A Cloud Project Proposal

- Introduction and motivation

- Current ATLAS cloud activities

- Possible projects

Introduction and motivation

- IaaS clouds gaining popularity in industry

  - elastic scaling of resources, pay as you go, reliability

  - concentrate on core competence

- Does this apply to us? Maybe not public clouds.

  - >80% occupancy – then buy your own

  - special performance needs, e.g. analysis io

- Profit aside, are genuine cost saving of fewer larger resources

  - scale, infrastructure, manpower, ...

  - quickly loses advantage if need N people per VO

    – operate large site as cloud, then it needs no VO specific support
    – rather than hand over cash to Amazon – investigate possibility of community cloud

- ATLAS and CMS-only sites: lack opportunistic sharing due to manpower, e.g. CMS validation, or ATLAS space token obsession.

  - Cloud techniques will give back this Grid ideal

ATLAS Cloud Activities

- A few summer student level pilot projects

- 1FTE @ LBNL, cloud provisioning and control
  - CloudCRV to start/stop various node types
    - uses Puppet to configure them
  - not yet tried for production.
  - small group of interested parties attend meetings
    - strong US bias. BNL will hire 1 FTE for Cloud.

- Future computing topic of interest
  - funding bodies will ask if we can benefit from cloud
  - working group/task force formed
    - early days

- CMS has some projects
  - I know of Brian Bockleman, Karlsruhe Virtualized WN

Public Cloud Evaluation

- Principally Amazon EC2, but there are others
- Rent or buy?
  - Helpful EC2 spreadsheet gives one answer!
  - $0.72/core/day. 1000 cores for a year ~260k$
    - scales with occupancy
  - buy 1000 cores - use for 3/4 years
    - electricity, cooling, network, rack space, manpower
  - balance is still with buying if occupancy>70%
    - but this may change. Academic price?
- Funding for O(10) servers constant, plus short O(1000) bursts for scaling tests, or high priority work.
  - deliverable is large scale simulation

Community Cloud Evaluation

- More data-intensive friendly and cheaper
  - io is free (c.f. 10c/GB). Storage available.
- No large scale example but some demonstrators
  - Magellan(LBNL) and StratusLab
    - StratusLab – 3MEuros, 2yr EU project
- Possible projects
  - partially convert one or few existing sites to cloud
    - allow other VOs access
  - can we use clouds for analysis
    - io optimization
  - Private/Hybrid clouds – alternative Grid deployment
    - Dell & ibm like this concept – more of the same

Cloud Configure & Control

- Common work to support VOs in cloud

- Preparing VM image, starting and configuring

- Storage in cloud: dCache, HDFS, xrootd?

- Monitoring & VM life cycle

  - start more workers, retire hosts

- Wallet optimizations

  - EC2 spot price instances ...

- Support group recipes, documentation to avoid everyone doing this themselves.
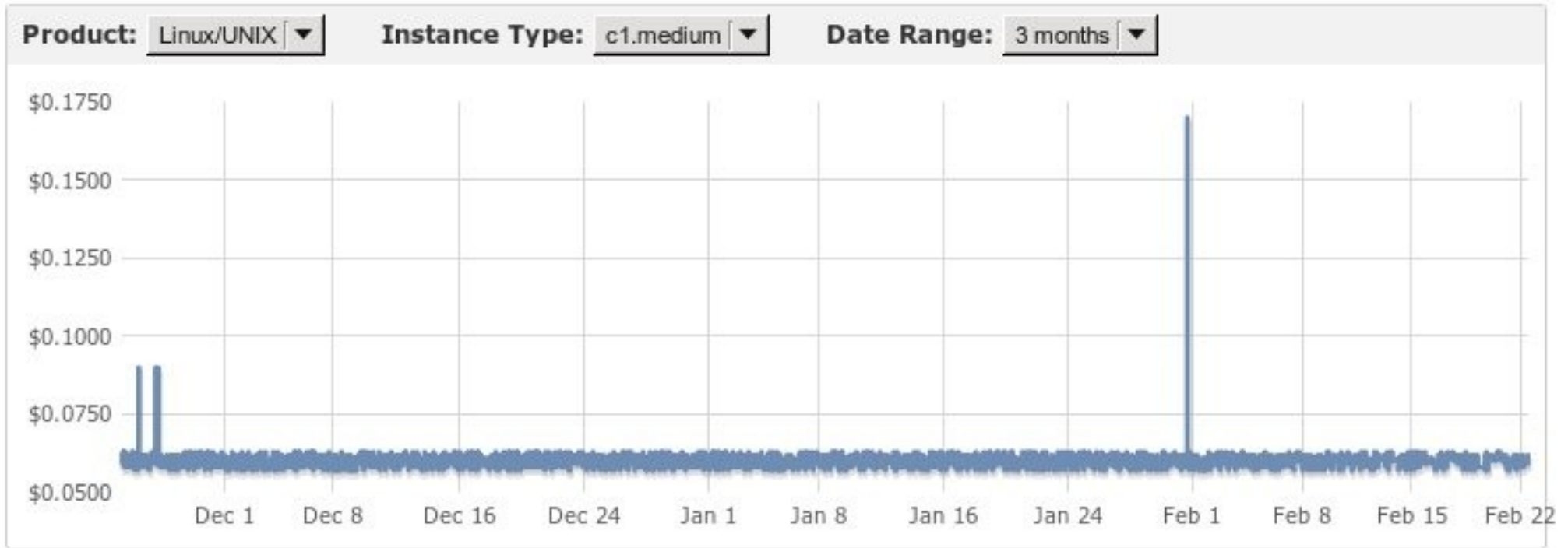
Medium compute – 2 cores of 2.5 EC2 units (1EC2 unit = 2007 Xeon 1.2GHz)
On-Demand @ $0.17/hr
Spot @ $0.06/hr
Spot instances killed without mercy when price climbs above what you are prepared to pay.
Specify maximum, but only pay the spot price.
1 spike in 3months and no daily/weekly structure
Suggests that spot price market is not really active.
If this was smooth then could optimize usage to limit uncontrolled kills.

Longer term vision

- Bulk compute resources envisaged to grow with LHC data
  - Good reasons for them to be at a single site(per funding pot)
    - Economies of scale, manpower, co-locate with cheap/green electricity/cooling. Opportunistic use & sharing is built-in.
    - Less data movement (save on HEPPI). Move roottuples, not TBs.
    - Cloud paradigm keeps resource 'owner' in control
  - DE Scientific bulk computing provided by Science Cloud?
    - better value for existing VOs
    - removes overhead for new projects
- User analysis, PROOF cluster at T2
  - bulk computing needs can piggy back these
  - local funding, 'free' infrastructure and manpower
  - diversity in technology choices
  - good reasons to grow T2s too

Conclusions

- Proof of concept & operational models can be done in public cloud, at scale.

- Economics & Analysis prefers community cloud
  - StratusLab collaboration, volunteer site

- Clear opportunity for cooperation between LHC experiments – cloud control, storage

- Necessary work and evaluation for Science cloud
  - should the question arise.

- Private clouds opportunities
  - sustainable support, VO sharing