ASGC Site Report

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Academia Sinica Grid Computing Centre (ASGC)
Taiwan

Asia Tier Centre Forum (ATCF8)
TIFR, Mumbai, India
3 Sep. 2024

ASGC Overview

- **Founded for participating WLCG and supporting the research collaborations**
  - **Being/serving WLCG Tier-1 center from Dec 2005 to Oct 2023**
  - **Migrating to WLCG Tier-2 center for ATLAS after Q3 2023**
- **ASGC is providing big data analysis and computing services for the R&E communities in Taiwan as a core facility**
  - **Funded by both Academia Sinica and National Science and Technology Council**
  - **Primary scientific collaborations: WLCG (ATLAS, CMS), AMS, Gravitational Wave, ICECube/ Neutrino, EIC, QCD, CryoEM, condense matter, etc.**
  - **Based on the core technologies of WLCG**
- **System efficiency as well as AI-enabled analytics are the new focus**

ATLAS EXPERIMENT CMS AMS-02

PHΦENIX STAR CEPC

KAGRA LIGO The Electron-Ion Collider
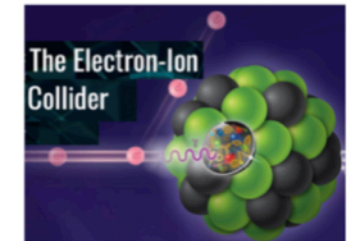
TIDC TAIWAN INSTRUMENTATION AND DETECTOR CONSORTIUM (TIDC)

