Cloud Based Analytics for Cloud Based Applications

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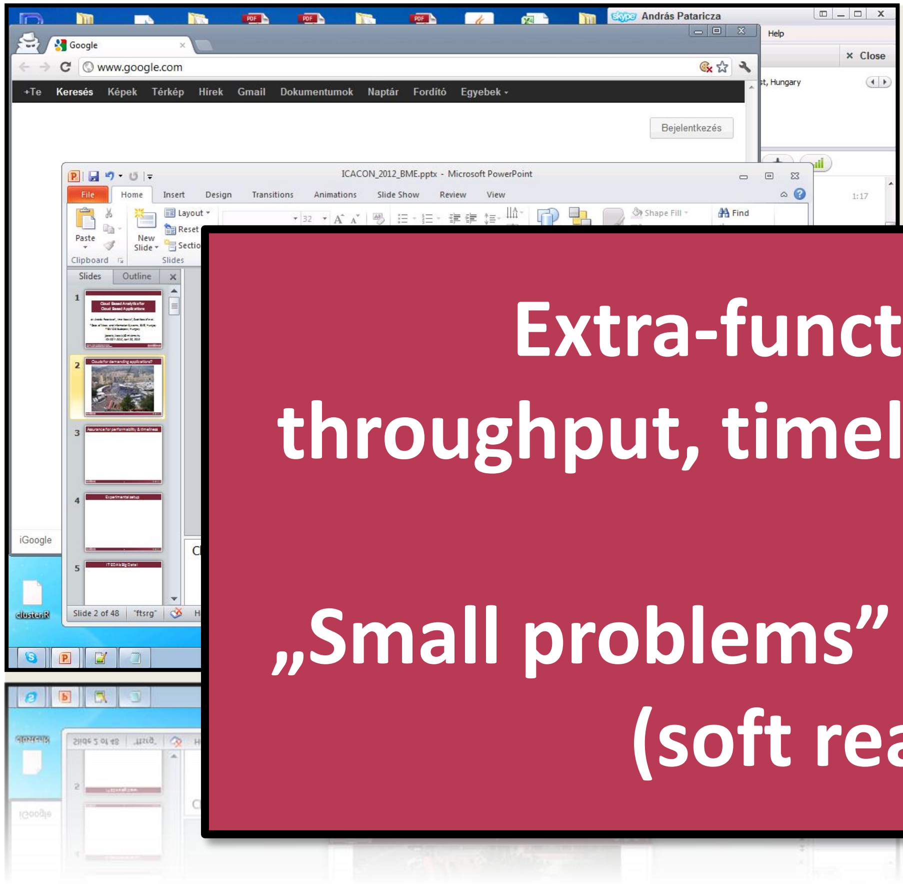
Standard infrastructure for demanding applications?

Power supply to an ER

- COTS energy source replicated -> ->
- Warm backup

- Power supply to an ER
- COTS energy source replicated
- Warm backup

Clouds for demanding applications?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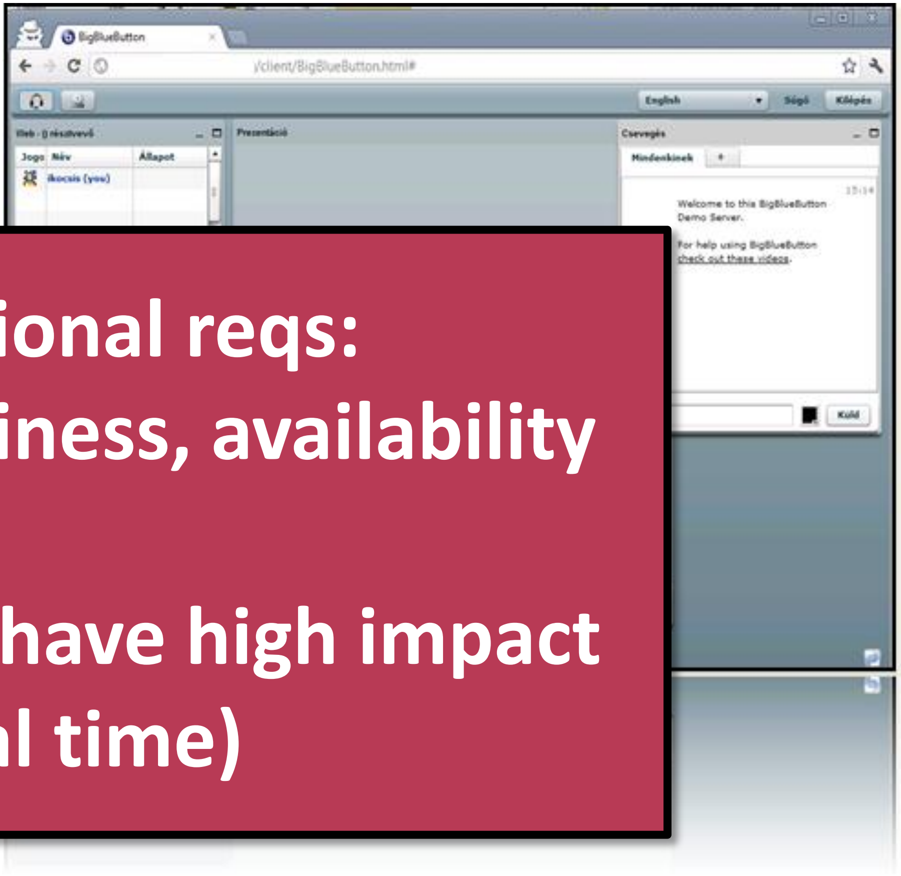


Welcome to this BigBlueButton Demo Server.

For help using BigBlueButton check out these videos.

