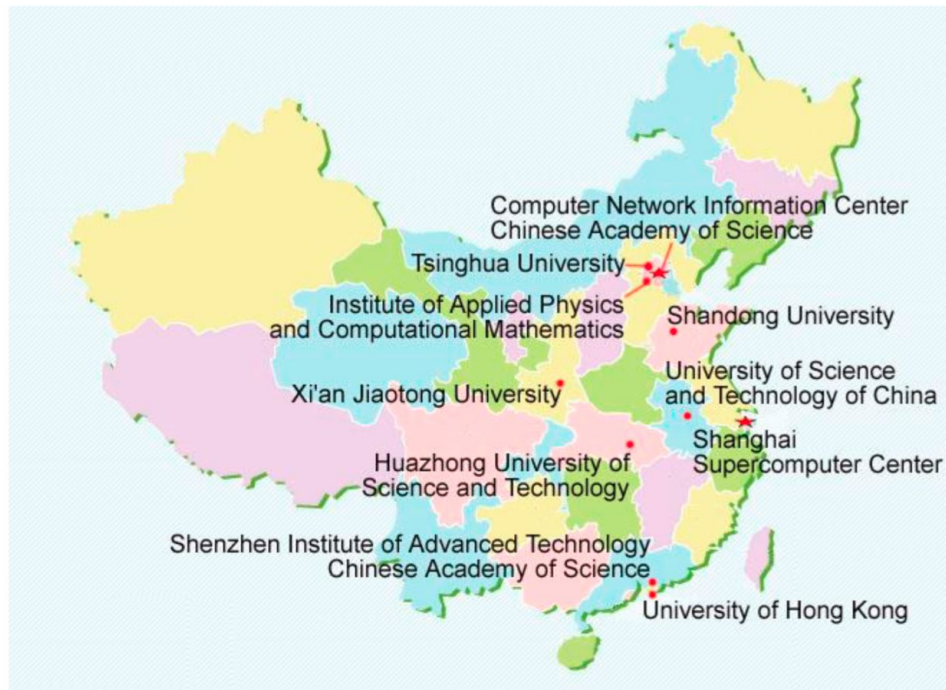

Integration of the Chinese HPC Grid in ATLAS Distributed Computing

— Andrej Filipčič on behalf of the —
ATLAS Collaboration

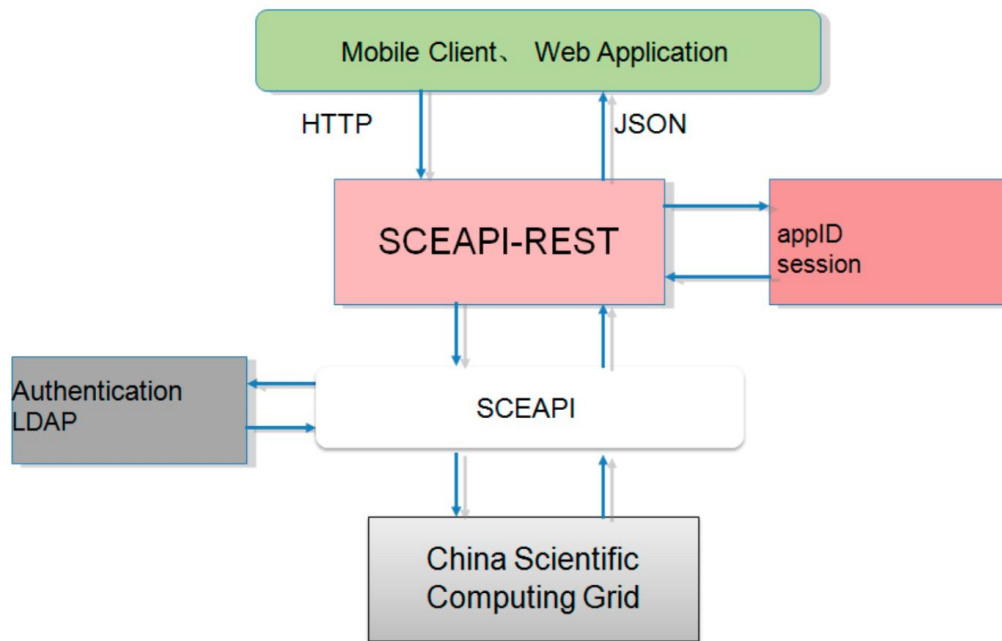
Chinese HPC CNGrid

- 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

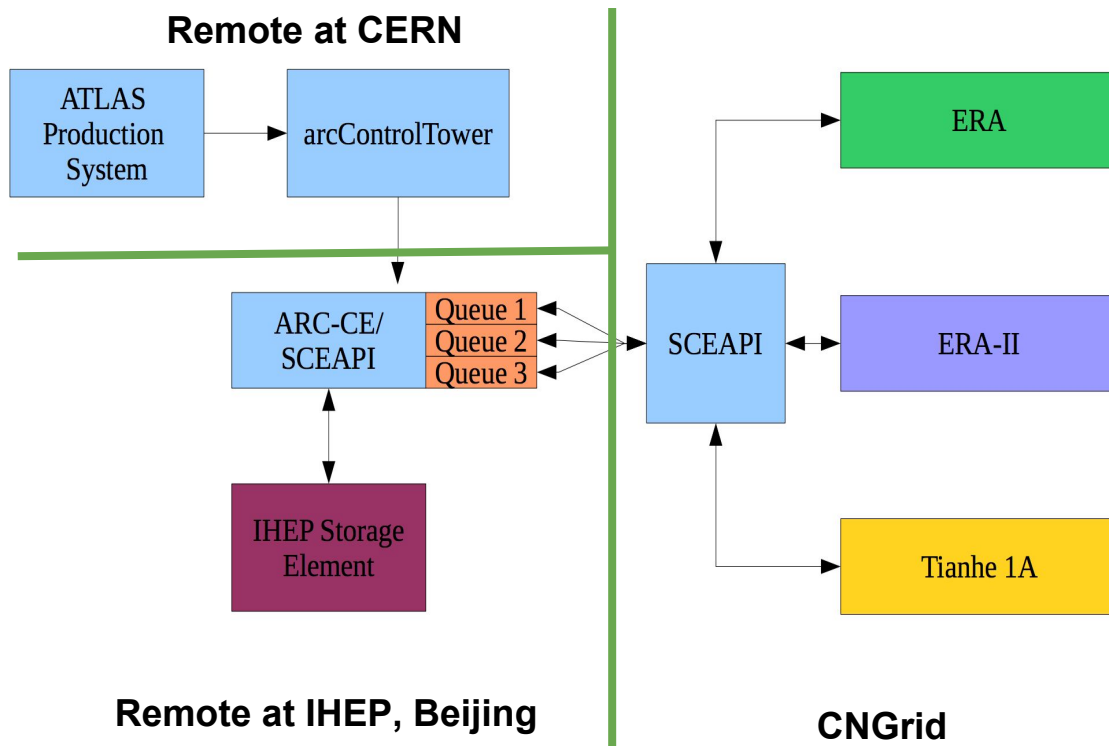


SCEAPI similar to grid Compute Element

- 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