ASGC TWGrid

Neutrino/MHEP — CryoEM

Quantum Materials Physics — Bioimaging

Physics of Active & Living Matter — Drug Discovery

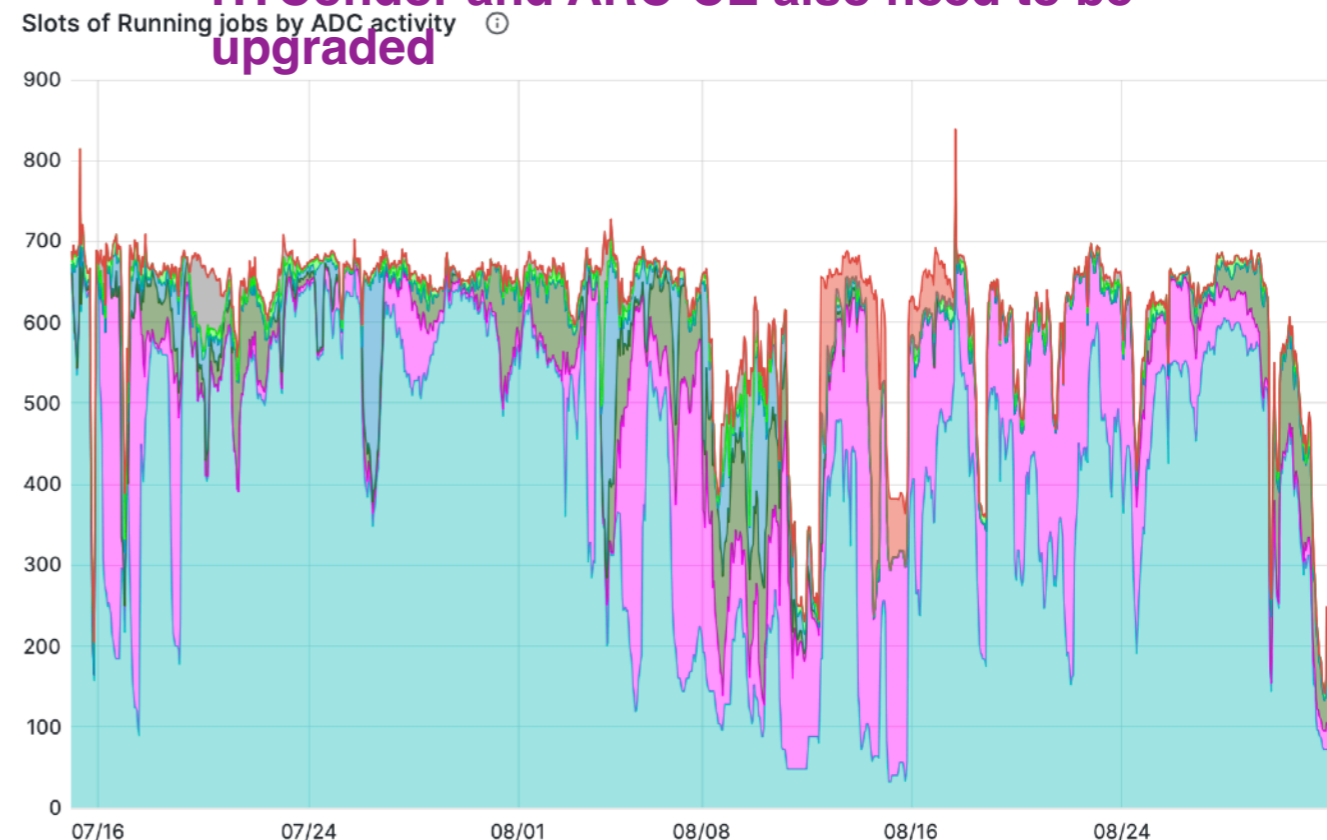Astrophysics — Computational Chemistry

Earth Science — Biodiversity & Ecology

WLCG Tier2 For ATLAS

- **Site has been in production after helpful and careful investigation in July 2024**
  - Connection with LHCONE was reestablished, efficiency was also affirmed
  - Local storage RSE was reconfigured and CRIC updated accordingly
  - Passed HC test jobs on 10 July, verified by ADC
- **Supporting MC Simulation jobs and analysis jobs mainly afterwards**
- **Current Status:**
  - Transfer efficiency: > 80%
  - CPU Efficiency: > 82%
  - Storage used: > 1PB
  - Issue: limited network bandwidth (< 10Gbps)
- **Pledge in 2024**
  - CPU: 30K HEPscore23
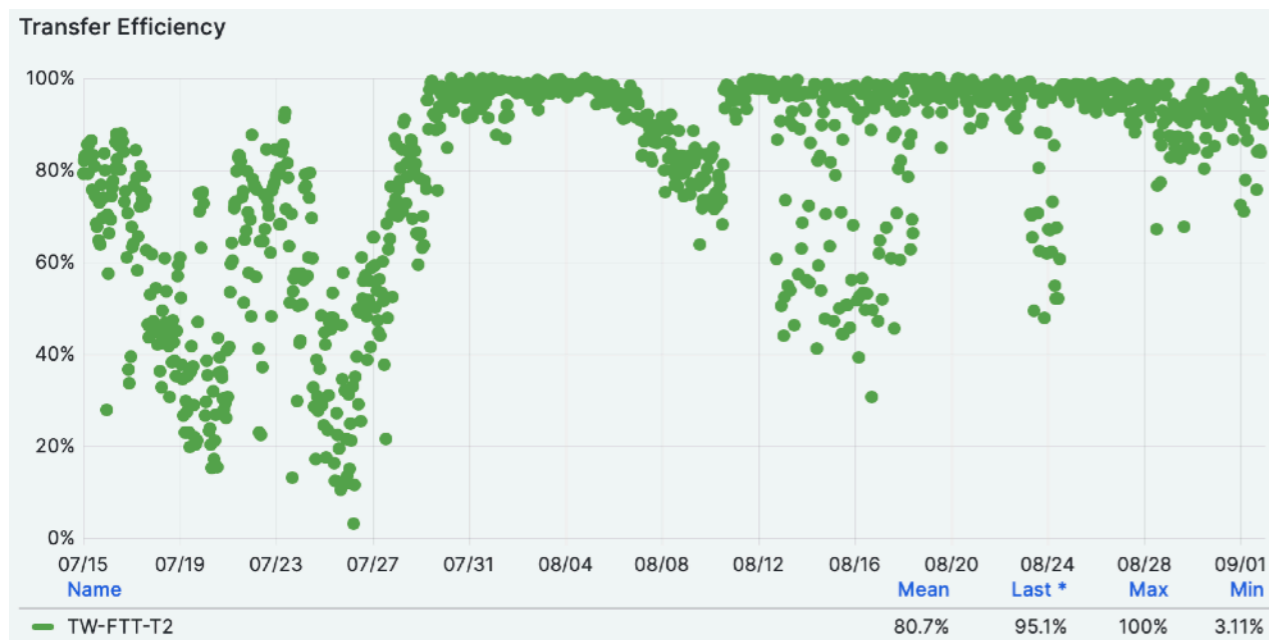
- Disk: 5 PB, managed by EOS
- **Job slots - 2,208**
  - ~ 839 job slots are available now because of OS migration
- **Next Step:**
  - Making better use of ASGC resource, e.g, pre-stage for analysis jobs
  - Will take USATLAS operation shift in Asia time zone
- **Migration to AlmaLinux 9 - will be accomplished before end of 2024**
  - 2-stage: ~ 1,370 job slots in AlmaLinux will be online in Sep.
  - HTCondor and ARC-CE also need to be upgraded

