Computing Center of IHEP

CERN Forum on IHEP Career Oppotunities

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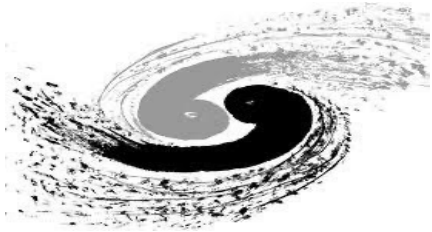
Introduction to IHEP-CC



- Founded in 1974, the birthplace of Internet technology in China
  - First email, first international link, first world wide web server in China
- Missions
  - Provision of large-scale scientific computing environment for HEP experiments
    - Facilities, and computing, storage, network services
    - Scientific software and database application
  - Research on computing technologies related to high-energy physics
    - Bigdata, AI, quantum computing, etc.
  - Development of IT services for advanced information processing
    - to facilitate management and improve operation efficiencies of the institute
- Strategic plan for the next 5-10 years
  - Leading the national data center for high energy physics and synchrotron radiation in China
  - Important International center for high energy physics computing
  - **World-class research programs**, include scientific software, AI, quantum computing, etc.

HTCondor Software Suite

DOMAS Data Organization Management Access Software

EOS

elastic

·l·u·s·t·r·e· File System

Cordwood

slurm

高能物理计算暑期学校 IHEP School of Computing

致知论坛 高能物理计算技术

国家高能物理科学数据中心 National HEP Data Center

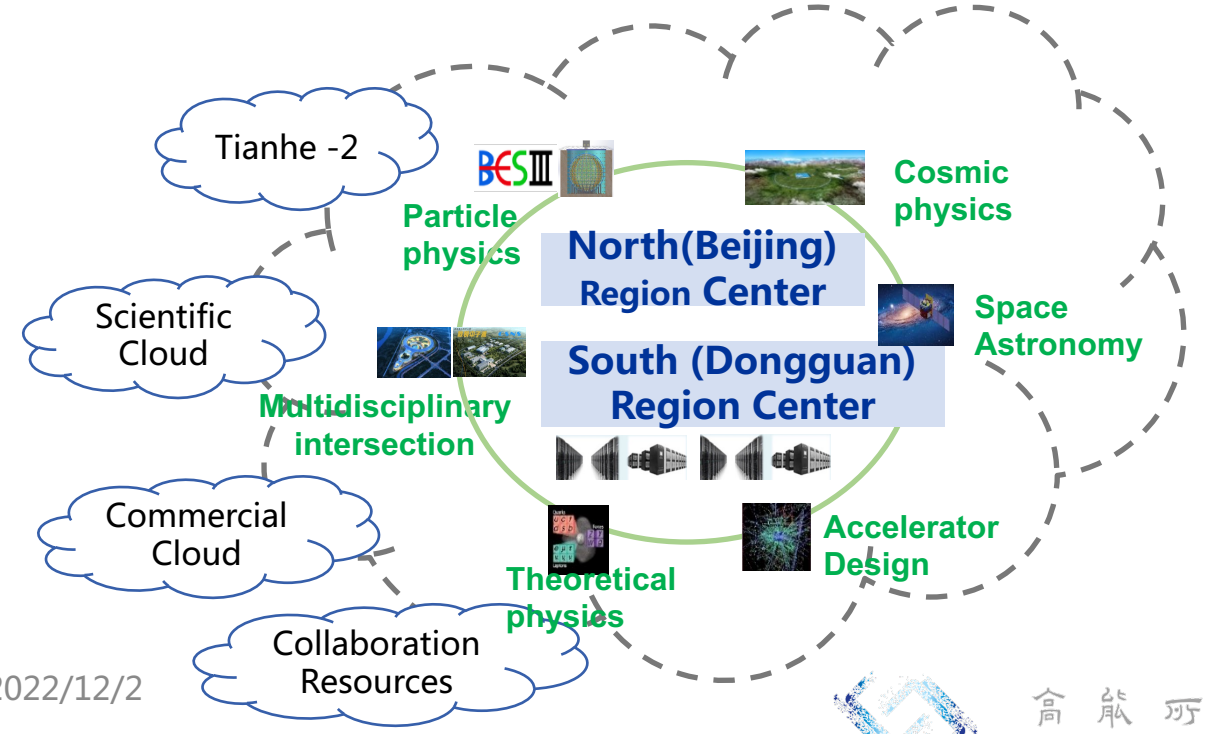
高能所計算中心 Institute of High Energy Physics - Computing Center

