The HEPiX Virtualisation Working Group

Towards a Grid of Clouds

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Background

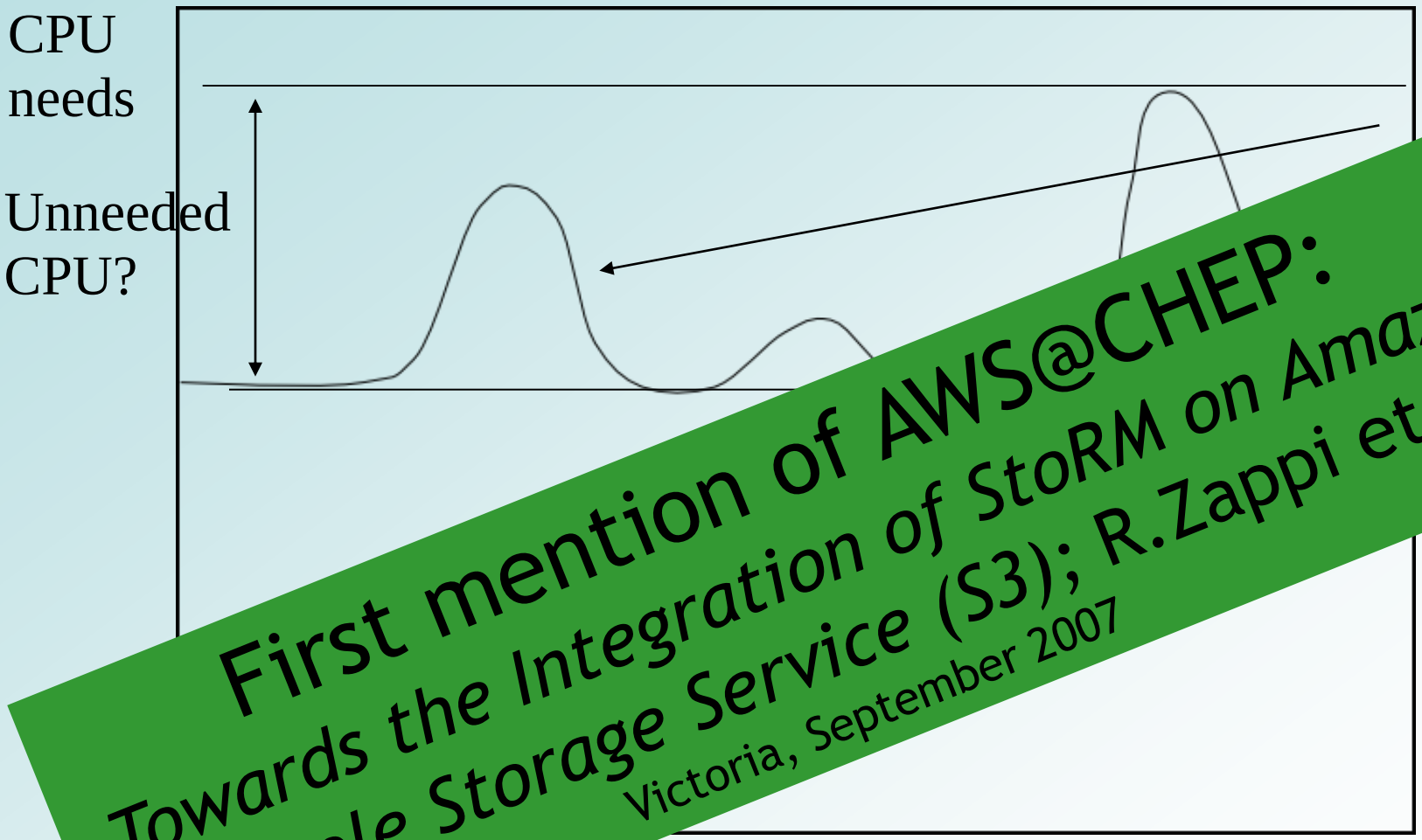
- The HEPiX virtualisation working group was formed to facilitate the instantiation of user-generated virtual machine images at HEPiX (and WLCG) sites.
- Users were expressing such a wish in 2008/9, but sites were worried about issues such as uncontrolled root access and the maintenance of the traceability logs required by Grid security policies.

