



Elastic extension of a local analysis facility on external Clouds for the LHC experiments



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The computing infrastructures serving the LHC experiments have been designed to cope at most with the average amount of recorded data

The usage peaks, as already observed in Run1, may however originate large backlogs, thus delaying the completion of the data reconstruction and ultimately the data availability for physics analysis

In order to cope with the production peaks, the LHC experiments are exploring the opportunity to access Cloud resources provided by external partners or commercial providers.

Dynamic Extension of the Bologna Local Farm

Step 0: virtualization

- Used custom light-weight images
- Based on existing Tier-3 configurations

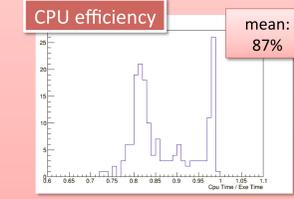
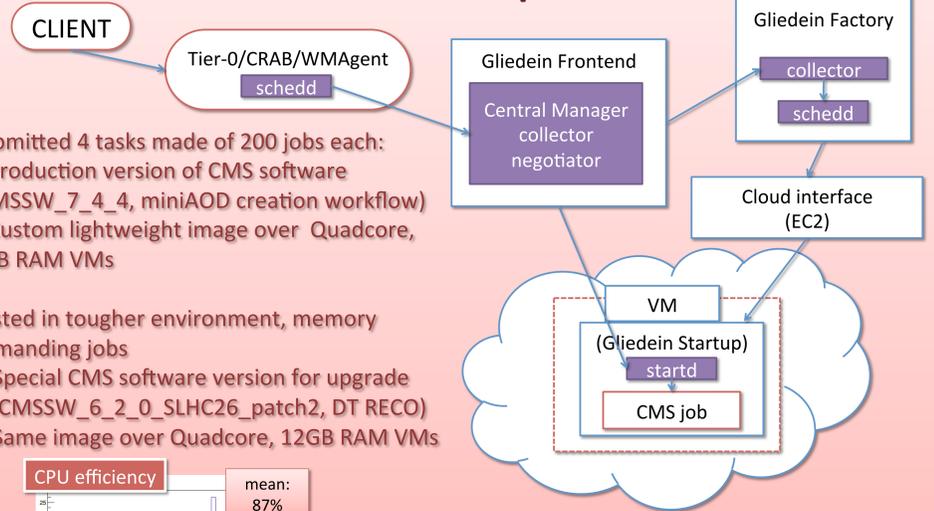
Step 1 : extending Bologna Local Farm

- Adding static nodes to the farm and accessing them through a test LSF queue
- Testing the LSF dynamic extension

Step 2: extending Tier-3 Grid site to CNAF OpenStack

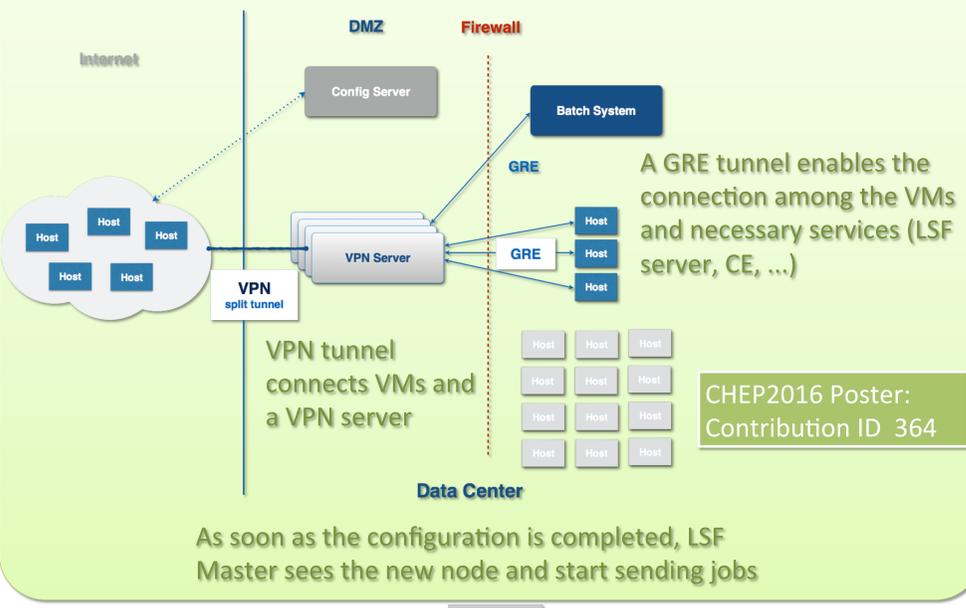
- Plug VM instantiated on OpenStack into a Grid production queue

