



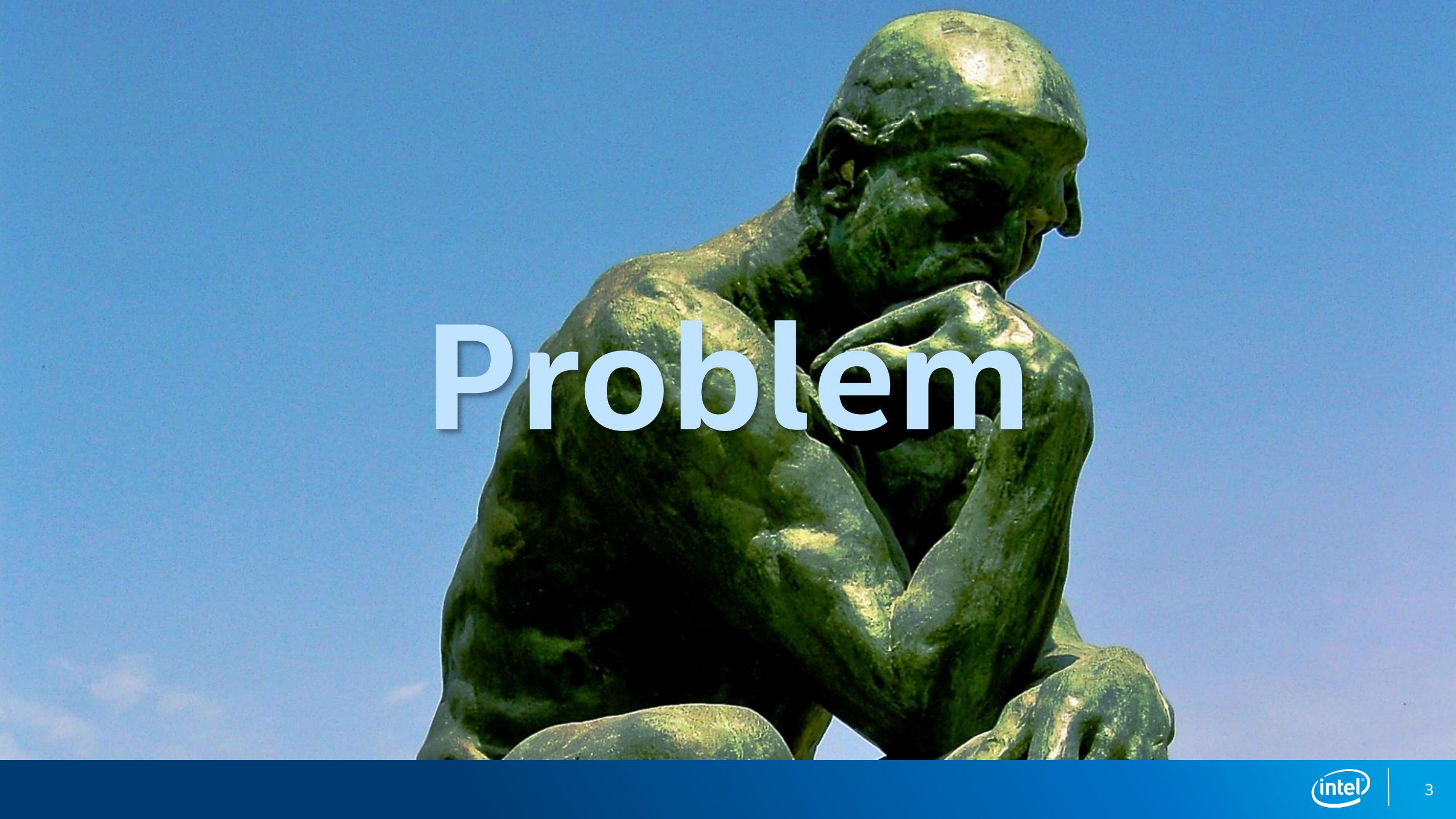
ORCHESTRATION-AWARE WORKLOAD COLLOCATION AGENT

aka OWCA

Maciej Iwanowski, Intel

Agenda

- Problem
- Past Work
- New Approach
- Architecture
- Future

A bronze statue of a man in a suit, looking down and holding his chin in his hand, symbolizing deep thought or a problem.

