

# **Status of WLCG FCPPL project**

- Status of Beijing site
- Activities over last year
- Ongoing work and prospects for next year

# Last year activities on one page

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## ‣ Grid Operation and development

- Participation of Chinese & French colleagues to monthly ATLAS and technical computing French meetings + vidyo/Skype/...
- Sharing of expertise and tools : grid middleware and experiment specific (**Xiaofei YAN (闫晓飞)**)
- Network monitoring (**Fazhi QI/齐法制**)

## ‣ HPCs for ATLAS simulation

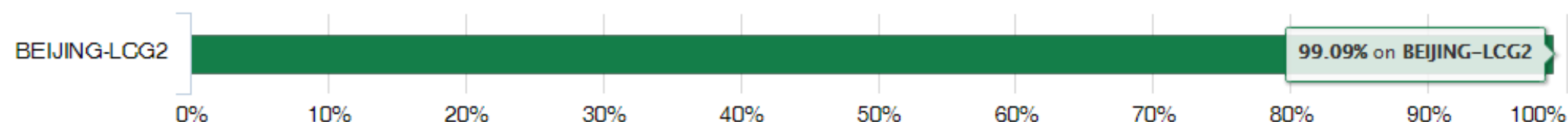
- Collaboration between IHEP, CNIC and European partners
- IHEP Wenjing WU (伍文静), (**Xiaofei YAN (闫晓飞)**)
- **ATLAS@home**: Volunteer computing project **Wenjing WU (伍文静)**

# Beijing Tier-2 - status

[Link to data](#)

## Site Reliability using ATLAS\_CRITICAL

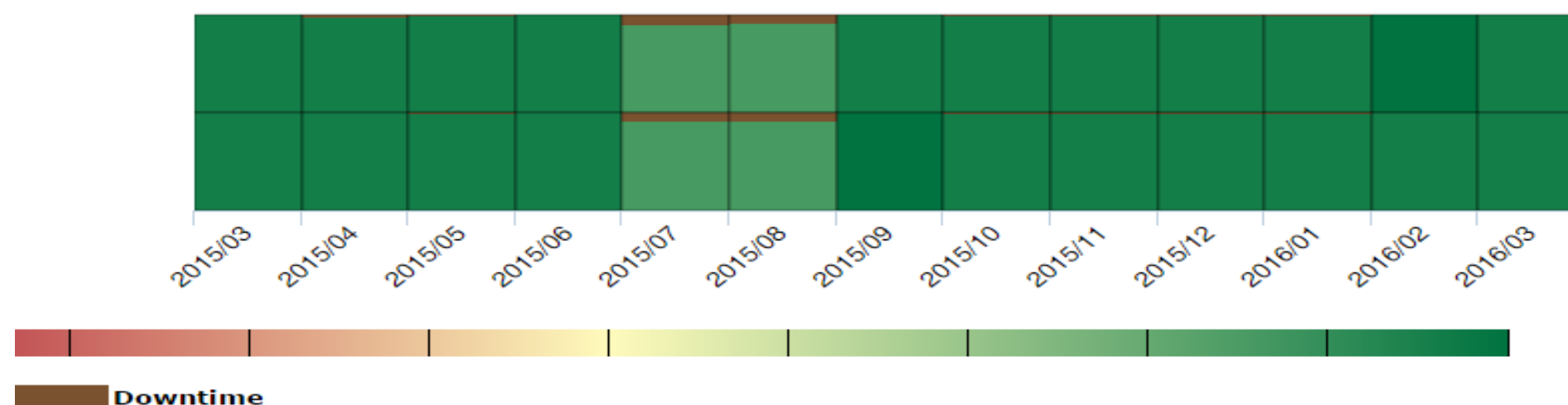
From 2015/03 to 2016/03



## Service Availability using ATLAS\_CRITICAL

n.ihep.ac.cn

From 2015/03 to 2016/03



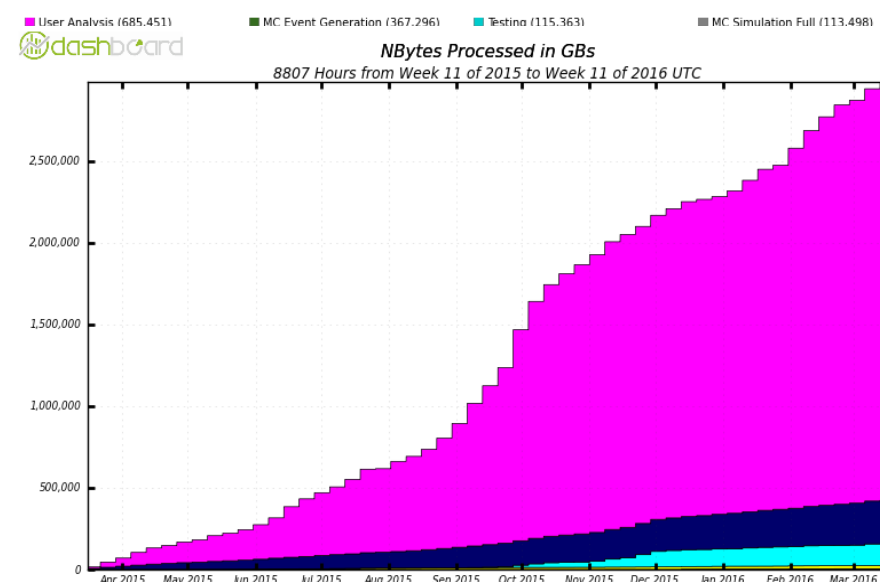
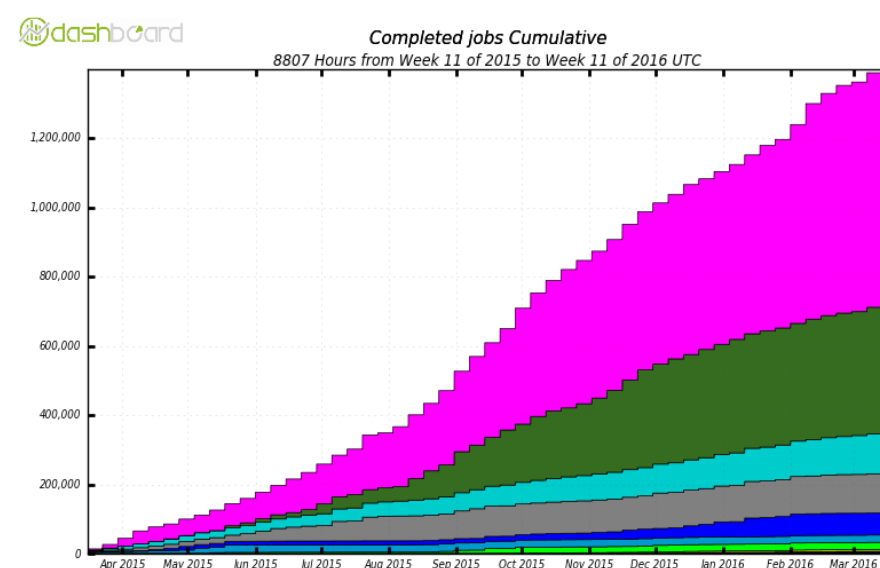
From 2015/03~2016/03

Site reliability: **99.09%**, ranked at 37<sup>th</sup> of 138 ATLAS sites.

