

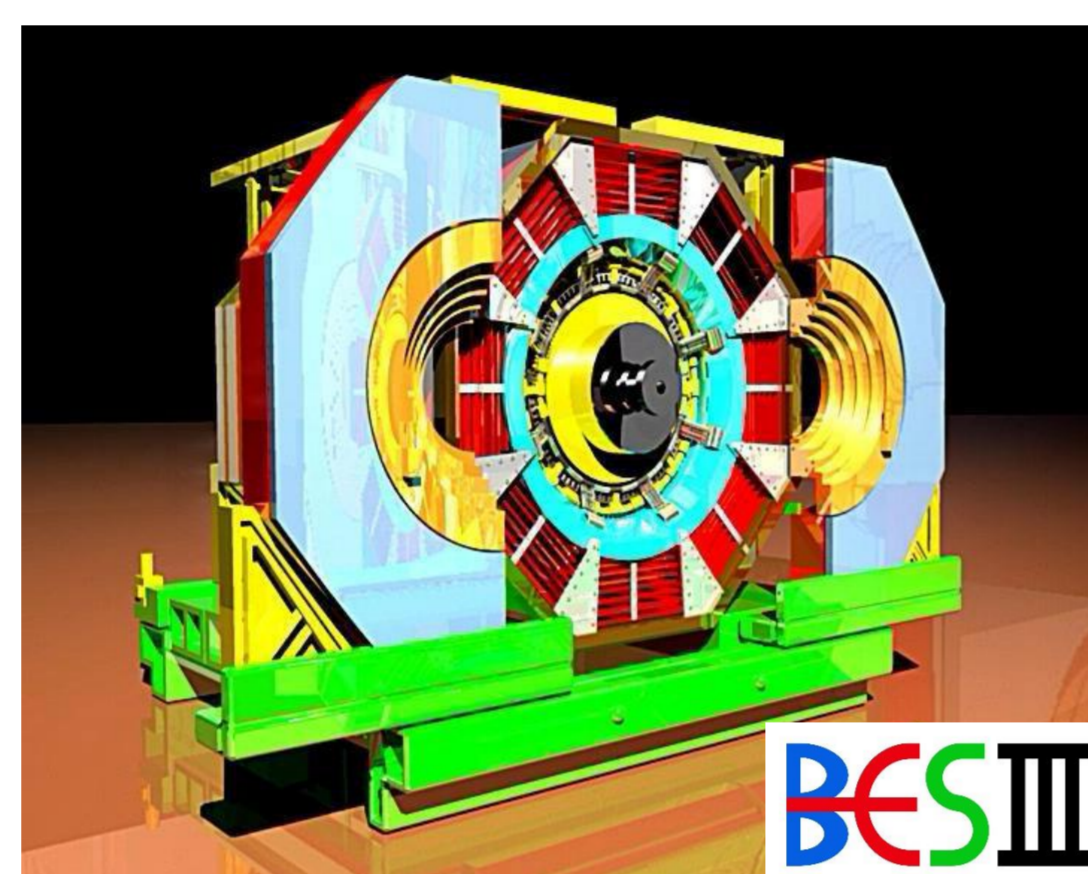
Exploring Private and Commercial Clouds for BESIII

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Introduction

- The BESIII experiment located in Beijing is an electron-positron collision experiment to study Tau-Charm physics
- Now BESIII is in its middle age. It has aggregated more than 1PB raw data
- The distributed computing system has been built up based on DIRAC and put into productions since 2012 to deal with peak demands
- Cloud becomes a popular way to provide resources among BESIII collaborations



Trial on AWS

- AWS is integrated with the similar way as private clouds
- AWS is commercial cloud, so the cost for AWS is important for users to decide to choose it
- Need to find out the most suitable instance type for BESIII
- EC2 holds most part of the billing
- Consider BESIII MC job (sim+rec+ana) as example, 1000 rhopi events need to pay 0.20 RMB

	Simulation (s/event)	Reconstruction (s/event)	Analysis (s/event)	CPU Usage
t2.micro	4.08	1.61	0.0357	86.5%
m3.medium	1.03	0.32	0.0073	95.7%
c3.large	0.64	0.21	0.0044	95.6%
Local Server	0.40	0.13	0.0028	99.5%