Transfer Efficiency

Name	Mean	Last *	Max	Min
TW-FTT-T2	80.7%	95.1%	100%	3.11%

Slots of Running jobs by ADC activity

CMS Tier2/Tier3

- **CMS T2 Pledge in 2024 (operated by NCHC)**
  - **CPU: 5K HEPscore23**
  - **Disk: 500TB**
- **CMS T3 is managed by ASGC from 2022, in collaboration with TIDC and local CMS groups (NTU and NCU)**
- **Analysis facility**
  - **Both Condor/UI and CRAB/ARC-CE are available**
    - **CephFS shared filesystem: 3TB/group by default**
    - **EOS by xrootd and fuse: 1PB**
  - **Condor cluster**
    - **768 cores(AMD EPYC 7713) + 768 cores (Intel CPU E5- 2650 v4)**
  - **Supporting user's access to CMS data or CRAB jobs submission**
  - **JupyterLab is also available for local user analysis**
- **User training and support are also provisioned**
  - **e.g., using Coffea with template for columnar analysis @ASGC**

tidc-ui01.grid.sinica.edu.tw

TIDC cpu pool

slurm-ui.twgrid.org

NSTC cpu pool
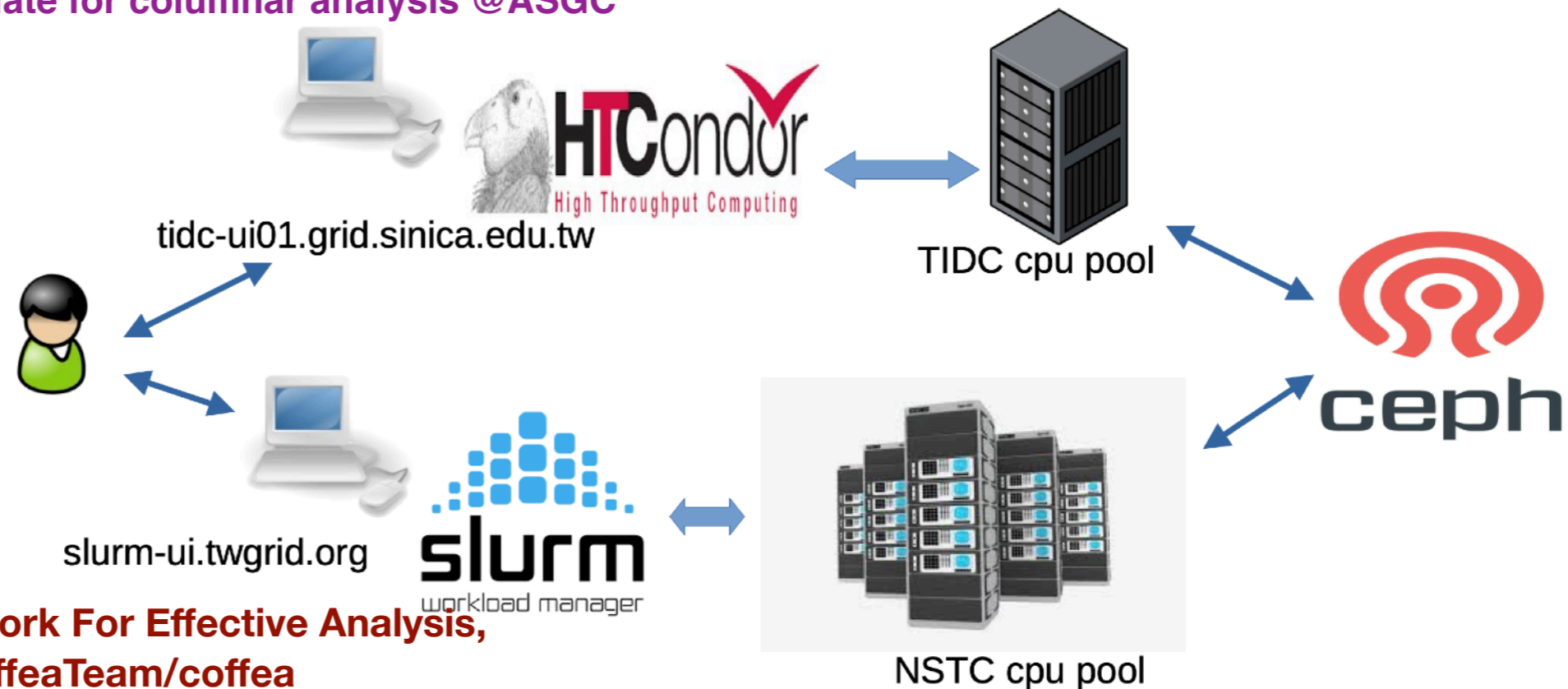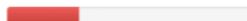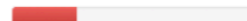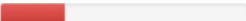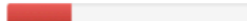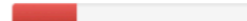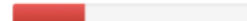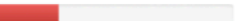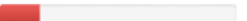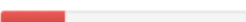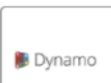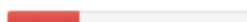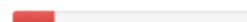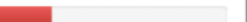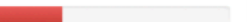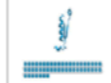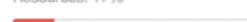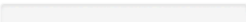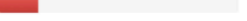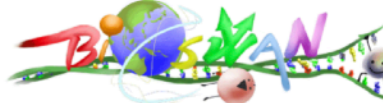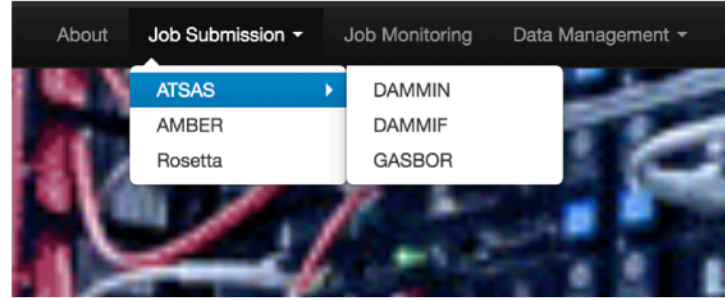
Coffee = Column Object Framework For Effective Analysis, https://github.com/CoffeaTeam/coffea

