HPCs in China

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Current HPC Resources

- 2 HPCs are available for use : Era-II and Tianhe_1A

- Provided through one Institute

  - CNIC(Chinese Network and Information Center, Chinese Academy of Sciences)

  - Common Interface to ARC CE: SCE (Science Grid Middleware)

- Current usable resource (Max. **2000** cores)

  - Era-II: Maximum 60 work nodes, **1440** cores

  - Tianhe_1A: Maximum 50 work nodes, **600** cores

  - Shared by different applications

- Can expect more (4000 cores?) with more effort

History

- Set up in Jan 2015 with PI (another HPC from SJU, China), started with one work node.

- March 2015, added Era (later upgraded to Era-II)

- Sep 2015, added Tianhe_1A

- Mar 2016, Era upgraded to Era-II

- Has some peak running between the middle of 2015 and 2016

- Became inactive due to little manpower support from ATLAS side to solve the technique issues since the end of 2016

2015.3 ERA   2016.3 ERA-II

Fully Running

2015.1 PI   2015.9 Tianhe_1A   2016.9   2017.9
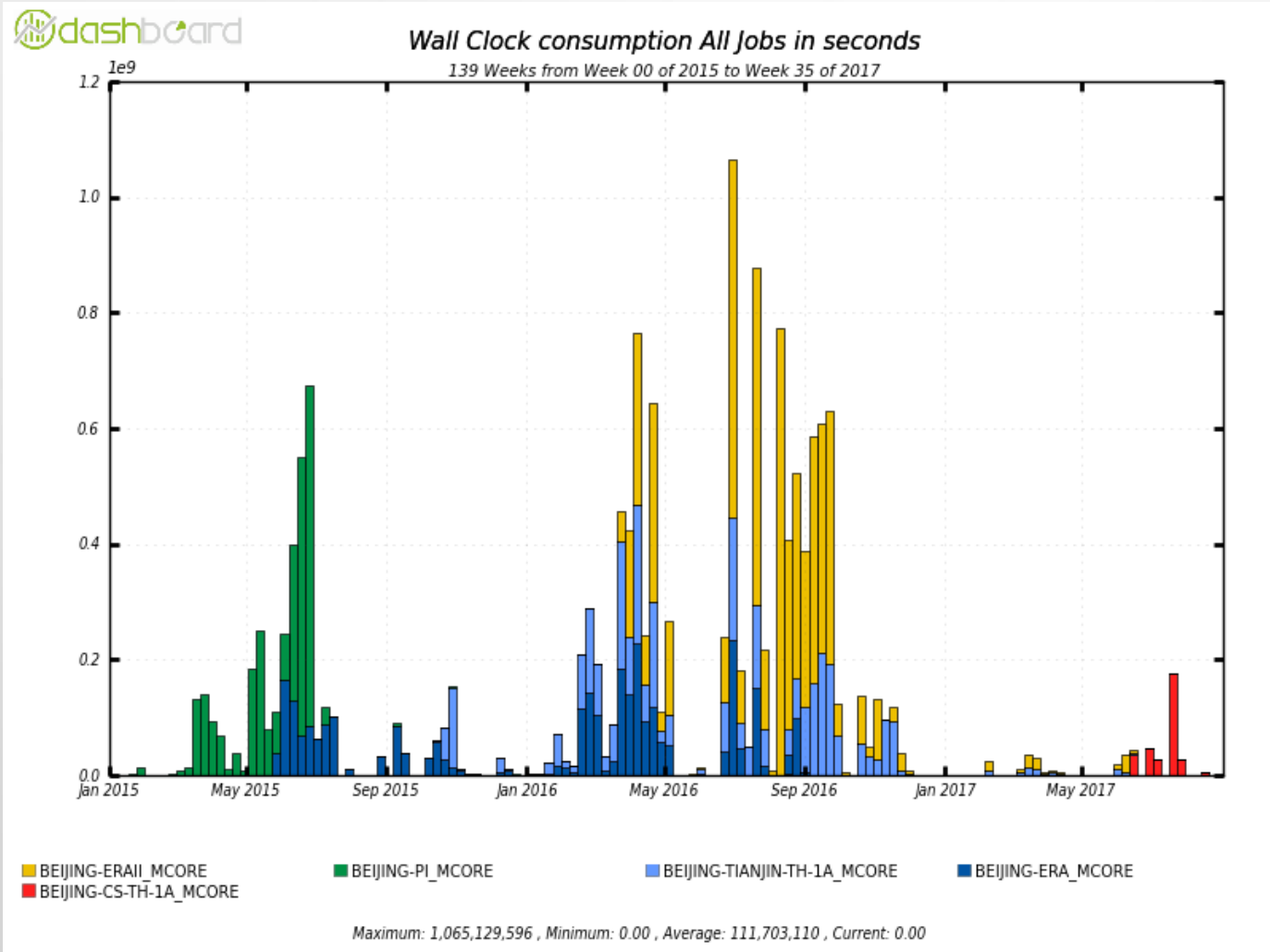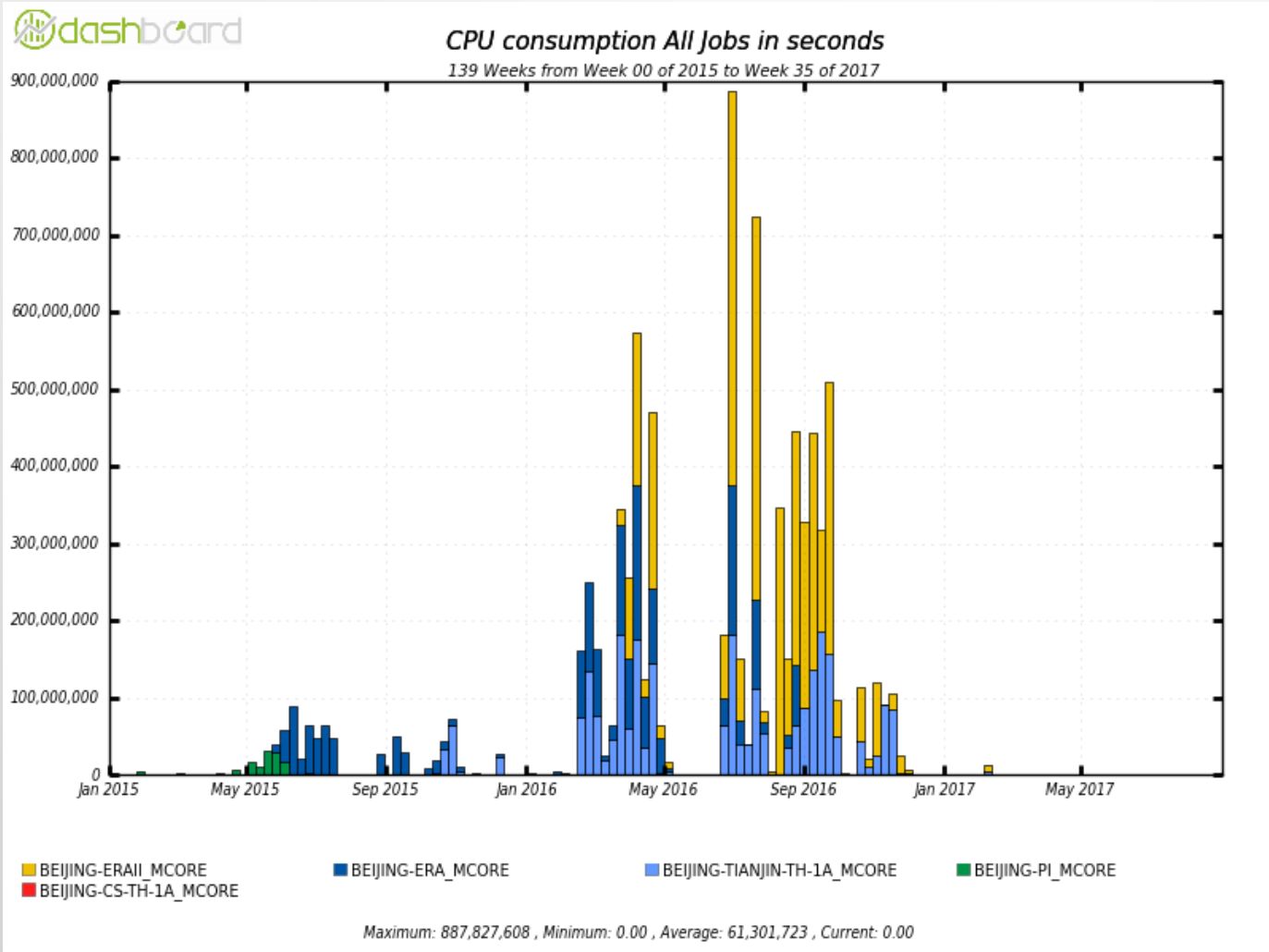
Past usage
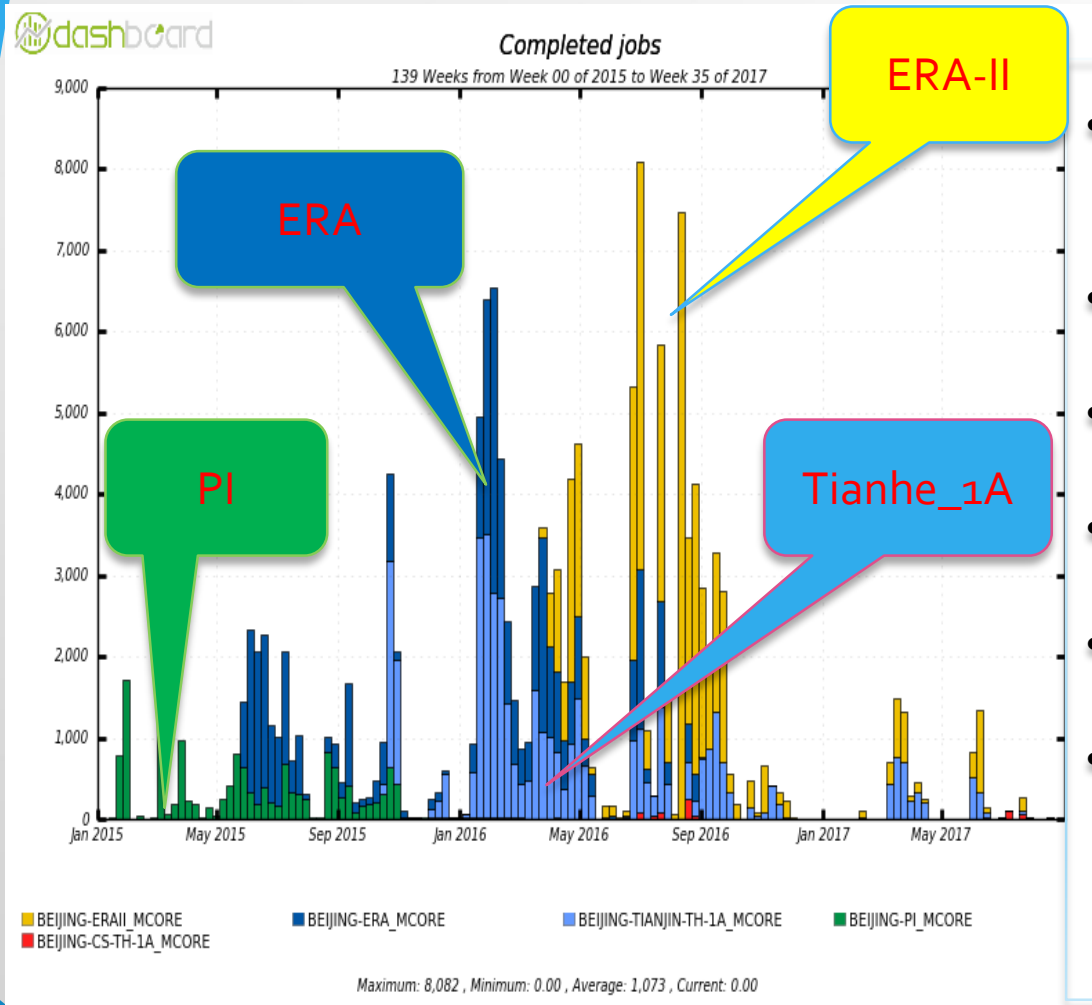
- Running Mcore jobs
  - 24 core (Era-II)
  - 12 core (Tianhe_1A)
- Used job cores grouped weekly
- 4 HPCs were used, 2 remain active
- Max. used of Era-II: **1400** cores/day
- Max. used of Tianhe_1A: **600** cores/day
- Currently active:
 - Era-II and Tianhe_1A
  - Both PI and Era stopped providing

