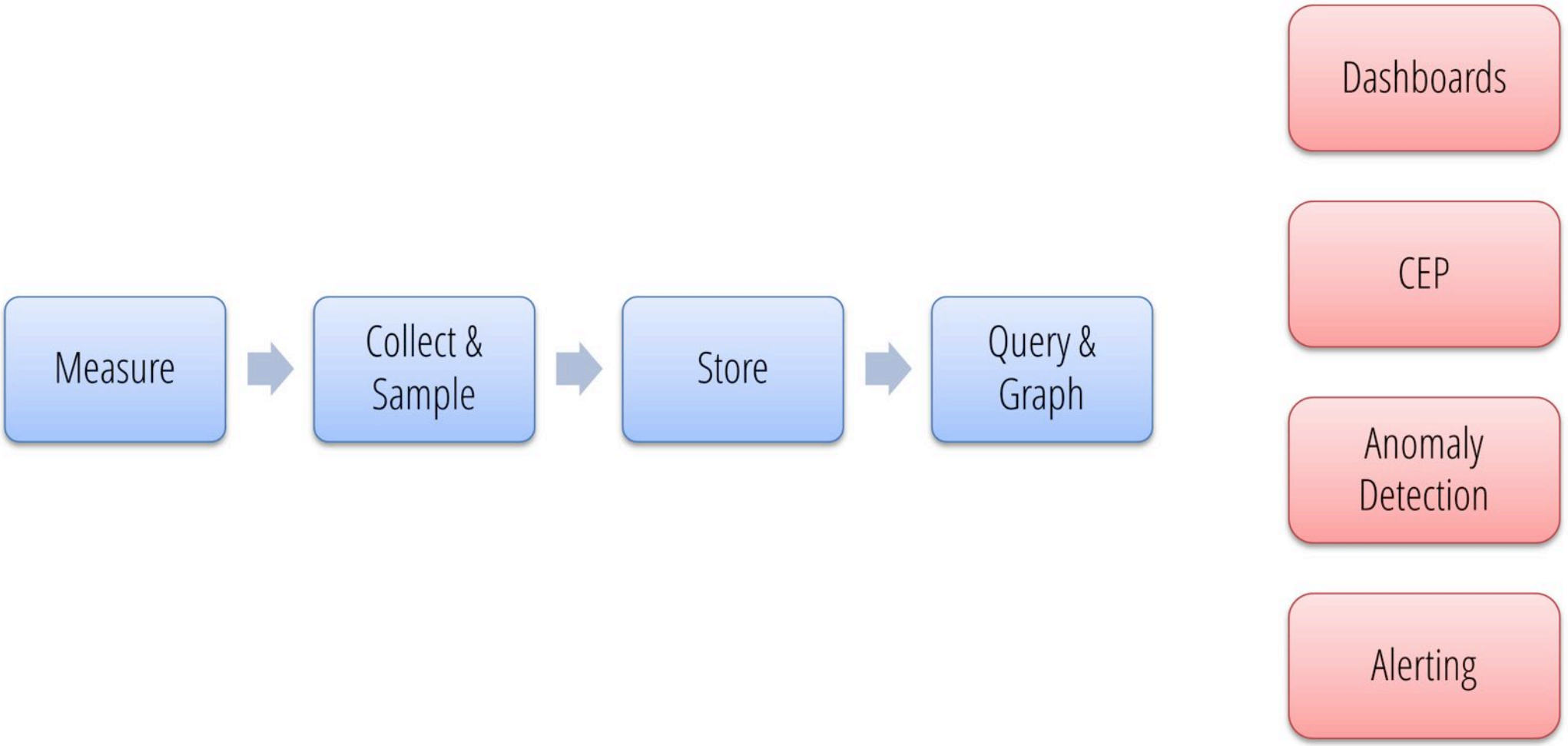
A meter measures the rate at which a set of events occur.

