Distributed clouds for particle physics and astronomy research computing

Randall Sobie and Ian Gable
University of Victoria

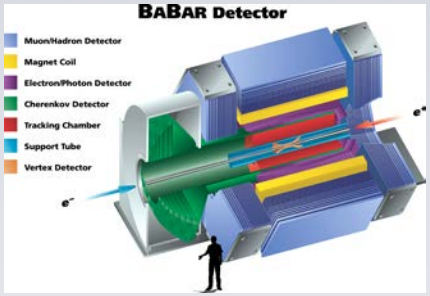
Motivation :

Sophisticated user communities in physical sciences
Non-GUI users Batch computing environments

Complex software packages and demanding system requirements
Specific OS system Specific application libraries and compilers

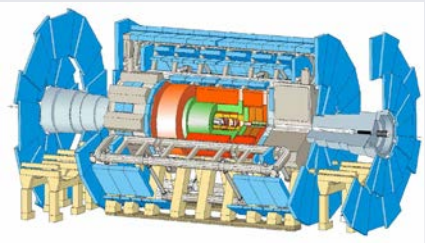
Medium-scale data sets (100s TBs)
Data accessed (on-demand) from remote or local repositories

Applications



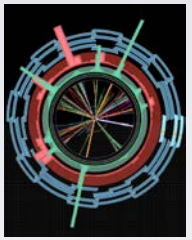
BaBar experiment (SLAC)
Stopped recording particle collisions in 2008