Problem

Noisy neighbor,
my dear Watson

Isolating High Priority

application from Best

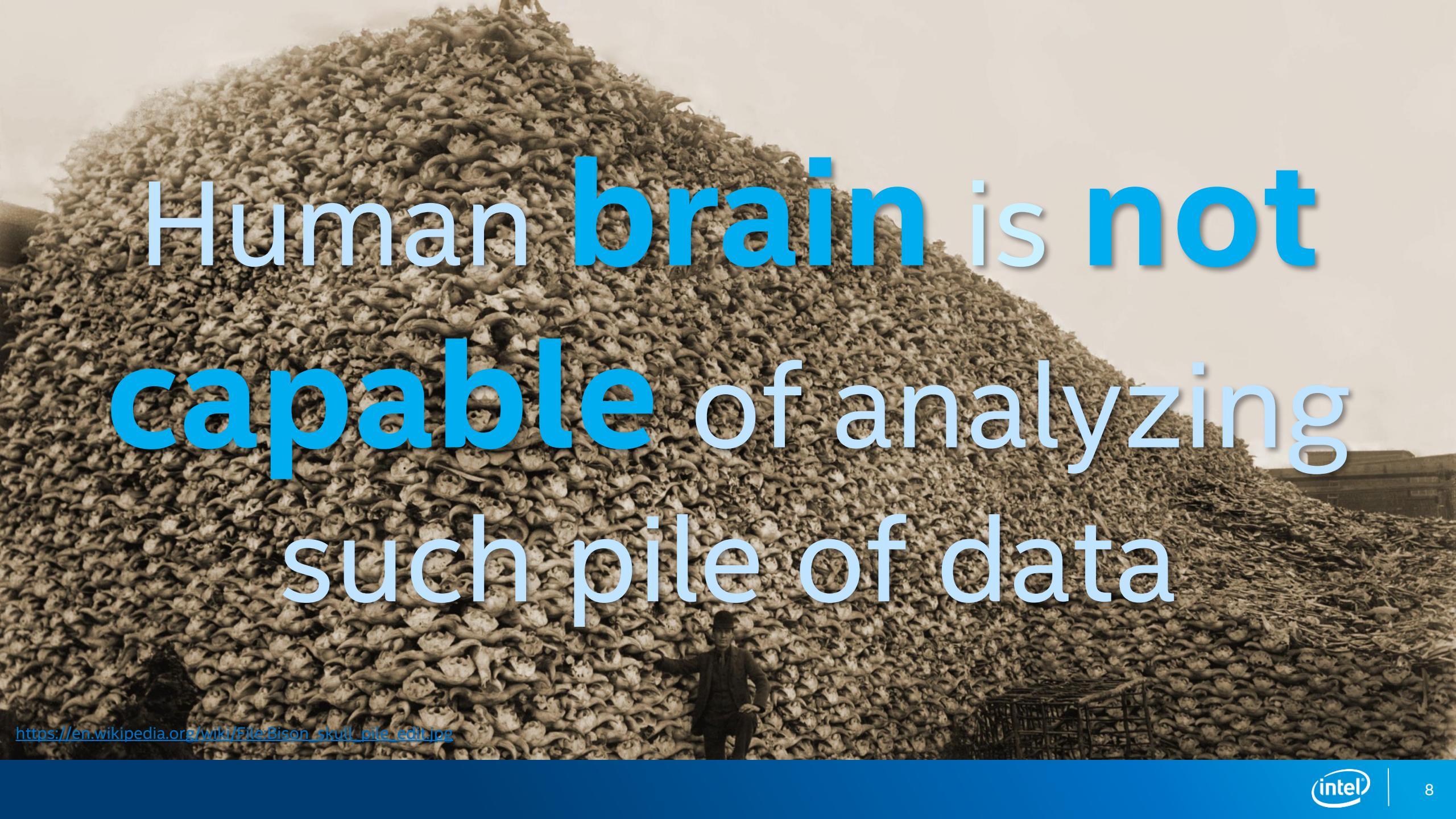
Effort ones is not
enough, though

**HP applications need to be
isolated from other HP
applications in constantly
changing environment**



Managing resources
manually on
data center scale is
impossible

<https://www.publicdomainpictures.net/en/view-image.php?image=152898&picture=mixer>

A black and white photograph showing a massive, sprawling pile of bison skulls and bones stretching across a landscape. A single person stands in the foreground on the left, wearing a dark coat and hat, looking up at the immense stack. The sheer volume of skulls emphasizes the scale of historical hunting or industrial activity.

Human brain is not
capable of analyzing
such pile of data

https://en.wikipedia.org/wiki/File:Bison_skull_pile_edit.jpg

Past Work



[https://commons.wikimedia.org/wiki/File:Archeological_dig_sites_at_Plaošnik_Monastery_-_panoramio_-_Colin_W_\(1\).jpg](https://commons.wikimedia.org/wiki/File:Archeological_dig_sites_at_Plaošnik_Monastery_-_panoramio_-_Colin_W_(1).jpg)

Mesos community and Intel
were working together on
QoS controller and
resource estimator*

* <https://github.com/mesosphere/serenity>

Since then we have been
doing a lot of
experimentation*
with workload collocation

* <https://github.com/intelsdi-x/swan>

New Approach



<https://pixnio.com/architecture/buildings/modern-architecture-construction-building-facade>