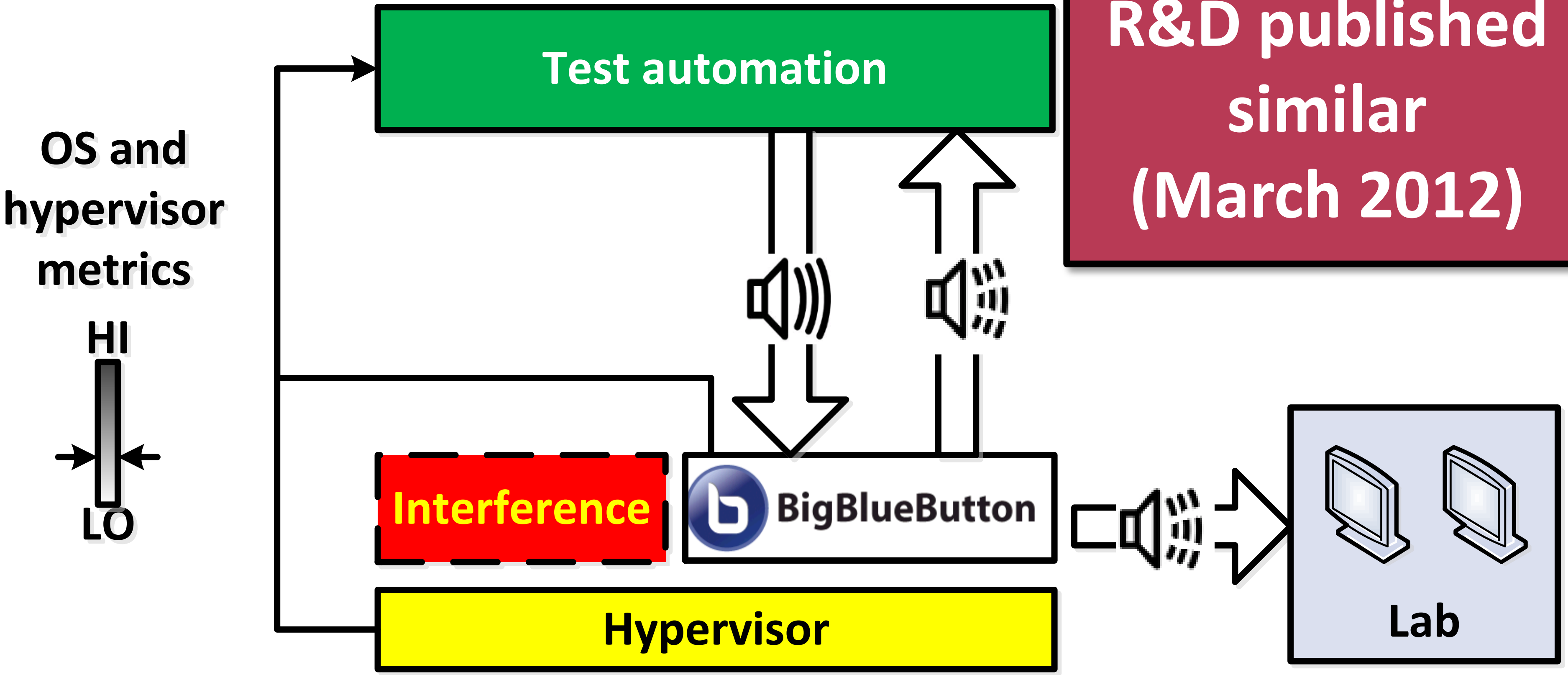
Extra-functional reqs: throughput, timeliness, availability

„Small problems" have high impact (soft real time)

Virtual Desktop Infrastructure

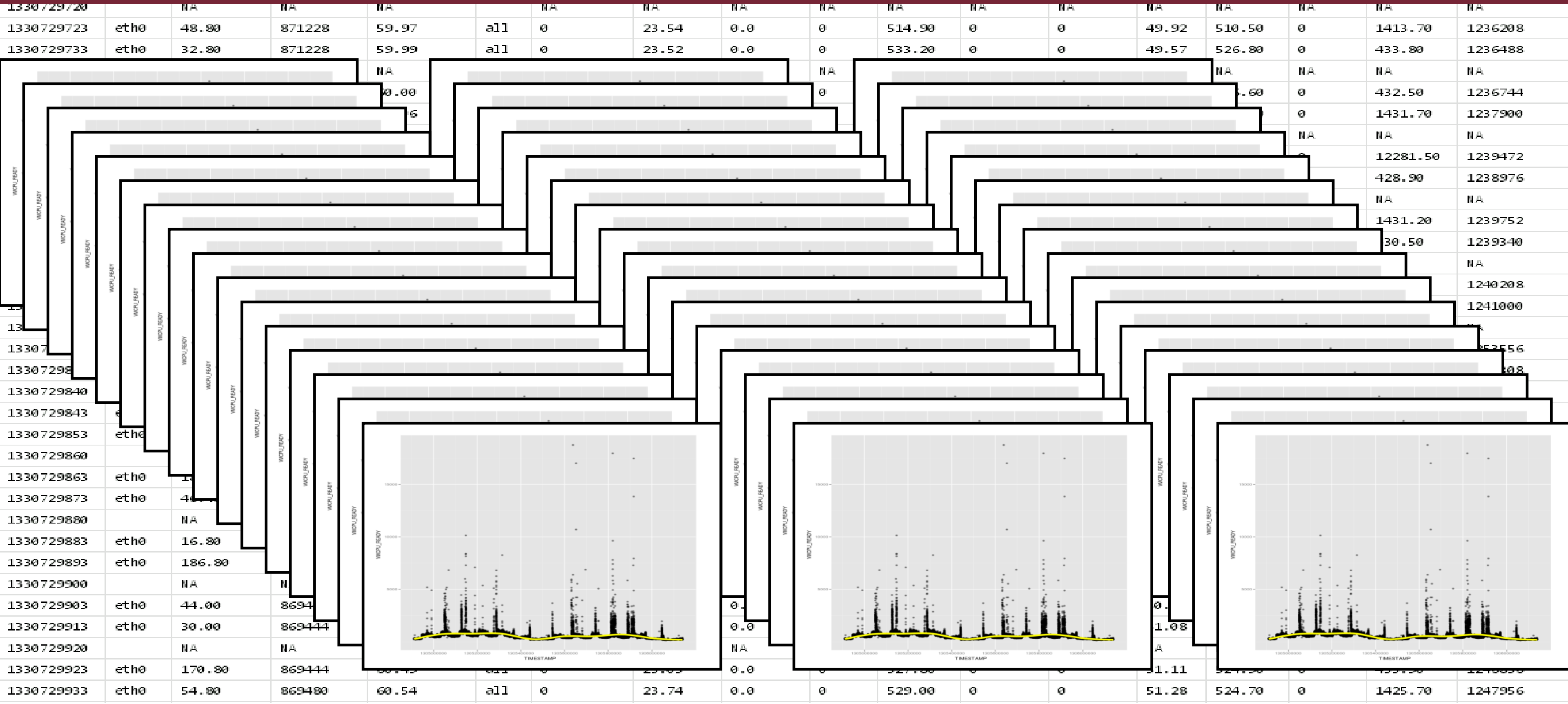
Telecommunications

Experimental setup



N.B.: VMware R&D published similar (March 2012)

IT EDA is Big Data!



