Summary of Research Activities

Cycle XXXI (31)

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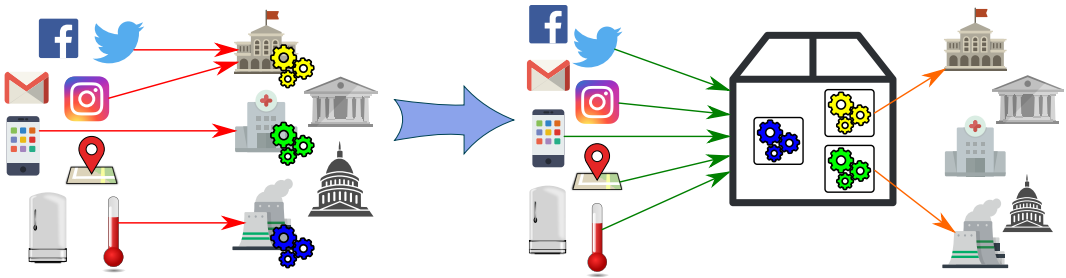
UNIVERSITÀ DEGLI STUDI
DI GENOVA

2017-10-12

Research Context

The Databox Platform



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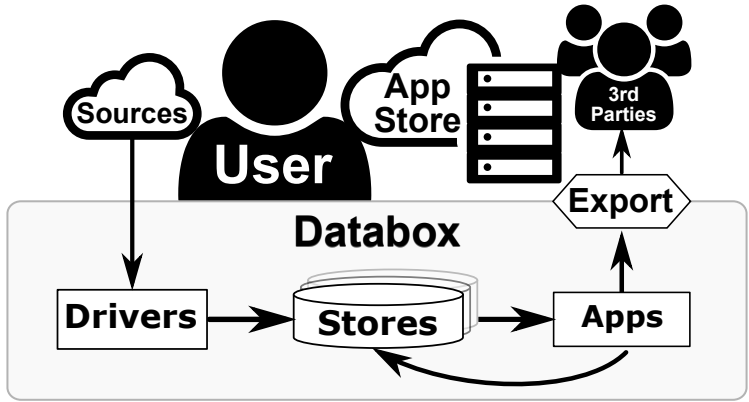

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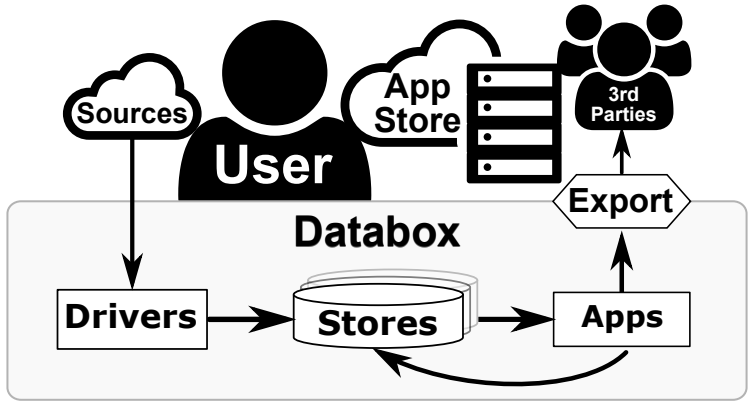
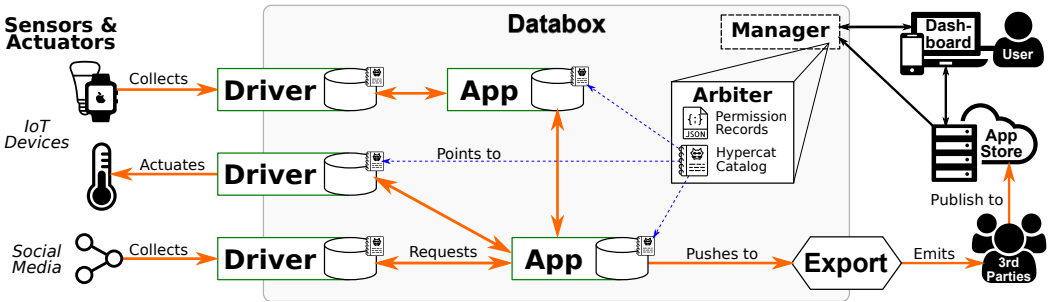


How can we design safe, scalable access control systems with arbitrary restrictions in this context?