# Peak used walltime (all jobs): **1700** CPU days/day

Wall Clock consumption All Jobs in seconds
139 Weeks from Week 00 of 2015 to Week 35 of 2017

Legend:
- BEIJING-ERAII_MCORE
- BEIJING-PI_MCORE
- BEIJING-TIANJIN-TH-1A_MCORE
- BEIJING-ERA_MCORE
- BEIJING-CS-TH-1A_MCORE

Maximum: 1,065,129,596 , Minimum: 0.00 , Average: 111,703,110 , Current: 0.00

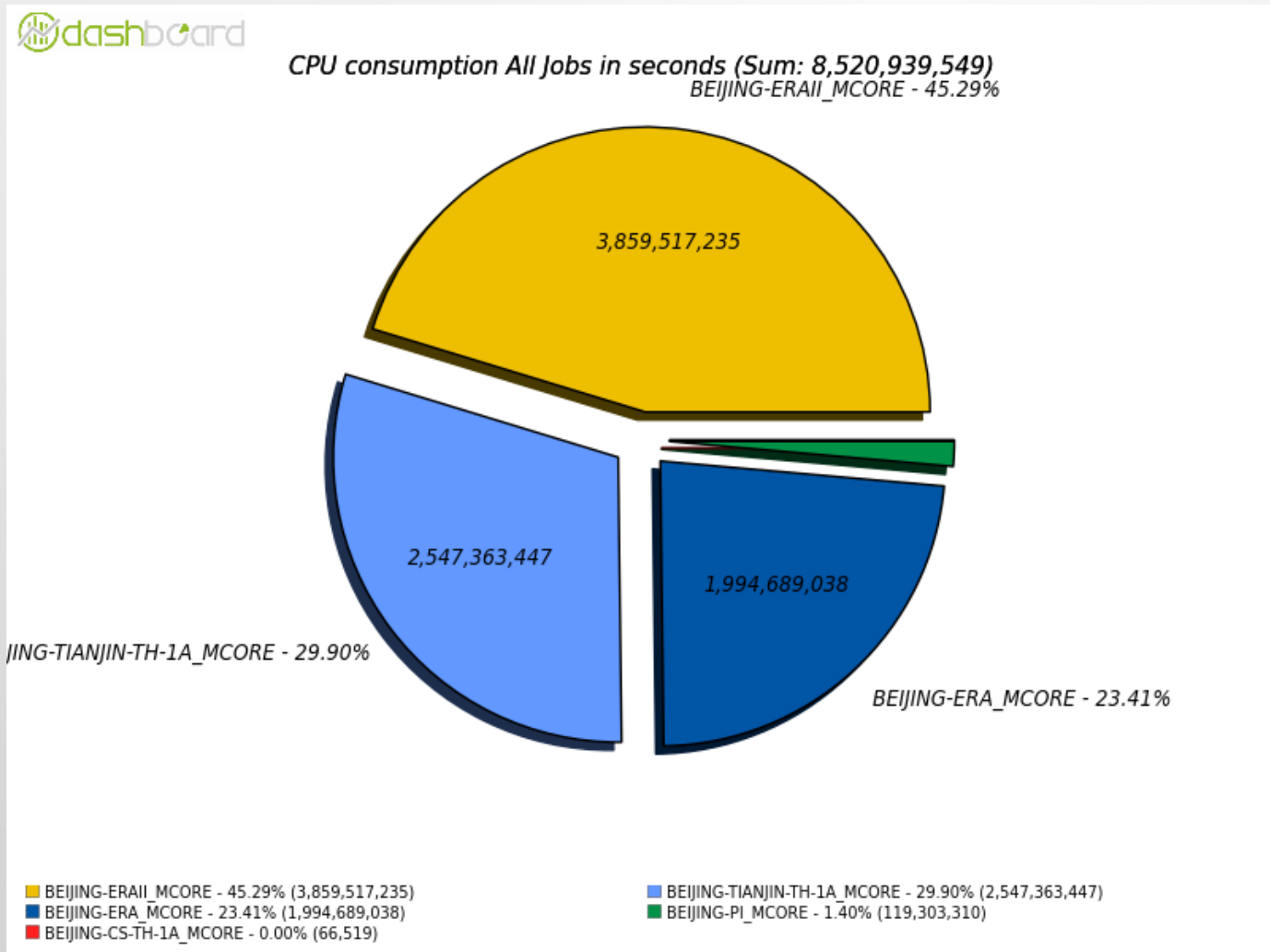# Peak used CPUtime (all jobs): **1500** CPU days/day

