Utilizing cloud computing resources for Belle-II

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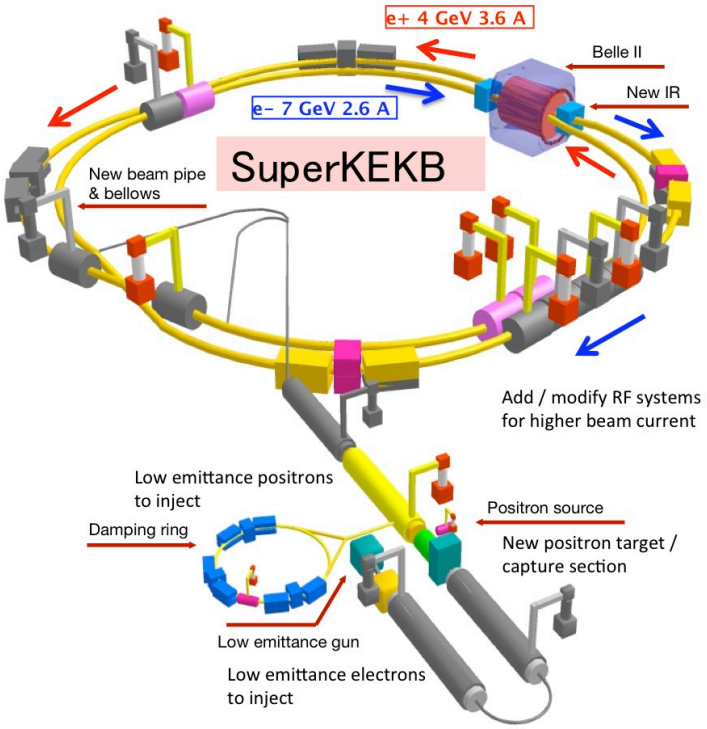
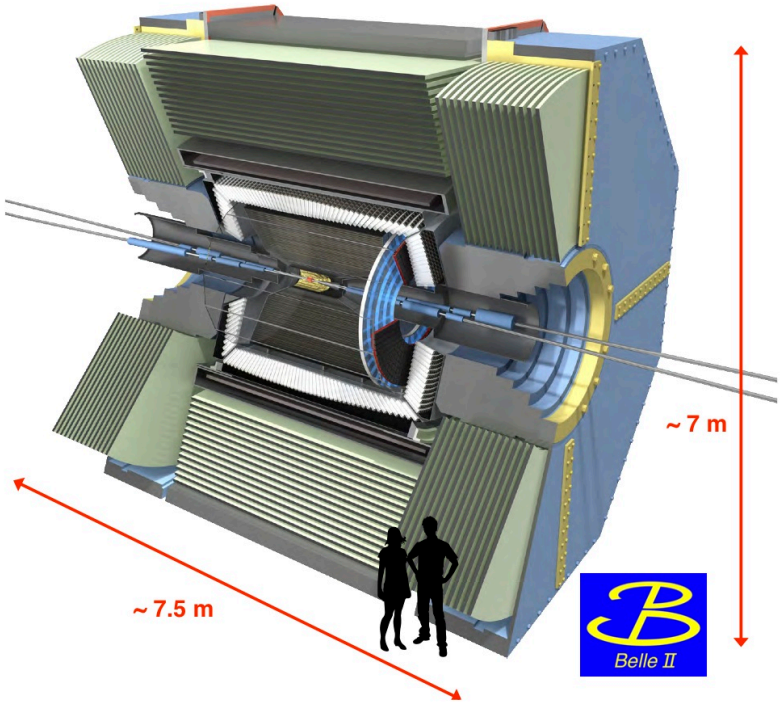
On behalf of the Belle-II Collaboration