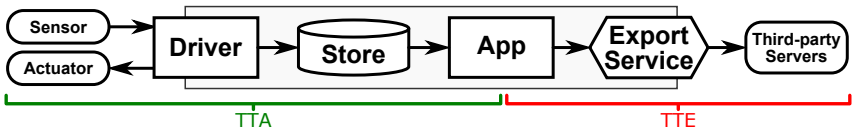
Research Context

The Databox Platform



Evaluation
Platform

- Scalability
  - Resource usage (CPU, memory, network I/O)
  - Inserts/s over stores under maximum load
  - Store launch time with and without arbiter interaction (memory bottleneck)
- Topology
  - Device → Cloud
  - Device → Cloud → Home
  - Device → Home
  - Device → Home → Cloud
- Time to Availability – High-frequency mobile sensors



The Serverless Paradigm

Background

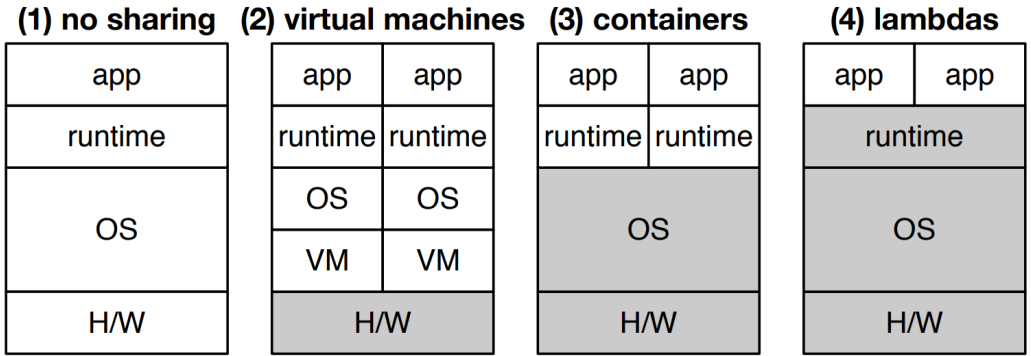


Figure 1: **Evolution of Sharing.** *Gray layers are shared.*

Figure: Hendrickson, et al. "Serverless computation with openlambda." Elastic 60 (2016): 80.