Belle Monte-Carlo production on the Amazon EC2 cloud

Martin Sevior, Tom Fifield (University of Melbourne)
Nobuhiko Katayama (KEK)

17th International Conference on Computing in High Energy and Nuclear Physics
21 - 27 March 2009 Prague, Czech Republic

Particularly useful for Peak Demand



First mention of AWS@CHEP:
Towards the Integration of StoRM on Amazon Simple Storage Service (S3); R.Zappi et al
Victoria, September 2007

Image endorsement

- The HEPiX VWG developed a policy that introduced the concept of image endorsers: people who would guarantee that generated images could be used safely at sites.
- Amongst other things, such images would
  - have no embedded user credentials, and
  - enable sites to contextualise the images to enable the required logging and make other necessary customisations.
    - » Sites agree, however, not to modify the software environment of the image.
- Sites are free to trust (or not) specific image endorsers but, if they do trust someone in this role, it is expected that any images endorsed by this person can be used at that site without the need for inspection or manual approval.
- The HEPiX VWG policy became the basis of an approved JSPG policy document, “Policy Trusted Virtual Machines”.

Current Status

- The endorsement policy is agreed.
- Technical arrangements have been defined for
  - image contextualisation
    - » these are compatible with EC2/OpenNebula/OpenStack
  - exchange of information between the site infrastructure and a running virtual machine
    - » e.g. remaining lifetime, that the virtual machine can be terminated, …
- A framework for image endorsers to publish and distribute images has been develop
  - This has been integrated with S tplace at LAL and is being integrated ance at CERN.
- CERNVM image with the HEPiX VWG policies
  - and ther en a security review of the underlying technology.

Many thanks to Owen, Michel, Belmiro & Ulrich

Job done then. What now?

- Why virtualise?
  - Give user control over the execution environment
    - An important topic in 2008/9, but addressed now by CERNVMFS, even for real machines.
  - Improve overall resource management at sites.
    - Still relevant but doesn't need user-supplied images.

Conclusions

- Grid works (for ~1% of all scientists)
  - Allows LHC to achieve scientific results almost instantaneously
- Operations are complex and costly
  - Still immature middleware and faulty hardware
  - Highly customized very different application frameworks
  - Different resource ownership and service levels
- Clouds will not make Grids cheaper or redundant ✓
  - But surely will add extra complexity ✗
- Grid is here to stay
  - Scientific data will always be distributed
  - Global science is a collaborative effort, and so is Grid
- Standardization and convergence to common approaches is badly needed
  - Otherwise Grid efficiency will remain relevant only to few selected applications, like HEP
- Something totally different will certainly come

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- **Exploit user-supplied images and cloud interfaces to simplify meeting the different goals of**
  - sites: use resources efficiently and respect commitments for resource sharing, and
  - experiments: allocate tasks amongst available resources to meet physics priorities.

How this could be used

User

Payload pull

Site A

Shared Image Repository (VMIC)

Site B

Central Task Queue

Instance requests

VO service

Site C

Image maintainer

Cloud bursting

Commercial cloud

Slide courtesy of Ulrich Schwickerath

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Summary

- The HEPiX Virtualisation Workin… …up has shown how trusted user genera… …n be safely instantiated at C…
  - compatibl… …rity policies and obligations, and
  - with a guar… …eed environment for the experiments.

Job Done.
The vwg should end.

- Three options now for following this up
  - Ignore and hope it goes away
  - Integrate trusted virtual images in… …ch environment
  - **Exploit the pr…** …uds" that enabl… …ent to experiments a se… …anging—set of resources that th… …exploit to schedule work according to phy… …rities.

A task for the WLCG GDB, not HEPiX
Plan for the future to be discussed at the December meeting.