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# Integration of the Chinese HPC Grid in ATLAS Distributed Computing

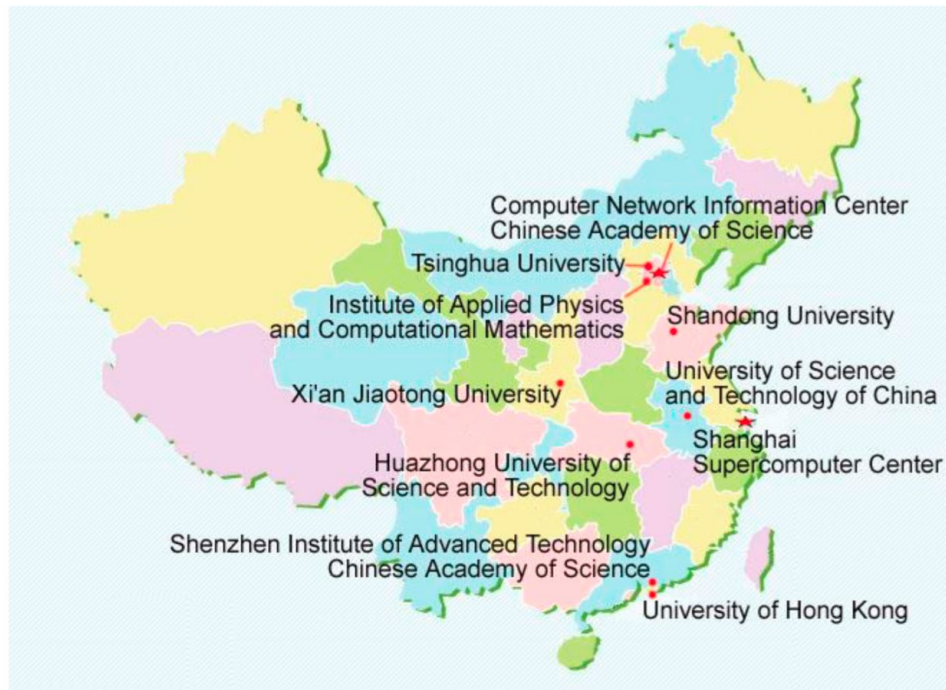
— Andrej Filipčič on behalf of the —  
ATLAS Collaboration

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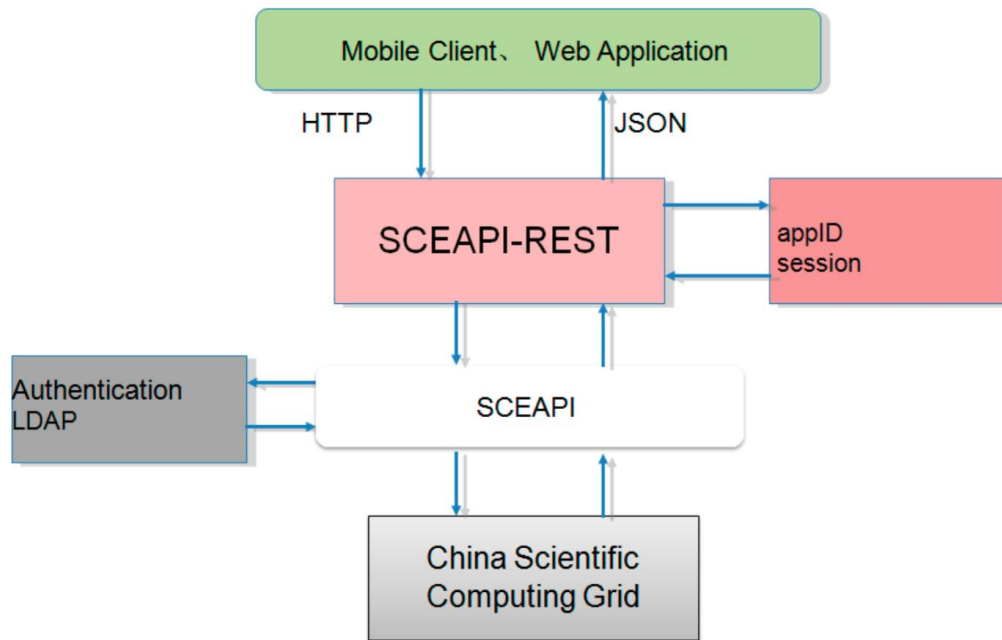
# Chinese HPC CNGrid