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1330729933	eth0	54.80	869480	60.54	all	0	23.74	0.0	0	529.00	0	0	51.28	524.70	0	1425.70	1247956

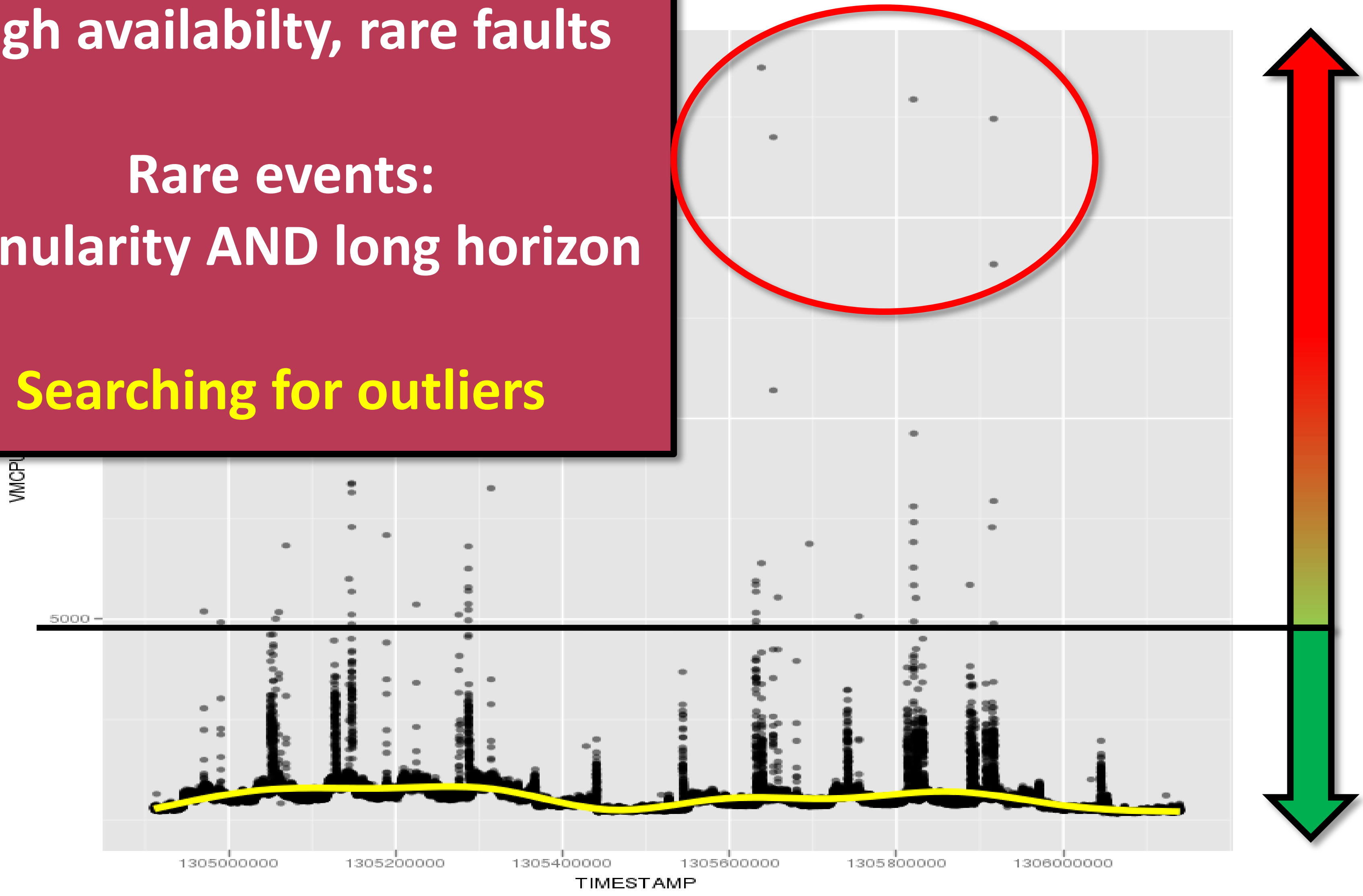
Which determine the QoS?

IT EDA is Big Data!