Belle-II Experiment

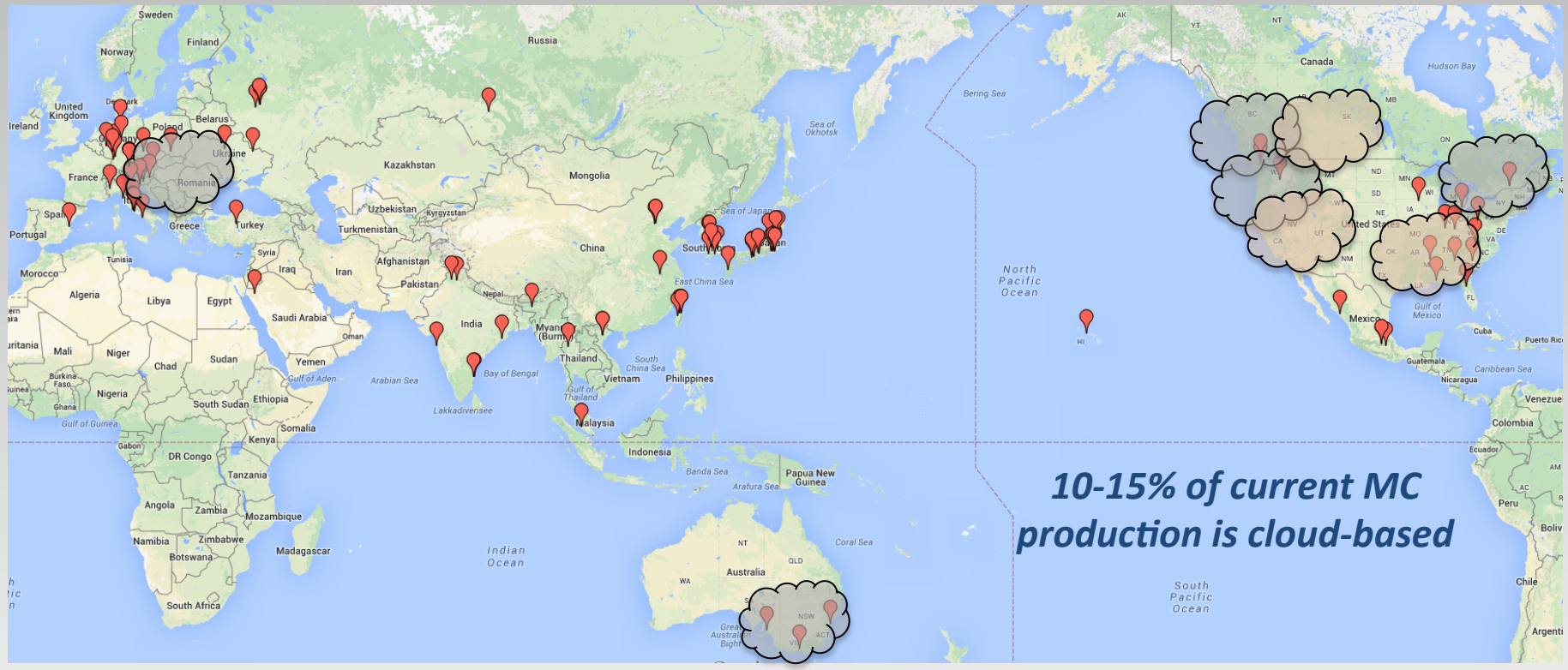




High-intensity frontier
Accelerator commissioning in 2016
Data taking starts in 2017

Belle-II computing model
WLCG structure
Shared infrastructure
See talk by Hara-san