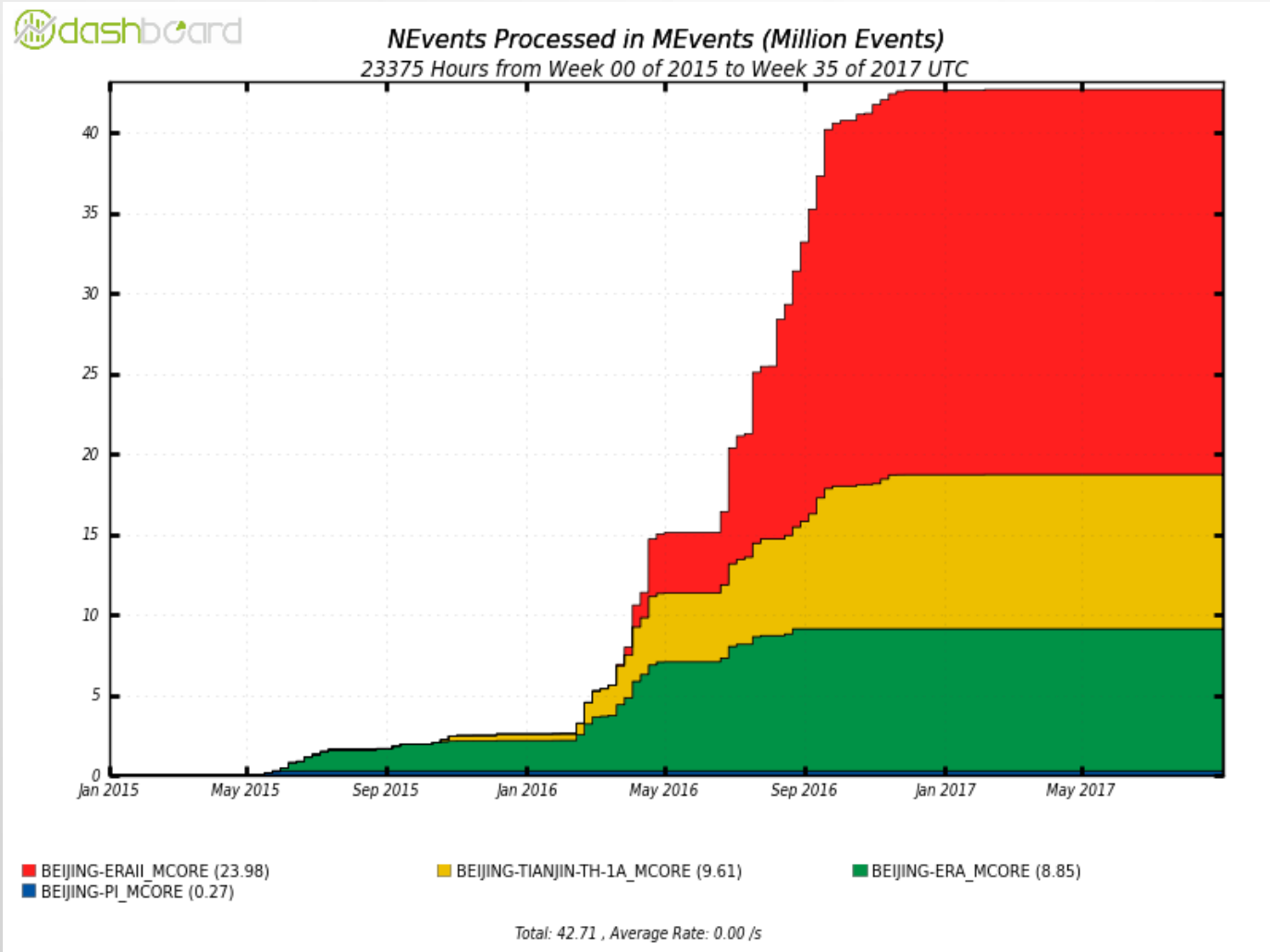# Peak simulated events (good jobs): **0.6**M events/day
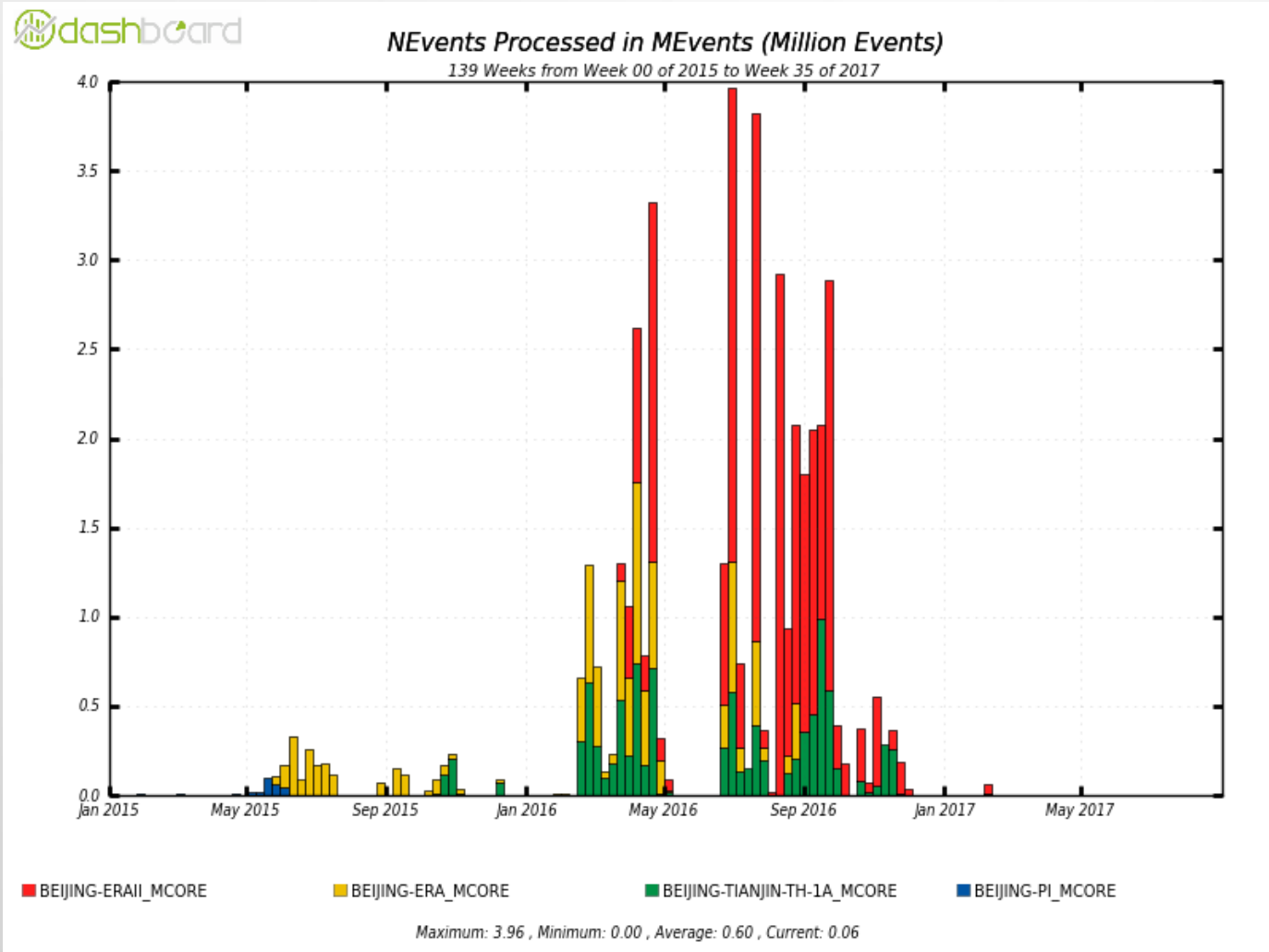
All used walltime (all jobs): **492** CPU Years (since 2015)