- 15 HPC centers participating in transparently accessible infrastructure
  - Including MilkyWay-1,2
- Some of them interested to provide resources to ATLAS
  - Tianhe-1A (CS, TJ)
  - CNIC ERA
- Resources are limited for now



# SCEAPI - the RESTful interface to CNGrid

- Secure http access
- Authentication and authorization:
  - Register with username and password
  - Json token
- Registered applications:
  - Preinstalled on selected HPCs
- Job submission interface
  - HPC selection
- File interface
  - Transfer job input and output files
- Job Status interface
- Job and file management

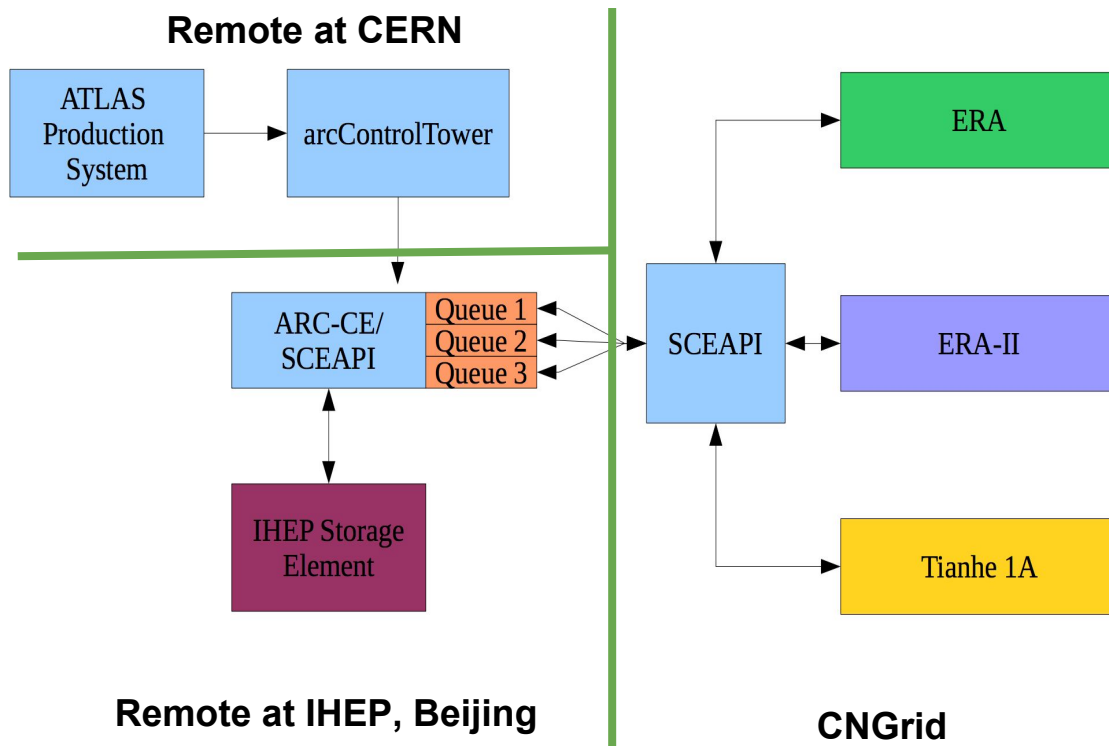


# SCEAPI similar to grid Compute Element

- Optimized for HPC jobs
- No outbound connectivity inside HPC
- All data management needs to be done externally
- Only approved applications can run
  - Job wrappers fixed and preinstalled
  - Payload description can be submitted as a an input file
- All required software needs to be preinstalled
  - Software is copied locally to each HPCs, shared CNGrid-wide filesystem facilitates deployment
  - Deployment is done by HPC administrators

# Connecting CNGrid to ATLAS production system

- arcControlTower + ARC-CE used for many years in Nordugrid with distributed dCache T1 storage
  - Data transfers controlled by ARC-CE
  - Input file caching
  - Suitable for clusters with capable shared file system
- ARC-CE backend extended
  - Using SCEAPI as yet another batch system
  - ARC-CE queue submits to targeted HPC



