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Exploiting the true potential of At-Scale debug

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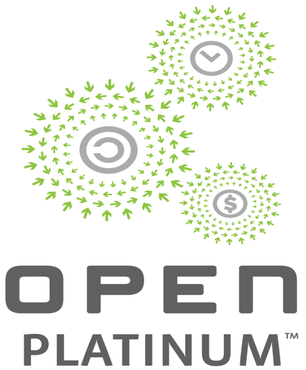
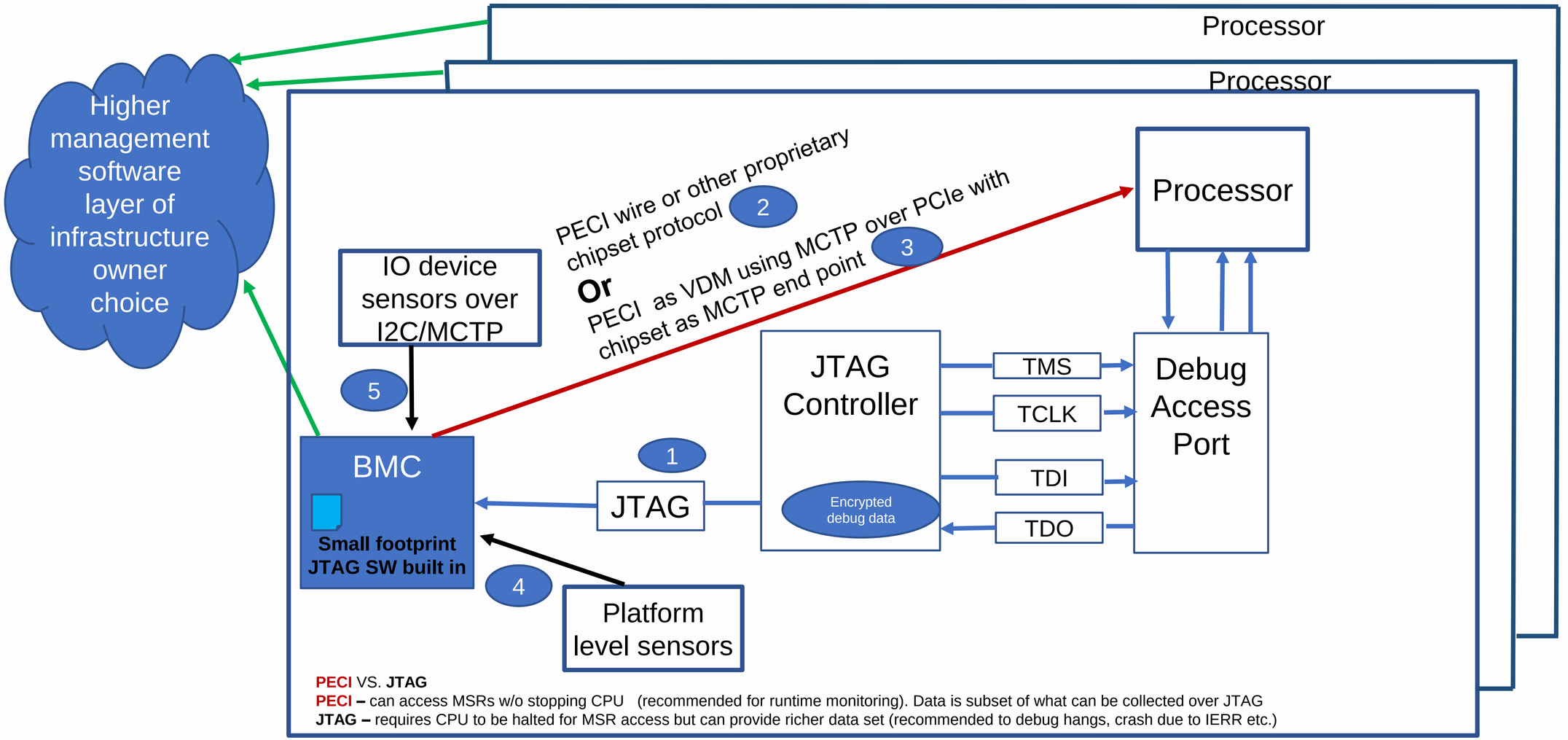


The Only Good Downtime is NO Downtime

- Cost of downtime is big in terms of $ but it is not just $
- Downtime analysis should also consider
  - “gray failures” – infrastructure up but not performing as expected
- Right data = “telemetry” from the systems is key to weeding out such issues before they persist and become a problem at scale
- Historical data is as important as data at the point to failure
- This presentation will dive into a reference implementation for server debug at scale – ***much more than JTAG connection to host chipset from BMC to mimic an In Target Probe at scale***

Platform hooks for Debug at Scale ?