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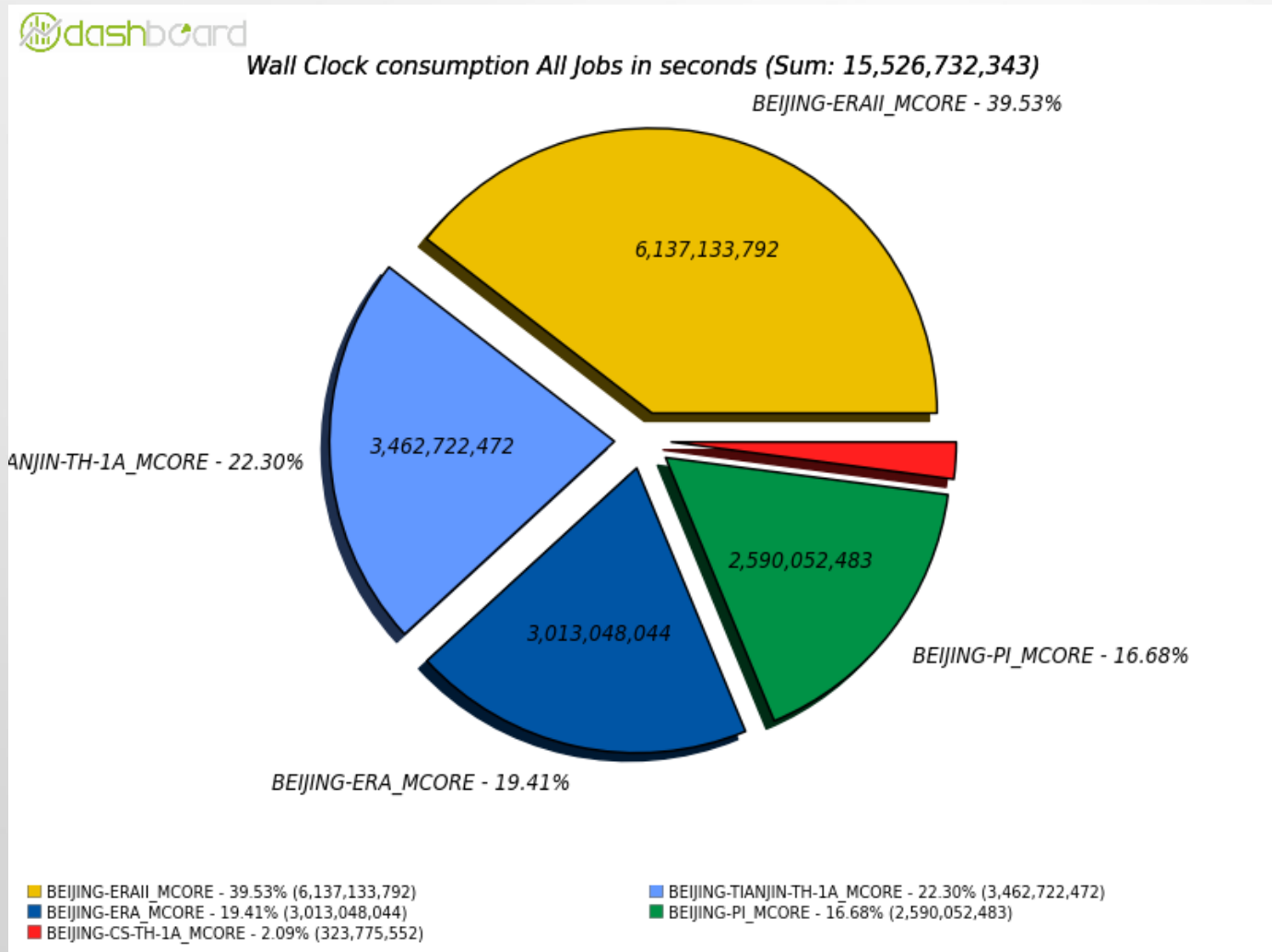
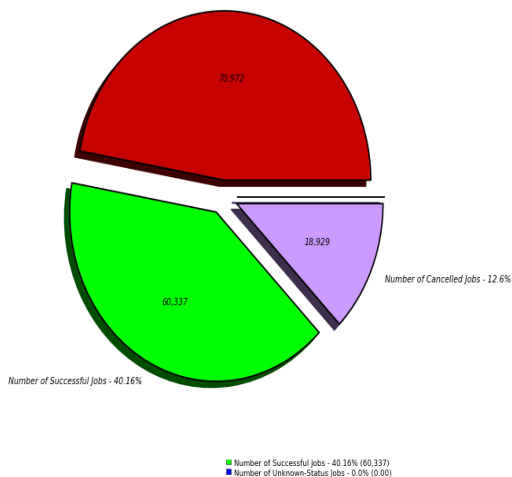# All used CPUtime (all jobs): **270** CPU Years (since 2015)