There is no one
algorithm to rule
all the workload
collocation scenarios

But there are all the
same input and
knobs for all the
algorithms

Two algorithms
are being
implemented

Anomaly Detection

- Identifies outlying values of **Cycles per Instruction, Cache Misses per Kilo Instruction and effective CPU cycles**
- Takes percentage of **CPU utilization** into consideration
- Detects anomalies on **Last Level Cache, Memory Bandwidth and power usage**
- Points at **contending tasks**

Resource Allocation

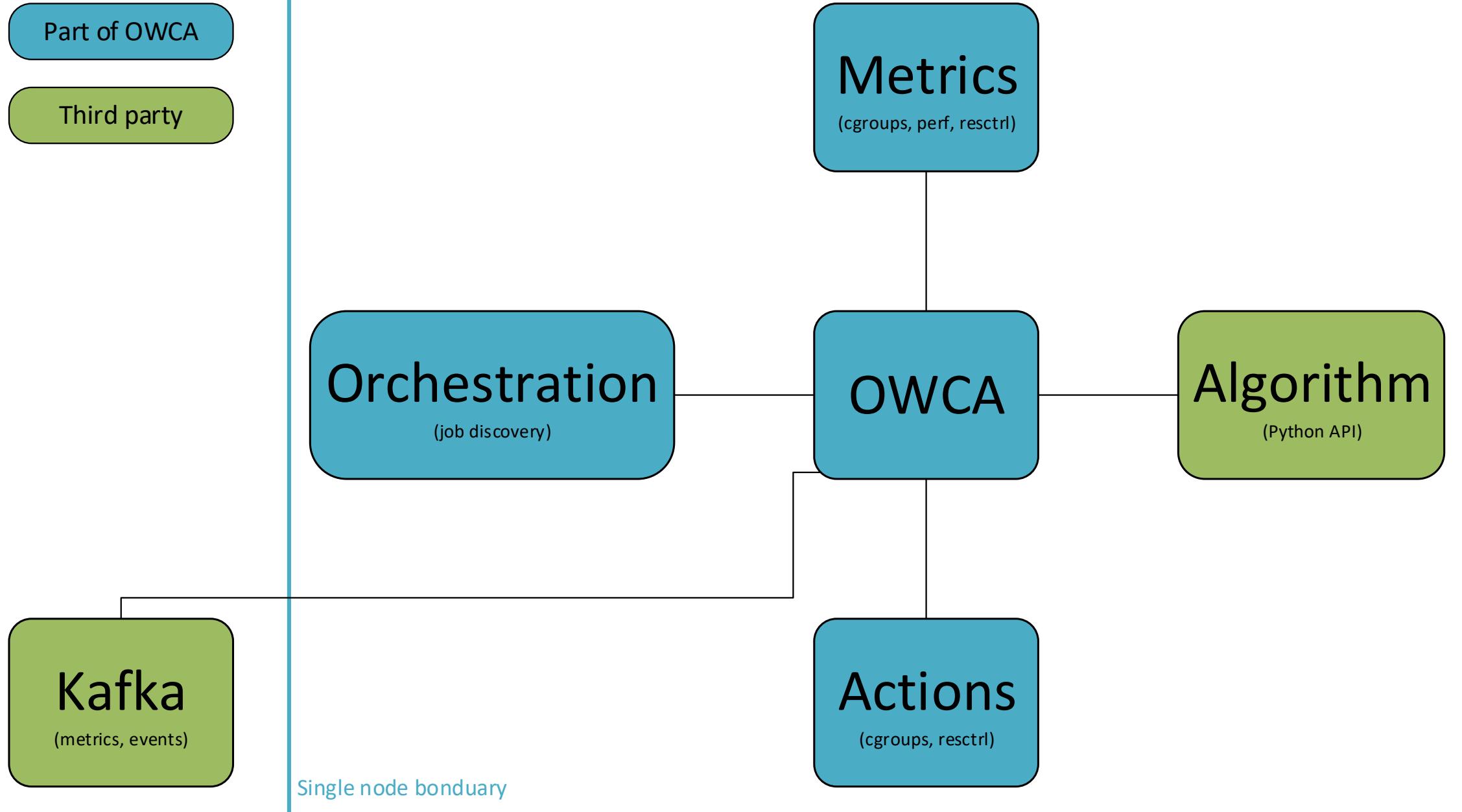
- Relies on **Anomaly Detection** algorithm
- **Allocates Last Level Cache** when LLC anomaly occurs
- Relies on **percentage of CPU time** that latency critical tasks use
- Calculates **effective headroom**
- Allocates **CFS quota and shares**