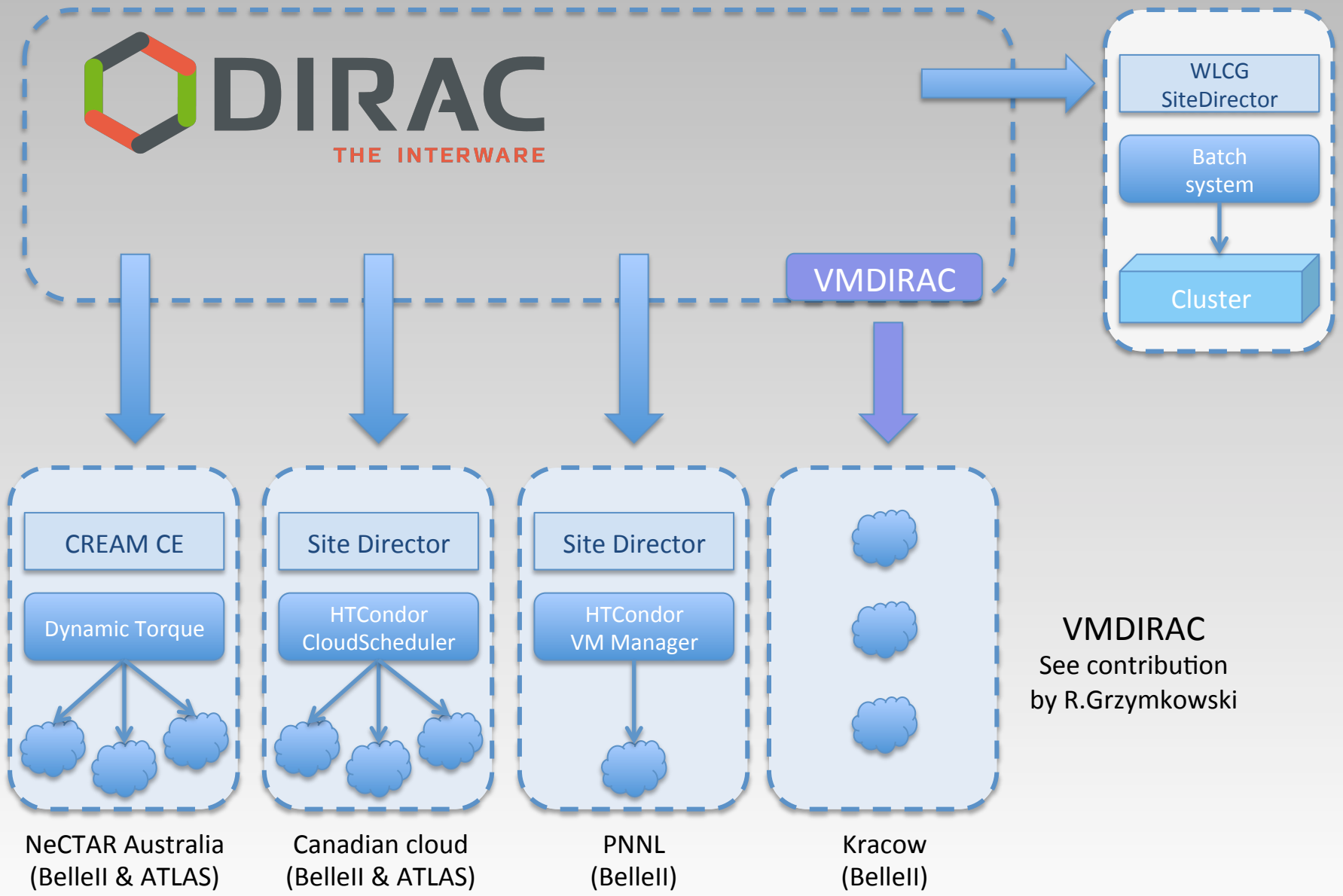
Clouds in Belle-II



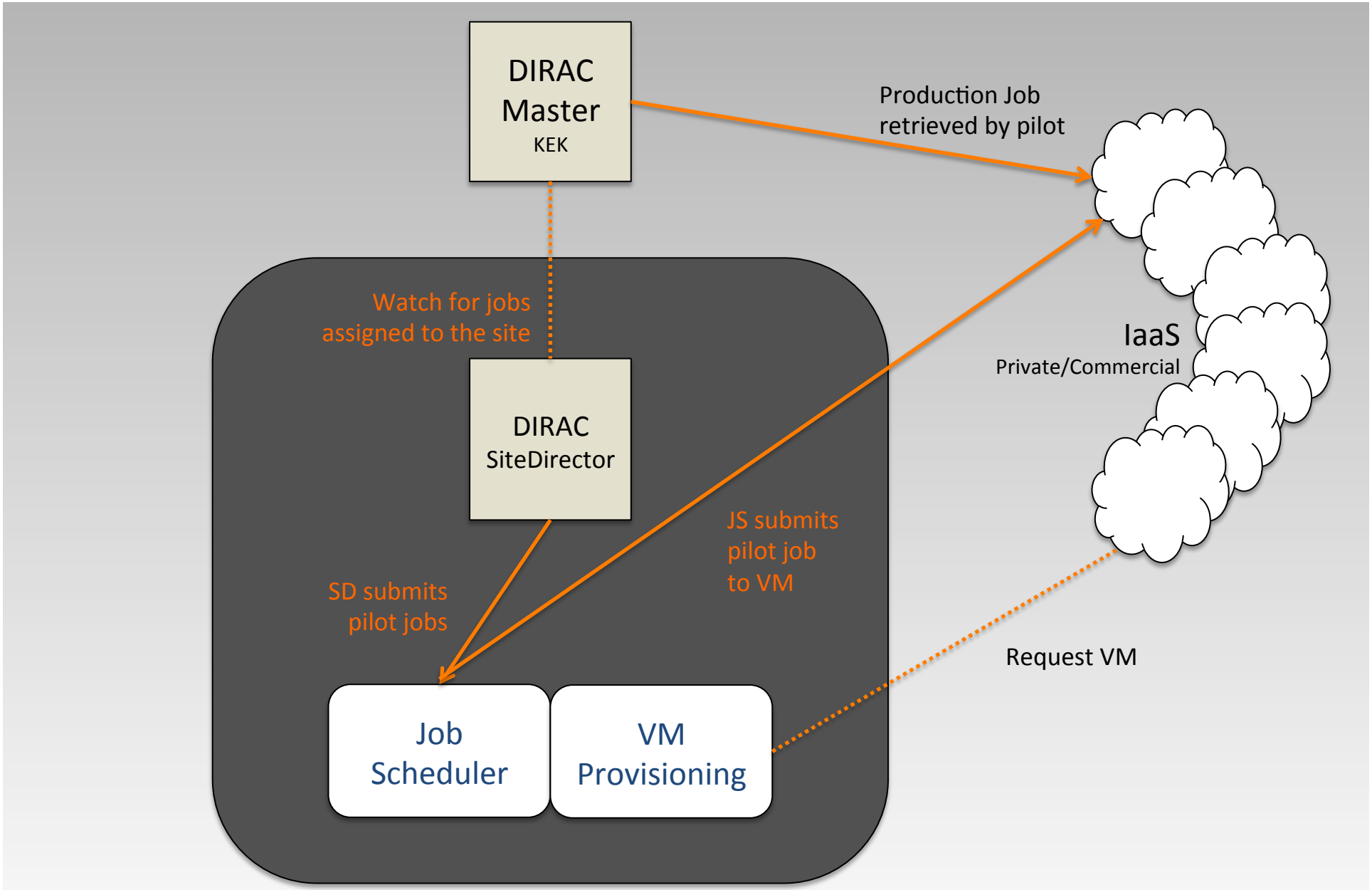
Clouds at Belle-II member sites

Opportunistic (private and commercial) clouds

Belle-II methods for using clouds

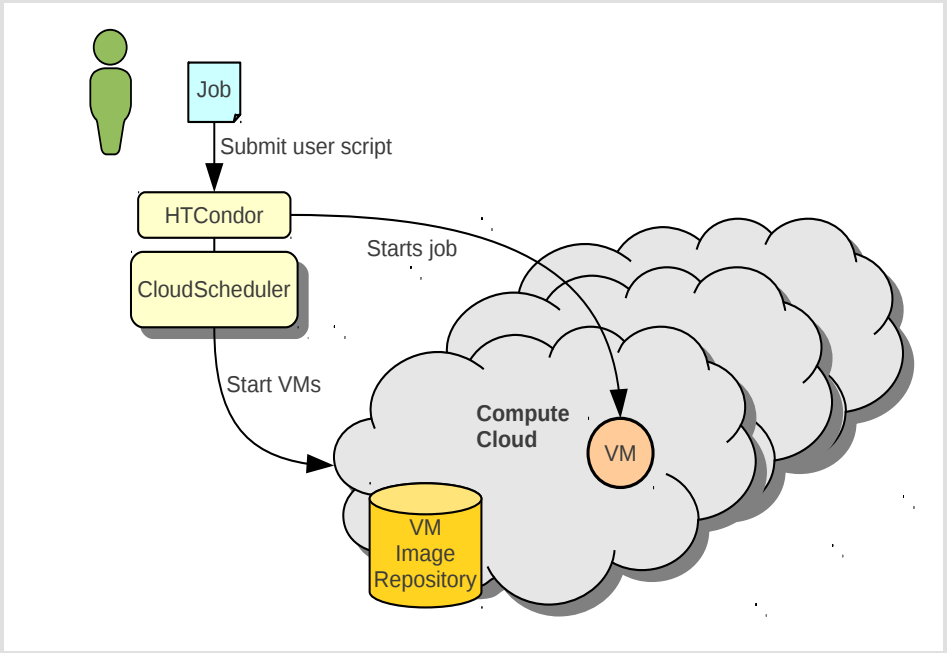


VMDIRAC
See contribution
by R.Grzymkowski


DIRAC