Site availability: maintenance period across July and August.

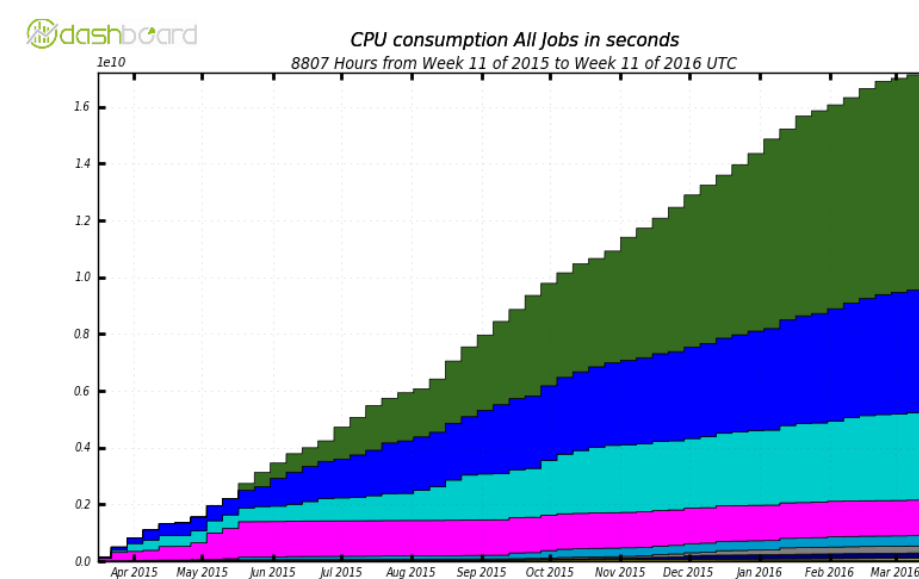
# Data Processed at Beijing Site

- ▶ **5.6Million** CPU hours.
- ▶ **1.5 Million** jobs completed
- ▶ **3PB** data, **3.5Billion** events processed .

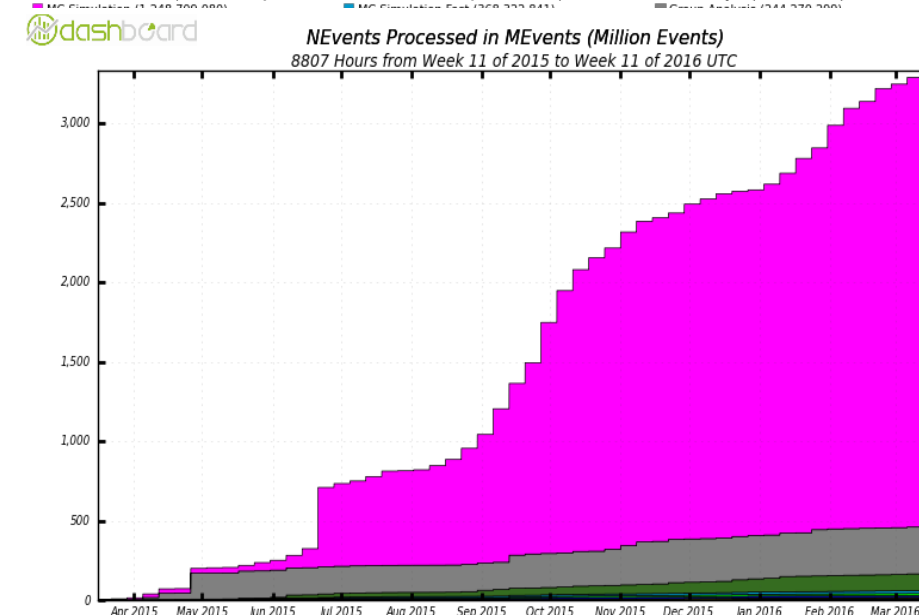


User Analysis (685,451) MC Event Generation (367,296) Testino (115,363) MC Simulation Full (113,498)  
 Analysis (2,565,380) Others (265,887) MC Reconstruction (134,507) MC Simulation (18,900)  
 Data Processing (5,195)

Total: 2,989,872 , Average Rate: 0.09 /s



MC Event Generation (7,613,579,080) MC Simulation Full (4,353,715,625) User Analysis (3,089,854,374)  
 MC Simulation Fast (268,373,841)