Architecture



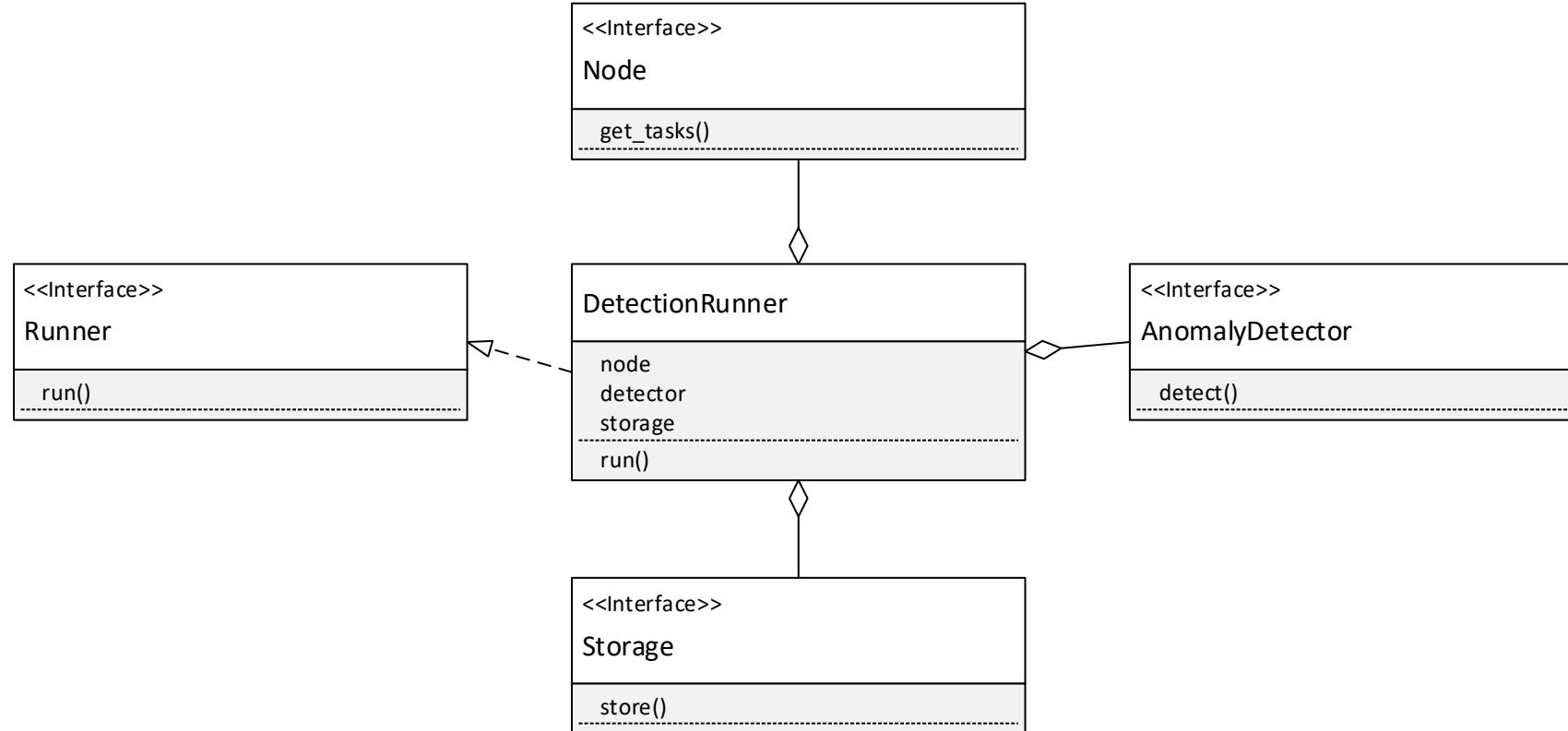
https://commons.wikimedia.org/wiki/File:Pa%C5%82ac_Kultury_i_Nauki_-_Pa%C5%82ac_M%C5%82odzie%C5%BCCy_w_Warszawie.JPG