Master
KEK
Production Job
retrieved by pilot
IaaS
Private/Commercial
Watch for jobs
assigned to the site
DIRAC
SiteDirector
JS submits
pilot job
to VM
SD submits
pilot jobs
Request VM
Job
Scheduler
VM
Provisioning

CloudScheduler

Manages remote IaaS clouds with HTCondor
See Gable talk



Transparently integrated into ATLAS and Belle-II computing systems

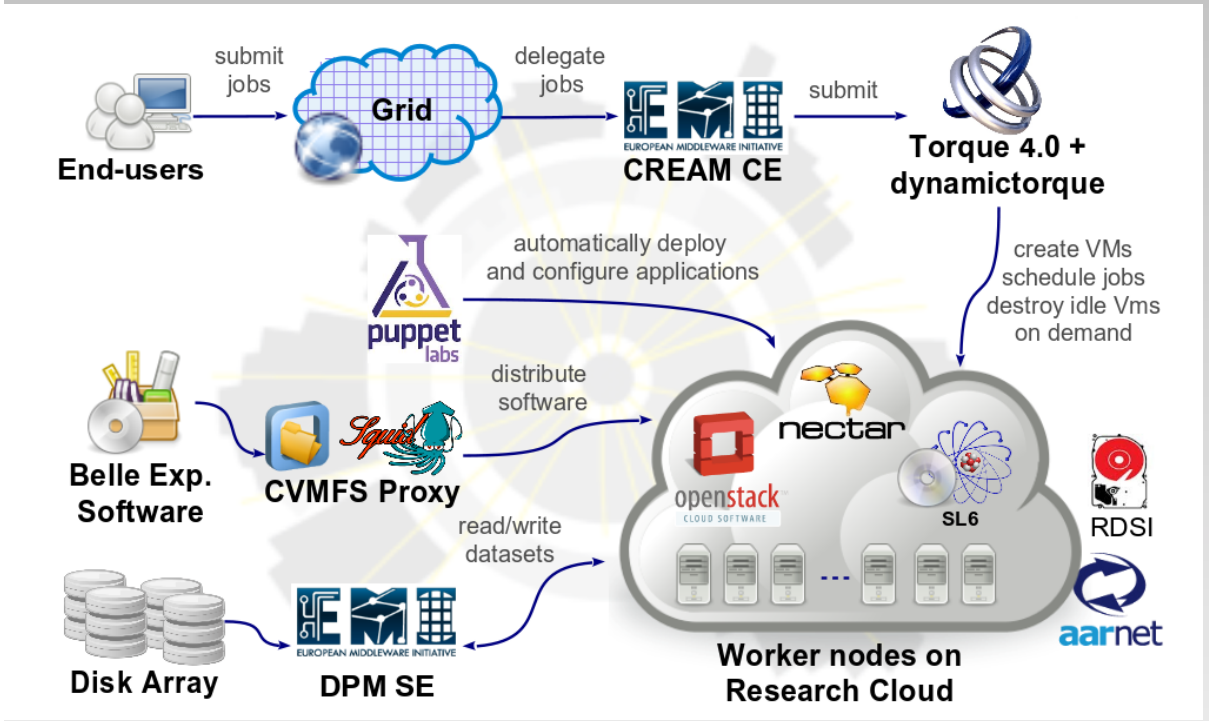
ATLAS and Belle-II
Canadian astronomy communities

uCernVM images with Shoal/Squid/ CVMFS for OS and application software

Glint extension to OpenStack Glance image repository for managing VM images on multiple clouds
(see poster)