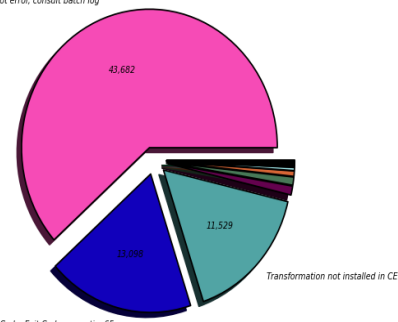# All simulated events: **45 M events** (since 2015)

NEvents Processed in MEvents (Million Events)
23375 Hours from Week 00 of 2015 to Week 35 of 2017 UTC

BEIJING-ERAII_MCORE (23.98)   BEIJING-TIANJIN-TH-1A_MCORE (9.61)   BEIJING-ERA_MCORE (8.85)
BEIJING-PI_MCORE (0.27)

Total: 42.71 , Average Rate: 0.00 /s

Errors

Number of Successful and Failed Jobs (Sum: 150,238)

Panda Failures by ExitCode (Sum: 70,920)

Number of Successful and Failed Jobs
139 Weeks from Week 00 of 2015 to Week 35 of 2017

- 47% Failed jobs
- Due to
  - SCI interface to ARC CE, weak file transfer functionality
  - ATLAS Software release upgrade
  - Incompatibility from Pilot upgrade
    - Trying to access files from CVMFS
- Current obstacle
  - Distribute ATLAS R21.0 to HPC shared file system

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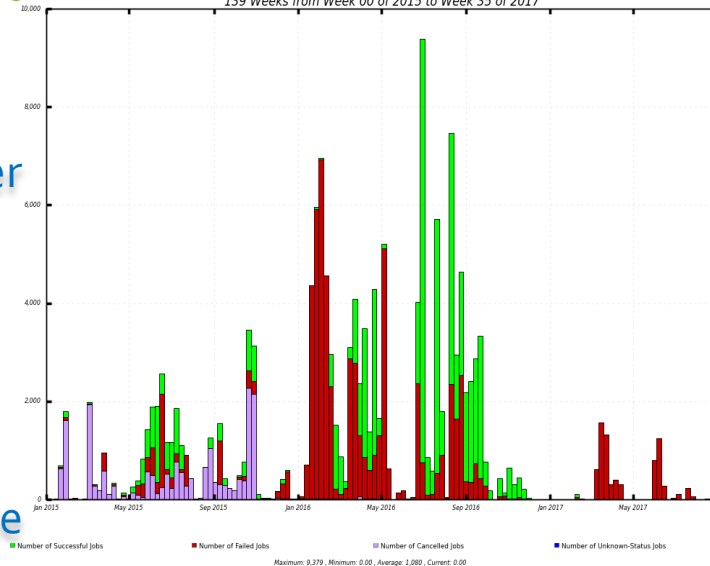
Can be Expected (1)

- Current Max. cores are **2000**

- All the resources are from the "Free" resources of HPCs, which is a small fraction of the entire resources

- These "Free" resources are shared by a few applications with equal priority.