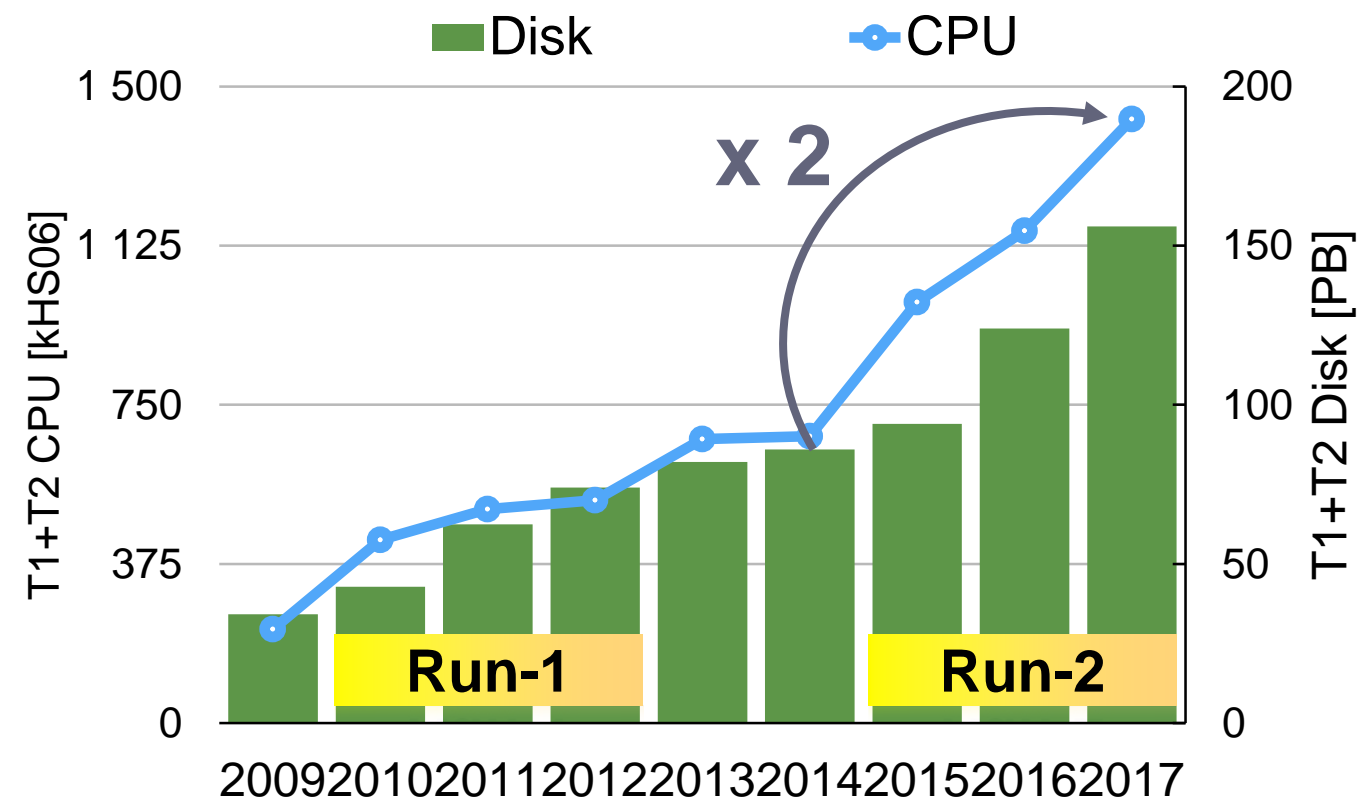
User Analysis (2,870) Group Analysis (294.67) MC Event Generation (106.97) MC Simulation Full (17.30)  
 Testing (13.45) MC Simulation Fast (10.94) MC Simulation (6.03) MC Reconstruction (5.70)  
 Data Processing (5.51) Others (0.02)

Total: 3,331 , Average Rate: 0.00 /s

# Seeking extra CPU resources

- LHC experiments need and use more CPU than pledged resources
- **LHC Run-2 : CPU needs x 2**
- Every possible options are investigated to get extra resources
  - Cloud computing
  - HPC (High Performance Computing) centres
  - Volunteer computing
- **Our collaboration is active in these areas**

## ATLAS resource needs at T1s & T2s



Home

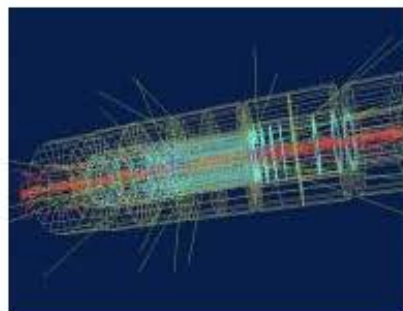
VISITORS overview

VOLUNTEERS resources

PROJECT news

PARTNERS

THE WORLD IS OUR  
CALCULATOR



# WELCOME TO ATLAS@HOME

atlas@home project news



Last Tuesday, 12th of January 2016, the project's volunteers contributed more than 10,000 computing cores in parallel !

The ATLAS experiment



What's new with LHC ?



ATLAS completes first year at 13 TeV and presents results in a packed main auditorium

JOIN US !!!!!

ATLAS@HOME Participants



## VOLUNTEERS

[ATLAS Jobs Statistics](#)

[Top participants and teams](#)

[Countries overview](#)

[Participant profiles](#)

## CURRENT TASKS

[Fall 2015 : up to the Higgs !](#)

[Summer 2015 : W's](#)

[Spring 2015 : top](#)

[Winter 2014 : rate, validation and stability](#)

[Summer 2014 : "MB" events](#)

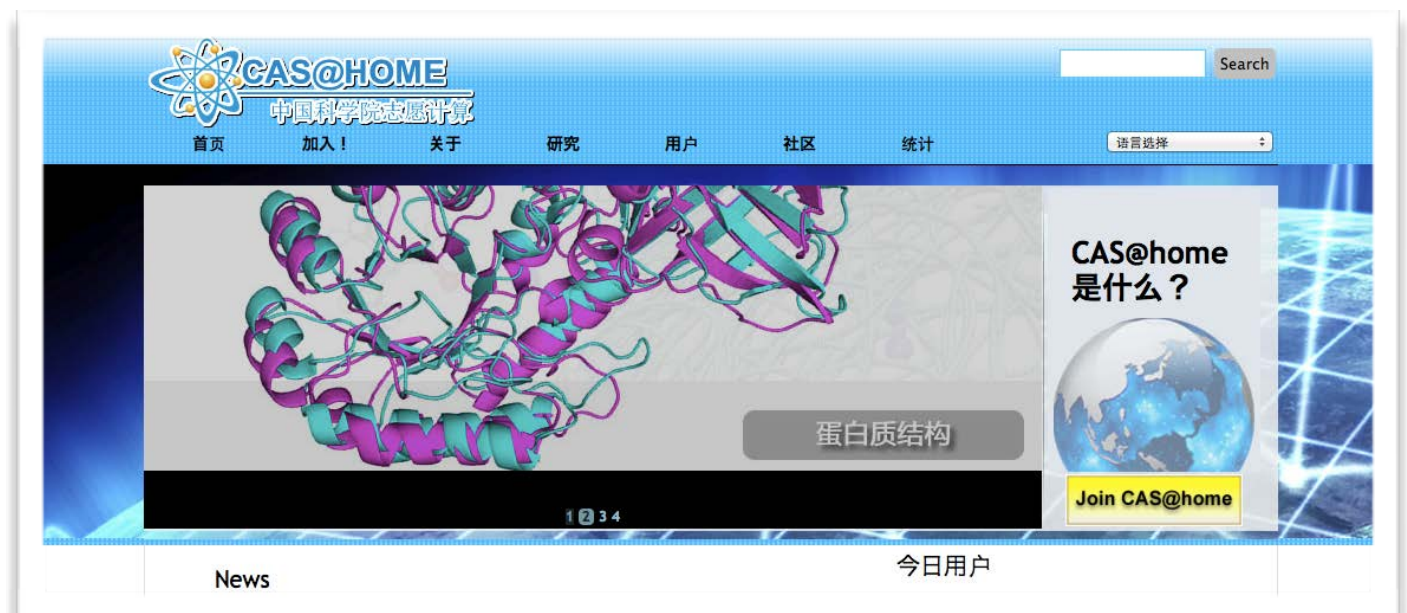
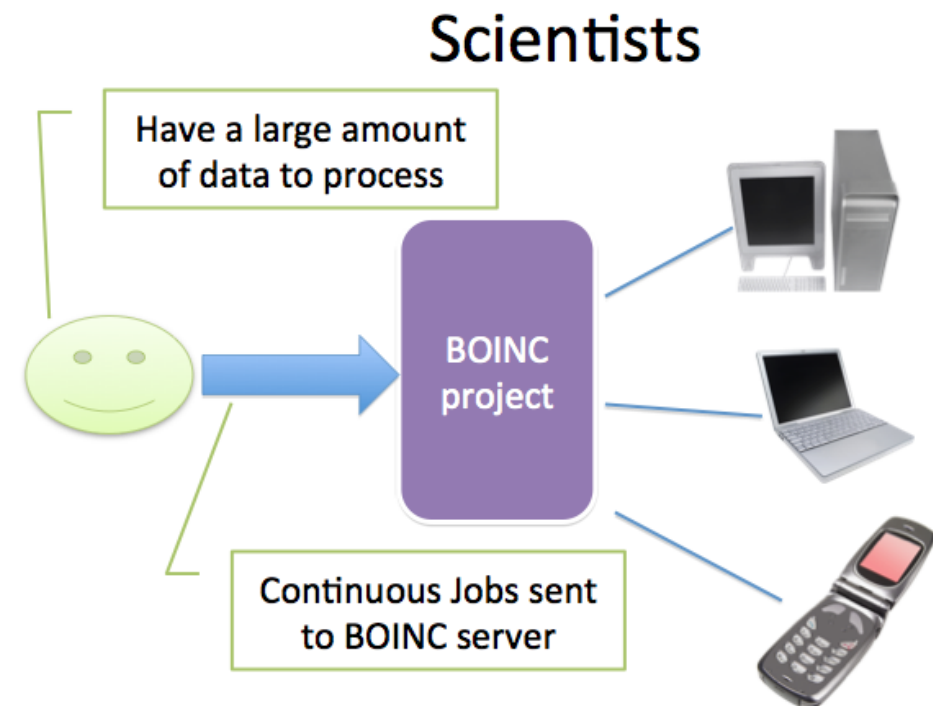
[Spring 2014 : the Z boson](#)