Introduction to the Chinese HEP Computing Platform

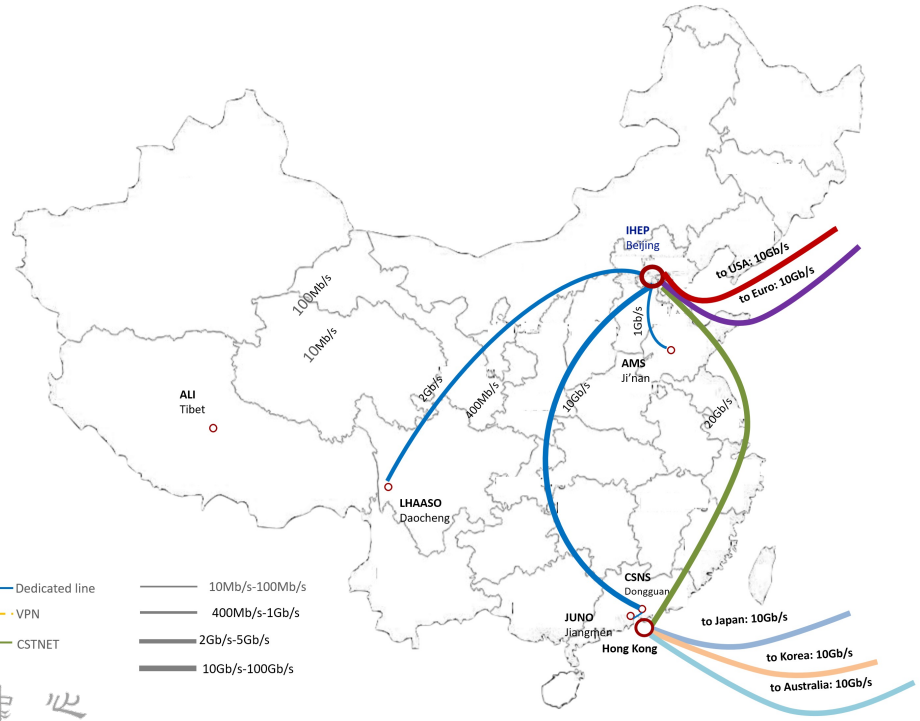
- Large-scale computing facilities
  - Computing: **100 k CPU cores, 300 GPU cards** to for more than 10 experiments
  - Storage: **85 PB** disk storage, 50 PB tape storage
  - Network: LHCONE member, WAN Bandwidth: 40Gbps (LHCONE 20Gbps)