PECI VS. **JTAG**
PECI – can access MSRs w/o stopping CPU (recommended for runtime monitoring). Data is subset of what can be collected over JTAG
JTAG – requires CPU to be halted for MSR access but can provide richer data set (recommended to debug hangs, crash due to IERR etc.)

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Reference Architecture

Target Capabilities

- Failure Prediction
  - Access to telemetry data (e.g. memory rd/wr bandwidth, cache allocation, power control events …etc.) for predicting Gray Failures
  - Predicting failures based on environmental conditions (high temperature, voltage …etc.)

- Failure Diagnosis
  - Some failures are hard to reproduce in a lab environment
  - Happen only at-scale in a given context, running a given workload in a given environment
  - Collecting failure and telemetry data at the point of failure is essential to diagnosing them faster and more accurately
  - Encrypted extraction of Intel micro-architectural state is key for certain hard-to-diagnose failures.

Data Analysis at the edge or at higher level ?

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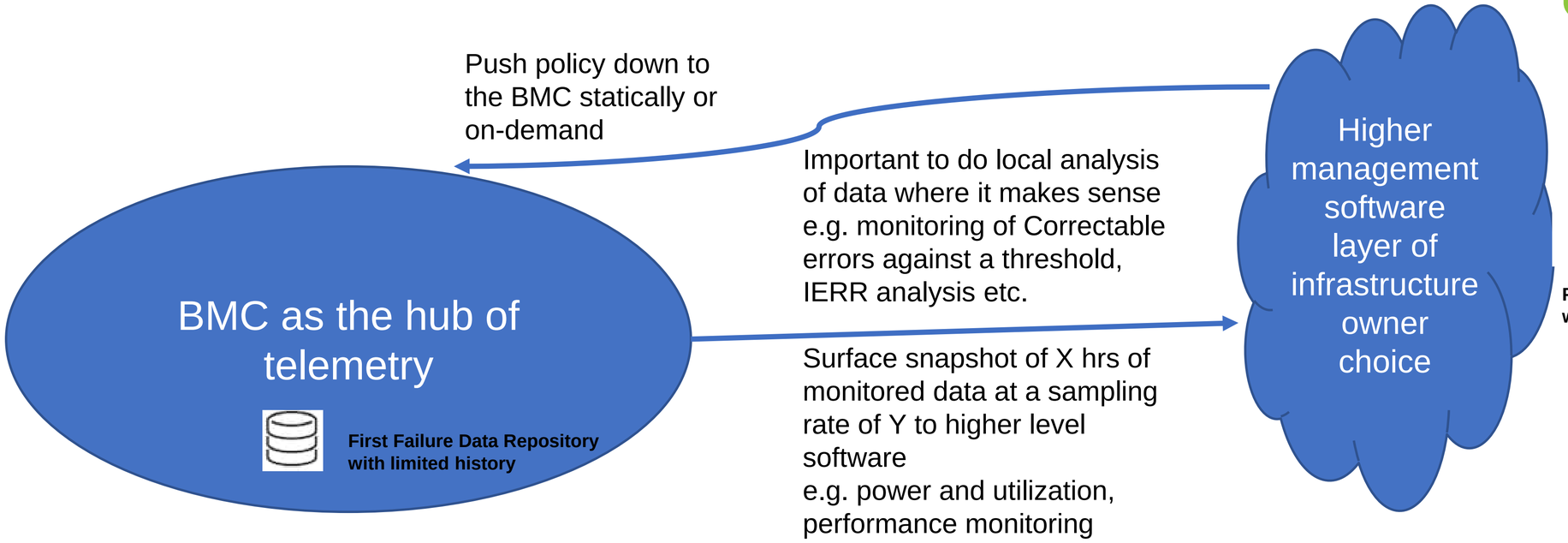

Reference Architecture

Types of telemetry possible

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Trained algorithms for detecting CPU access anomalies

