Pre-GDB - Clouds

Testing the CERN Agile infrastructure

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Experiment Support

Outline

- Common cloud testing

  - AgileInfrastructure@CERN

- Testing process and architecture

- First results

- Summary

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Cloud testing goals
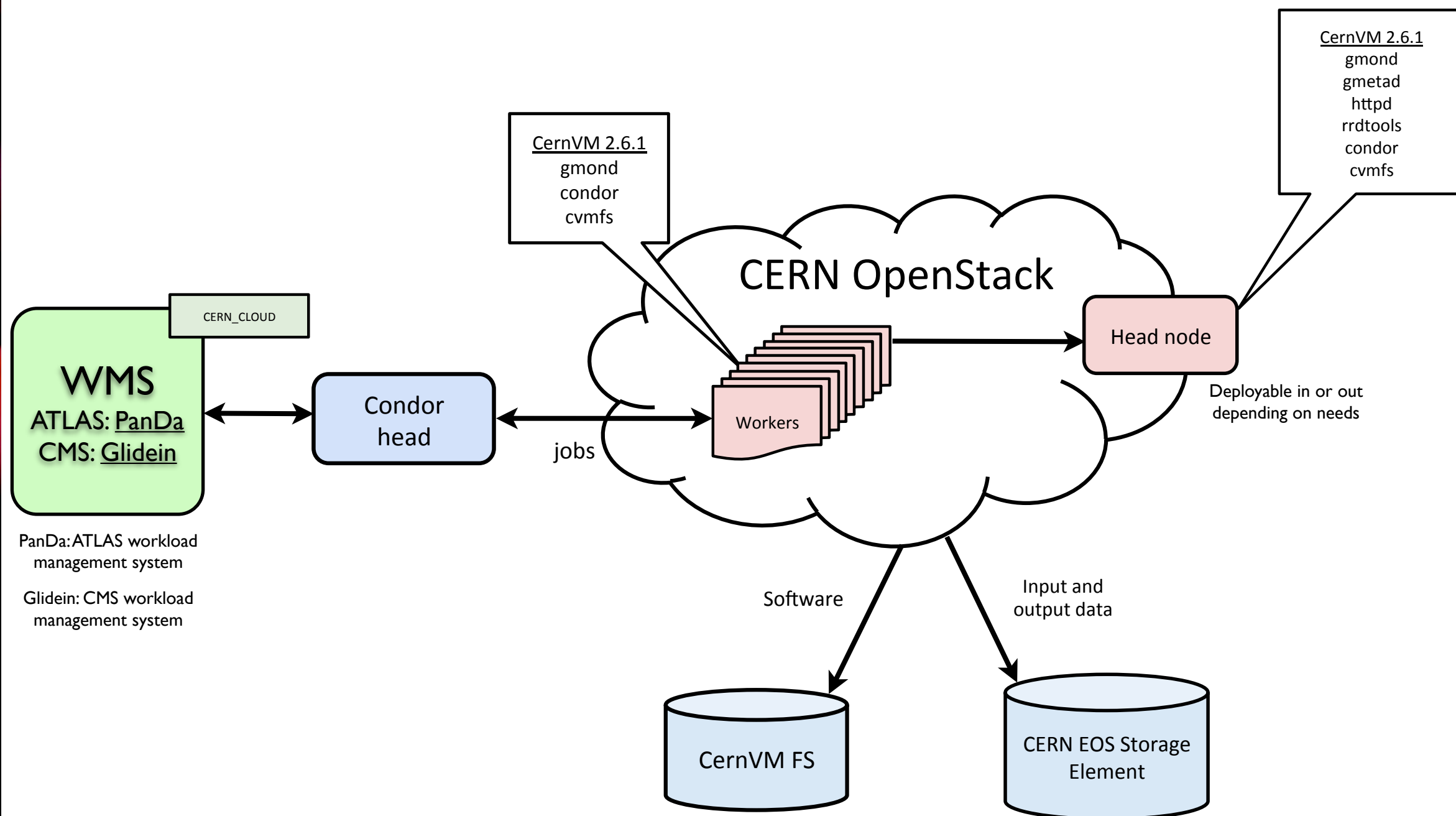
✓ Functional

  ✓ ability to transparently interface with different cloud providers

✓ Performance

  ✓ understand performance and reliability compared to a Grid site

✓ Extra-resources

  ✓ transparently offload experiment workflows to clouds

● Possible future ambition

  ➡ use commercial services as a significant fraction of overall resources available?