High availabilty, rare faults

Rare events:
granularity AND long horizon

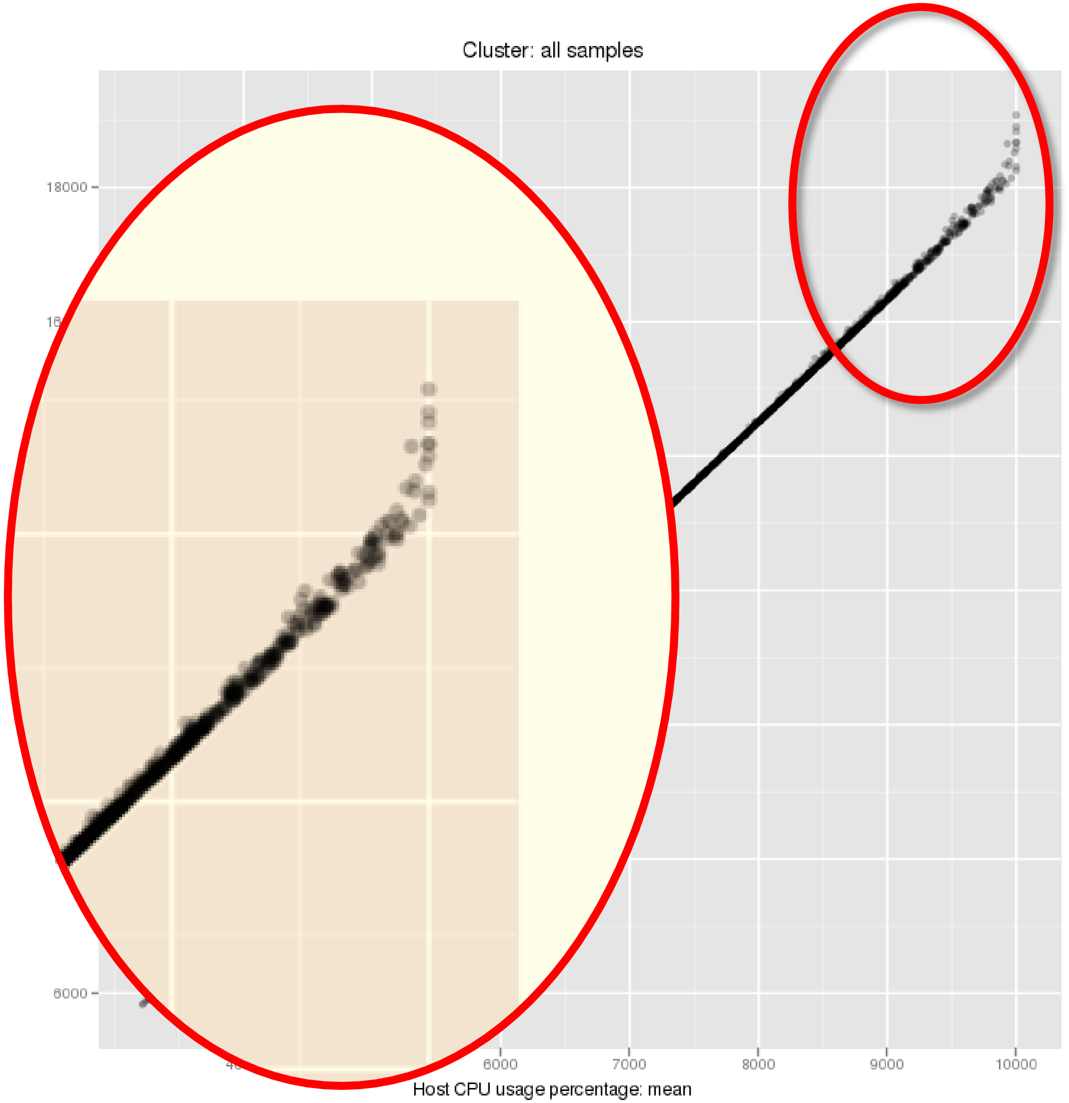
Searching for outliers



Rare events: lot of sand, a few pellets

Typically sand: gold mining ≠ data mining

Visual analytics = causal **insight**



Computing power use = CPU use × CPU clock rate (const.)

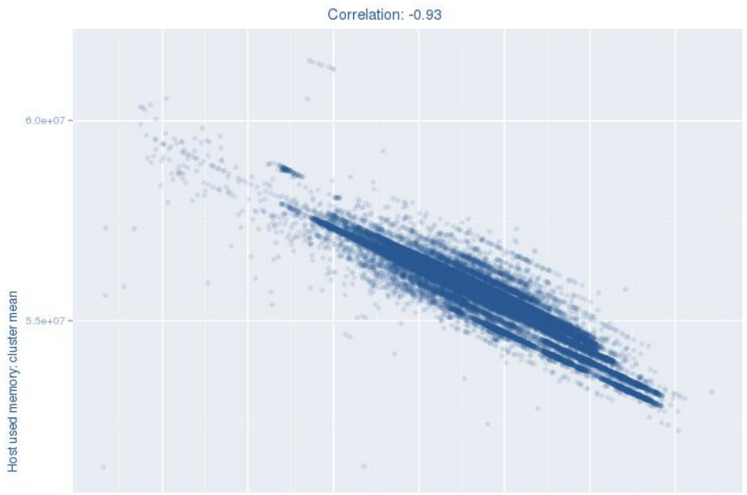
Should be pure proportional

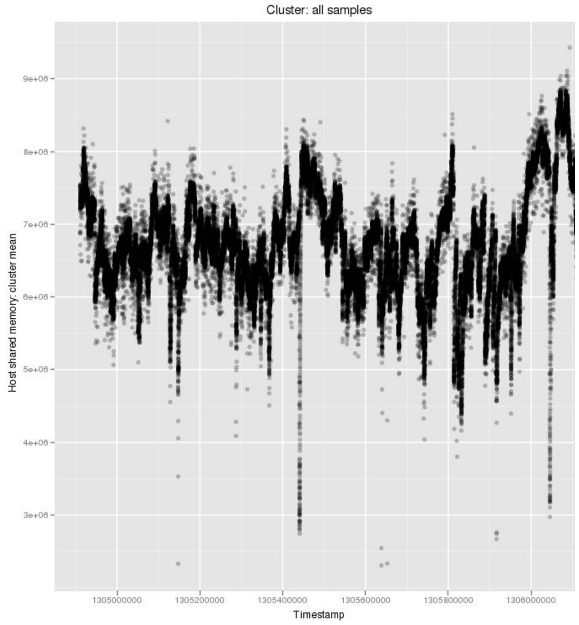
Correlation coefficient: 0.99998477434137

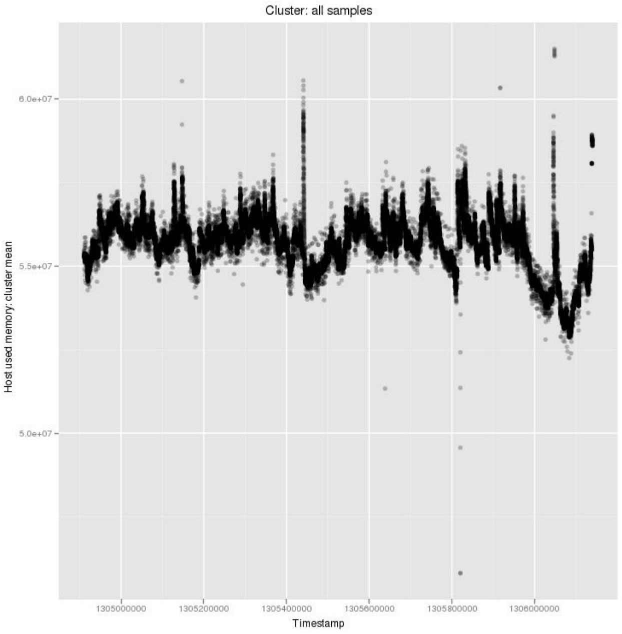
Well-visible, but numerically suppressed

Origin???

Visual analytics







Noisy…

High frequency components dominate

But they correlate (93%!)