Low-latency Serverless
Approach

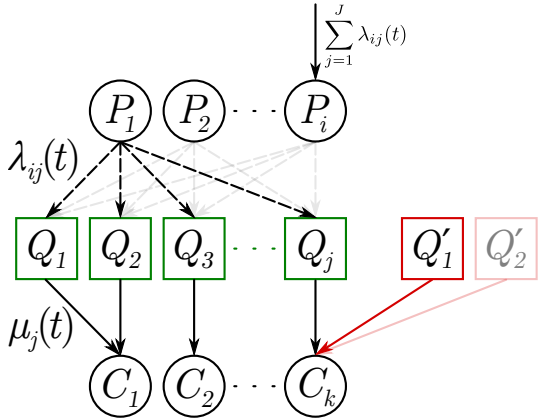


Figure: An Overview of Inter-component Relationships

Low-latency Serverless

Approach

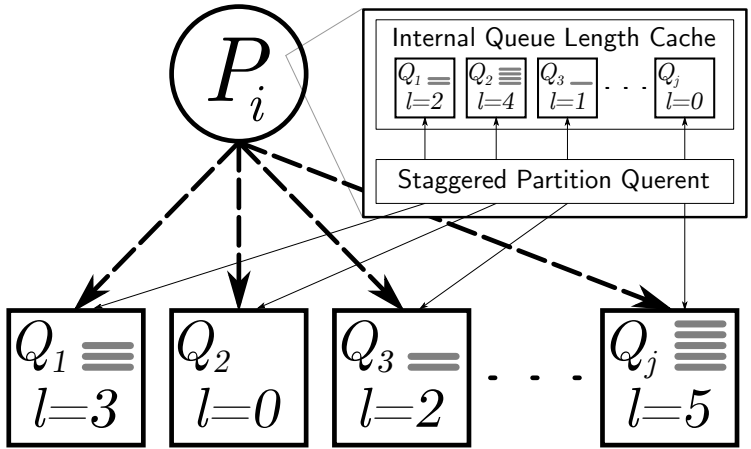


Figure: The Internal Components of a Producer

Low-latency Serverless

Approach

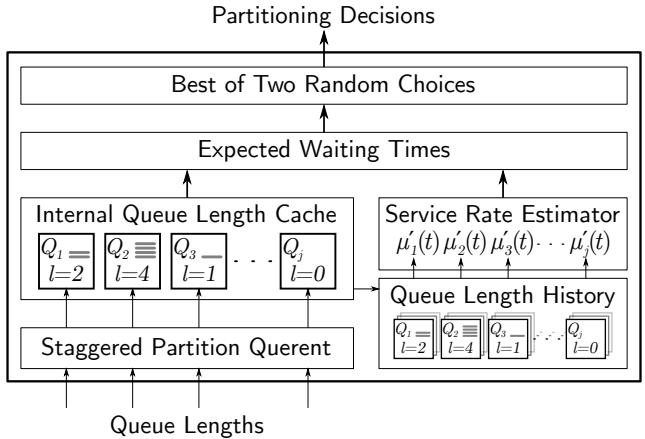


Figure: Producer-intrinsic Steps for Computing Partitioning Decisions from Stale Queue Lengths

Low-latency Serverless
Simulations

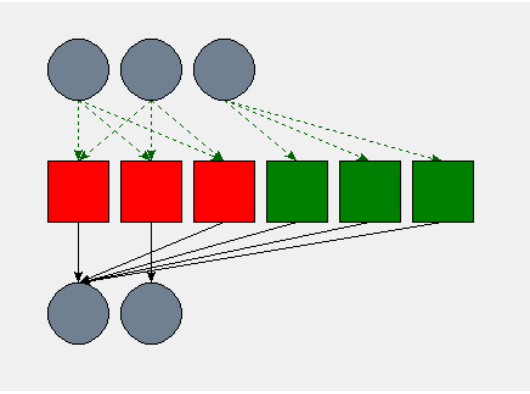


Figure: An Example of Simulation Topology

Low-latency Serverless

Simulations

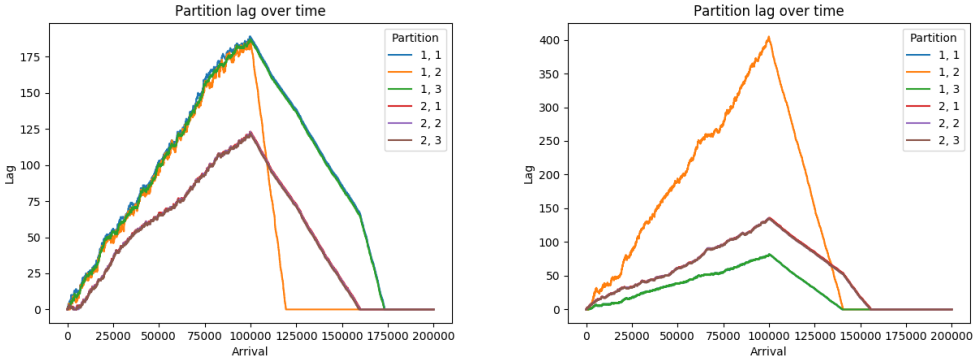


Figure: Simulation Results with Different Partitioning Algorithms

Plans
Privacy and Risk Metrics

- Measuring privacy risk is very subjective
- Information-theoretic, content-independent metrics are generalisable
- Looking just at metadata and schema of personal data, calculate objective metrics:
  - k-anonymity
  - l-diversity
  - t-closeness
- Thresholds can be embedded into tokens – privacy-aware access control for free (!)