Common testing

- Common strategy between ATLAS and CMS

  - LHCb starting

- Already tested other cloud infrastructures

  - StratusLab, LxCloud

- Currently focusing on AgileInfrastructure@CERN

  - IT point of view:

    - productive system testing

  - Experiments point of view:

    - first time running jobs in the new CERN IaaS

    - possibility to use extra resources

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4

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Agile Infrastructure

- Project reviewing the CERN computer-centre management toolset

  - improve infrastructure efficiency and management

  - increase functionalities and QoS

- Horizontal IaaS: OpenStack as cloud software for virtual machines and image management

  - Two service models:

    - Pets: unique, long lived, with given names

    - Cattle: identical to other cattle, random names

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5

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Testing Process

(1) Upload image to the cloud provider repository

(2) Boot VM with uploaded image

(3) Contextualization of the VM

(4) Interface VM with experiment Workload Management System
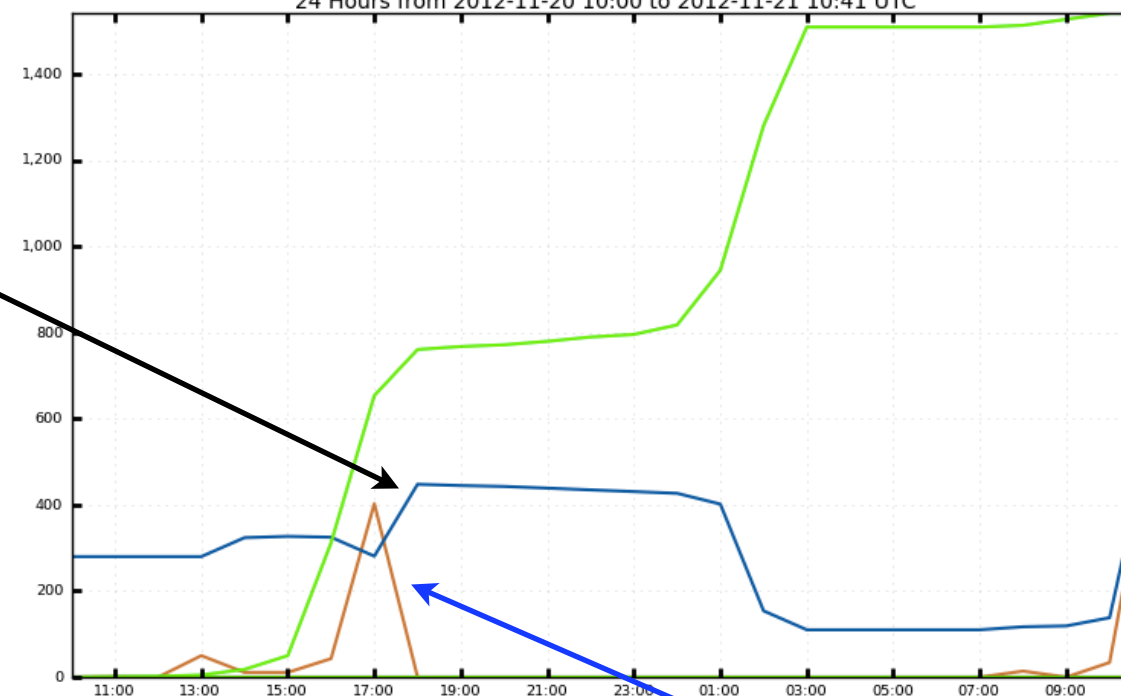
(5) Test - Monitor - Improve cycle

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Architecture

CernVM 2.6.1
gmond
gmetad
httpd
rrdtools
condor
cvmfs

CernVM 2.6.1
gmond
condor
cvmfs

CERN OpenStack

CERN_CLOUD

WMS
ATLAS: PanDa
CMS: Glidein

Condor head

jobs

Workers

Head node

Deployable in or out depending on needs

PanDa: ATLAS workload management system

Glidein: CMS workload management system

Software

Input and output data

CernVM FS

CERN EOS Storage Element

Testing variables

- ATLAS

  - Job type:

    - HC tests and real production
      (evgen, merge, pile, reco, simul, validation)

  - constantly 200 VMs (4cores, 8GB RAM, 80GB disk)

- CMS:

  - Job type:

