ATLAS Goals for Magellan

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(Some) VM People in US ATLAS

- Paolo Calafiura, LBNL
  - AthenaMP: multi-core version of ATLAS offline framework
- Yushu Yao, LBNL
  - AthenaMP, VMs for Tier 3s
- Doug Benjamin
  - VMs for Tier3s
- Sergey Panitkin
  - Panda in the cloud, VM for Tier3s, VMs for analysis

Virtualization & Clouds in ATLAS

- ATLAS has been heavily involved in the CERNVM virtualization project
  - Primarily desktop VMs
  - Extensive work on adapting our software for the many-core era: parallelization, virtualization
  - Little cloud use thus far, no production experience like STAR
  - Our production/analysis system, Panda, has taken small steps into the clouds

Panda in the Cloud

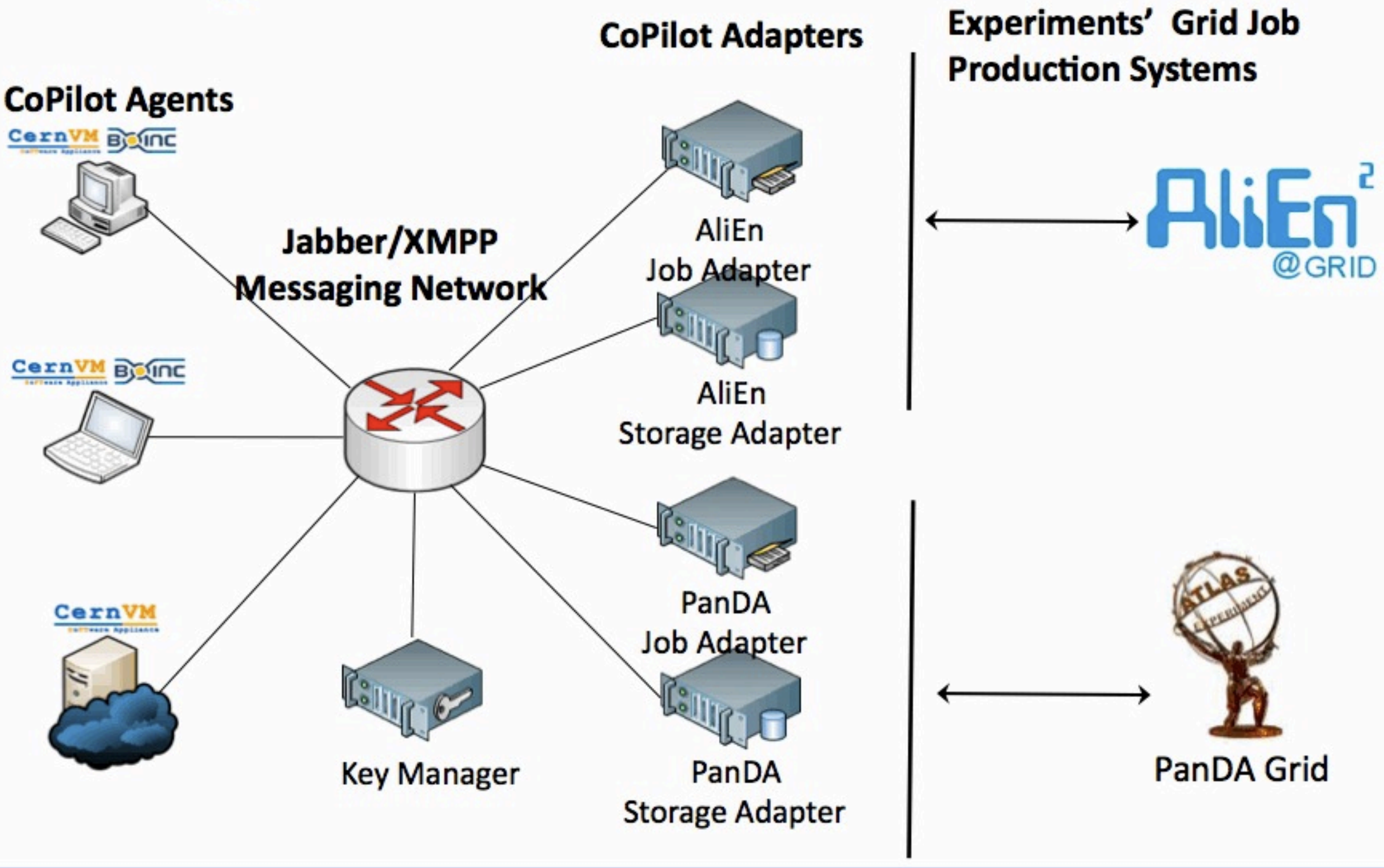
- EC2 version of Panda server (central Panda job queue, brokerage, dispatcher to pilots, data flow manager) implemented and operating to gain experience
- More interestingly for large scale cloud use, CERNVM project has worked with Panda team to make Panda pilots CERNVM compatible