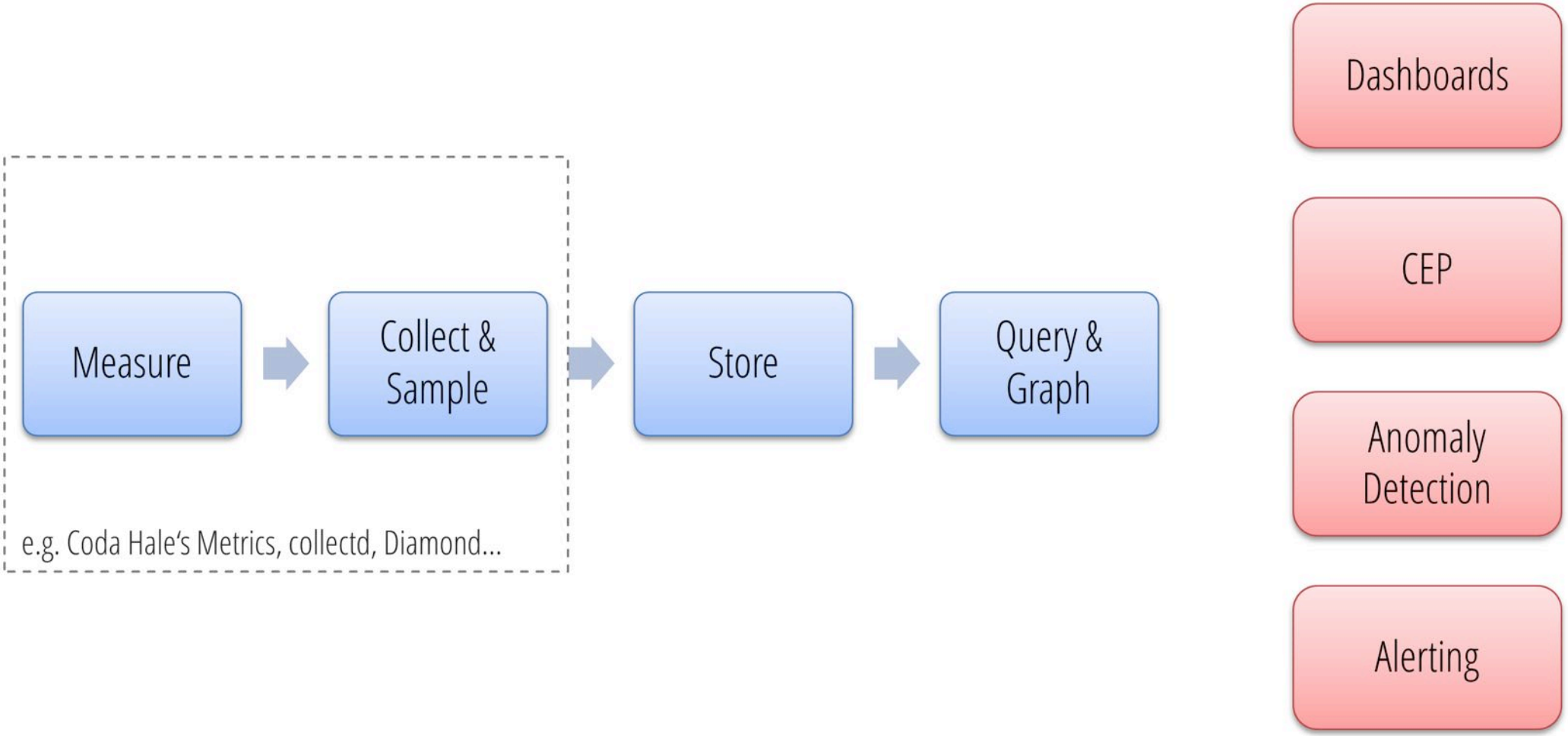
Histograms

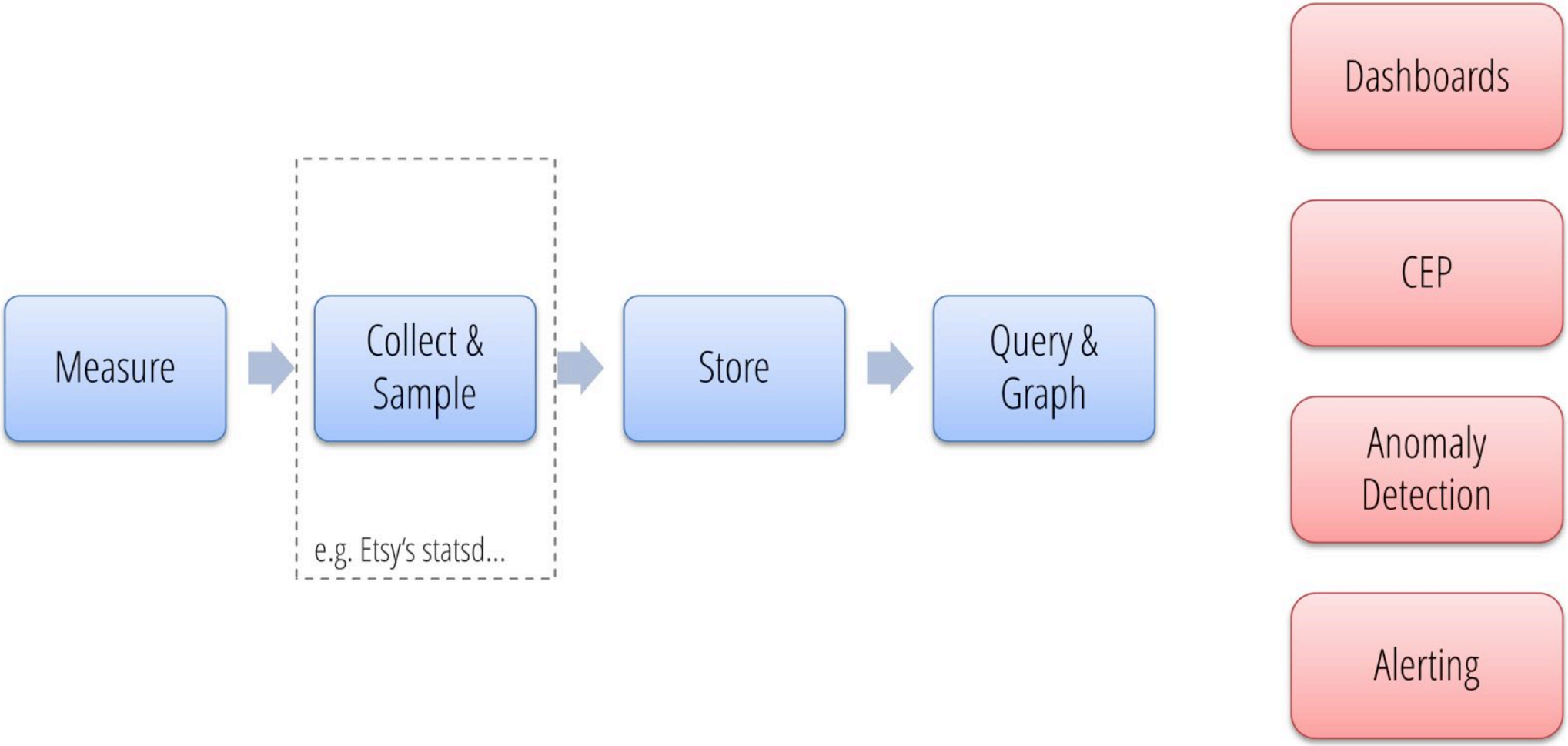
A Histogram measures the distribution of values.



Timers


Measure
Collect & Sample
Store
Query & Graph
Dashboards
CEP
Anomaly Detection
Alerting


Measure
Collect & Sample
Store
Query & Graph
e.g. Coda Hale's Metrics, collectd, Diamond...
Dashboards
CEP
Anomaly Detection
Alerting


Measure
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Store
Query & Graph
e.g. Etsy's statsd...
Dashboards
CEP
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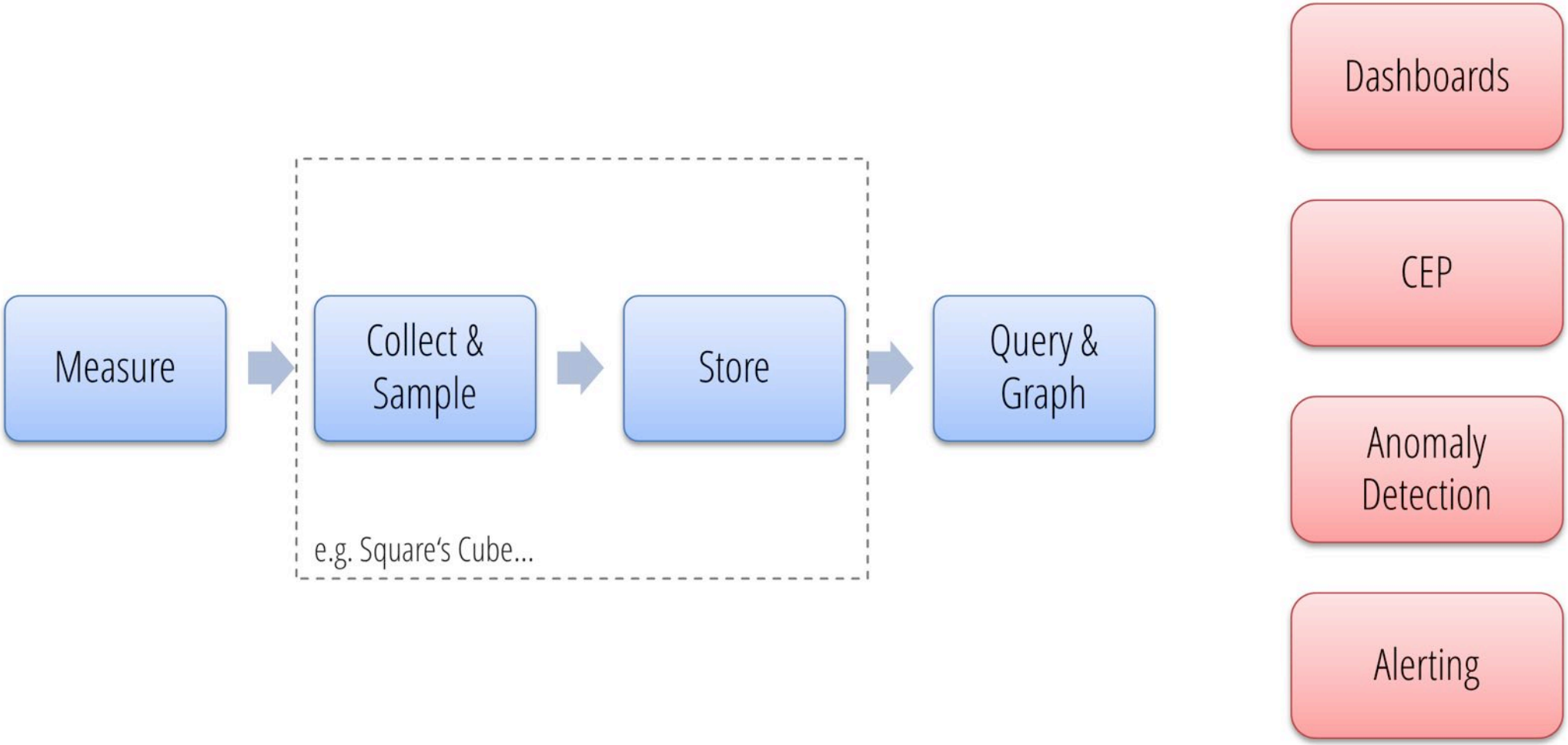
Alerting