    - MonteCarlo: pythia simulation tests running ~1h/job

    - analysis: ~8h test jobs reading /DoubleElectron/Run2012B-PromptReco-v1/AOD from EOS
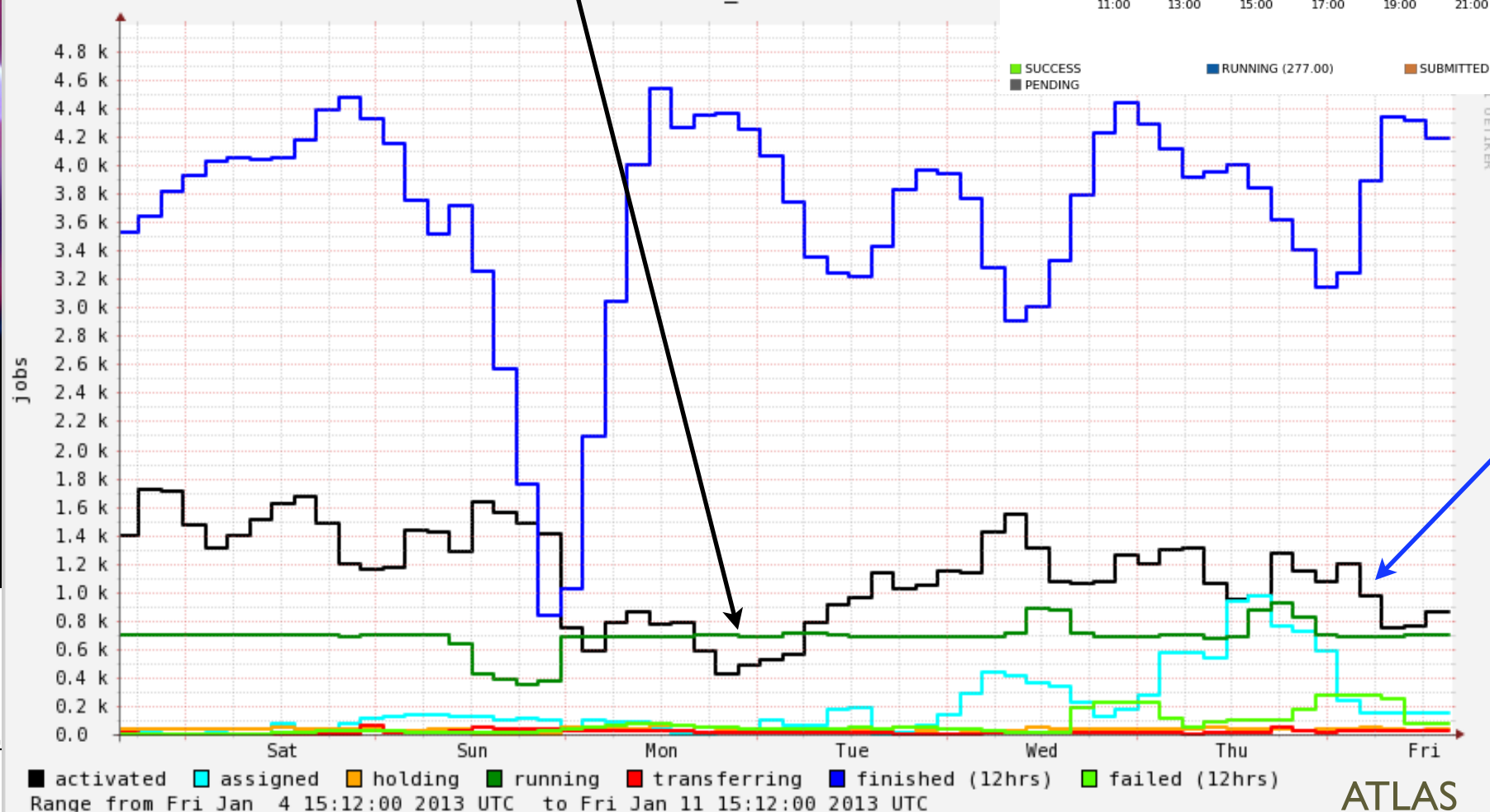
  - peak of 200 VMs (4cores, 8GB RAM, 80GB disk)

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Results

~450 jobs running
in parallel

~700 jobs running
in parallel

pending jobs
correctly absorbed

Plots taken from PanDA
monitoring and Dashboard

OpenStack CMS testing
24 Hours from 2012-11-20 10:00 to 2012-11-21 10:41 UTC

SUCCESS   RUNNING (277.00)   SUBMITTED (22.00)   FAILED   TIMEOUT
PENDING

OPENSTACK_CLOUD - week

activated   assigned   holding   running   transferring   finished (12hrs)   failed (12hrs)
Range from Fri Jan 4 15:12:00 2013 UTC   to Fri Jan 11 15:12:00 2013 UTC