CERNVM as Cloud Platform

- Our software stack supported, good toolkit for managing it
- Efficient CVMFS file system makes managing ATLAS software tractable
- Desktop, cloud have same environment
- Cloud deployment supported now (EC2, Nimbus,...)

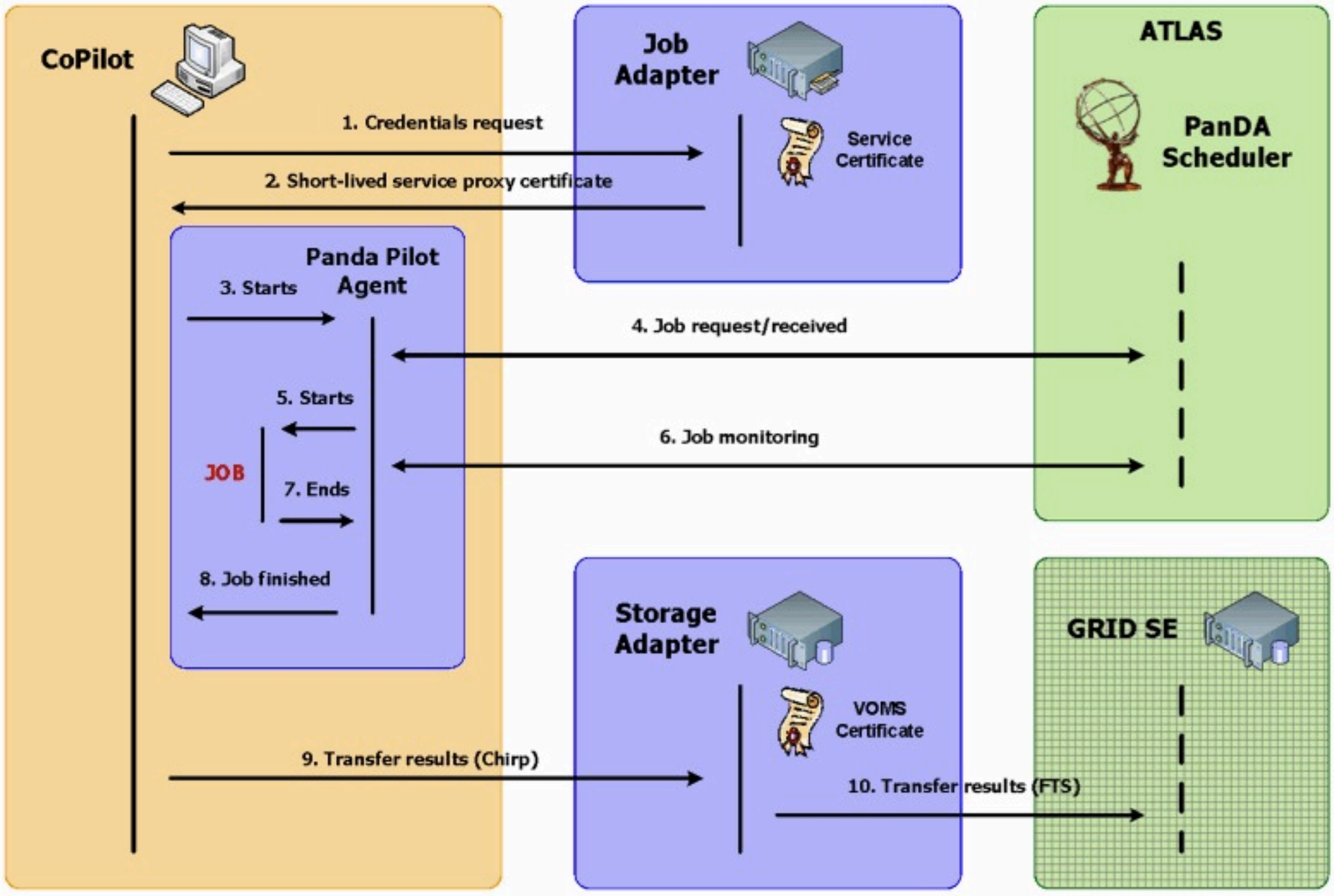
CernVM CoPilot

CernVM
SoFTware Appliance



CernVM
SoFTware Appliance

CoPilot for PANDA



Magellan Opportunities for ATLAS

- A quantitative testbed
  - Performance studies under controlled, understood conditions; impossible on eg. EC2
- Leading edge technology
  - Evaluate cloud performance with ‘tomorrow’s technologies’ today: infiniband, SSD, ...
- Scale
  - Large enough to conduct meaningful large scale tests to study scaling behavior

ATLAS Magellan Goals

- Specific near term goals from Paolo and Yushu's submission...

ATLAS software performance

- Compare the ATLAS Software performance on a virtualized cluster to the performance on PDSF
  - Currently the LBL ATLAS group is running analysis jobs on the CHOS based PDSF cluster.
  - ATLAS has both I/O intensive (e.g. data analysis) and CPU intensive (e.g. simulation) jobs.
  - They will provide a good benchmark for testing the performance of virtualized clusters.

Flash Storage

- Test I/O Performance and Reliability of Flash Storage
  - ATLAS analysis jobs will require reading large amount of data
  - These data are normally stored in disk arrays and shared for each node in the cluster
  - Comparing the performance of SSD disk array to conventional disk array will be a valuable study, especially when there is concurrent access of the same storage unit by a number of jobs (hundreds)
  - Study file system optimizations that fit SSD
  - Besides performance, reliability is another important aspect
  - Failed disk replacement cost and power consumption are also important factors when making disk purchases

Scalable Virtual Cluster

- Many smaller institutions have limited manpower to set up and maintain a batch cluster.
- We are prototyping a Virtual Tier3 Cluster for ATLAS, where the user (institution) can easily launch a cluster ready for ATLAS jobs.