[Getting started in 2014 : first WU's are for SUSY](#)



# What is volunteer computing?

- ▶ Use of personal computer spare cycles (when computer sleeps) to run jobs for a community
- ▶ Initial project SETI (Search for Extra-Terrestrial Intelligence) launched in 1999
- ▶ Standard interfaces provided by BOINC project (Berkeley Open Infrastructure for Network Computing)
- ▶ Pioneer project in Asia : CAS@home



# ATLAS@home : a visible project

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- Numerous contributions to
  - ATLAS & LHC meetings,
  - Computing workshops
- 2 contributions at CHEP-2015 conference
- Visible on the Web
- Part of ATLAS outreach strategy
- Fully integrated in ATLAS production system
  - First and only LHC experiment !

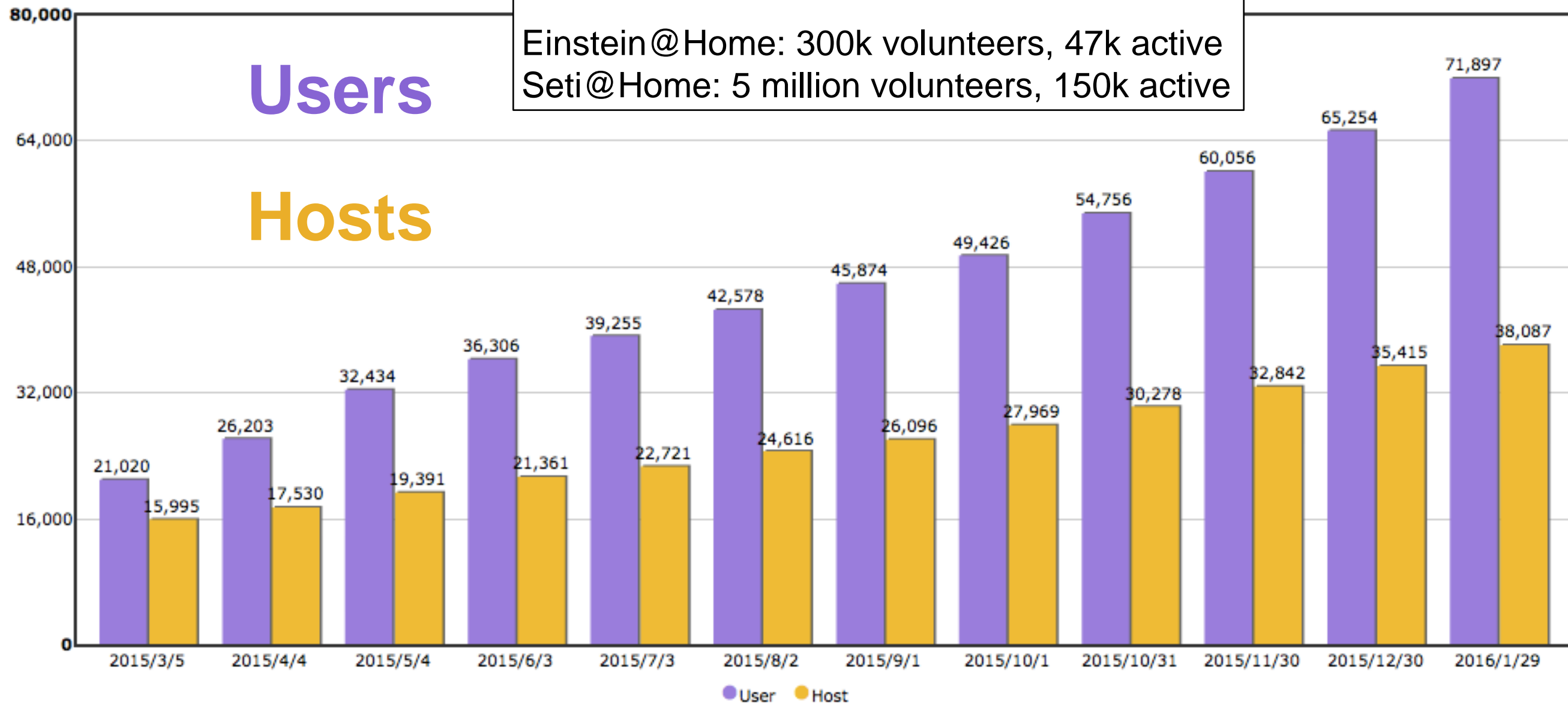


# Volunteer growth since March 2015

## Currently 72k volunteers:

- 7500 ran at least one job
- 2500 currently active

Einstein@Home: 300k volunteers, 47k active  
Seti@Home: 5 million volunteers, 150k active