VMs and clouds seen as a way to preserve access and analysis capability



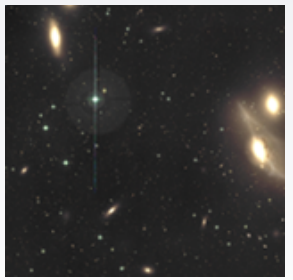
ATLAS Tier 3

User analysis of smaller data sets (1-10TB) recorded by the ATLAS

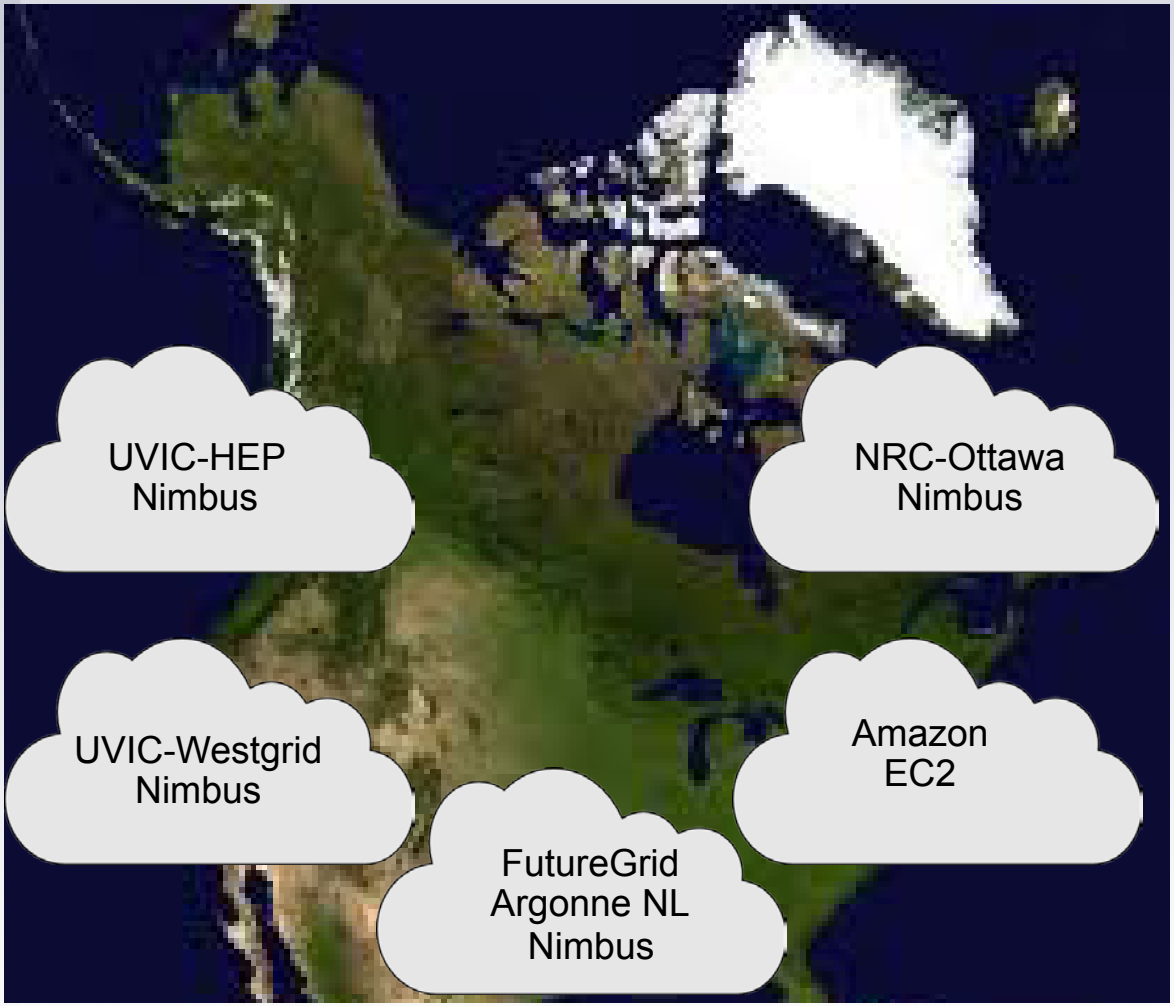


CANFAR
Canadian Advanced Network for Astronomical Research

CANFAR Project
(NRC Herzberg Institute for Astrophysics Victoria)
Provides for the delivery, processing, storage, analysis, and distribution of astronomical survey data



Distributed compute cloud



Virtual machines and clouds
Provide users with base-VMs to customize and store in Image-Repository

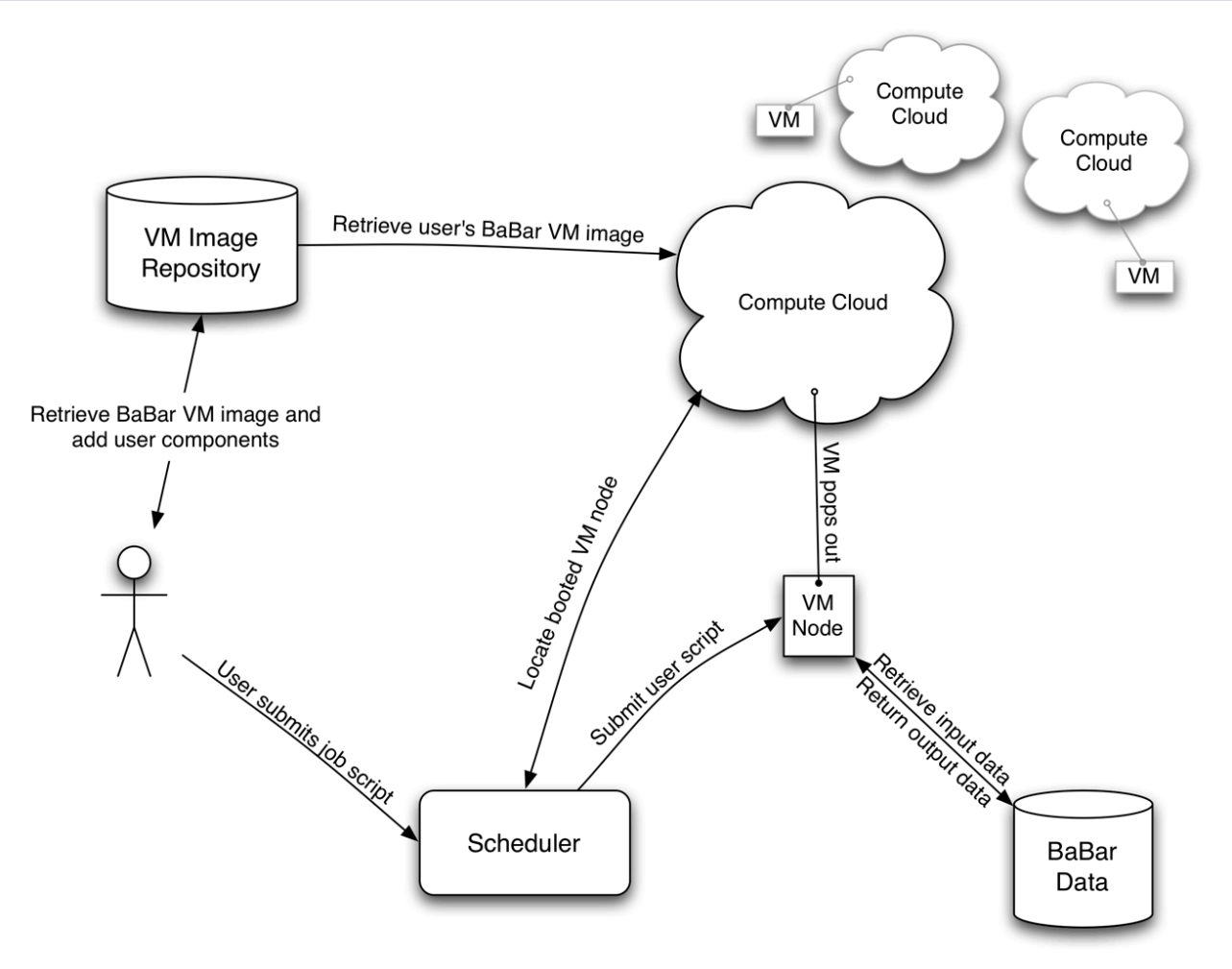
Distributed compute cloud
We have access to mutilple computing centres configured as clouds