# ATLAS software installation

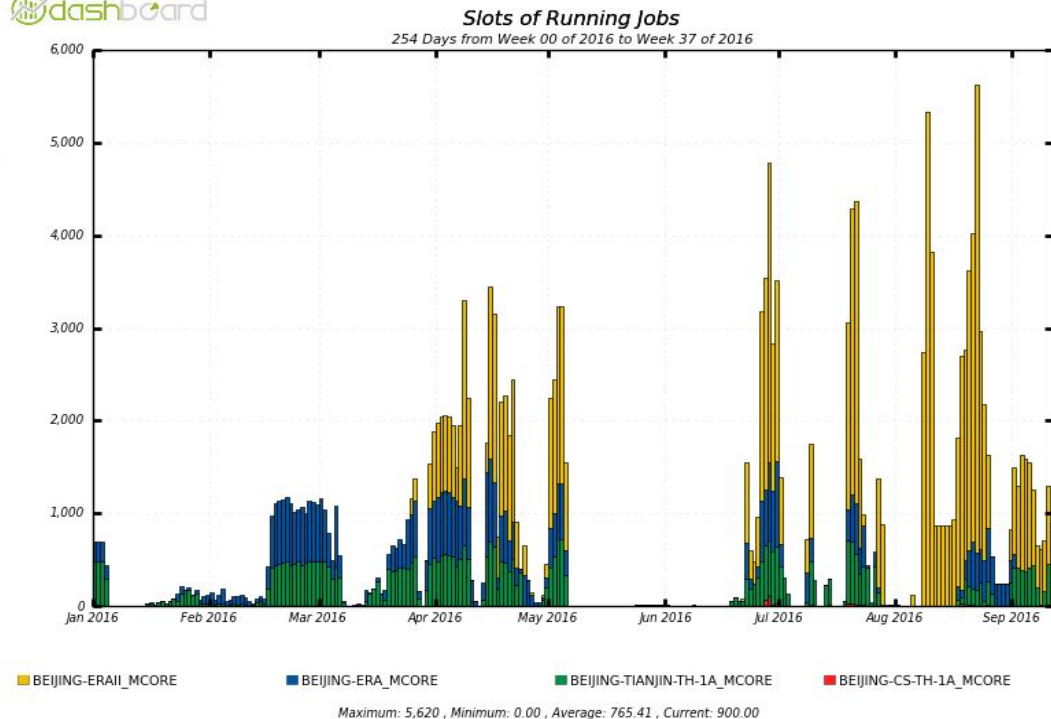
- CNGrid targeted for ATLAS Monte-Carlo simulation only
  - The most CPU time consuming activity
  - ATLAS production campaigns span periods of many months, the same software release is used throughout the campaign
- CVMFS tarballs - part of the tree
  - Targeted ATLAS software release
  - Supporting common software (compilers, wrappers, 3rd party libraries)
  - Detector conditions packed in DBRelease sqlite distribution
  - Scripts to automatically fix the software relocation paths in ATLAS setup scripts
- CNGrid installs the software on HPCs when requested by ATLAS
- Manual test jobs are sent by ATLAS to validate the site

# Job Submission to CNGrid

- Each HPC has its own PanDA queue
  - BEIJING-ERAII\_MCORE, BEIJING-TIANJIN-TH-1A\_MCORE, ...
- arcContolTower submits activated jobs to ARC-CE at IHEP, Beijing
- ARC-CE transfers data from IHEP Storage Element to CNGrid and submits the payload to the targeted HPC
- Outputs are delivered to IHEP SE

# Production in 2016

- Using 3 HPCs in 2016, but the usage is sporadic
  - The MC15 campaign not active all the time
  - Longer maintenance periods on both IHEP and CNGrid
  - The infrastructure is not yet bug free and often requires manual intervention
- Nevertheless, CNGrid has simulated about 1% of ATLAS MC events in 2016, contributing 3.5M cpu hours
  - The CPUs are also twice faster than the typical grid ones





# Conclusions

- ATLAS is efficient in including non-standard sites into its production system
- The ARC-CE architecture was the most appropriate to extend the submission mechanism to the SCEAPI RESTful interface by customizing the batch system backend and by exploiting the ARC-CE data management and caching support
- ATLAS used limited resources at CNGrid for production up to now, but there are possibilities for a significant cputime allocation on several of the world's largest machines