North and South Regions

Chinese HEP Computing Platform

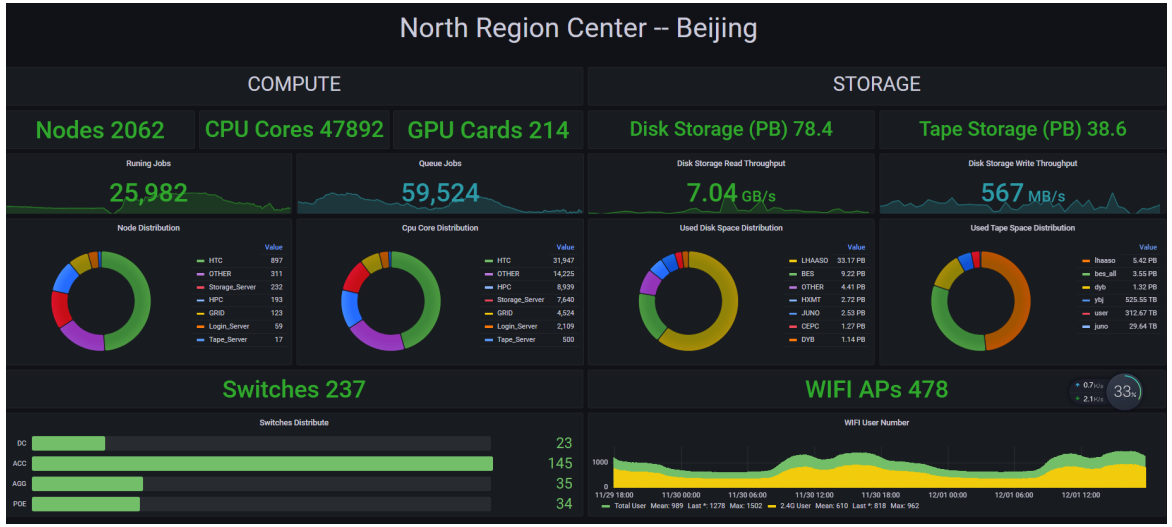


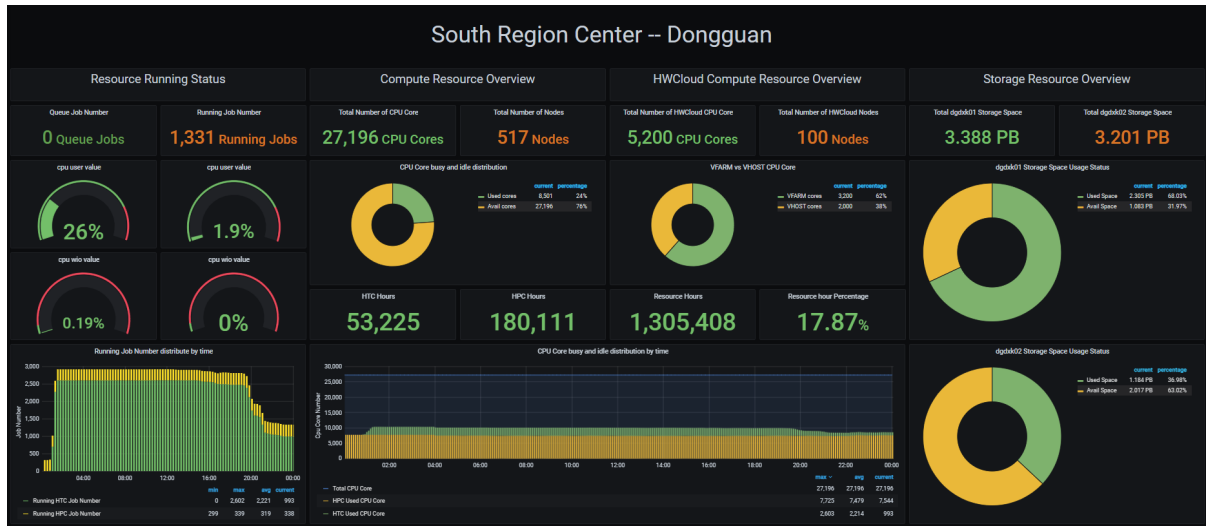
Network Connection of IHEP



Introduction to Chinese HEP Computing Platform

- cross-regional unified data processing platform
  - North Region Center in Beijing :
    - Intel x86 cpu , Nvidia A100/V100 gpu cards
    - High Throughput Computing / High Performance Computing
    - Open source Distributed file system/ Tape Library
    - Atlas, CMS, LHCb grid site and is going to build LHCb Tier 1
  - South Region Center in Dongguan
    - Intel x86 cpu , Arm , Nvidia A100/V100 gpu cards
    - High Performance Computing
    - OceanStor9000 support by HUAWEI
    - Cloud Computing

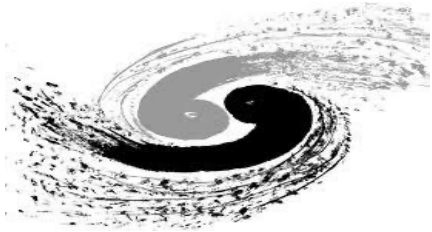




- Combining multiple remote computing sites and Compatible with heterogeneous hardware
  - IT services deployed to the HEP Exp. Facilities
  - Collaboration member IT resources
  - Commercial clouds, super computing Center

Global View on Chinese HEP Computing Platform

Research and Study Team



- Human resources of IHEP-CC (~100 member)
  - Currently 55 staff (including CSNS branch), 6 post doctors, 15 visiting members, 30 master and Ph.D. students
- Research fields