WLCG-Based Common Infrastructure for Scientific Computing

- **PanDA + RUCIO serve as the core of the common distributed infrastructure**
  - **Federation of distributed institute resources**
  - **Federation of core facilities (including CryoEM, NSRRC, MRI, computing centre, etc.)**
- **Web-based Cloud services & Slurm clusters are provided**
  - **VM for core services and on-demand worker nodes managed by OpenStack**
  - **Containerized resources managed by Kubernetes framework - for software on-demand services and part of core services**
    - **Batch and interactive GUI jobs: Jupyterlab, virtual desktop**
    - **GPU Cloud**
    - **SaaS: web-based application environment**
- **Resource status: 4.24M CPU jobs, and 44K GPU Jobs in 2024 (till end Aug)**
  - **5,152 CPUCores + 2,176 CPUCores (by end 2024)**
  - **24x A100 GPUBoards, 16x4090, 48xV100, 56x3090: high demanding**
  - **Ceph is the common scalable storage pools: > 10PB is online (+2.5PB by end 2024)**
    - **6 MDS + 6 hot-standby (one-on-one backup); 7 MONs**
    - **462 OSDs, 51 hosts.**
  - **1x full rack 12PB LTO9 tape storage will be available in Q4 2024 - dark data, backup**
- **Both core technology and application platform are evolving with user experiences**
- **OSG software stack has been deployed for IGWN and will be part of the infrastructure**

60+ Web Applications Provided

CryoSPARC 32 P100 Version: 3.2 Resources: 83% Launch	**CryoSPARC 1080ti** Version: 3.3.2 Resources: 29% Launch	**CryoSPARC RTX3090** Version: 3.3.2 Resources: 26% Launch	**spyder cpu/eman2** Version: Resources: 17% Launch	**Octave** Version: V5.2 Resources: 29% Launch	**Transfer Data** Version: Resources: 86% Launch
CryoSPARC RTX3090 Version: 4.0.2 Resources: 26% Launch	**CryoSPARC RTX3090** Version: 4.1.1 Resources: 26% Launch	**CryoSPARC RTX3090** Version: 4.4.1 Resources: 26% Launch	**cisTEM** Version: Resources: 86% Launch	**Ovito** Version: Resources: 86% Launch	**OpenACC** Version: GPU P100 Resources: 83% Launch
AlphaFold Version: GPU with A100 Resources: 75% Launch	**AlphaFold (Full DB)** Version: GPU with A100 Resources: 75% Launch	**IMOD** Version: GPU with 1080ti Resources: 29% Launch	**Triton** Version: 22.01-py3 (GPU P100) Resources: 83% Launch	**AlphaFold** Version: GPU with RTX3090 Resources: 26% Launch	**AlphaFold** Version: GPU with V100 Resources: 17% Launch
RoseTTAFold Version: GPU with rtx3090 Resources: 26% Launch	**Dynamo** Version: GPU with 1080ti Resources: 29% Launch	**MATLAB** Version: R2018b on GPU V00 Resources: 17% Launch	**Jupyter Lab** Version: CPU with Tensorflow v1 Resources: 86% Launch	**Jupyter Lab gpu 3090** Version: GPU with Tensorflow 3090 Resources: 26% Launch	**Jupyter Lab GPU 1080ti** Version: GPU with Tensorflow v2 Resources: 29% Launch
RFDIFFUSION Version: 2023 on GPU V00 Resources: 17% Launch	**diffdock** Version: 2023 on GPU V00 Resources: 17% Launch	**EvoDiff** Version: V100 Resources: 17% Launch	**Jupyter Lab GPU V100** Version: GPU with Tensorflow V100 Resources: 17% Launch	**Jupyter Lab GPU A100** Version: GPU with Tensorflow A100 Resources: 75% Launch	**Jupyter Lab Cryocare GPU** Version: GPU with 1080ti Resources: 29% Launch
QIIME2 Version: Genome Resources: % Launch	**Scipion3** Version: P100 Resources: 83% Launch	**Phenix** Version: Resources: 86% Launch	**Jupyter Lab GPU A100** Version: GPU with Tensorflow v2.6 Resources: 75% Launch		