Measure
Collect & Sample
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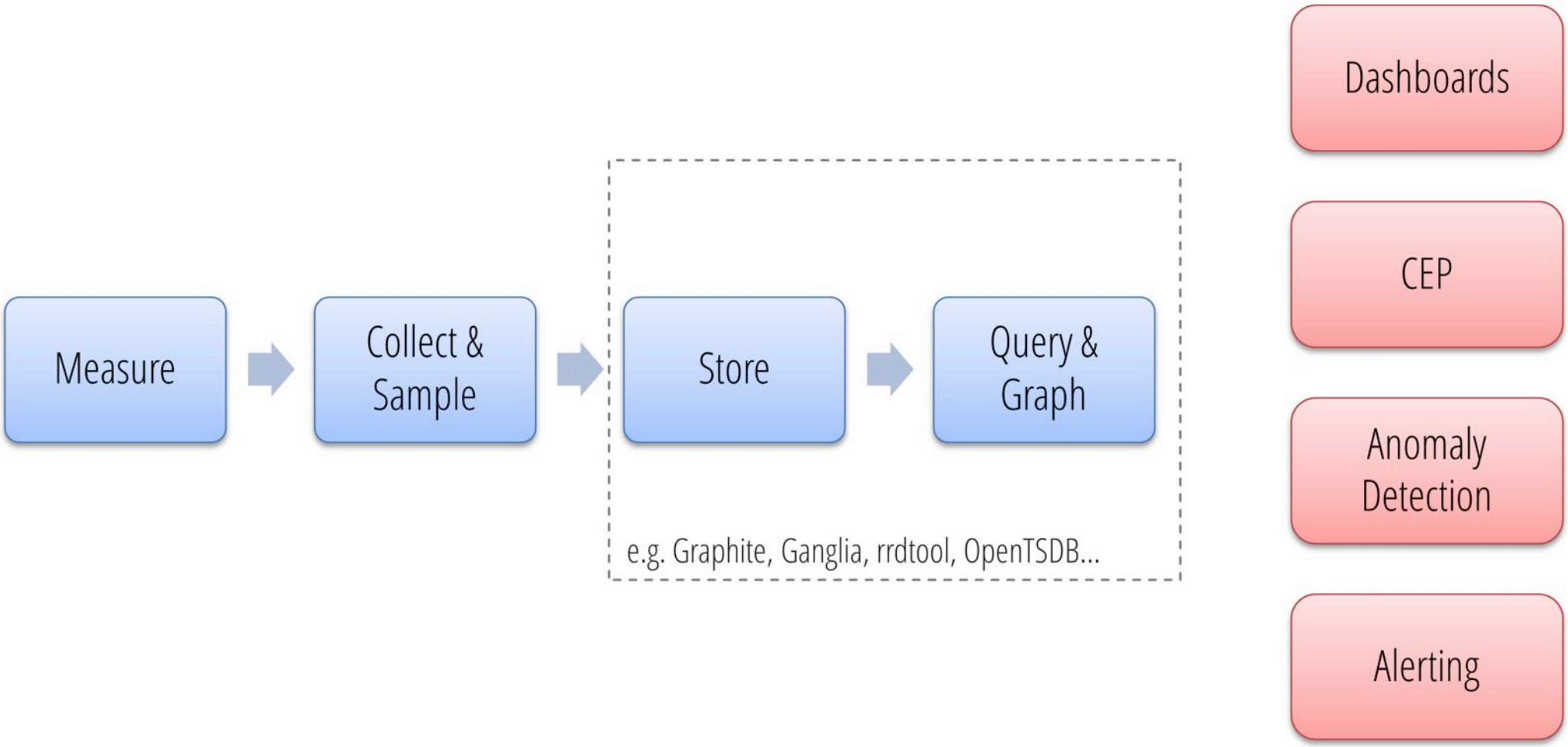
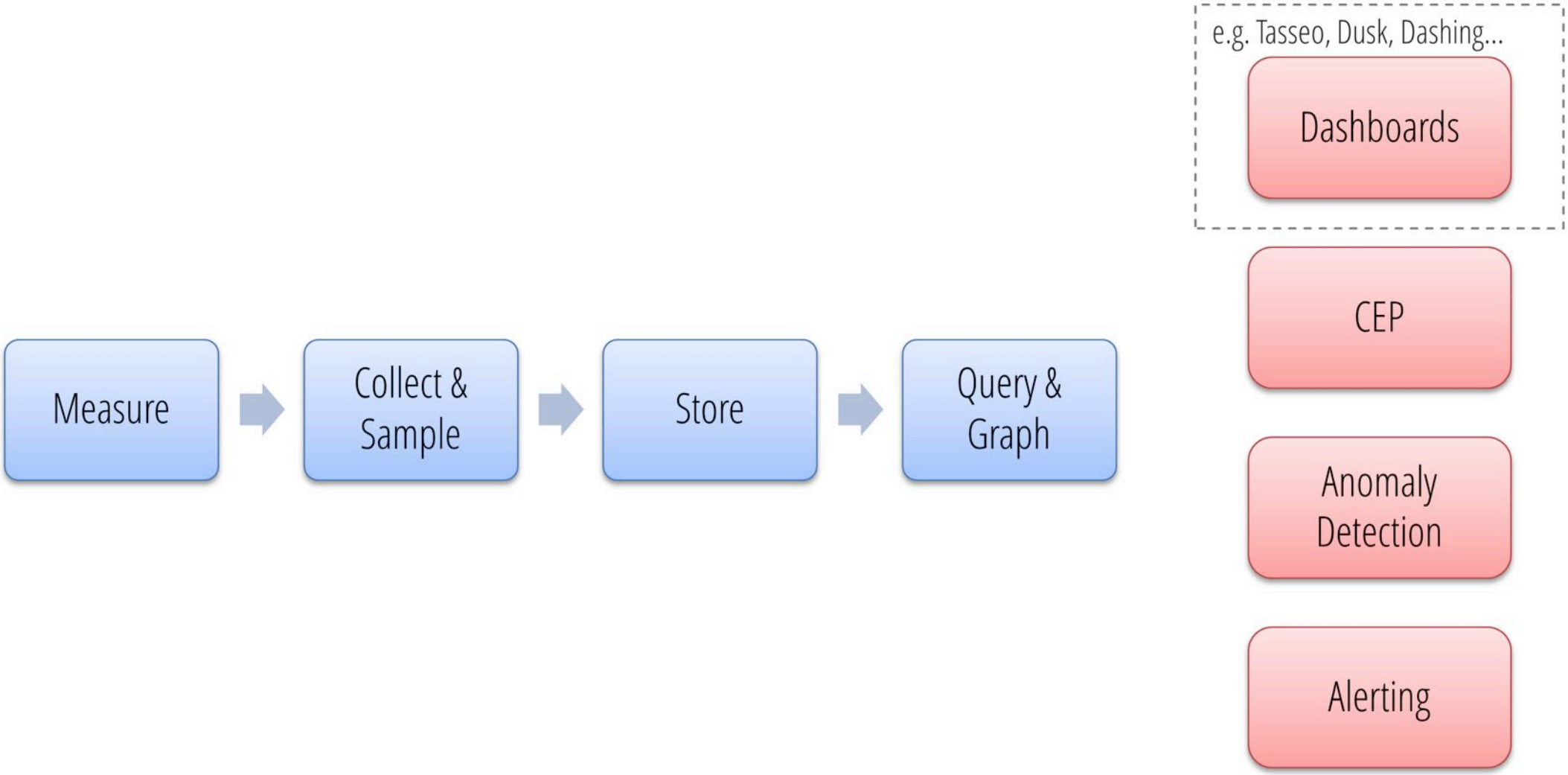
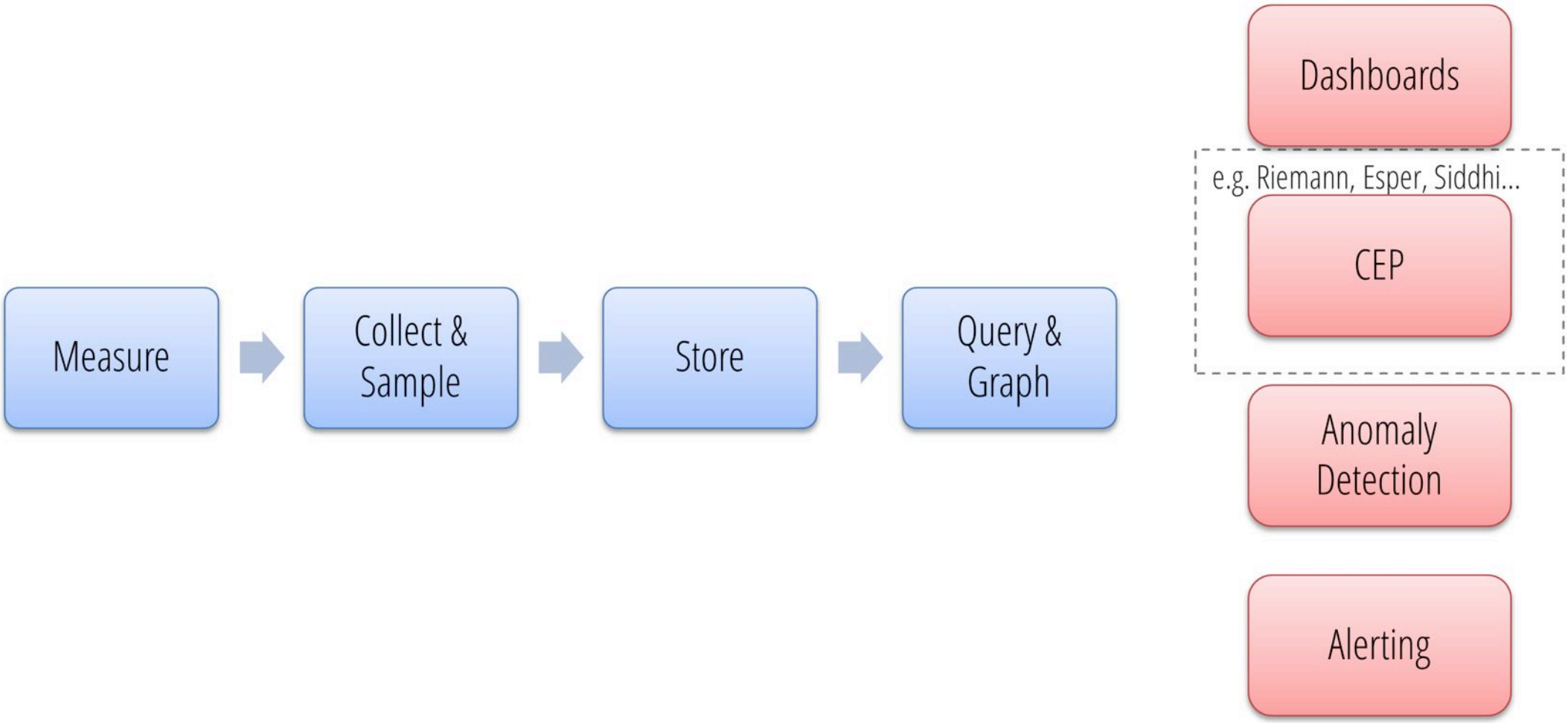