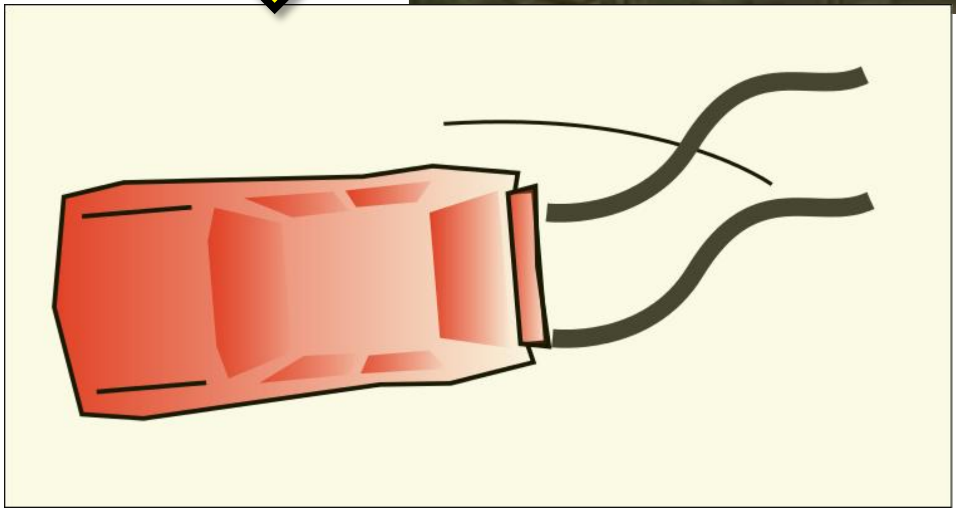
YOU DON’T SEE IT

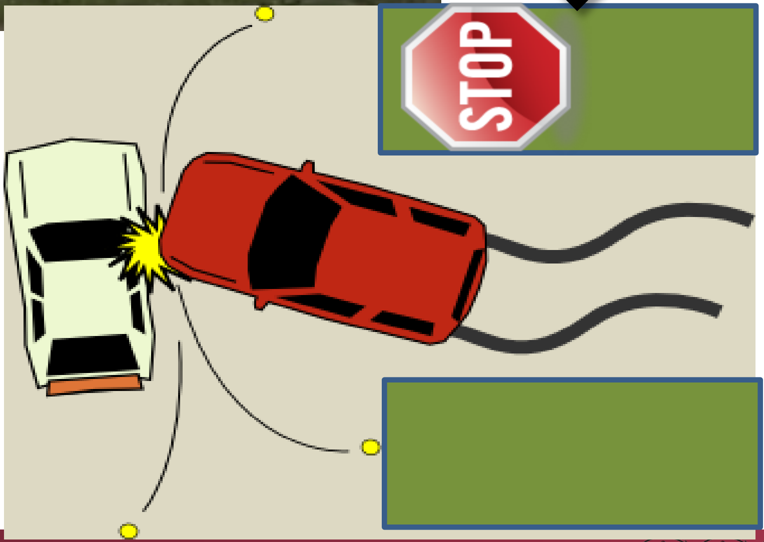
Dangers in a standard cloud for demanding apps?

Impacts of resource sharing?