Operational for 3 years
Many millions of HEP jobs
Panda/DIRAC workload managers
Amazon EC2 used in production

Australia- Belle II Grid site



Dynamic Torque
NECTAR

Multiusers

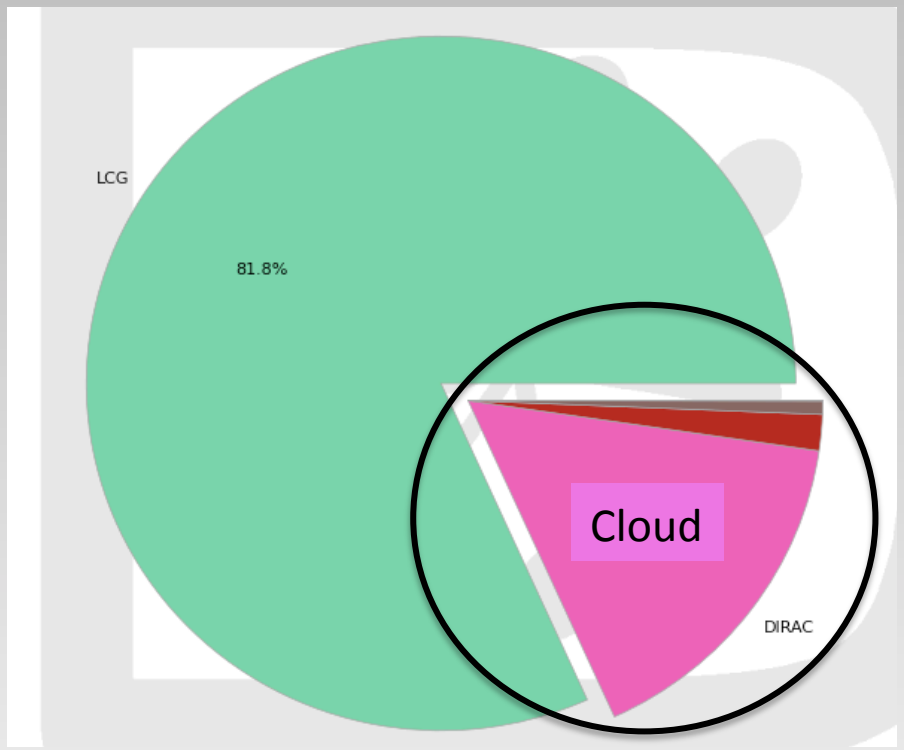
ATLAS and Belle-II

SL6 VMs configured with Puppet

CVMFS for Belle-II software

See proceedings of CHEP 2014

Belle-II MC production in the cloud



LCG	1610926.9
DIRAC	313647.0
CLOUD	33003.5
SSH	12050.4
ANY	522.2

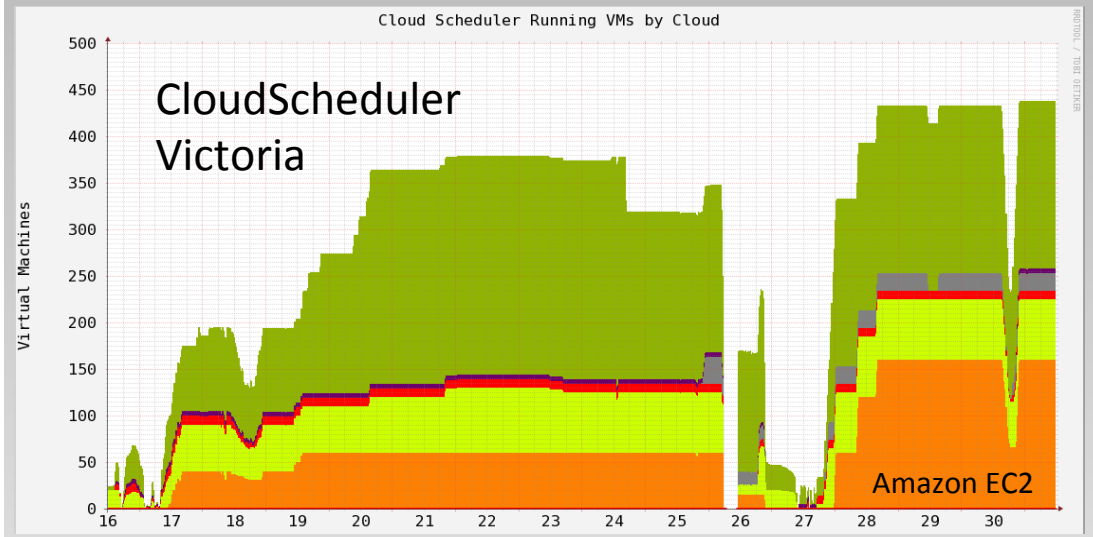
March 2015 MC production

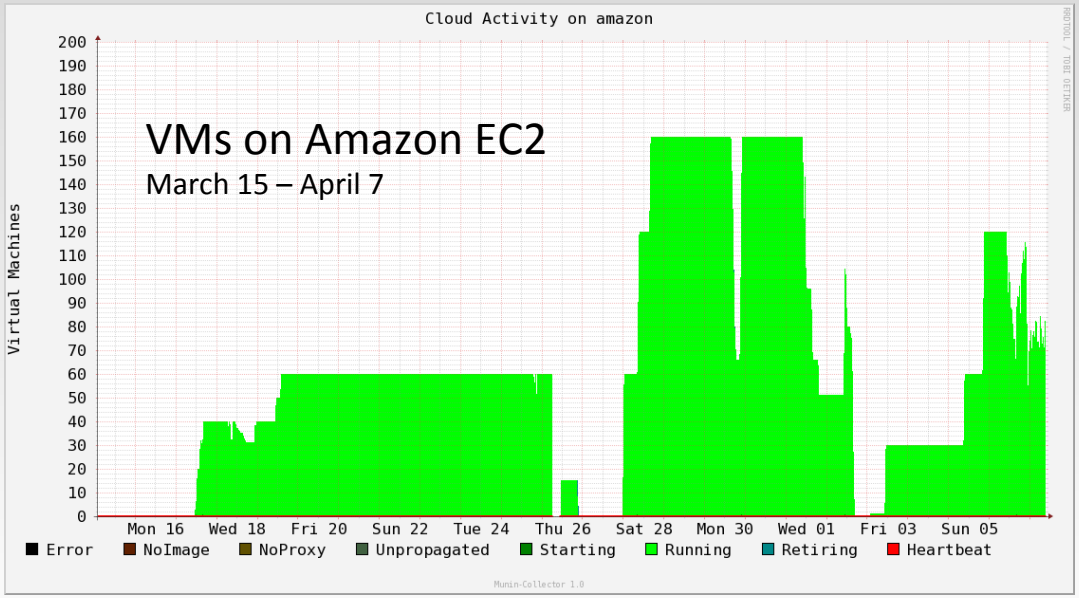
DIRAC – mainly cloud sites

Cloud – VMDIRAC

Over 300,000 jobs on the cloud

Commercial cloud use in Belle-II





Running 180 4-core VMs
Oregon EC2 site

Only utilizing 3 of 4-cores

Using CernVM3 (spot instance)

Booted a local squid for only EC2 VMs

Data transferred to North American SE

Any drop in EC2 usage is a result in our exceeding our max-spot-price limit

Summary

- Cloud resources account for significant fraction of the Belle-II computing
  - Plans for further expansion of cloud use
  - Additional work to improve use and data access is underway
  - Testing of multicore jobs will start after CHEP
- The clouds are utilized in a number of ways
  - Primarily to simplify the integration into existing infrastructure
  - Method is selected to meet requirements of non-HEP users
- Clouds are becoming reliable, stable production platforms
  - Adding dynamic or context-aware capabilities to utilize nearest squid caches
- Clouds will continue to improve
  - CernVM, CVMFS, data federations, 100G networks (SDN)