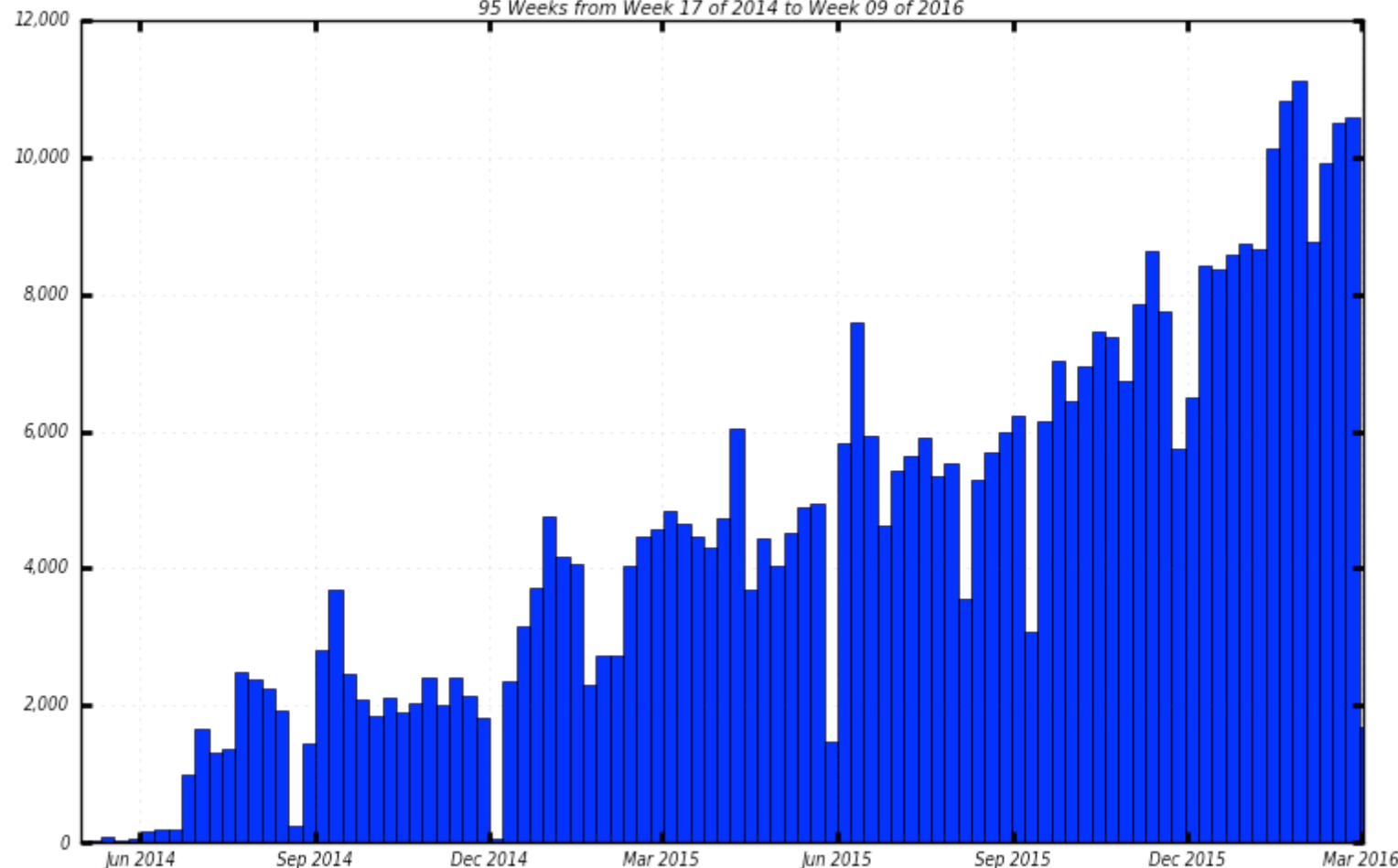
# Job statistics since May 2014

- Continuous increase in running jobs
- Now 11k parallel running jobs
- 4M completed jobs
- 5.6M CPU hours, 64M events
- Gaps are due to technical issues, not lack of volunteers

dashboard

Slots of Running Jobs

95 Weeks from Week 17 of 2014 to Week 09 of 2016



■ MC Simulation

Maximum: 11,129 , Minimum: 0.00 , Average: 4,378 , Current: 1,694

MC Simulation on all Grid sites  
[Mar. 2015, Mar. 2016]  
**ATLAS@home : 3<sup>rd</sup> site**