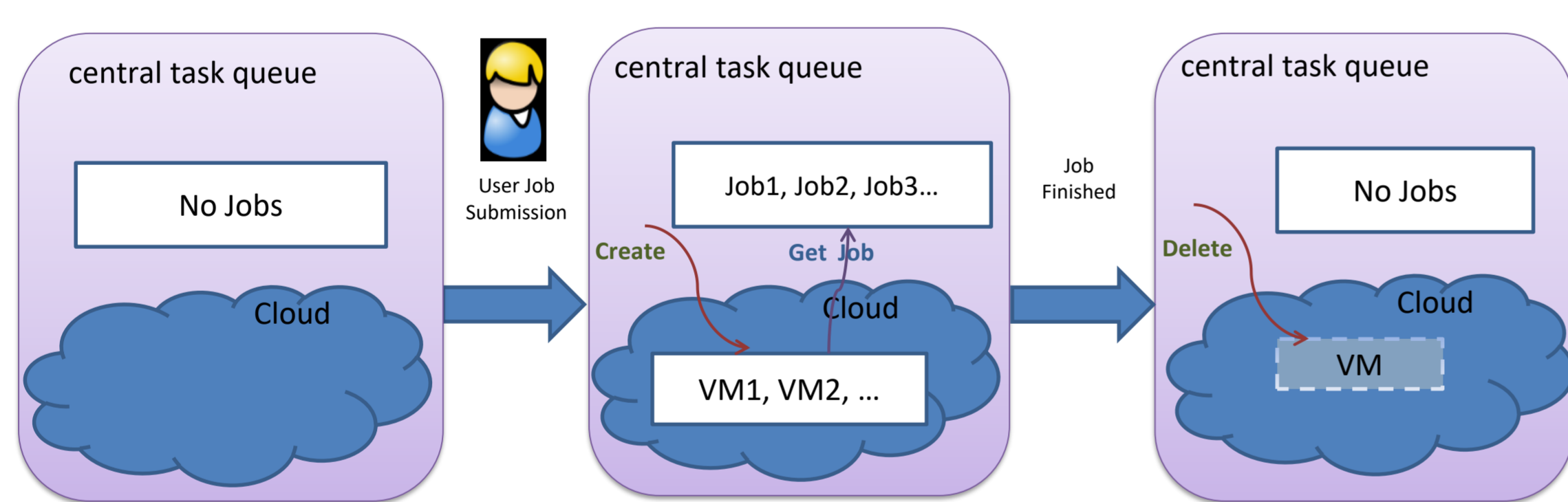
Performance of different instance types

	Billing (CNY)	Percentage
Data Transfer	1.60	2%
EC2 c3.large Instance	73.60	92%
EBS I/O Requests	2.40	3%
EBS Storage	2.40	3%
Other	-	-