Our goal is to utilize these clouds as a single resource for batch jobs

Remove need for sysadmins being “application specialists”

X509 certificates used for authentication

Overview of system



Familiar environment

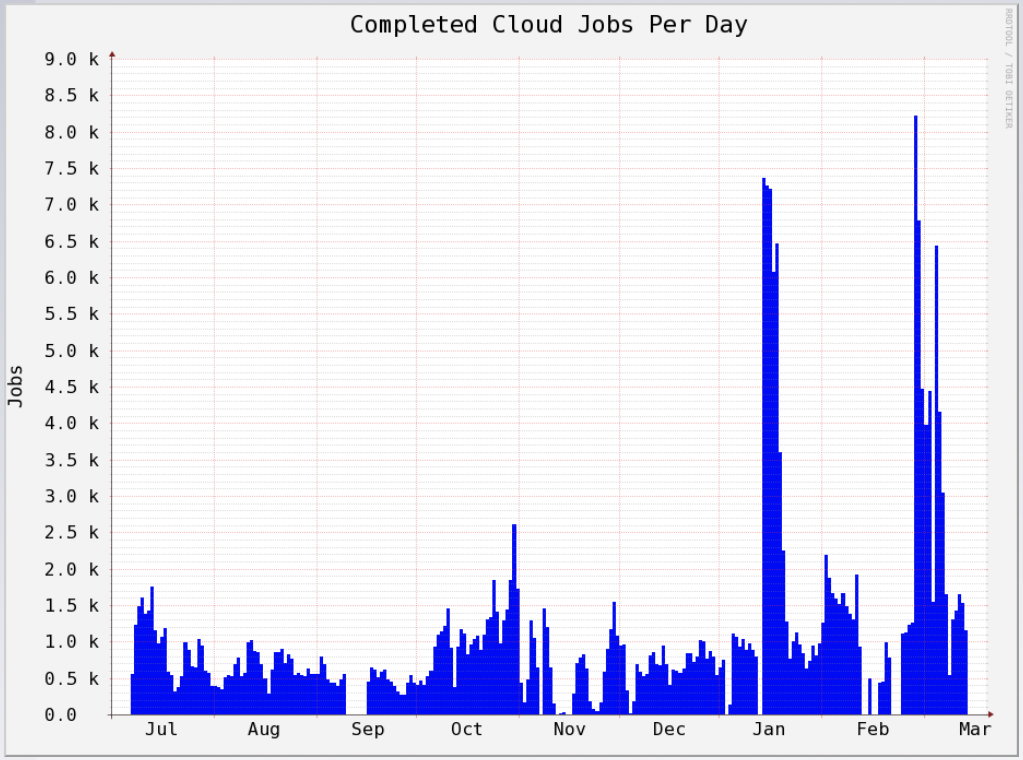
Users build their code within an application-specific VM

Submit to a batch system

System boots the user-customized VM on one of the clouds

Retrieves data from a local or remote source

Current status



Operational for 1 year

Tens of thousands of VMs booted and jobs processed

Using Nimbus, EC2 clouds

Particle Physics (BaBar, ATLAS T3)
Astronomy (CANFAR)

<u>Main challenges</u>

- Security and authentication
- Data I/O

Support provided by
CANARIE, NSERC, NRC, Amazon, Google, FutureGrid (NSF)