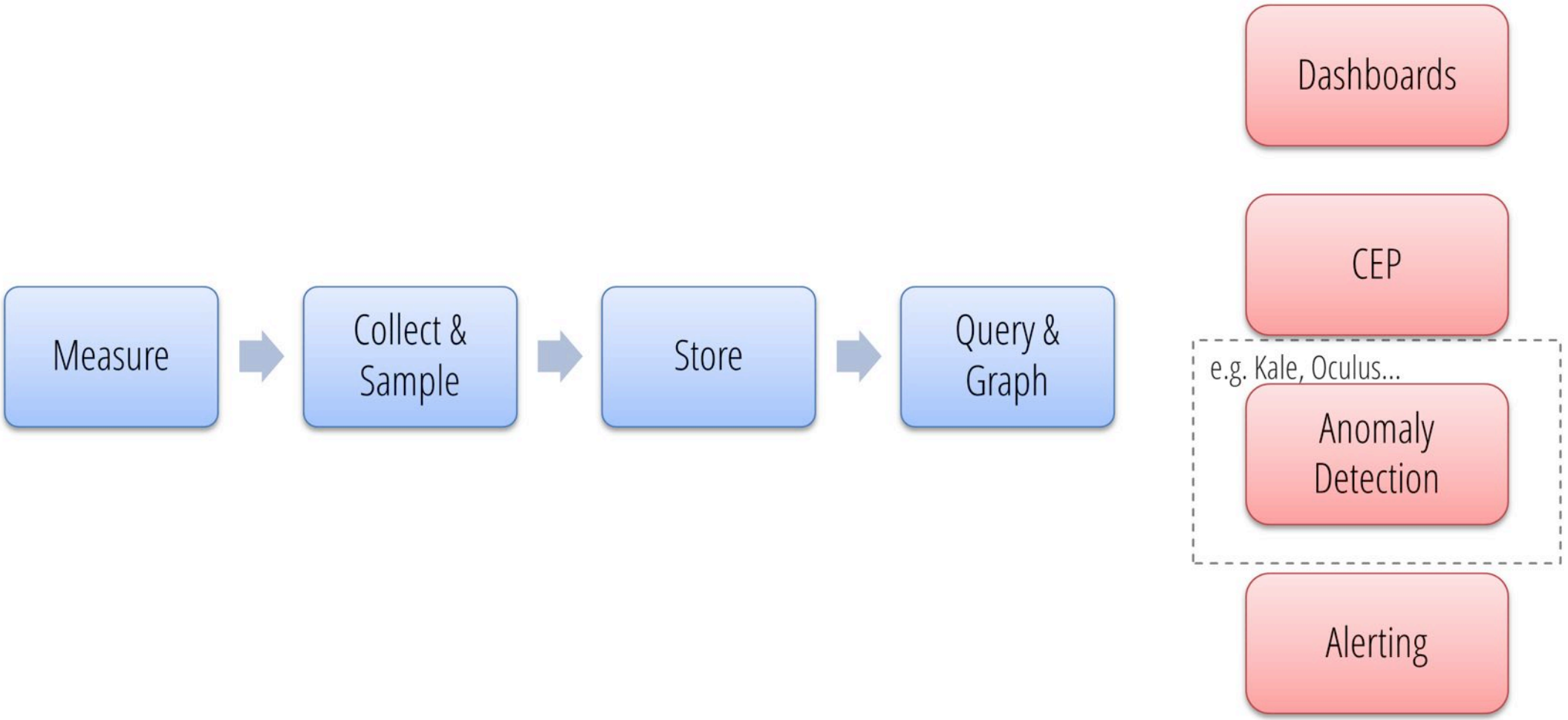
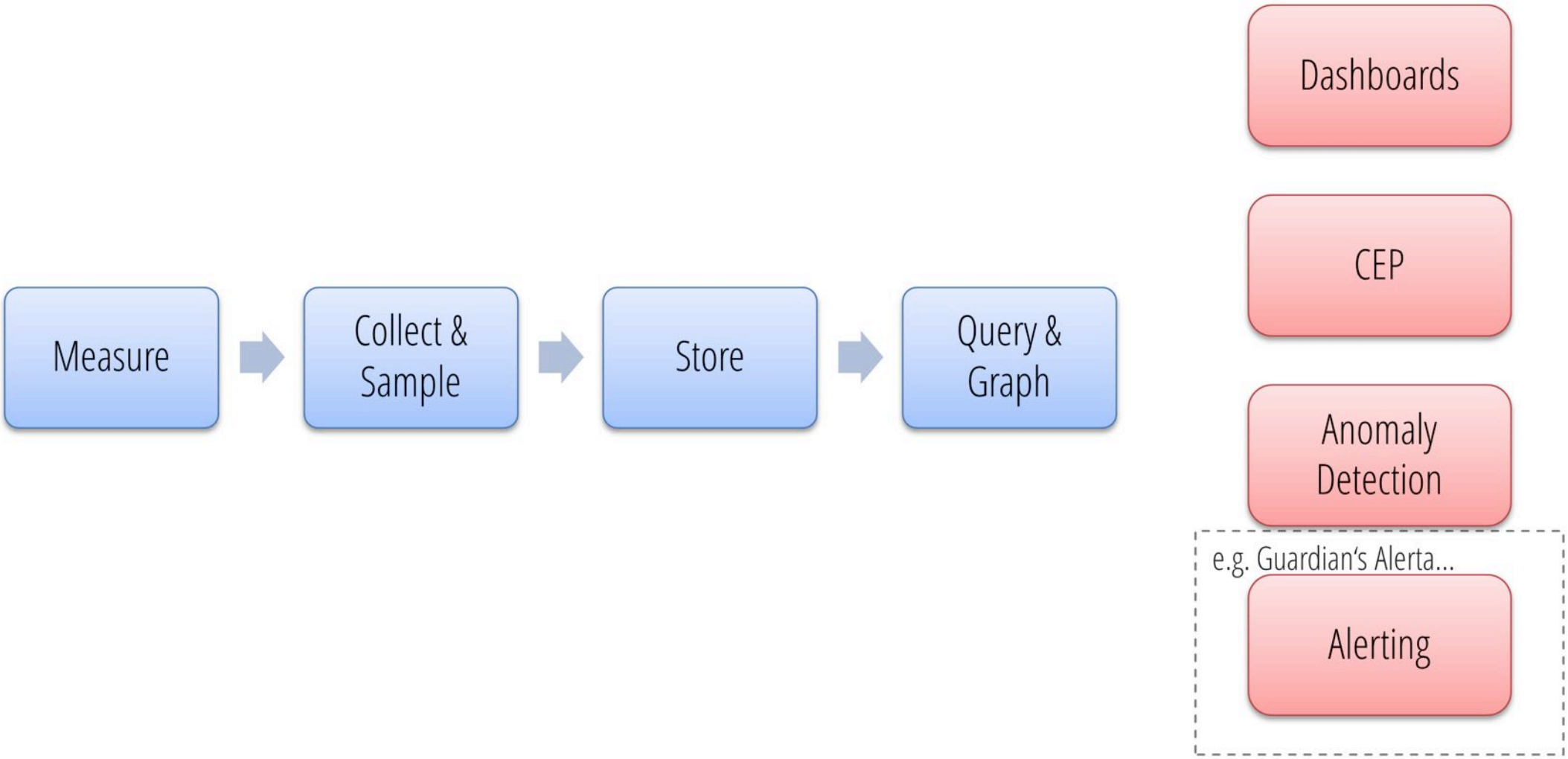
Query & Graph
e.g. Square's Cube...
Dashboards
CEP
Anomaly Detection
Alerting