ATLAS

VMs Load

Jobs correctly load Virtual Machines resources

openstack Cluster Load last day

CMS resources

OPENSTACK CLOUD Cluster Load last week
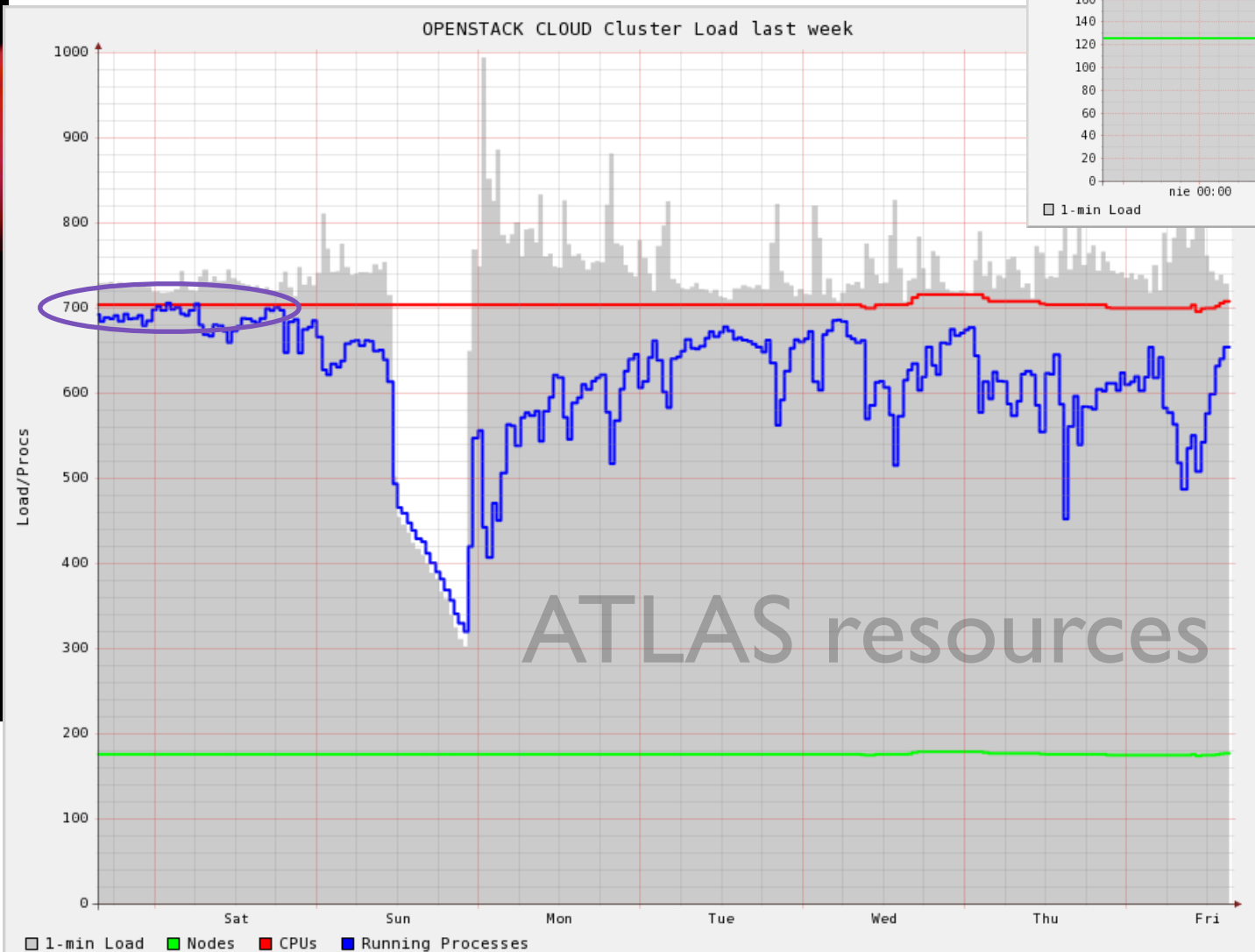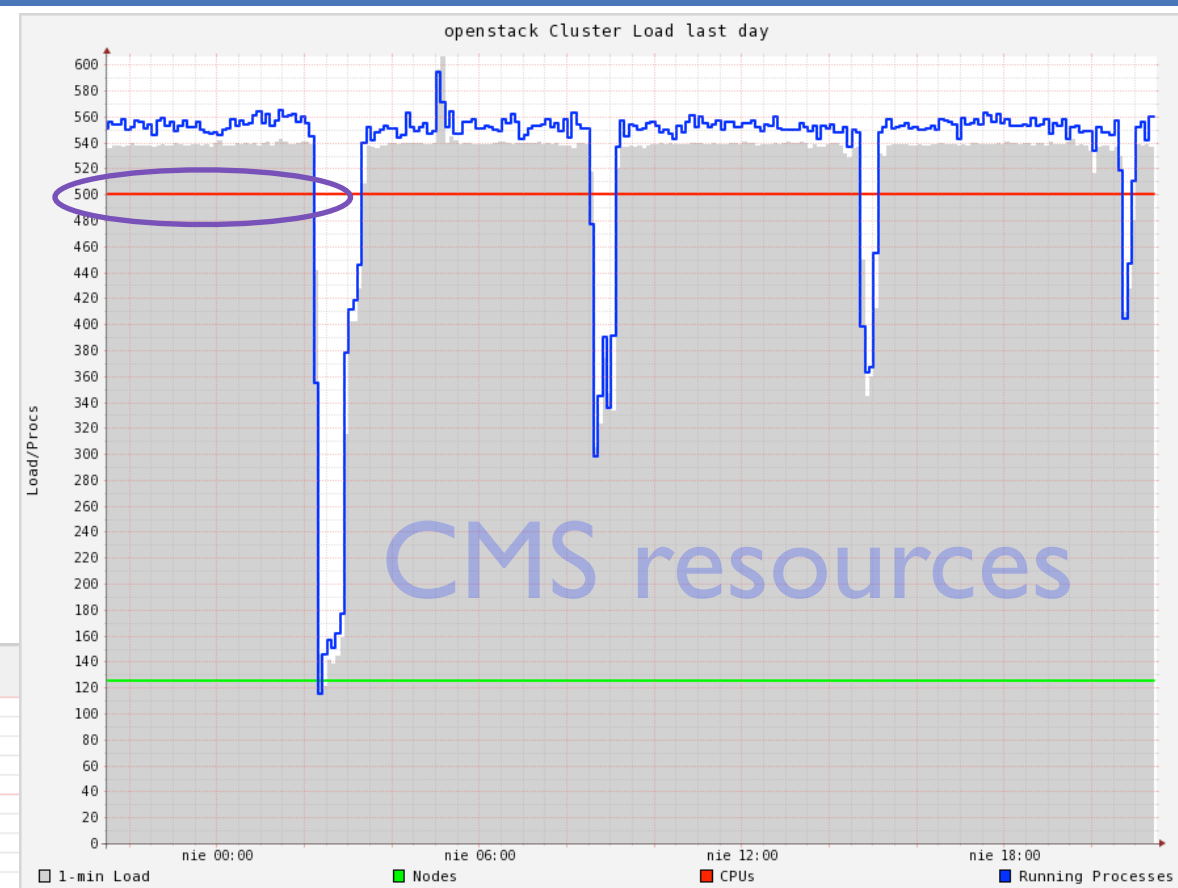
ATLAS resources