- We will need a testbed for testing this prototype in a larger scale, and to measure the performance and scalability of the Virtual Cluster.
- A lot of research is needed for the infrastructure that provides these services, e.g. security, resource provisioning, usage accounting (cpu, memory, io, storage, remote database access)
- Another aspect of the same problem is that in many institutions a batch cluster will serve several very different scientific projects (like PDSF).
    - Virtualized clusters can help to reduce maintenance cost and consolidate usage.

Desktop to Cloud

- Complex scientific software systems like ATLAS need considerable effort to setup a development or analysis environment

- Virtualization has been proven to greatly simplify the deployment of both the software and a working environment for development and analysis, eg. CERNVM

- Although development is done on a desktop, jobs are normally sent to distributed systems (grid, cloud) for execution.

- A solution to seamlessly integrate the development, deployment and job execution process is needed.

- This idea can be generalized to how can we use virtualization to deploy a certified work environment to users for the work that needs human input.

- In this work environment, how are data communicated with the cloud and other work environments. In the cloud, how to handle events initiated from a work environment.

- Magellan can provide a real-world setting for developing/assembling this infrastructure and applying it in a real way for development/analysis

Finally

- Whatever the preferred label on ‘distributed homogeneous computing infrastructure’ is, grids or clouds or whatever, it is crucial for experiments like ATLAS
  - Computing at a huge and unavoidably global scale while keeping implementation tractable and ops manageable
  - ATLAS adds ‘data intensive’ to the mix, which is where many of the biggest challenges come
- How our computing problem translates to the cloud is an unanswered question that must be answered, and Magellan can be a valuable resource in finding answers