Measure
Collect & Sample
Store
Query & Graph
e.g. Graphite, Ganglia, rrdtool, OpenTSDB...
Dashboards
CEP
Anomaly Detection
Alerting

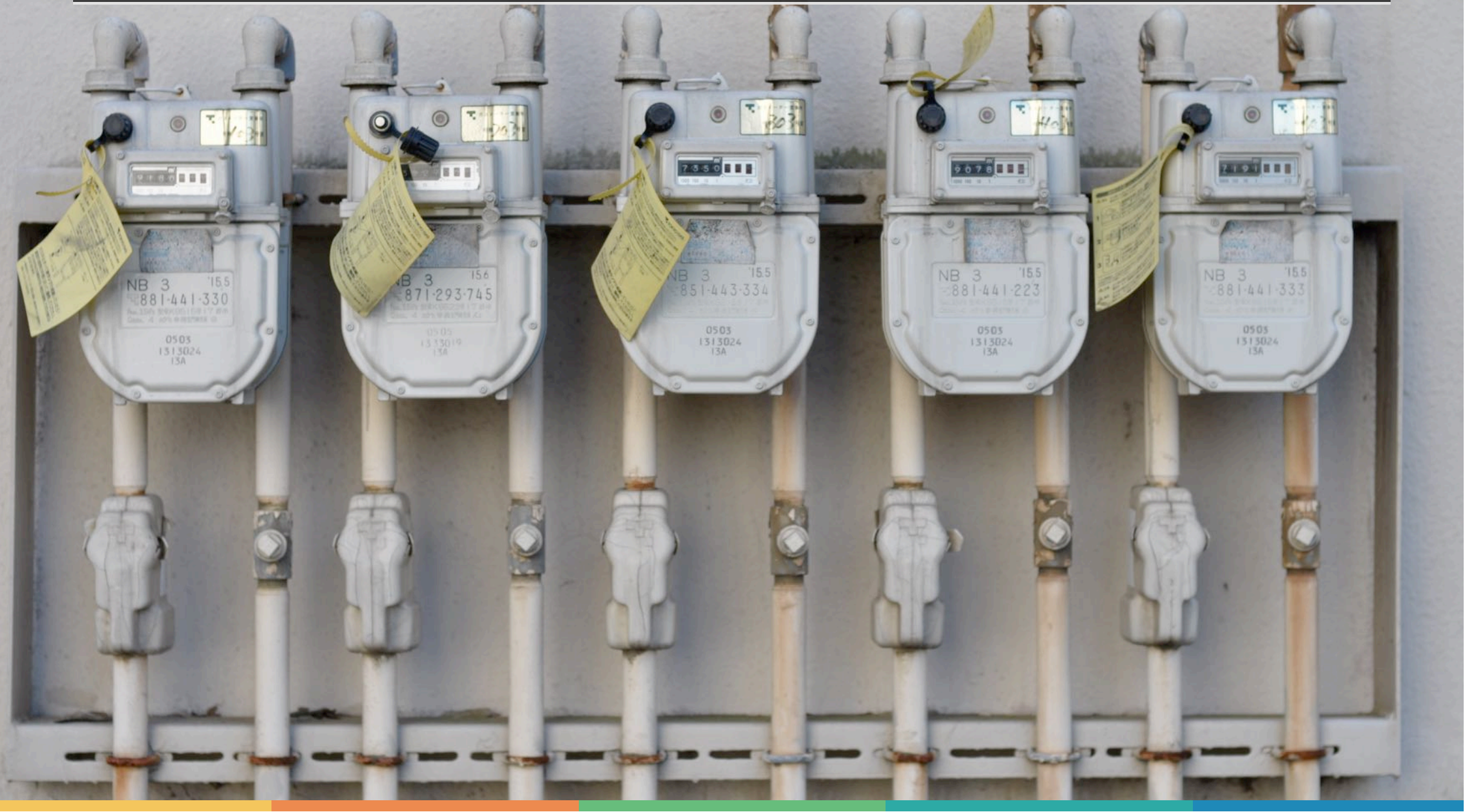

e.g. Tasseo, Dusk, Dashing...
Dashboards
CEP
Anomaly Detection
Alerting
Measure
Collect & Sample
Store
Query & Graph


