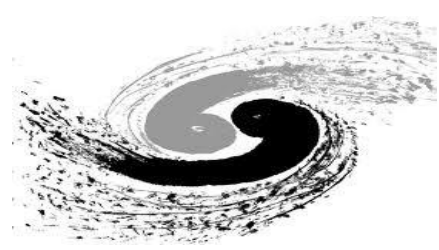# Computing Center of IHEP

Career Information Session of IHEP CAS

Jingyan Shi
IHEP – CC
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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
  - Providing large-scale scientific computing environments for HEP experiments
    - Facilities and computing, storage, network services
    - Scientific software and database application
  - Research on computing technologies related to HEP
    - Bigdata, AI, quantum computing, etc.
  - Developing IT services for advanced information processing
- Strategic plan for the next 5-10 years
  - Becoming a leading national data center for HEP and synchrotron radiation in China
  - Establishing an Important International center for HEP computing
  - Developing world-class research programs, including scientific software, AI, quantum computing, etc.

2024/1/31

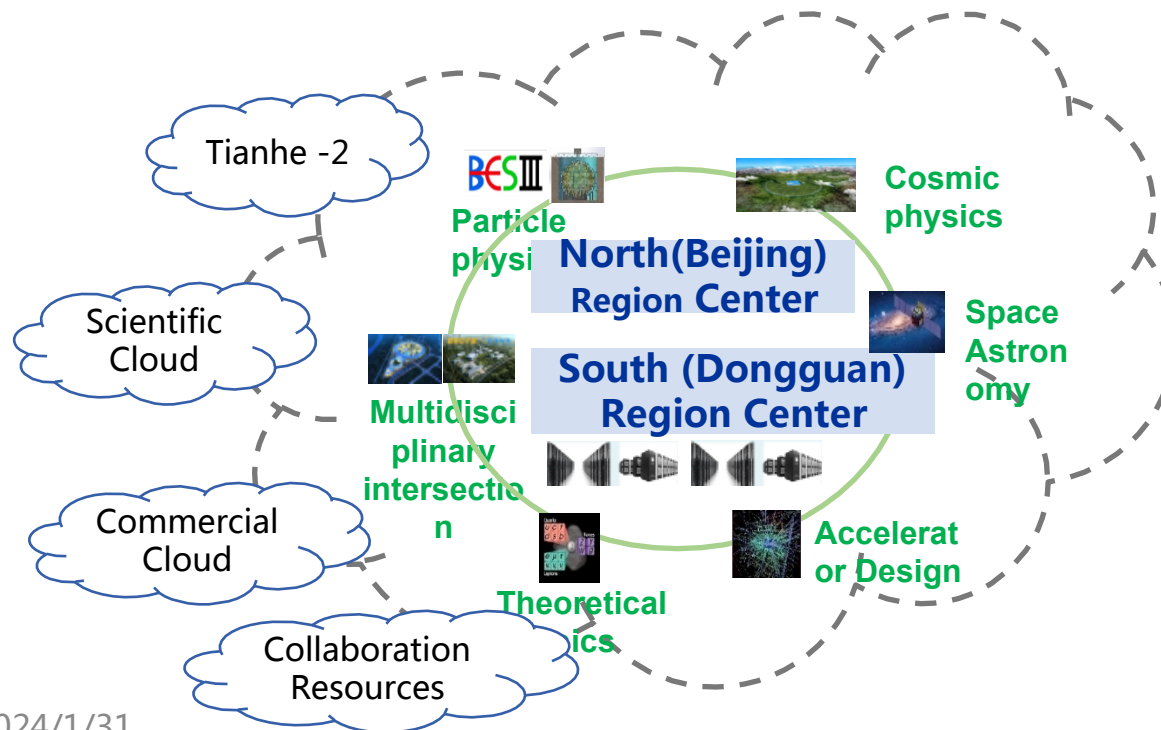# Introduction to Chinese HEP Computing Platform
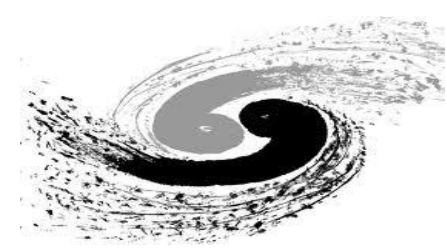
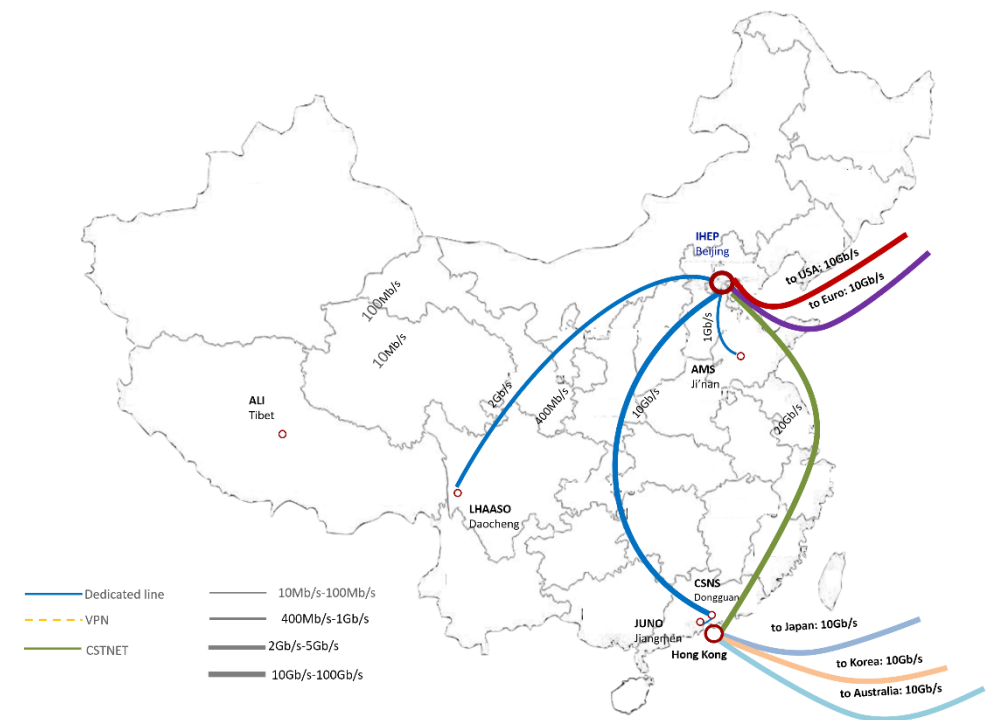■ **Large-scale computing facilities**

