Virtual Machine Provisioning, Code Management, and Data Movement
Design for the Fermilab HEP Cloud Facility

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HEP Cloud Overview

Accounting

Write AWS Probe for existing Gratia accounting system.
How many VM's running each hour?
How much did we pay?
How many got pre-empted for bid price?

Monitoring

Use BOTO routines to query the state of AWS.
Custom scripts to query our batch pool.
Graphite backend.

Benchmarking

Prediction and Decision

Prediction Engine calculates the probability that a VM will finish without preemption in a variety of bidding models.
We chose to bid 25% of on-demand price.
Estimated pre-emption rate ~10%.
Decision Engine picks VM with best price / performance at that time.

Data Movement

Input data was staged to AWS S3 in both cases
Output Decision:
1) Stage data directly back to Fermilab—more cost in idle VM's. CMS
OR
2) Write data to AWS S3 and stage back data later with dedicated file mover process – more cost in S3 storage. NOvA

Acknowledgements

Squid available to AWS only. Peak: 8 per determined name.

Sustained Peak—60000 job slots, 10000 AWS Instances.
The dark red shows HEP Cloud elasticity in terms of running jobs bursting to AWS. This corresponds to a net 25% increase of total CMS resources.