Measure
Collect & Sample
Store
Query & Graph
Dashboards
e.g. Riemann, Esper, Siddhi...
CEP
Anomaly Detection
Alerting

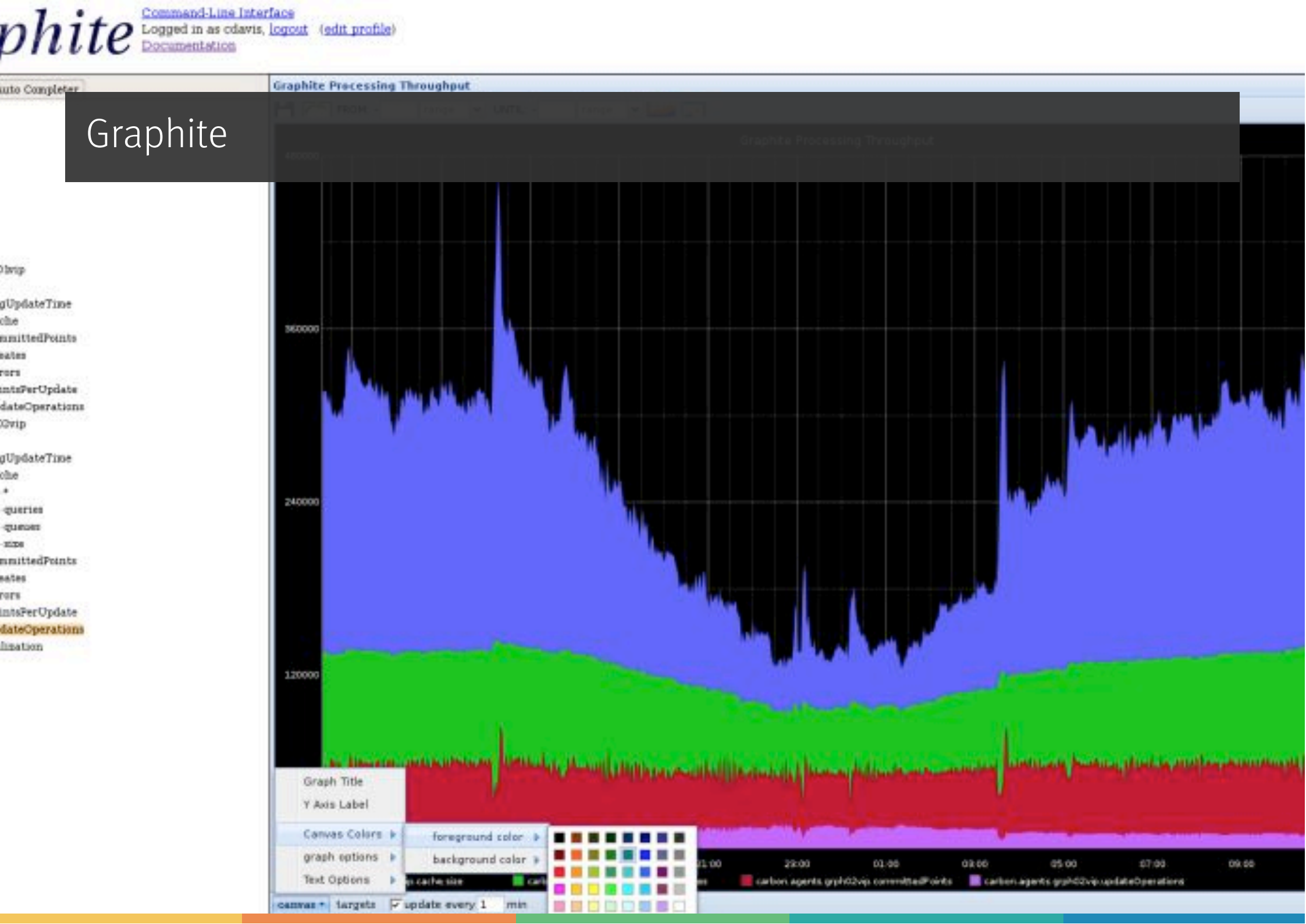

Measure
Collect & Sample
Store
Query & Graph
Dashboards
CEP
e.g. Kale, Oculus...
Anomaly Detection
Alerting


Measure
Collect & Sample
Store
Query & Graph
Dashboards
CEP
Anomaly Detection
e.g. Guardian's Alerta...
Alerting

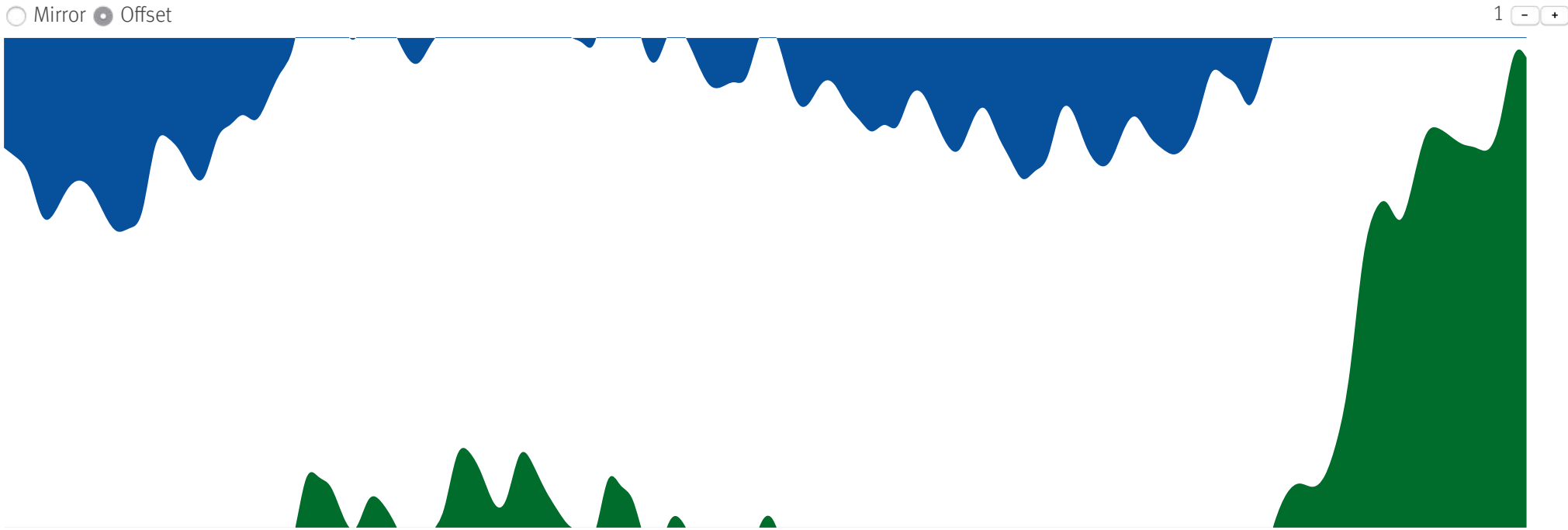
Dashboards


NB 3 '15.5
881-441-330
0503
1313024
13A
NB 3 '15.6
871-293-745
NB 3 '15.5
851-443-334
0503
1313024
13A
NB 3 '15.5
881-441-223
0503
1313024
13A
NB 3 '15.5
881-441-333
0503
1313024
13A