- ■ Computing: **100 k CPU cores, 300 GPU cards** to for more than 10 experiments
- ■ Storage: **102 PB** disk storage, **50** PB tape storage
- ■ Network: LHCONE member, WAN Bandwidth: 100Gbps (LHCOPN 20Gbps)
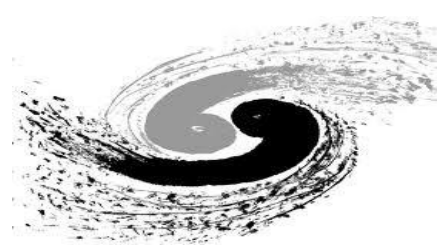
==North and South Regions==

Chinese HEP Computing Platform

Tianhe -2

Scientific Cloud

Commercial Cloud

Collaboration Resources

BESⅢ

Particle physi

Multidisci plinary intersectio n

Theoretical ics

North(Beijing) Region Center

South (Dongguan) Region Center

Cosmic physics

Space Astron omy

Accelerat or Design

Network Connection of IHEP

2024/1/31

# 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
    - Grid Site: LHCb Tier 1 and Atlas, CMS Tier2
 - South Region Center in Dongguan
    - Intel x86 CPU, Arm , Nvidia A100/V100 GPU cards
    - High Performance Computing
    - OceanStor9000 support by HUAWEI
    - Cloud Computing