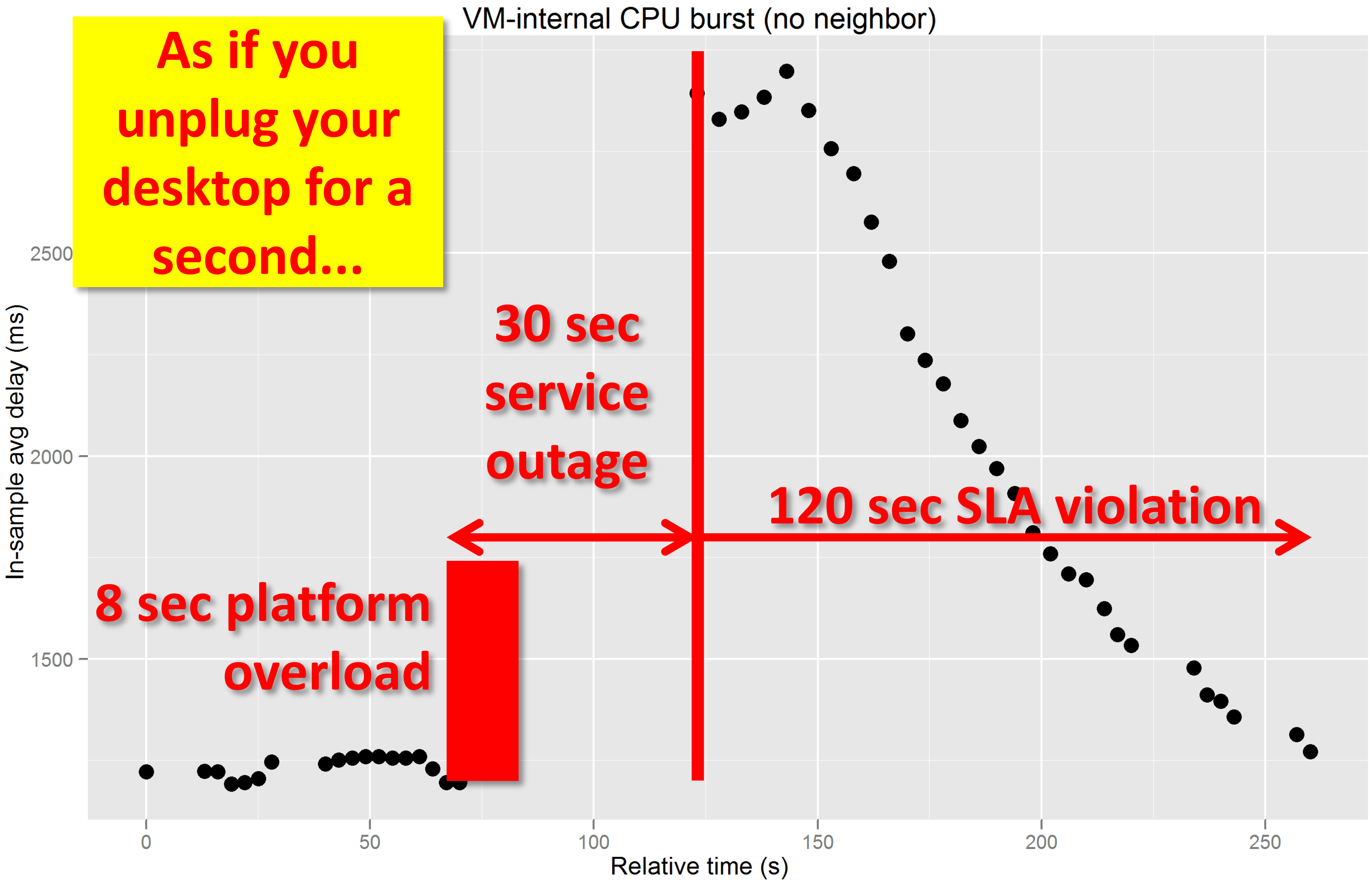
Self-induced

Parasitic influence





Short transient faults – long recovery



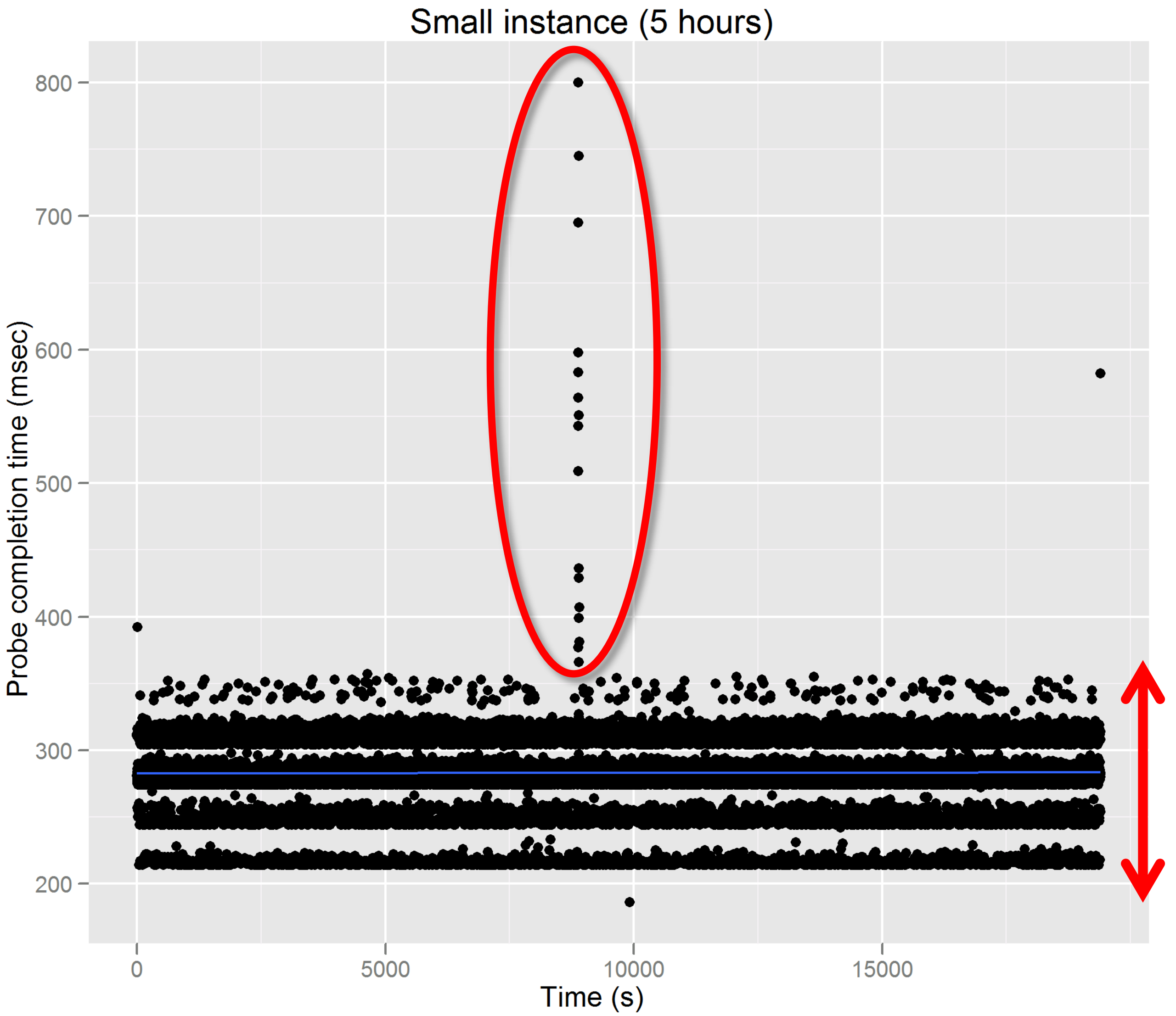
As if you unplug your desktop for a second...

30 sec service outage

120 sec SLA violation

8 sec platform overload

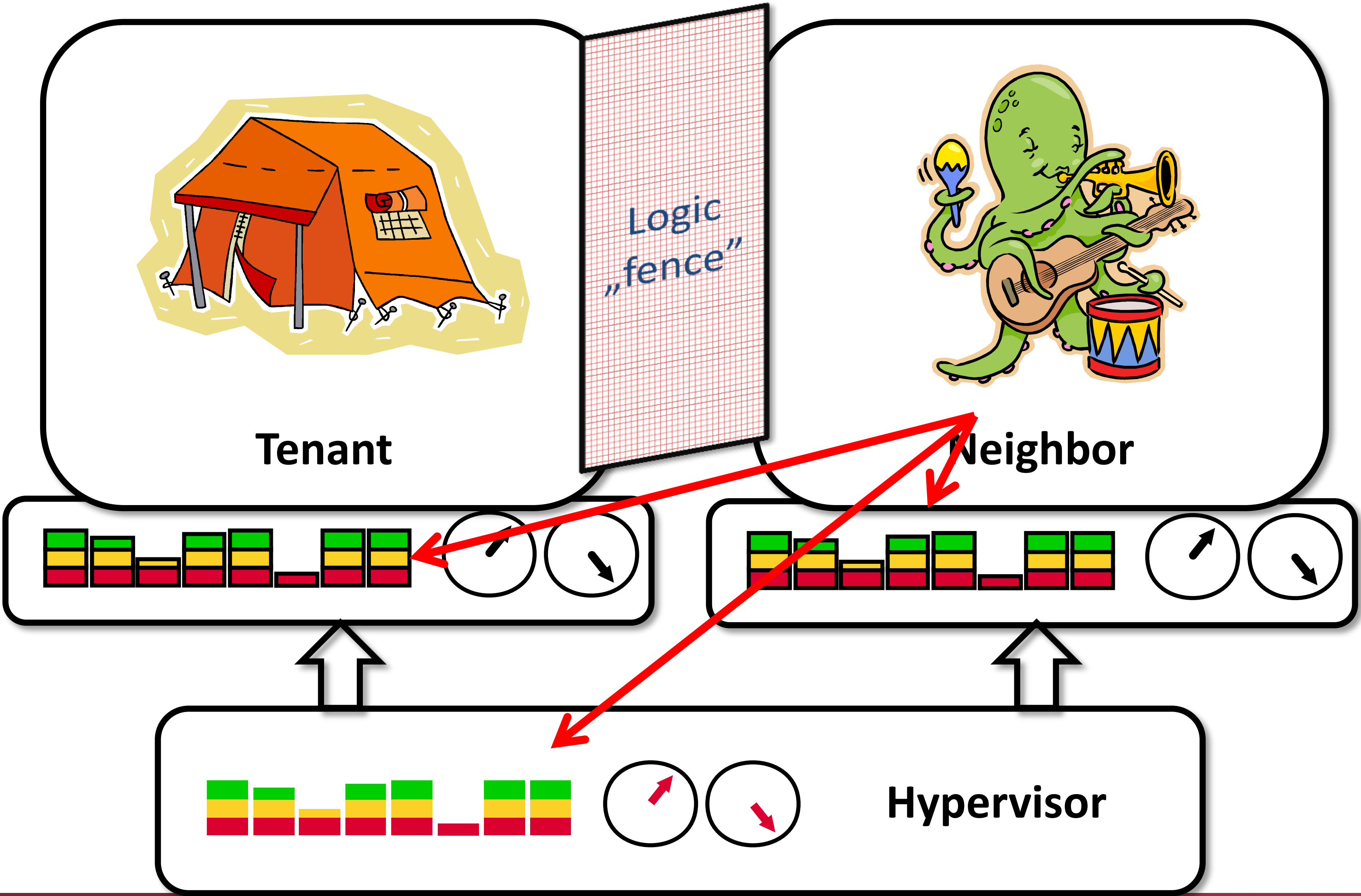
Deterministic (?!) run-time in the public cloud...