# Long... ATLAS@home work-plan for 2016

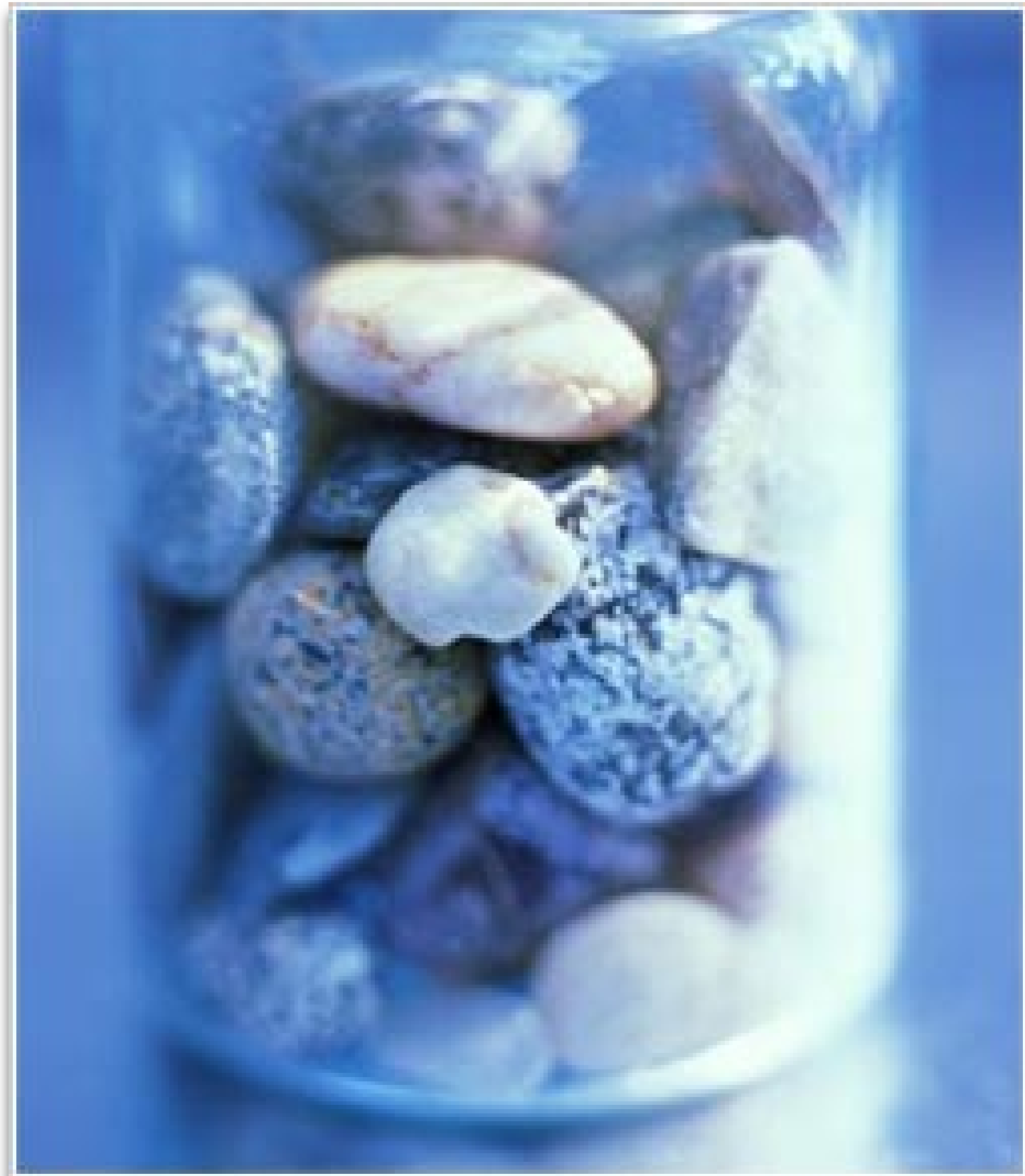
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- ▶ Multi-core: run dynamically multi-core jobs on volunteer machines based on no cores assigned to ATLAS
- ▶ Event Service: integration with event service for continuous upload of events as they are produced
- ▶ New task types: start running event generation and other low I/O workloads
- ▶ Scaleability: investigate how infrastructure could scale with a 10 or 100-fold increase in volunteers
- ▶ Outreach: Challenger, web design, “screensaver”, volunteer recruitment, ...

# HPCs for HEP simulations

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- The jar on the right is full of rocks
- Nevertheless it is not full
- Often when supercomputers are “full”, there are empty nodes
- We developed a program to use those empty nodes for ATLAS simulation
- Pioneer work
  - that can be used for other experiments and future projects
  - in light of developing large initiatives in the area of big data and computing at the exascale



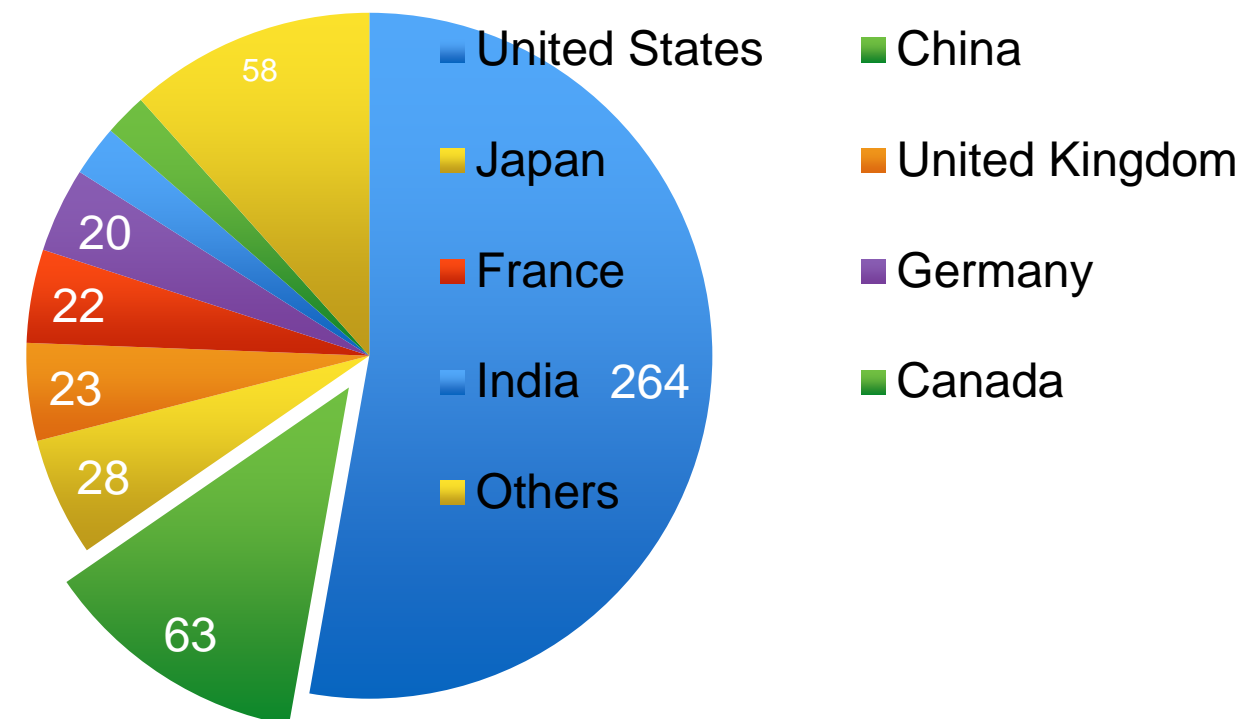
# HPC (High-Performance Computing) resources

- ▶ Large investments in many countries : from Peta to Exa scales initiatives<sup>[1]</sup>
- ▶ Latest competitive supercomputers are familiar Linux clusters
- ▶ **Large** number of spare CPU cycles are available at HPCs which are not used by 'standard' HPC applications
- ▶ **China** host some of the largest HPC facilities worldwide



**SuperMUC a PRACE Tier-0 centre :**  
**155,000 Sandy Bridge cores    2.8M HS06**  
**WLCG 2013 T0/1/2 pledges ~2.0M HS06**

Number of facilities in Top500 per country (2014)



# Interface of HPCs from CAS

- Collaboration between European collaborators, IHEP and CNIC (Computer Network Information Center)
- HPC centres from CAS inter-connected through ScGrid!
  - Unique in the world!
- Jan. 2015 workshop at CNIC to define the interface between WLCG and ScGrid
- Fall 2015, the interface is installed in IHEP
  - Event simulation on HPCs
  - Storage at IHEP
- Prototype is working now!