Each node must
operate
independently of
other nodes

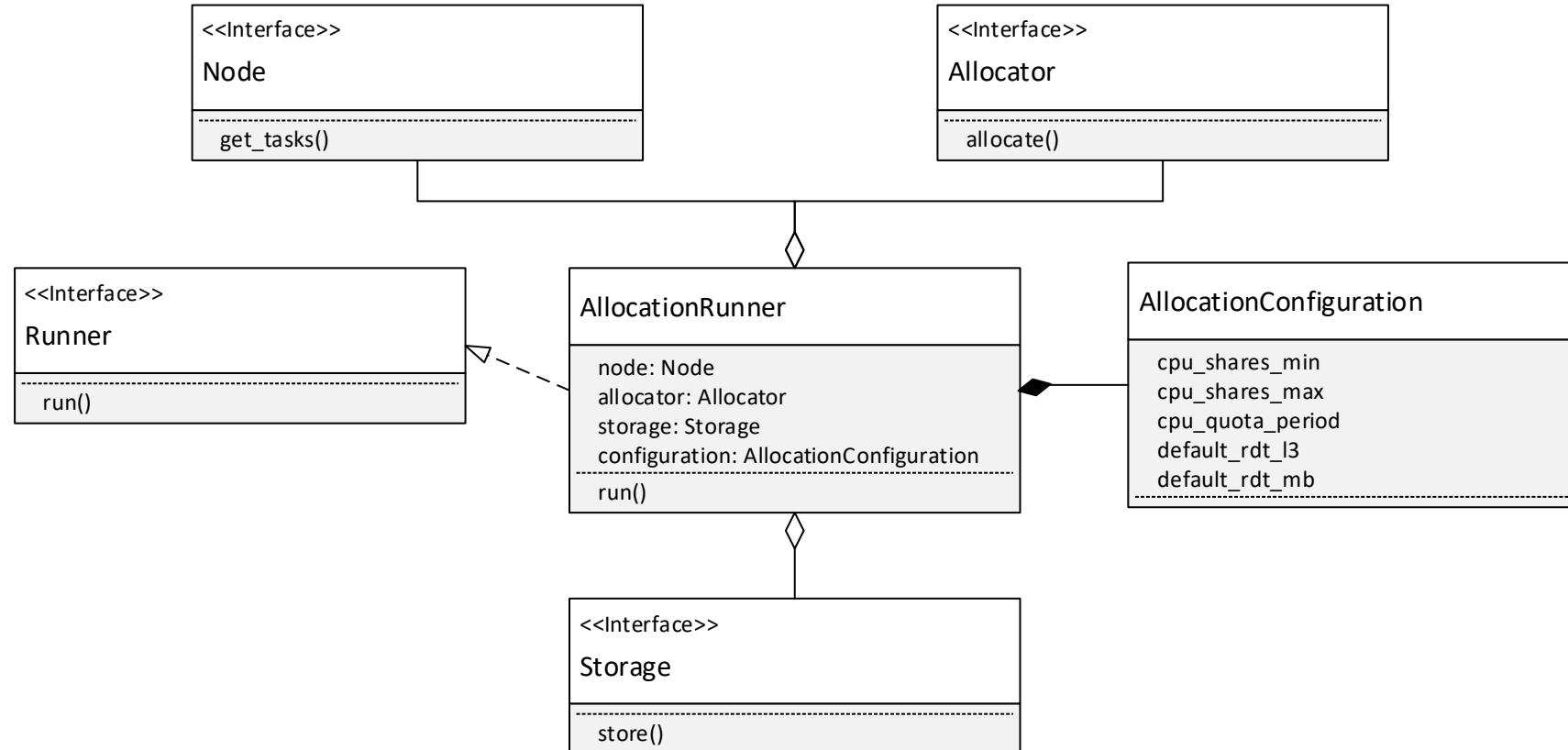


It must be possible to
swap one algorithm
with another easily

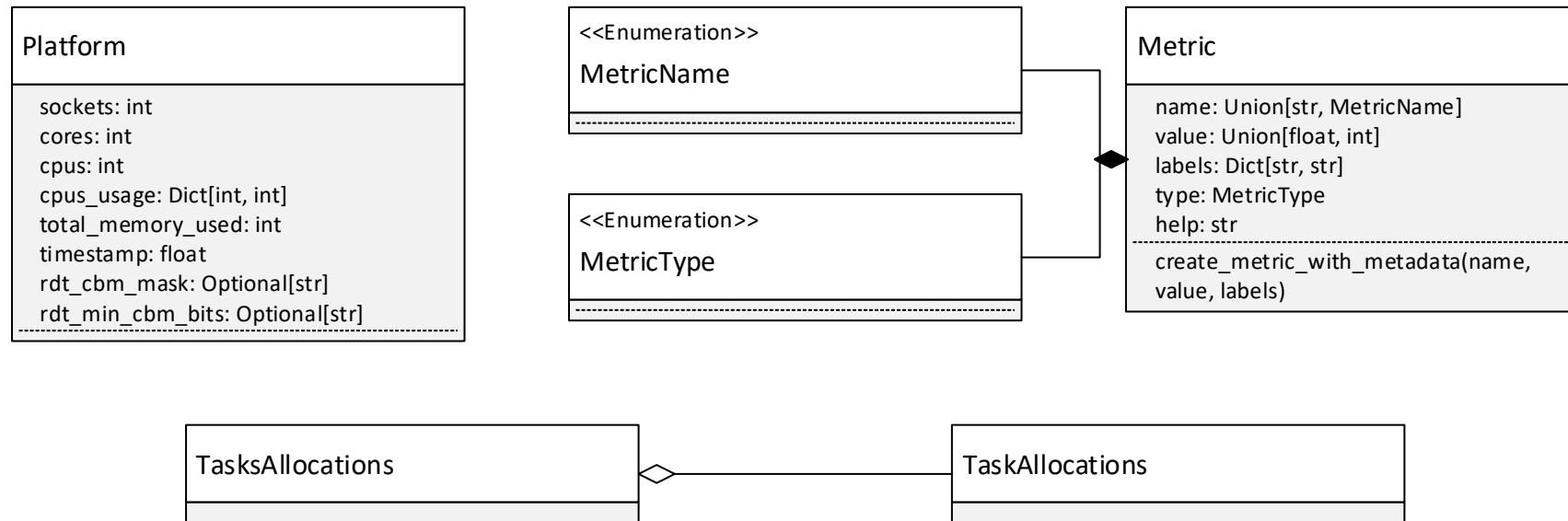
Anomaly Detection



Resource Allocation

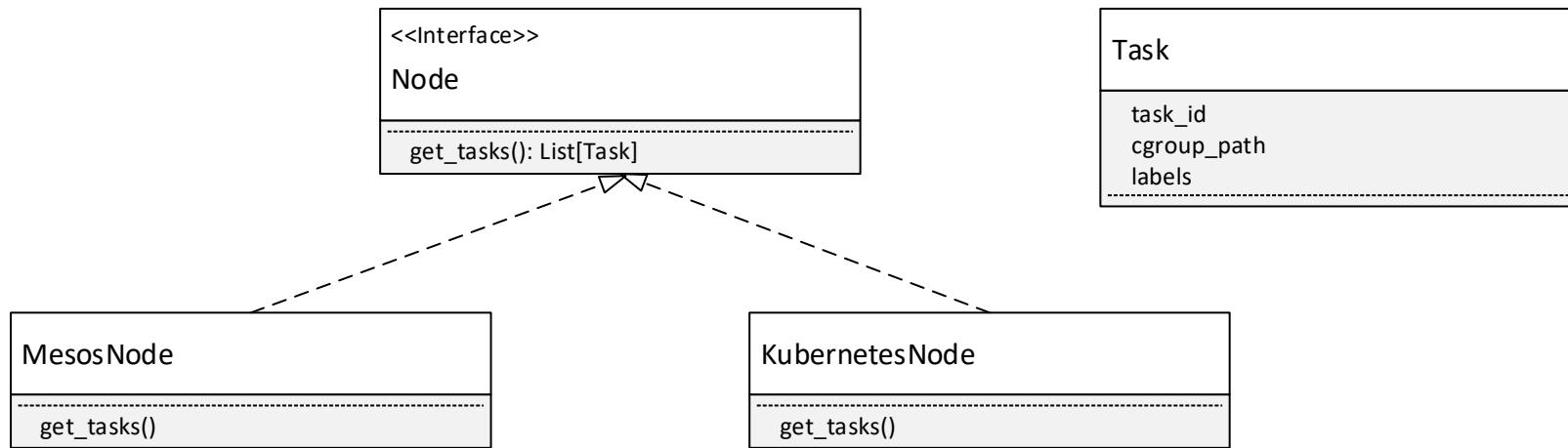


Communication Primitives

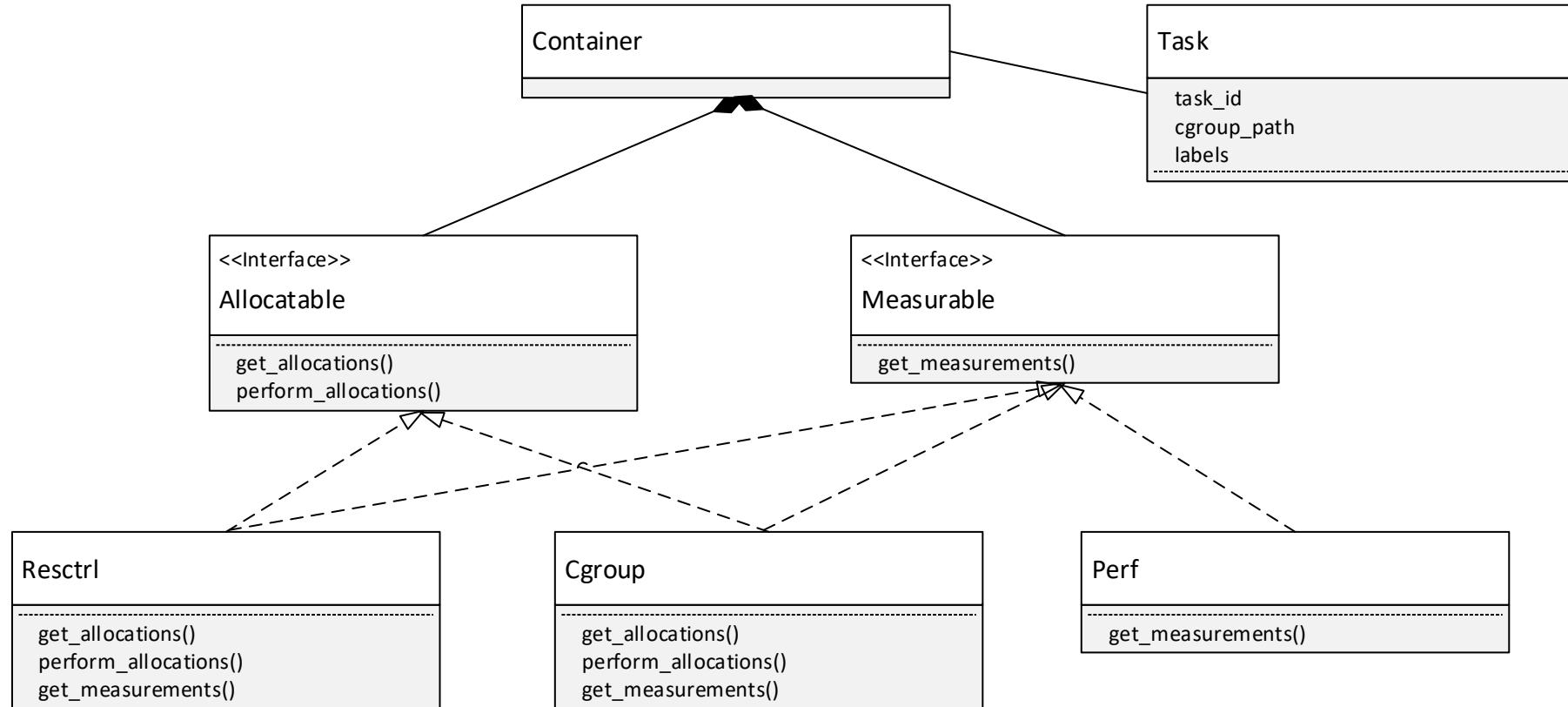


Solution must be
integrated with
existing orchestration
stack

Job Discovery



Resources: Consumption And Allocation

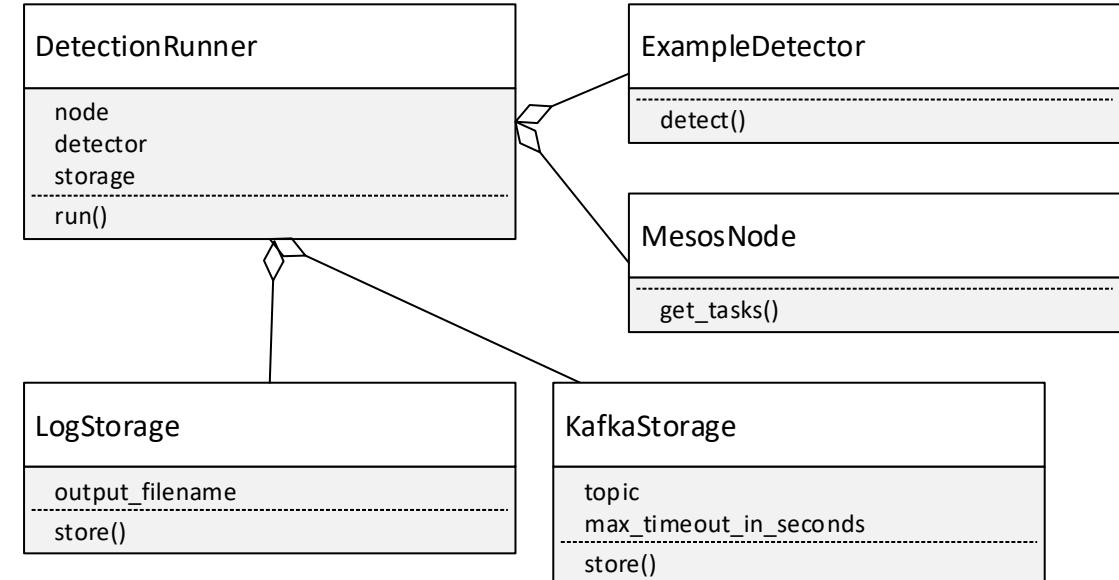