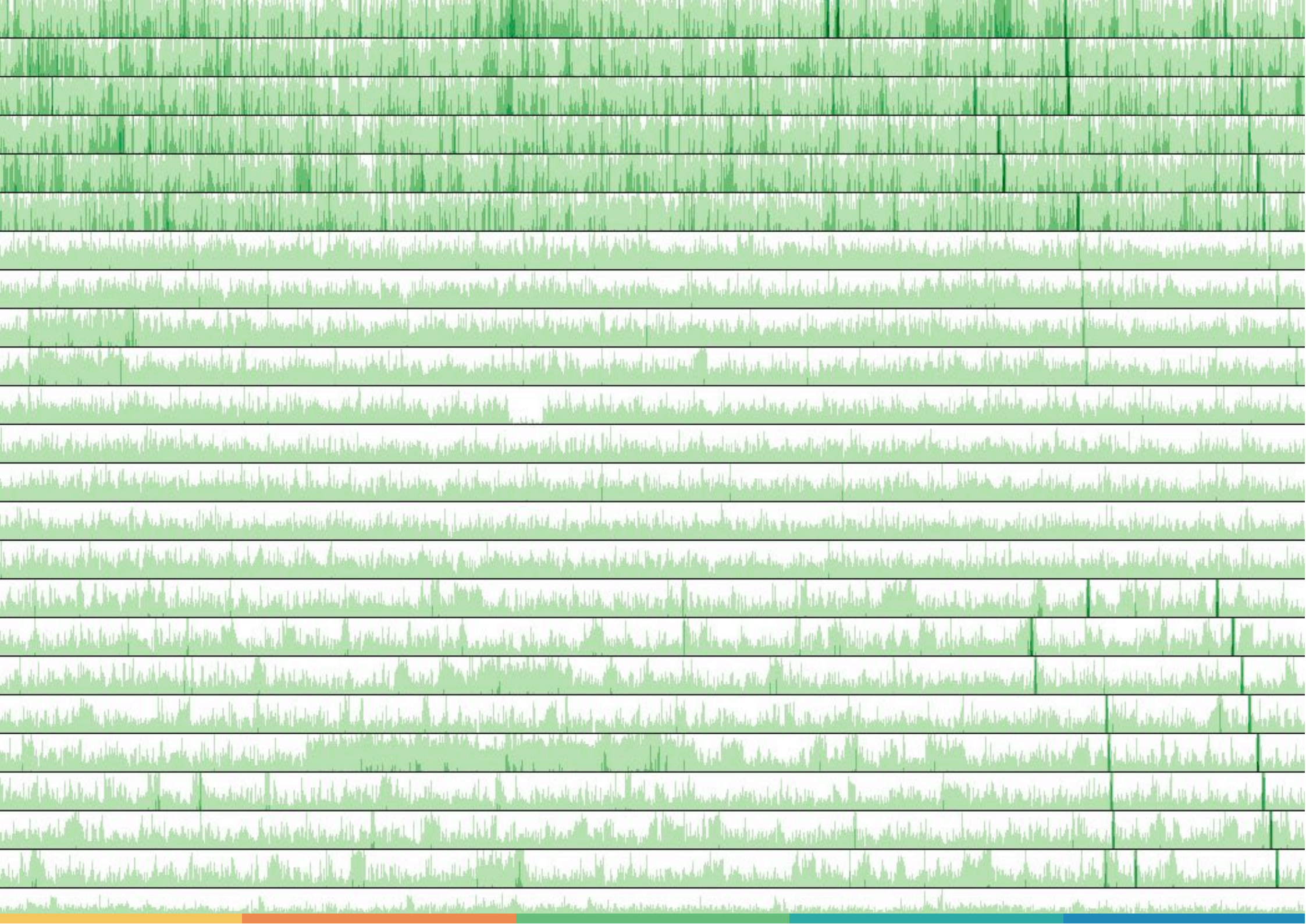
Graphite


phite
Command-Line Interface
Logged in as cdavis, logout (edit profile)
Documentation
Graphite Processing Throughput
360000
240000
120000
Graph Title
Y Axis Label
Canvas Colors
graph options
Text Options
foreground color
background color
canvas
targets
update every 1
min