BMC as the hub of telemetry

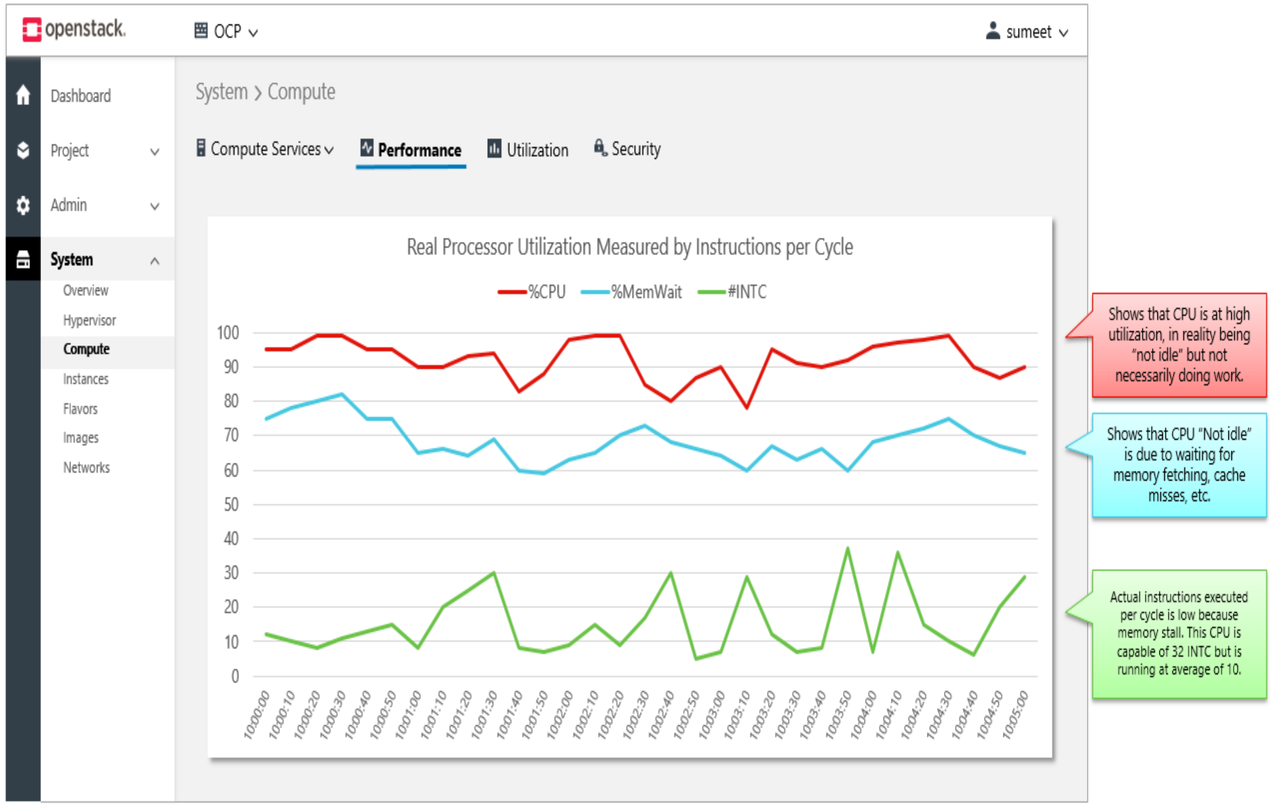
Utilization and power consumption

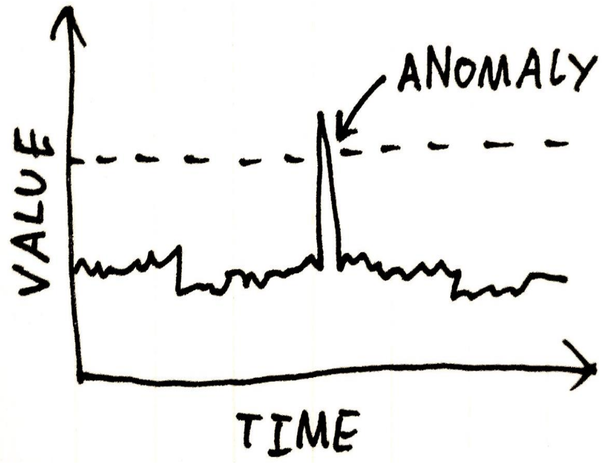
Debug at Scale

- **“Gray Failures”**
- **Crash dumps**
- **Perf**

Reference Architecture

Visual mapping of telemetry w/ plugins





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Reference Architecture

ASD – Cloud Use Models

- Runtime Monitoring – Reliability & Availability
  - Secured Telemetry – non-intrusively pull heart-beat data from remote nodes
  - Perform Predictive Analysis and take proactive actions to migrate customers' workloads to new machines
  - Compute Workloads: Multi-tenant Stateless computing - Availability is key
  - Storage Workloads: Stateful computing/pass through – Data Retention, Protection and Storage – Reliability is key
- Downtime Analysis - Serviceability and Diagnosablity
  - Remote OOB Debug interfaces required
  - FRU identification for expedited root-cause and part replacement tools/interfaces
  - Multi-tenant serviceability could be a challenge

Call to Action

- Provide feedback on the high level idea – BMC centric vs. host centric
- Welcome thoughts on type of telemetry that is of importance
- We plan to start contributing this framework to OpenBMC by end of this year. Help review and extend capabilities when available.


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