Plans
Privacy and Risk Metrics

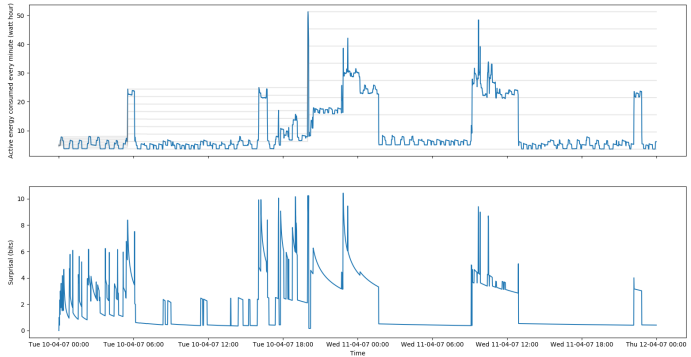
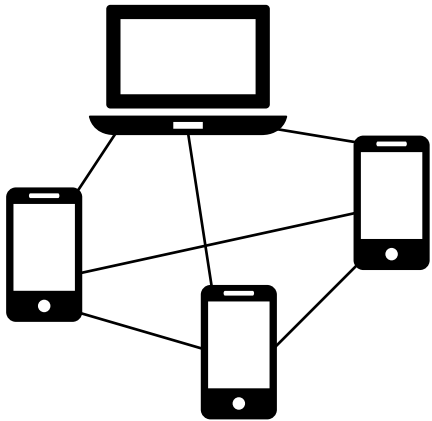


Figure: One Proof of Concept Experiment – Surprisal over Real Smart Meter Data

Plans

Serverless over Transient Clouds

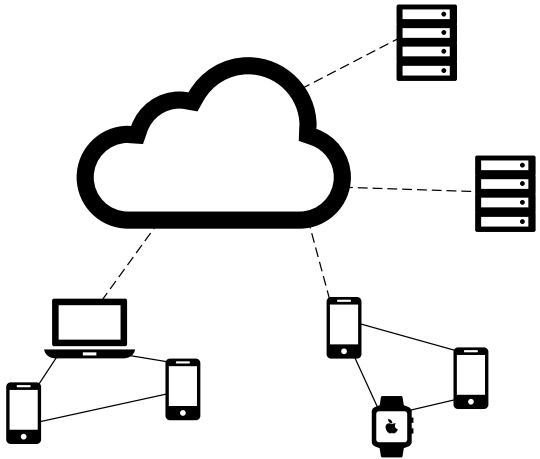
- Serverless on the edge
- Optimising for context through latency
- Processor selection based on arbitrary metrics, e.g. surprisal



Plans

Transient Privacy-Aware Clouds

- Encoding user-defined thresholds into bearer tokens
- Joint context at hierarchical levels
- TCACs $\rightarrow$ TPACs?



The Big Picture

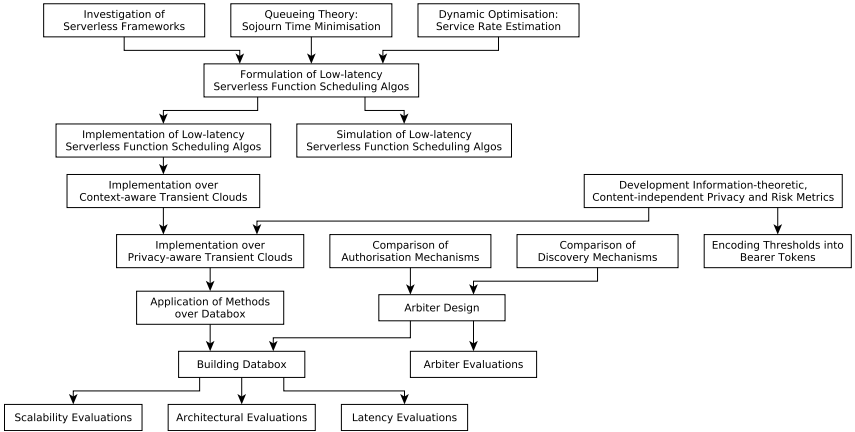


Figure: A High-level Dependency Graph of Research Activities

Thank you for your attention!

Questions?

More info: `http://yousefamar.com/`
Slides at: `https://github.com/yousefamar/unige-presentation-year2`