Cubism.js

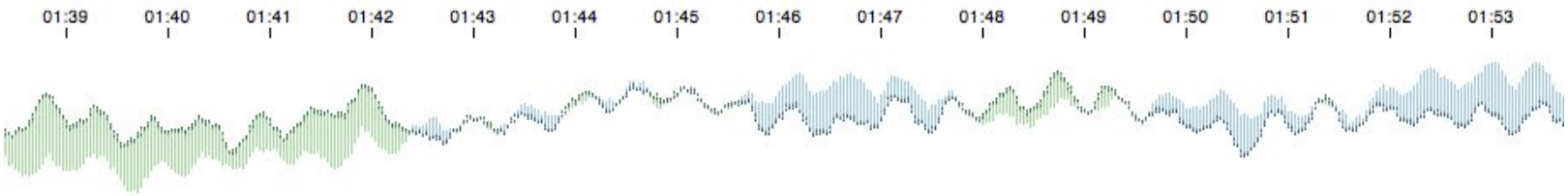


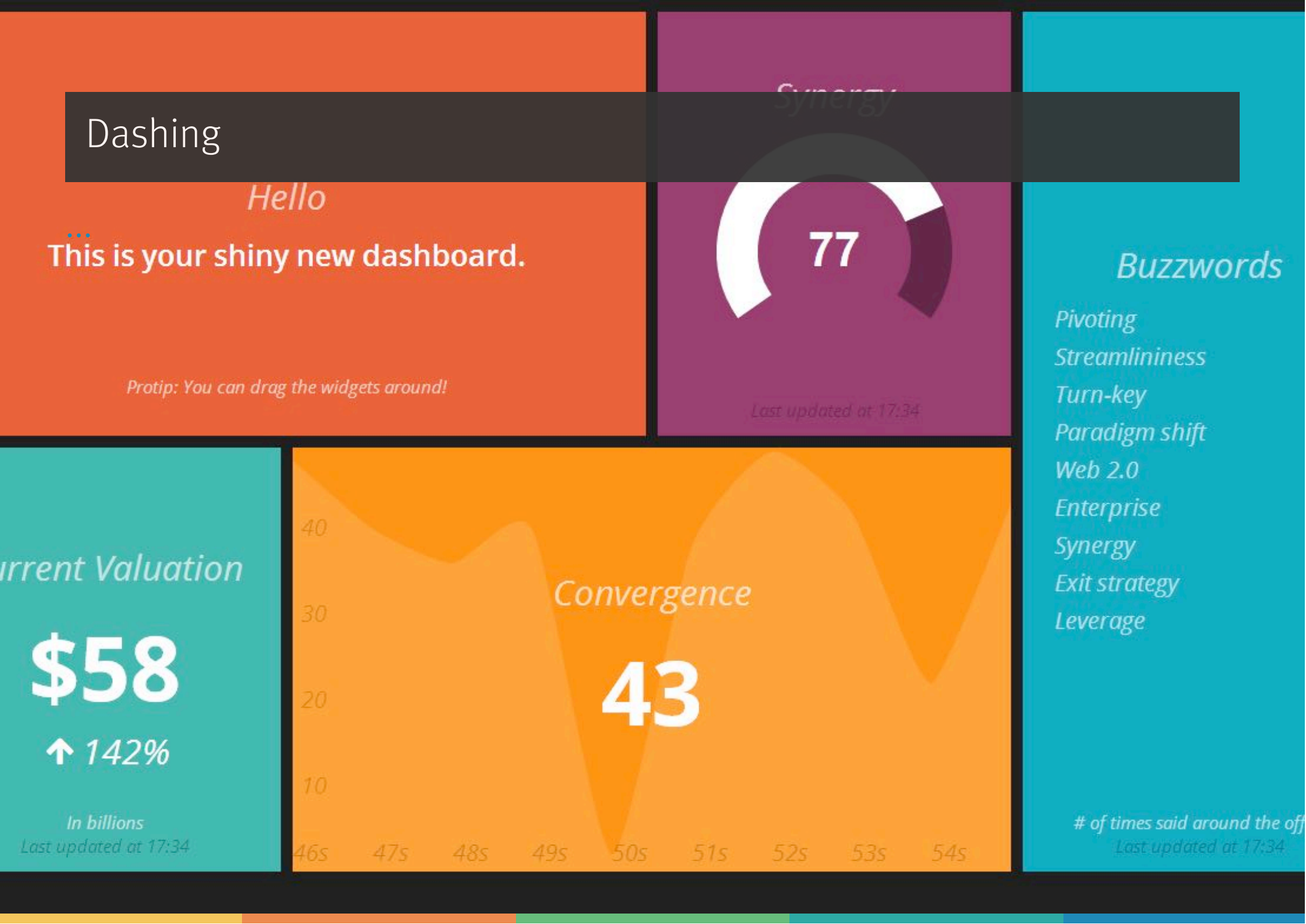
Credits: Michael Bostock



Comparisons

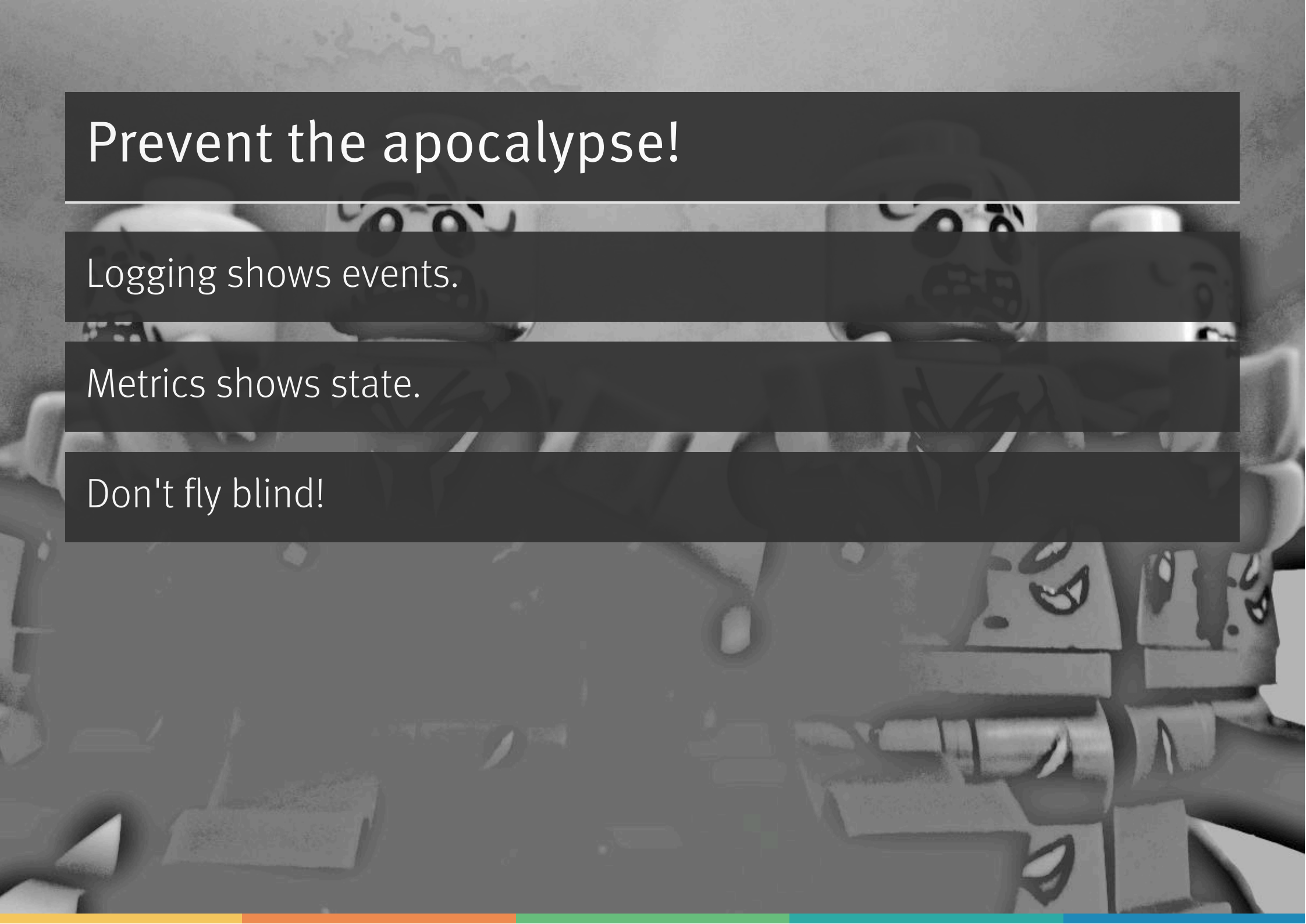
```
var cube = context.cube("http://..."),
primary = cube.metric("sum(request)"),
secondary =
  primary.shift(-7 * 24 * 60 * 60 * 1000);
```




Dashing
Hello
This is your shiny new dashboard.
Protip: You can drag the widgets around!
77
Last updated at 17:34
Buzzwords
Pivoting
Streamlininess
Turn-key
Paradigm shift
Web 2.0
Enterprise
Synergy
Exit strategy
Leverage
# of times said around the off
Last updated at 17:34
urrent Valuation
$58
142%
In billions
Last updated at 17:34
Convergence
43
40
30
20
10
46s
47s
48s
49s
50s
51s
52s
53s
54s

Best practices

- Measure everything!
- Counters ./. Meters
- Metrics are cheap, but not for free.
- Retention Policies
- Get rid of silos
- Correlate your data
- ...to make better decisions



Prevent the apocalypse!

Logging shows events.

Metrics shows state.

Don't fly blind!

Thanks for your attention!

Alexander Heusingfeld | @goldstift

Tammo van Lessen | @taval

https://www.innoq.com/

Credits

- Buuz and Woody
- Monolith by Ron Cogswell
- Dave - Wrapping up monolith tins
- Pleuntje - connected
- CPU by mbostock
- Mess by Rev Stan
- Pay Here by Marc Falardeau
- Cockpit by Ronnie Rams
- Stream by Phil Whitehouse
- Magnifier by John Lodder (Flickr)
- Flying Saucer, Cup, and Teapot! by Mr Thinktank
- Ice berg by Derek Keats
- Gas Meters by mxmstryo (Flickr)
- Gauge Stock by Andrew Taylor (Flickr)
- Counter by Marcin Wichary (Flickr)
- Histogram of legos by color frequency by Jeff Boulter (Flickr)
- pomodoro timers by Paul Downey (Flickr)
- Zombie Apocalypse by pasukaru76