Computing and Storage	Network and Cyber security	IT Services	Scientific Software	Innovation
• High Performance Computing • High Throughput Computing • Grid/Cloud computing • Distributed storage	•Datacenter and campus network • Dedicated link for remote experiments • International network collaboration	• Database technology and application • Conferencing Technology • Institutional management tool	• Open data and open science • Scientific data management • Scientific software framework	• Big data • AI for science • Quantum computing
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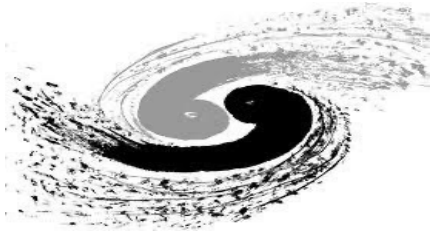
- we provides faculty member or post doctor positions

Project – Scientific Software Framework



- Project Mission: a general large-scale basic software architecture with good expansibility
  - shield the complexity of computing architecture and the diversity of computing resources
  - support the integration of multi-domain scientific algorithms, software tools and artificial intelligence applications,
  - address the demand of growing scale and throughput of scientific experiment data.
- Plan:
  - First, focus on serving High Energy Photon Source (HEPS).
  - Then apply to other scientific area, such as space astronomy, life science.
- Current progress
  - the basic software framework is ready.
  - Some scientific data analysis algorithms and tools have been integrated
  - Several specific applications have been developed
- We are waiting for your join
  - Develop scientific data processing software framework and data processing application system for the next generation light Source, space astronomy and other disciplines.
  - Develop workflow systems for big experiments
  - Work with domain scientists to develop data analysis algorithms and tools

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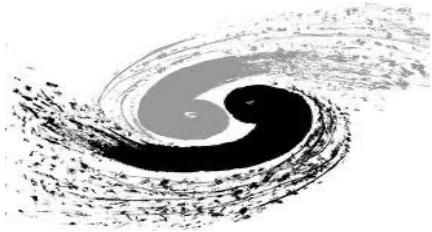
Project – HEP Artificial Intelligence Computing Platform



- Project Mission:
  - a full stack tool chain for AI algorithm research and product deployment
  - help scientists quickly realize advanced **AI for Science** algorithms and sustainable development
  - explore a feasible path for the transformation of scientific research paradigm based on big data and AI.
- Current progress:
  - basic HAI framework is developed
  - Six classic or SOTA algorithms and three datasets have been reconstructed and integrated into the framework.
- Need to continuously improve the framework and develop algorithms.
  - Research on advanced AI/ML algorithms and applications in HEP, astrophysics, synchrotron radiation etc.
  - Develop and optimize HAI framework and develop tools from data annotation, data processing, algorithm research, model training, performance evaluation to cloud/edge deployment
  - Explore next generation AI driven by knowledge and data synergy.

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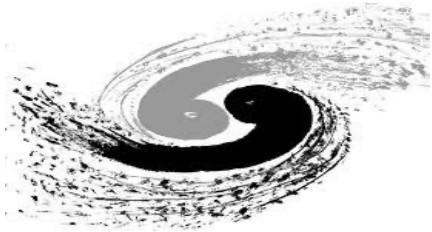
Project – Quantum Computing



- Project Mission:
  - Develop an R&D platform to facilitate the cutting-edge exploration of HEP physicists on quantum computing and simulation.
- Plan:
  - Develop an interactive, flexible, web-based development interface which supports small scale proof of quantum computing application
  - Extend the simulation scale to at least 38 Qbits on multi-GPU/multimode environment
  - Develop a domain-specific quantum software developing framework to facilitate the development of new quantum applications
- Current Progress:
  - First version of the interactive interface has been delivered, including k8s scheduling, jupyter-based programming, drag-and-drop of quantum circuits
  - Integration with IHEP distributed computing environment has been finished which includes SSO authentication, SLRUM job submission and result retrieval etc.,
  - Prototypes of quantum machine learning (CEPC experiment) and L-QCD simulation are progressed as planed on the platform
  - Cooperation with quantum computing manufacturers inside China have been initiated
- Come and join us to:
  - Cooperate with physicists on developing a domain specific quantum algorithm framework
  - Integrate the quantum simulation workflow with the distributed computing platform of HEP
  - Optimize the performance of common simulation toolkits such as Qiskit, Cirq, etc.,
  - Develop and deploy quantum applications on the first-class real quantum machines

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Welcome

Contact Now!

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