Have a look at our projects on GitHub:
https://github.com/MatterMiners

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Transparent expansion of a WLCG compute site using HPC resources

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Development of the Situation in HEP Computing

Abundance of Data and Heterogeneous Resources

- Unprecedented amounts of data will produce a huge demand for computing resources in the next years
- Non-HEP computing resources will be available, however, not fulfill HEP specific demands

Transparent and Dynamic Resource Allocation

- Resources have to be made available to the users in a transparent way, optimally without any changes to the user's workflow
- Jobs need specific environments to run, e.g. specific operating systems, software versions or file systems

Dynamic Resource Integration using COBalD and TARDIS

COBalD – The Opportunistic Balancing Daemon

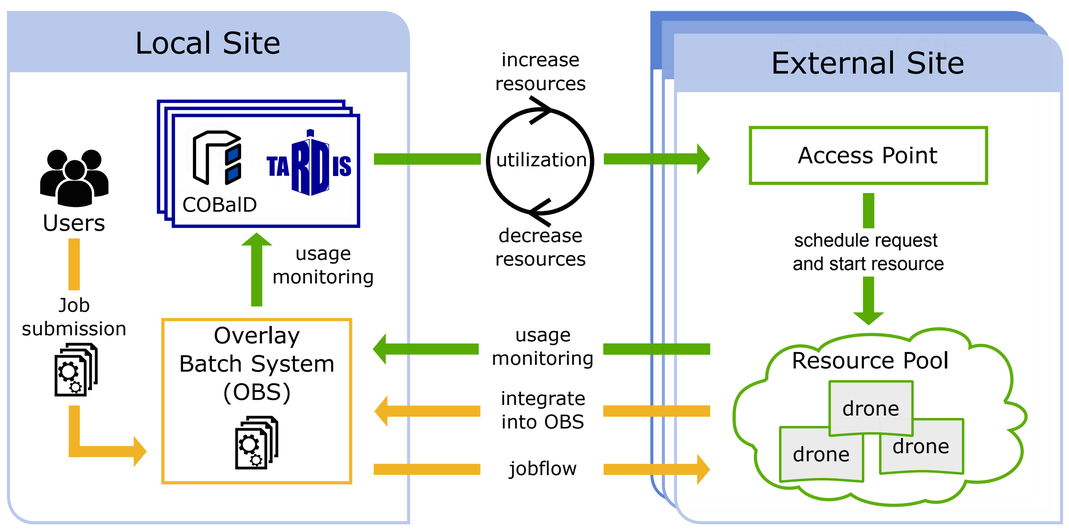
COBalD [1] is a meta-scheduler:

- By grouping indistinguishable resources into pools, COBalD can assess the overall utilization of those resources in the pool
- COBalD then adjusts the number of resources per pool to the current demand

Transparent Adaptive Resource Dynamic Integration System: TARDIS

TARDIS [2] interfaces the resources and integrates them into an overlay batch system (OBS):

- The OBS acts as single point of entry for the users and performs authentication and authorization
- Resources are abstracted as drones, constituting the worker node component of the OBS
- Jobs are started in containers or virtual machines to provide the required environment
- TARDIS has full control over the life cycle of the drones



Example: HPC Cluster at RWTH WLCG Tier 2

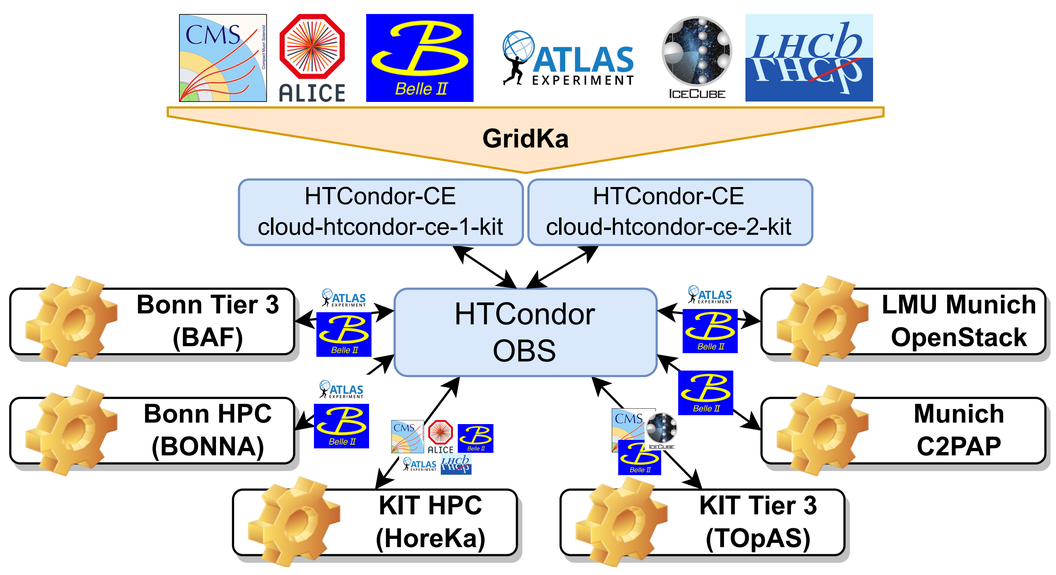
University HPC Cluster

- The university HPC cluster CLAIX at the RWTH Aachen University is dynamically integrated into the WLCG tier 2 site, operated by the local physics department, using COBalD/TARDIS
- The WLCG tier 2's HTCondor [3] batch system acts as OBS, starting the jobs in Singularity containers served through CVMFS
- More than 10 million core-h could be provided additionally to the CMS experiment in 2022 already

Heterogeneous Resources in HEP Infrastructure

- COBalD/TARDIS enables provisioning of resources from HPC clusters and cloud providers through a single point of entry
- By providing the required environment through lightweight virtualization technologies, virtually any resource can be used for HEP

Example: Cloud Resources at KIT WLCG Tier 1



Federated cloud resources

- KIT operates WLCG entry point (compute element) explicit for cloud resources
- Using COBalD/TARDIS, resources from multiple research institutes throughout Germany are integrated into a single HTCondor OBS
- More than 20 million core-h could be provided additionally to the experiments in 2022 already

Have a look at the current status of the cloud resources at KIT!

[1] COBalD: https://github.com/MatterMiners/cobald
[2] TARDIS: https://github.com/MatterMiners/tardis
[3] HTCondor: http://research.cs.wisc.edu/htcondor/

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