中国科学院  
计算机网络信息中心  
Computer Network Information Center  
Chinese Academy of Sciences

Supercomputing Center of Chinese Academy of Sciences

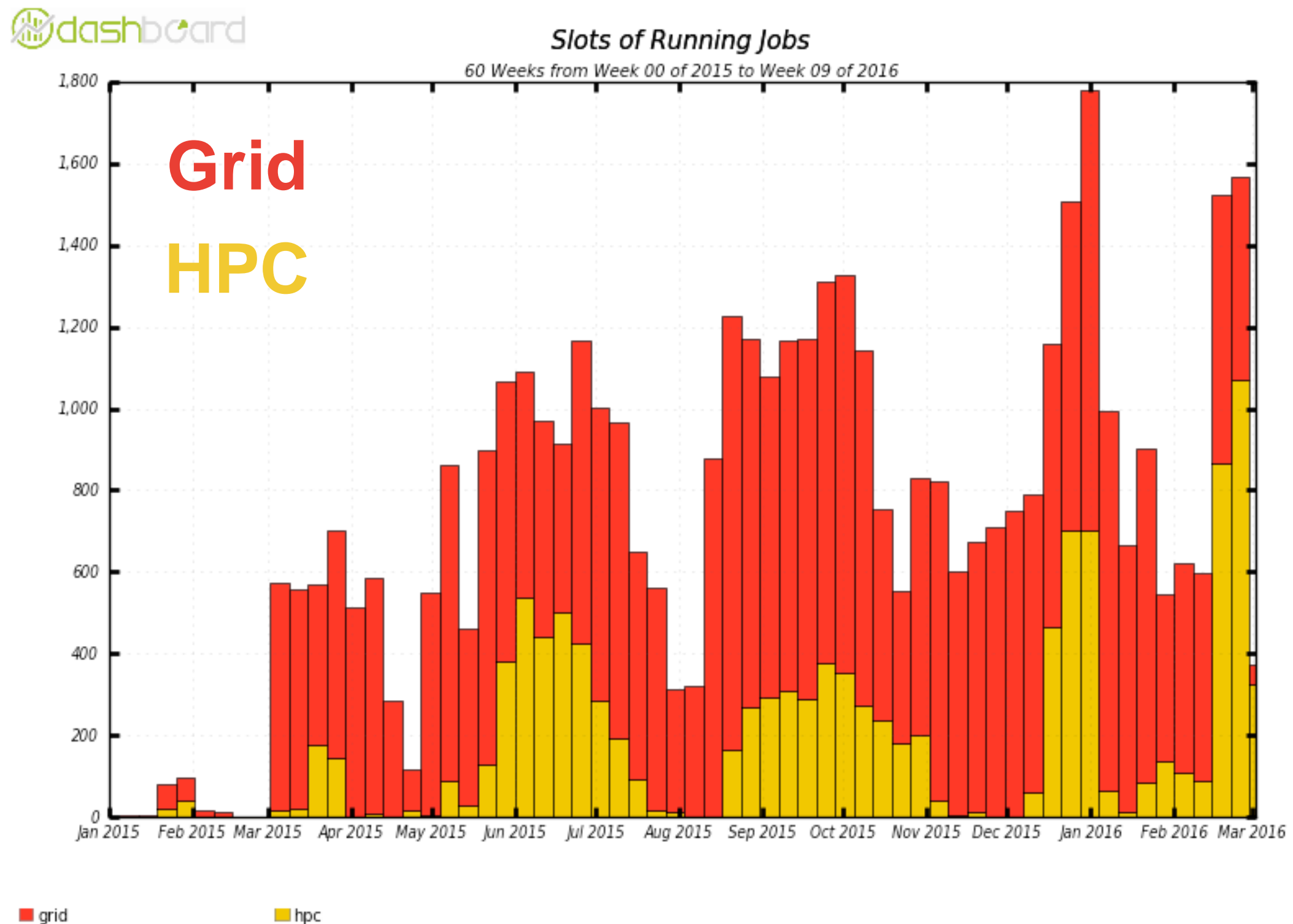
## Scientific Computing Grid (ScGrid)

- ▣ Supercomputing Environment in CAS
- ▣ computing resources
  - 300T flops CPU
  - 3000T flops GPU
- ▣ 30+ Institutes from CAS
  - SCCAS: Head Center
  - 8 branch centers
  - 18 regional centers
  - 11 GPU clusters

21



# IHEP (ATLAS) Tier 2 site simulation activity since Jan. 2015



Huairou campus of CNIC

Chinese: 元 (Yuan)