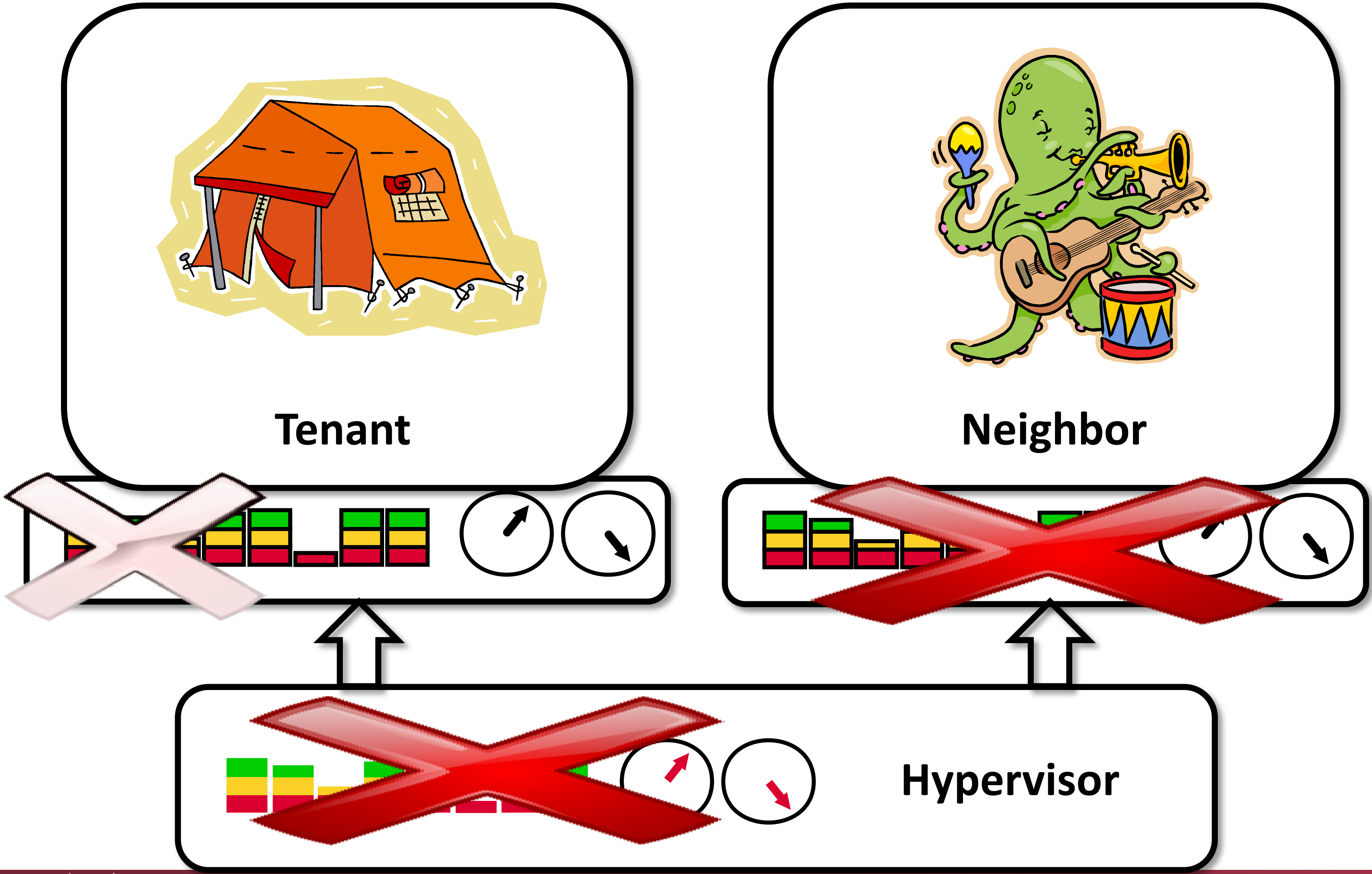
Performance outage intolerable by overcapacity

Variance tolerable by overcapacity

The noisy neighbour problem



Tenant-side measurability and observability



Let’s try it at user level

The mistery shopper concept

- Basic logic as with benchmarks, but...

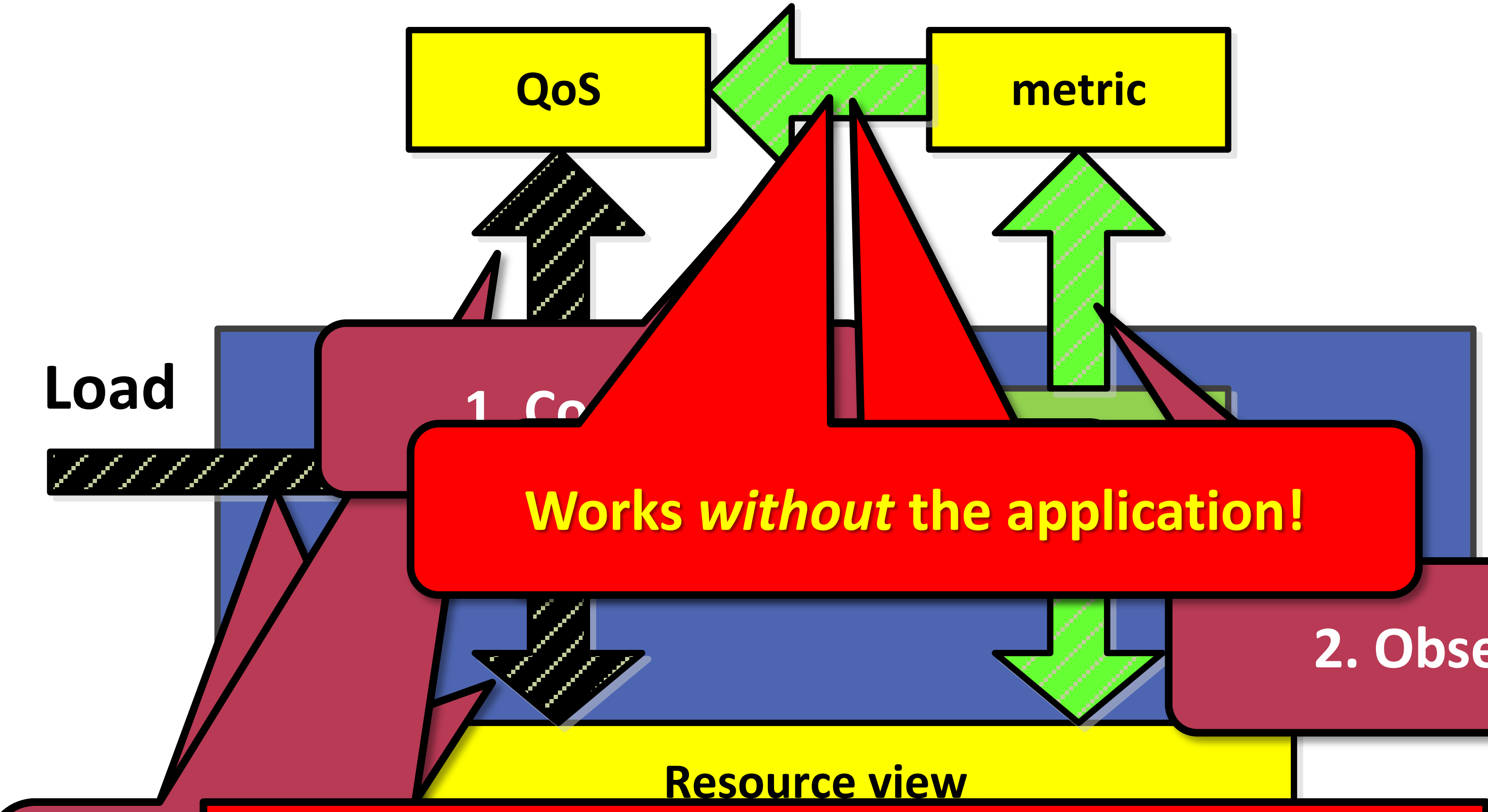
Not trivially feasible...
but everything else impossible