- **Web Portal**
- **Application over Cloud**
- **Jupyterlab**
- **Web Terminal**

MorphoGraphX Version: GPU with P100 Resources: 83% Launch	**LabVIEW Run-Time Engine** Version: 2019 Launch

DiCOS-BioSAXS Platform

Deepmd-kit Version: GPU with A100 Resources: 75% Launch	**Deepmd-kit** Version: GPU with V100 Resources: 17% Launch	**MAML** Version: GPU with A100 Resources: 75% Launch
MAML Version: GPU with V100 Resources: 17% Launch	**PVserver** Version: 5.8.0 (GPU 1080TI) Resources: 29% Launch	**Paraview Client** Version: 5.8.0 Resources: 86% Launch
PyRoot Version: GPU with 1080ti Resources: 29% Launch	**qiskit** Version: Resources: 86% Launch	

About | Job Submission | Job Monitoring | Data Management

ATSAS → DAMMIN
AMBER   DAMMIF
Rosetta   GASBOR

Energy Saving

- **Reliability enhanced by intelligent monitoring and control is the key approach**

- **Retirement of legacy hardware**

- **Improvement of AHU efficiency, including the replacement by top-flow cold air**
  - **Anomaly detection**
  - **Well-prepared backup plan**

- **Energy-sensitive operation:**
  - **Plan for power efficient hardware: e.g., non-X86 CPUs**
  - **Power saving - shutdown some idle WNs when the waiting queue is quite short**
    - **20% power usage reduction in 2023 - Effective on 3 CPU clusters (> 3,000 CPUCores) from May 2023**

- **Overall, DC power usage achieves around 20% reduction rate achieved per annum in 2023 and 2024 (till end Aug.)**

Regional & International collaborations

- **Asia could make significant contributions to the international collaboration, although network latency and time zone might be issues**
  - **Hubs in Asia have been providing multiple 100Gbps links with other continents**
  - **Regional data lake and caches could cope with latency issue**
  - **Operation in Asia time zone could make up around the clock collaborations**
- **In addition to deployment, participating to core technology development and extending to other e-Science applications could enhance both the technology evolution and also the capacity building.**
  - **e.g, Improving site and WLCG efficiency intelligently**
- **Active participating experiment/WLCG oriented events and share with regional partners**
  - **CHEP, HEPIX, GDB, LHCONE/OPN come to Asia regularly. We also have some routine collaboration events, such as ATCF, ISGC, APAN, etc.**
  - **Differentiate focus of these events and make them complementary to each other**
  - **e.g, Summer school in Asia, WLCG Workshop in Asia when CHEP is here.**
- **Pilot All-Phontonics Network (APN) and IOWN in Asia has been constructed (3,000 KM). Technologies are expected to be mature by 2030**
  - **100x energy efficiency, 100x transmission capacity; 1/200 latency**

Welcome To ISGC2025 in Taipei

- **Schedule: 17-21 March 2025**
- **Venue: Academia Sinica, Taipei, Taiwan**
- **Call for Abstract/ Session will be open soon**
- **Keynote speech, Asia Partner Updates, and workshop/session are major components**
  - Security workshop, sessions of HEP, Grid & Clouds, Networking, infrastructure and AI are typical arrangements. Domain-specific workshop or sessions are also welcomed
- **Contact: ISGC Secretariat**
  - vic@twgrid.org