English: ERA

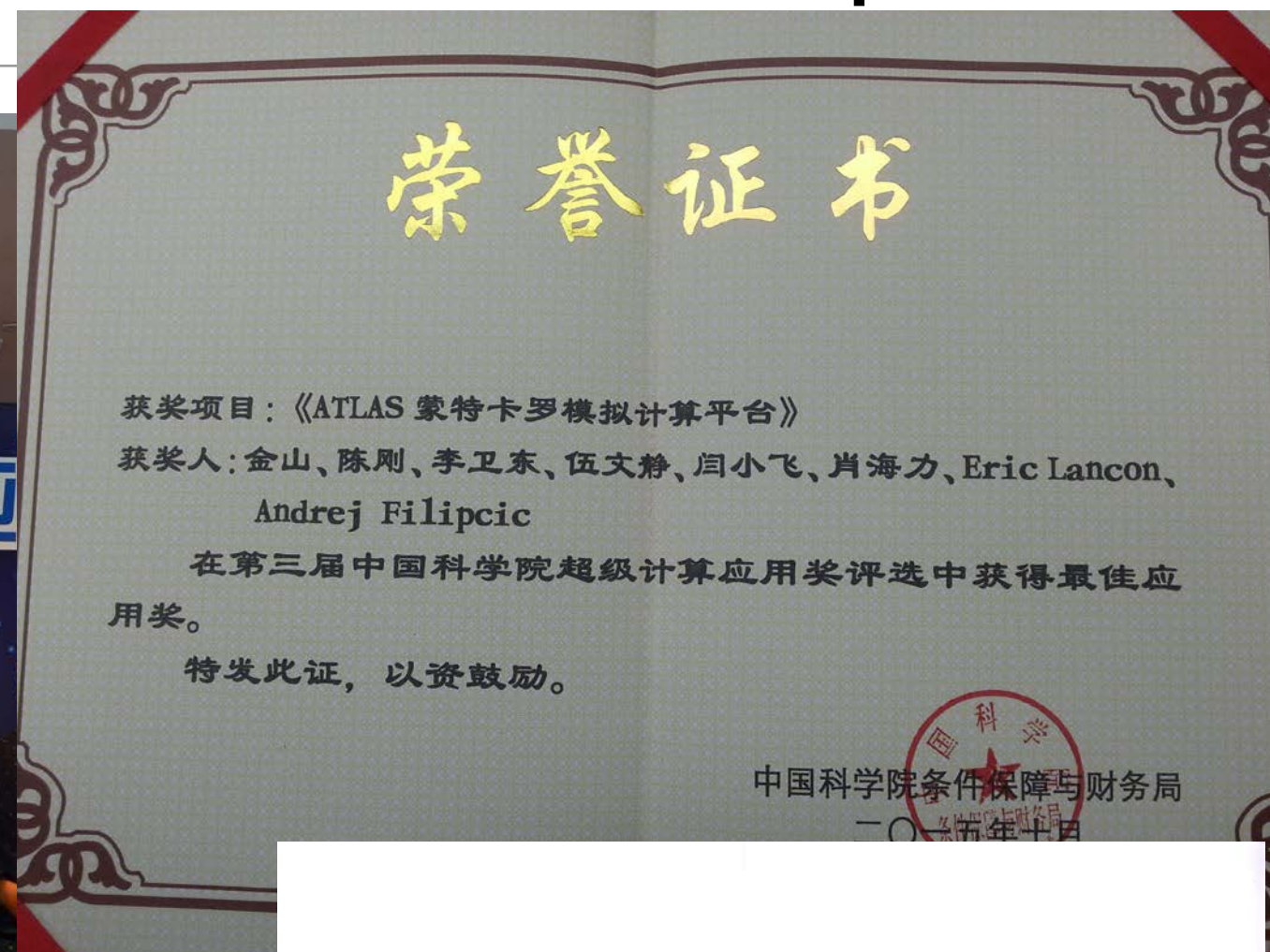


Tianhe-1A : TOP500 2nd, June 2011





# Our activity won the 2015 CAS HPC prize!



# 2016 work-plan on HPCs

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- Scalability tests, it is just the beginning !
- Publish our work and present at conferences
- Test and use more HPC centres
- Use of ScGrid as a whole, no just a few HPCs independently

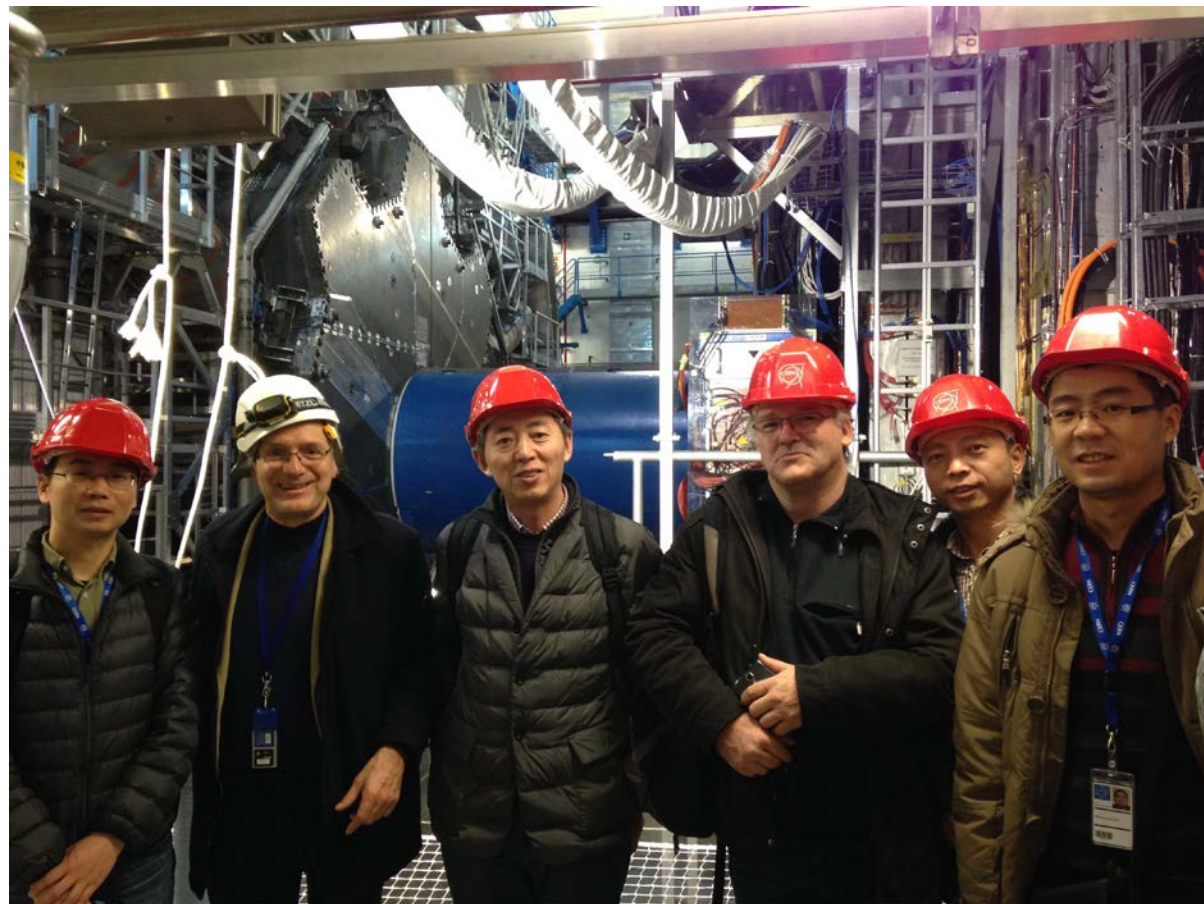


# Meetings and workshops

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Annual workshop of the French-cloud in Tokyo  
Participants from : Beijing, Honk-kong, Tokyo, France

Visit of ATLAS and participation to ATLAS  
computing workshop



+ many others....

# Summary & Outlook

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- A very healthy collaboration ! with visible contributions
- Prospects for the forthcoming year
  - ATLAS@home : Born in FCPPL, not yet at full scale, many optimisations to be done
  - HPC : from prototype to production
- Long term and substantial support needed
  - Collaboration need regular face to face meetings
    - Dedicated meeting next week @IHEP, Beijing
  - Opportunities come from small talks and not through Skype/Video-conf.

謝謝