- Metric req:
  - same ***interference***-sensitivities as the service
  - same ***resource***-sens
  - representative for ***t***

Example: short computation bursts sampling available CPU for longer computation

- Runtime req:
  - ***Non-intrusiveness*** (instead of saturation)
  - ***Long running*** (rare events)
  - ***(Low specific impact on service)***

Indirect platform & QoS observability



1. Co

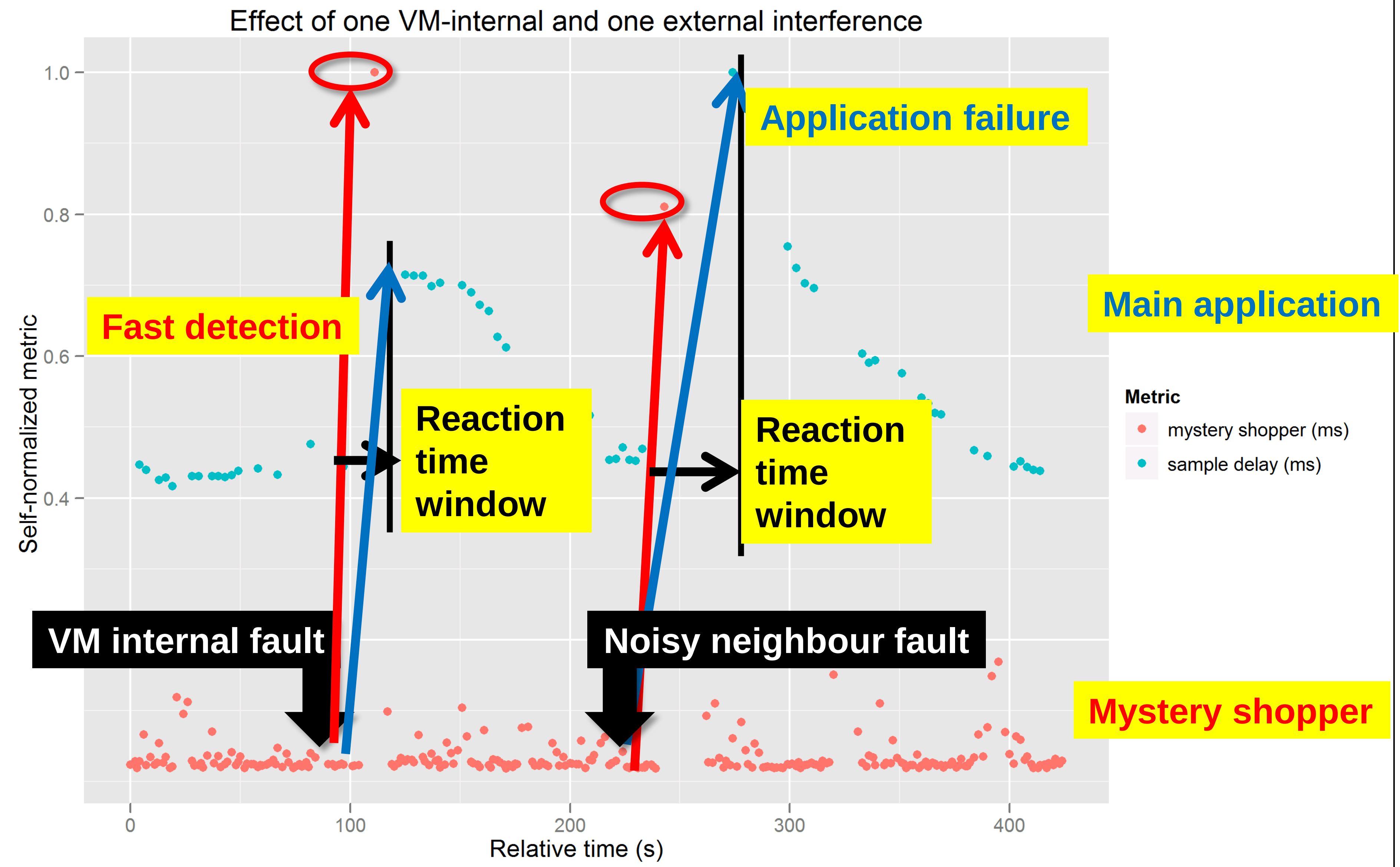
Works without the application!

2. Observe

Observability problems (if present) bypassed

deploy, run/test, observe, analyze

Mystery shopper & service QoS



Fast detection

Application failure

Main application

Reaction time window

Reaction time window

VM internal fault

Noisy neighbour fault

Mystery shopper

Summary

- Technical
  - SLA coverage needed for all aspects
  - Missing guarantees can be (somewhat) compensated
    - Cheap computing power -> redundancy
    - „Double” autonomic computing
      - Cloud level – provider
      - Application level – user
- Methodology
  - Visual exploratory data analysis for insight
  - Algorithmic analysis for proofs and evaluation
  - Fault-tolerance design patterns revisited
    - Cheap redundancy in the cloud