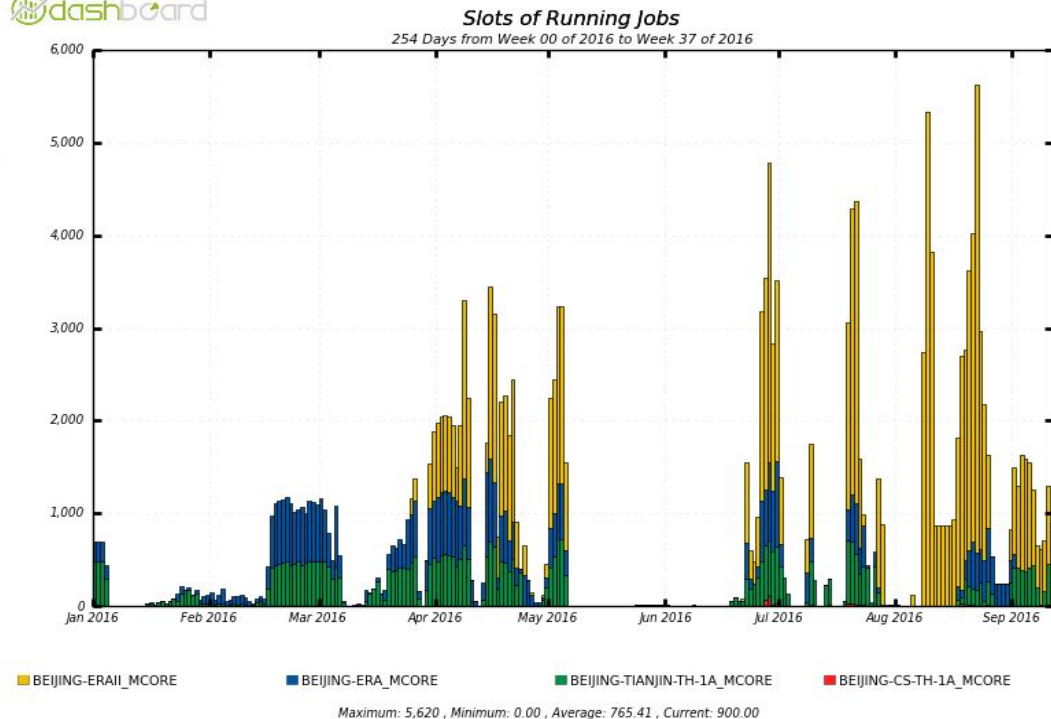
- CNGrid targeted for ATLAS Monte-Carlo simulation only
 - The most CPU time consuming activity
 - ATLAS production campaigns span periods of many months, the same software release is used throughout the campaign
- CVMFS tarballs - part of the tree
 - Targeted ATLAS software release
 - Supporting common 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