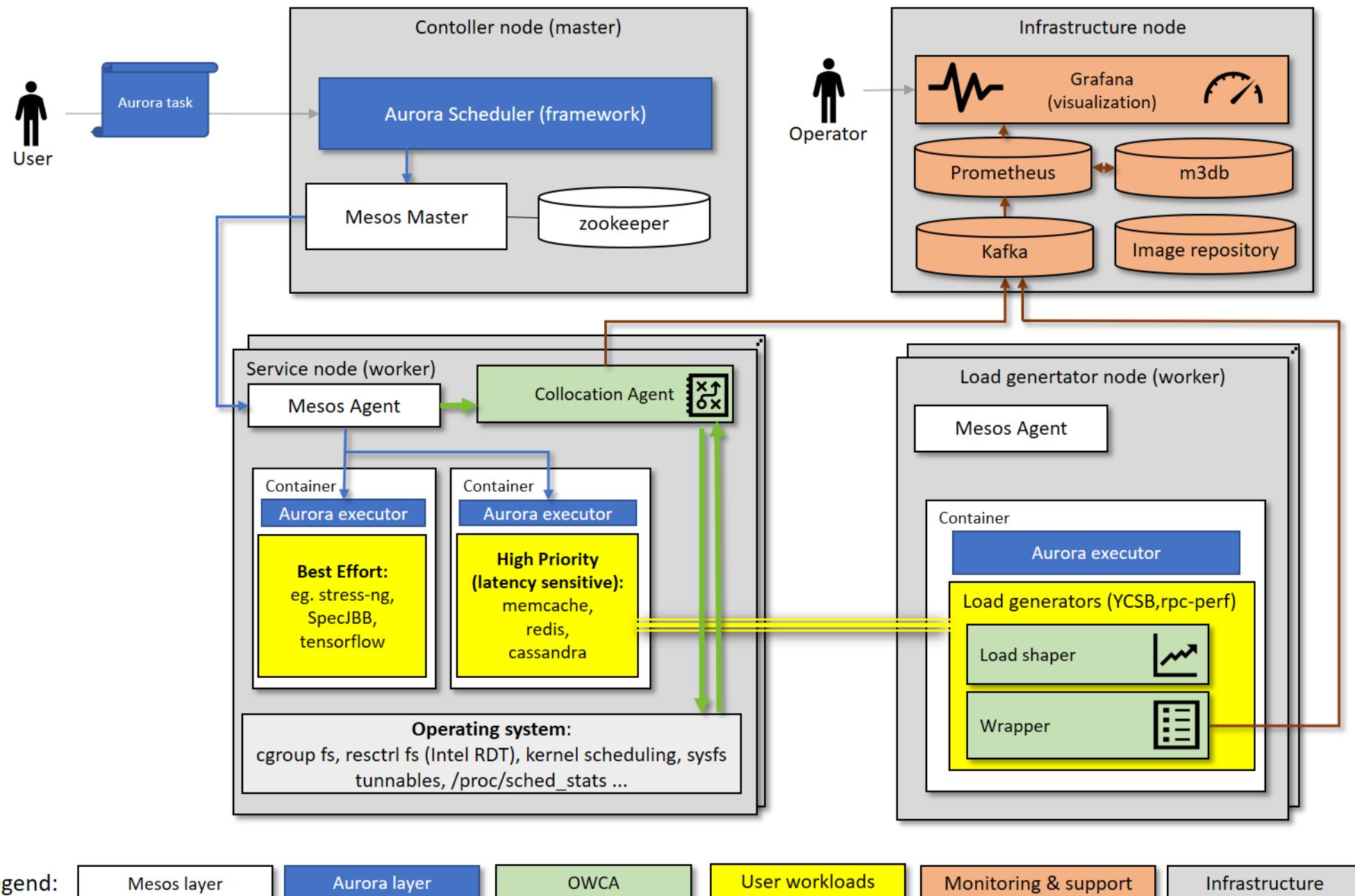
Dependency Injection

```
runner: !DetectionRunner
node: !MesosNode
action_delay: 1.

anomalies_storage: !KafkaStorage
topic: owca_anomalies
max_timeout_in_seconds: 5.
metrics_storage: !LogStorage
output_filename: '/tmp/metrics.log'

# Use external component.
# Requires registration with
# -r example.external_package:ExternalDetector
detector: !ExampleDetector
```





A photograph showing the back of a man's head and shoulders. He is wearing a light-colored military-style shirt and has a black watch on his left wrist. He is looking through a pair of binoculars. In the background, there is a body of water with some boats and a distant pier or industrial area under a cloudy sky.

Future

[https://commons.wikimedia.org/wiki/File:US_Navy_090321-N-9909C-152_Vice_Adm._Bill_Gortney_watches_through_binoculars_as_the_Los_Angeles-class_attack_submarine_USS_Hartford_\(SSN_768\)_transits_into_Mina_Salman_pier_in_Bahrain.jpg](https://commons.wikimedia.org/wiki/File:US_Navy_090321-N-9909C-152_Vice_Adm._Bill_Gortney_watches_through_binoculars_as_the_Los_Angeles-class_attack_submarine_USS_Hartford_(SSN_768)_transits_into_Mina_Salman_pier_in_Bahrain.jpg)

We want to move a
sidecar into upstream

We will be adding
more algorithms

We are going to add
more workloads
to existing suite

Last but not least:
renaming 'ɔf.tſa to
something easier to
pronounce

We've had tough
time looking for
an **equally**
good name...



Links

- [Repository](#)
- [Architecture document](#)
- [Initial algorithms implementation](#)