Constitution of billing

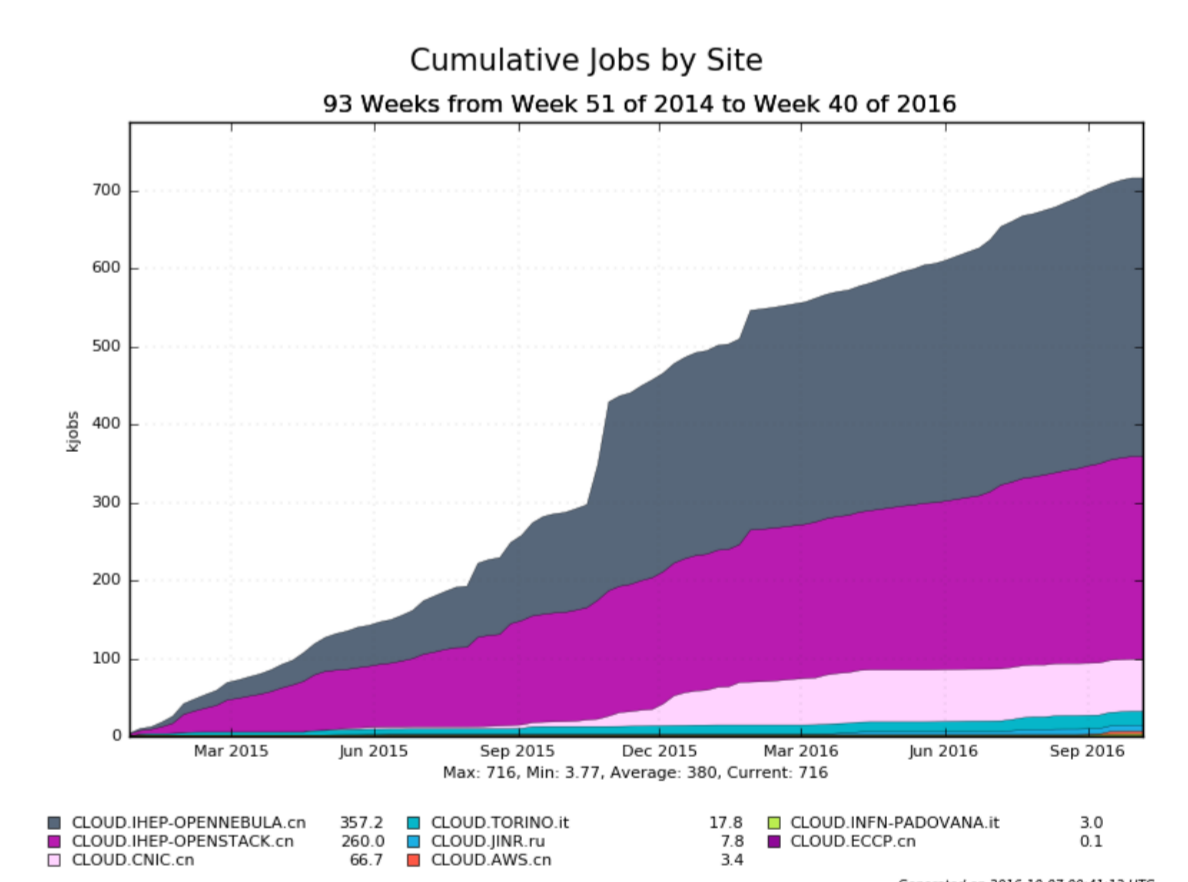
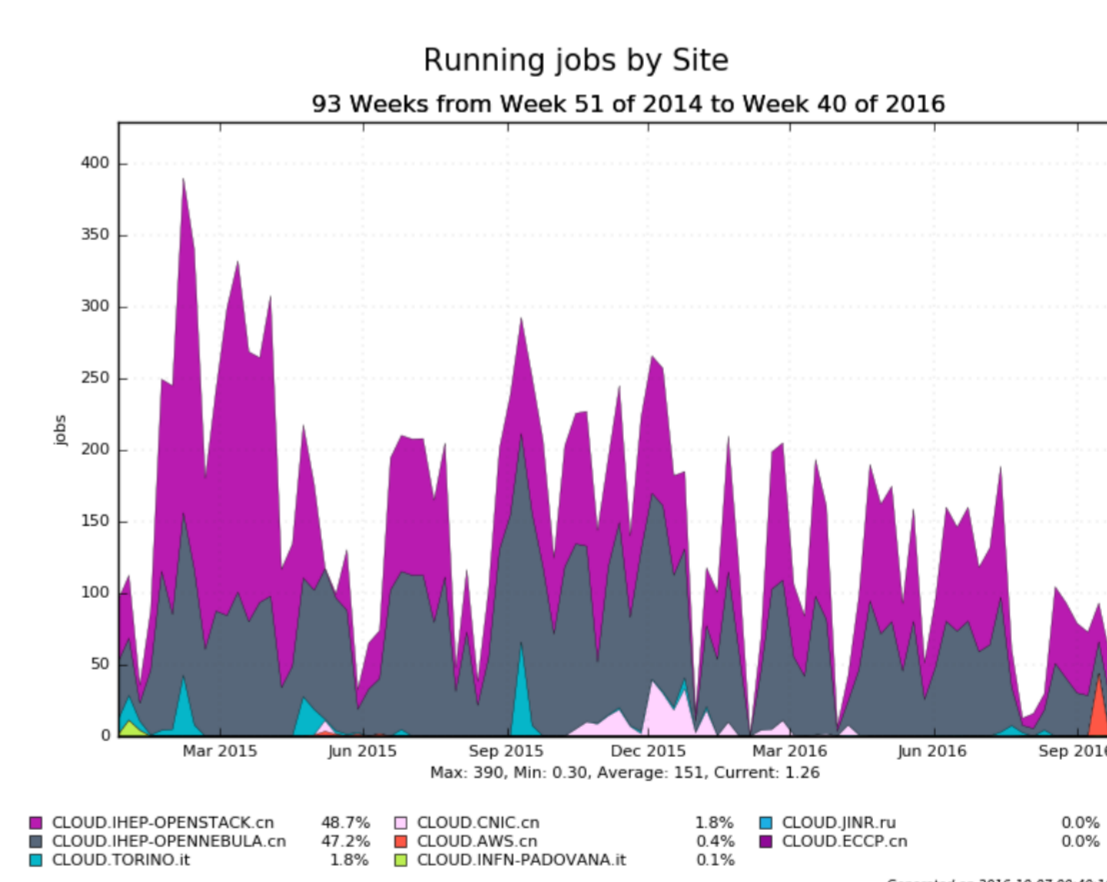
Cloud Resource Scheduling with VMDIRAC

- VMDIRAC is the first method we adopted to integrate cloud resources
- VMDIRAC is an extension of DIRAC for implementing elastic cloud resource scheduling
- Instead of submitting pilot jobs, VMDIRAC starts VMs equipped with Job agents through cloud managers according to the demands of DIRAC task queue



Job Statistics on Cloud

- Cloud resources are ready for BESIII user and become important parts of BESIII distributed computing
- 6 cloud sites are available which are provided by different institutes
- More than 700k jobs have been processed on cloud sites in the past 2 years



Integrate Different Cloud for BESIII

- With VMDIRAC OpenStack, OpenNebula and AWS are integrated in BESIII distributed computing
- VMDIRAC communicates with different cloud type with cloud specific interfaces
 - OpenStack: Apache libcloud
 - OpenNebula: rOCCI command
 - AWS: boto/boto3 API
- The cloud-init has been adopted as the standard way to do contextualization
- Cloud-init is used for building environment in the virtual machine in order to manage jobs running and virtual machine monitoring
- Cloud-init also deal with additional configurations for the virtual machine

Future Plan

- Support for multi-core application with new DIRAC pilot
- More flexible contextualization
- Optimize scheduling policy in order to optimize resource usage and scheduling speed
- Improve the monitoring web interface for getting status of cloud virtual machines much easier