CMS setup

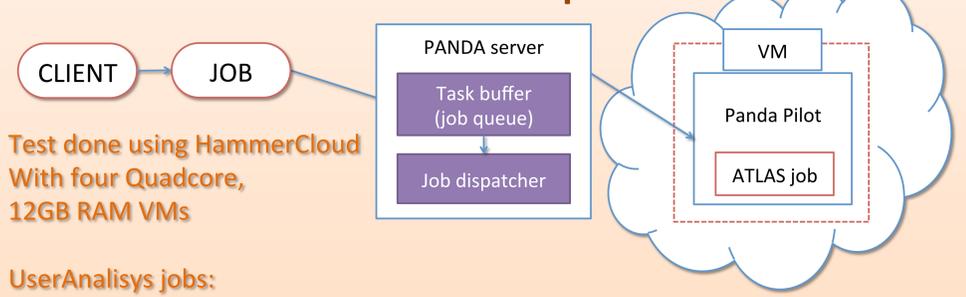


Used in the Production System: more than 3000 CMS jobs completed with very good efficiency

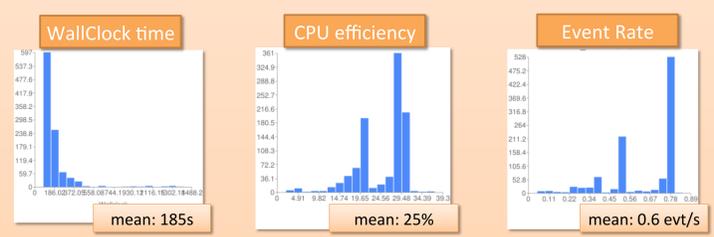
DynFarm framework architecture



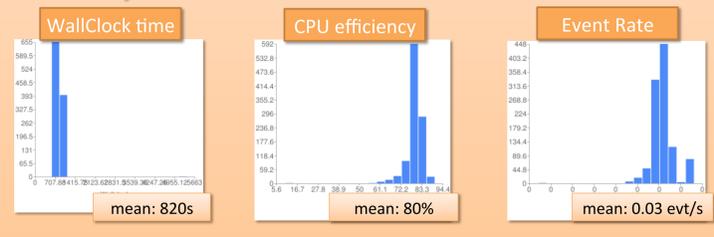
ATLAS setup



UserAnalysis jobs:

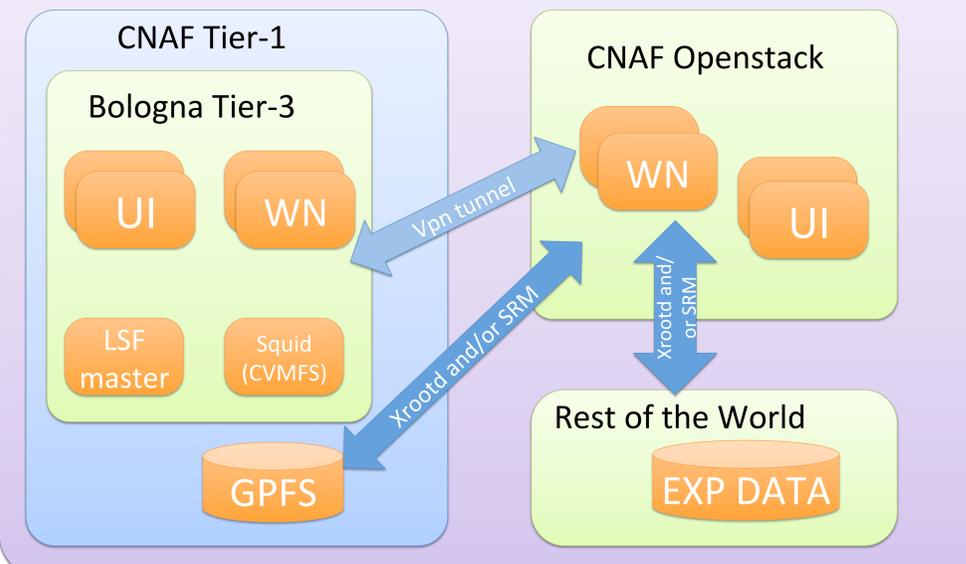


MC Production jobs



Results are comparable with real Worker Nodes

The Extended Tier3 configuration



The Bologna Tier-3 has been a realistic use case for the CNAF OpenStack infrastructure. The LSF Dynfarm extension served as development environment for the tools and setup. After this successful experience, the Bologna Tier-3 is evaluating to become a pure Cloud site in order to reduce maintenance costs and profit from the CNAF Tier-1 infrastructure