Plots taken from VM resource monitoring system configured during contextualization

More results

- Job efficiency is very high (1% failures for the ATLAS use case)

  - CERN-PROD failure rate 0.2-05%

- Apparently network latency not an issue

  - deeper investigation being done

- First results on CPU efficiency:

  - ATLAS tests with HammerCloud to evaluate CPU/ network performances

    - overhead for the CPU that sits somewhere in between 7% and 21%

      - virtualized environment? under investigation

  - No HammerCloud tests for CMS yet

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VMs Provisioning

- CERN IT Agile Infrastructure provides a total of ~1.6K cores for our testing (800 for each ATLAS and CMS)

  - 200 VMs: 4-cores, 8GB RAM, 40-80GB local disk

- Manually handling VM life cycle

  - CLI/Web tools (e.g.: euca-tools, nova client)

  - customized scripts or tools

- BNL development of automatic provisioning in PanDA pilot factory on going

- GlideinWMS has automatic provisioning through Condor

  - VMs requested/stopped depending on job queue

    - already tested on AI with sleeping jobs

    - need to send real jobs and to increase the scale

    - need to evaluate potential load issues

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- Work conceptually very close between the experiments

  - sharing existing efforts, experiences and tools

- Demonstrated the possibility to run real jobs on the AgileInfrastructure@CERN

- Evaluate puppet for machine configuration

- Investigate job efficiency metrics

- Test automatic provisioning systems

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14

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