  - Applications with more jobs can get a bigger share of resources

- Possible to add more from other Chinese HPCs

  - All the major Chinese HPCs are integrated into one interface (Science Grid), and managed by CNIC.

  - The technique challenges for extending to different HPCs are from share file systems, software distribution.

  - We did not progress well on this due to inactive follow-up and communication with the CNIC. (Manpower!)

Can be Expected (2)

- We can expect Max. ~ 4000 cores if
    - there is more manpower to solve the tech issues and remain good communication and connections with the HPC centers.
    - Motivate the HPCs centers to give more

Motivation for HPC centers

- They are not part of WLHC collaboration

- From HPC centers' point of view: "Free" resources are normally given to customers to "try", eventually they become paying customers. No HPCs are FREE!

- Political views: why should they give so much to ATLAS?

- They are interested

    - Visibility (paper, collaboration)

    - International collaborations which could bring them potential national/international funding opportunities

- Already done

    - CNIC people attended ATLAS software week in CERN in 2016

    - Attended CHEP2016, co-published paper in proceeding.
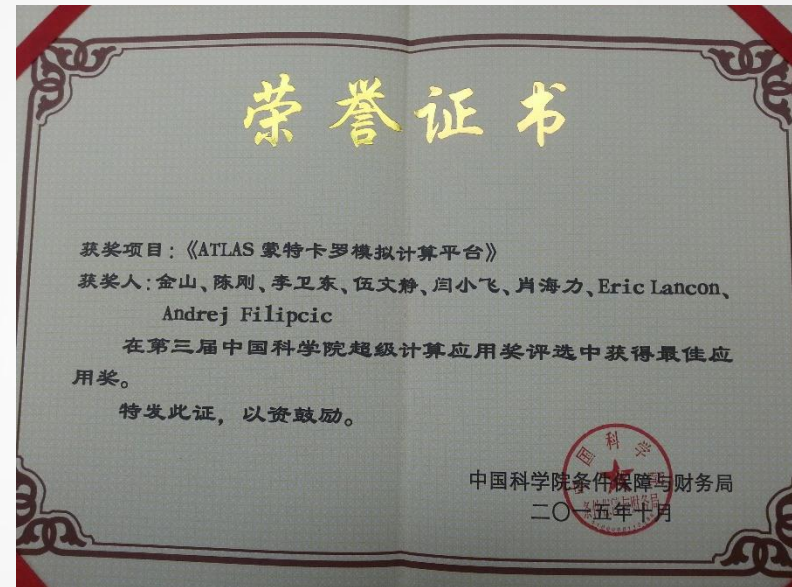
Complaints from HPC

- Not fixing problems in time
  - Job keep failing for a few days, wasting CPU time
- Information is not transparent or being shared
  - Usage pattern (when and how much resources does ATLAS jobs need?)
  - Job monitoring information (how much are failing from ATLAS point of view)
    - The common ATLAS monitoring is a bit too big and complicated for the HPC center to look at, need to provided smaller/simpler job monitoring
- Solutions
  - Will add extra 0.25 FTE (Wenjing) in 2017 to work with HPC centers
    - monitoring running status, solving tech issues
    - bridging information sharing between HPCs and ATLAS
    - Motivation to HPC centers (common effort for funding search, publication)

Summary

- Chinese HPCs can provide a considerable amount of CPUs for ATLAS simulation.

- Was not fully used due to lack of manpower investment

    - Tech issues

    - Communication with HPC centers

- Hopefully can be improved in the later half of 2017

    - Reactive the usage of current available 2 HPCs (solve the new software distribution problem)

    - Add 1 or more HPCs to the Free resource pool

Acknowledgements

- ATLAS application won "Best Application" award in 2015 from CAS HPC alliance

- Ack. to
  - CNIC (HPC) : Xuebing Chi, Haili Xiao, Rongqiong Cao, Shasha Hou

  - NordGrid (Uni. Oslo) : s.h.raddum, Jon Kerr Nilsen, ATLAS : Eric Lancon, Andrej Filipcic, David Cameron, Paul Nilsson

  - IHEP : Gang Chen, Xiaofei Yan

  - SJU : Eric Germaneau

Thanks!