North Region Center - Beijing

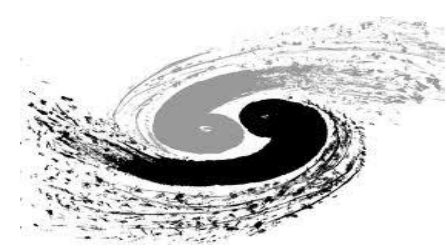South Region Center - Dongguan
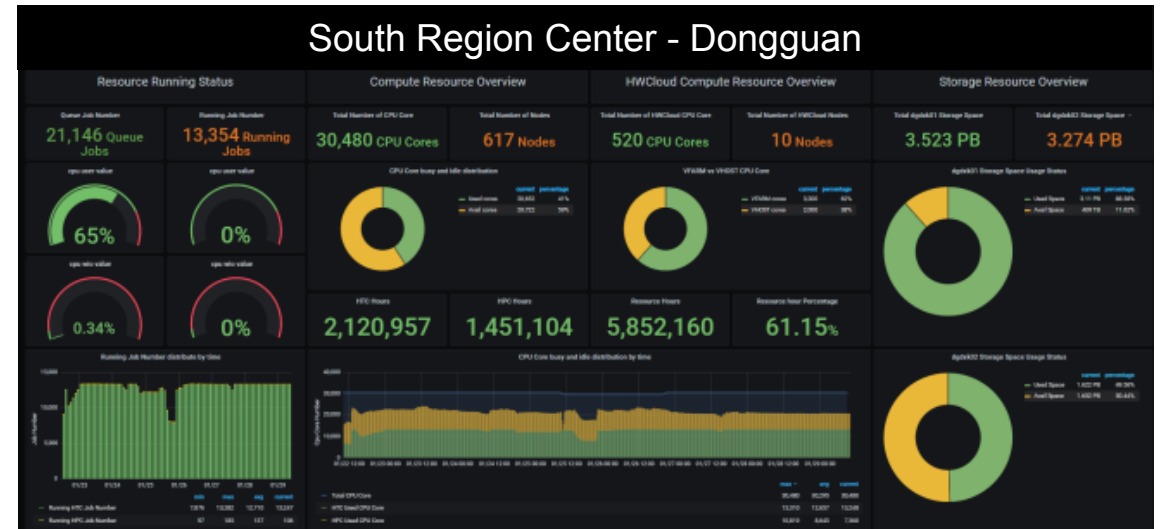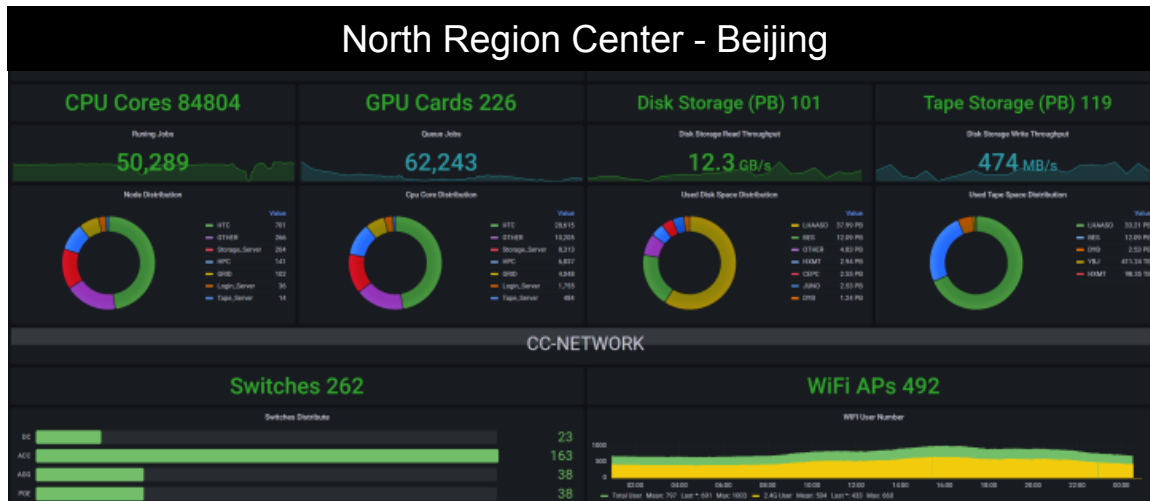
- **Combining multiple remote computing sites and compatible with heterogeneous hardware**
  - IT services deployed to the HEP Exp. facilities
  - Collaboration member IT resources
  - Commercial clouds, super computing center

Global View on Chinese HEP Computing Platform
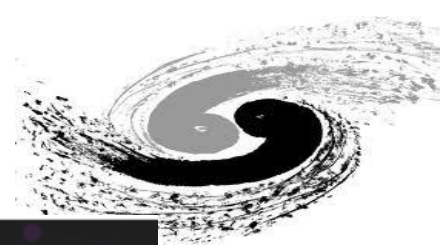
Research and Study Team

- Human resources of IHEP-CC (~100 member)
  - Currently 53 staff, 6 post doctors, 15 visiting members, 28 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
shijy@ihep.ac.cn	zengshan@ihep.ac.cn	sunzh@ihep.ac.cn	hmzhang@ihep.ac.cn	zhzhang@ihep.ac.cn
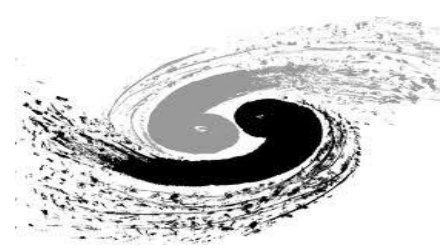
Position description

<mark>IHEP-CC provides faculty member and post doctor positions</mark>

Staff – Deputy Director of NHEPSDC
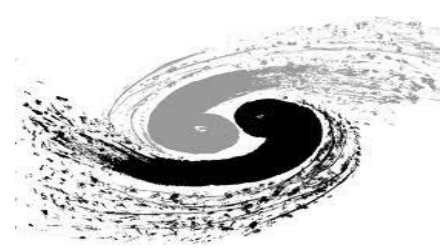
- NHEPSDC: The National High-Energy Physics Science Data Center
  - One of the first 20 national data centers certified by the Ministry of Science and Technology
  - Aiming to achieve data resource management, standard-setting, open sharing, and integrated analysis
- Responsibilities
  - Deputy Director of National HEP Data Center
  - To solve key technical issues and manage hybrid teams
  - Responsible for scientific data management and processing software, Artificial Intelligence and other related work
- Requirements
  - International perspective and excellent management skills
  - Experiences in the fields of HEP, AI, or their interdisciplinary fields
  - Preferred for experts who serving as a professor or equivalent position in well-known research institutions, universities

Contact with: Dr. Fazhi QI
qfz@ihep.ac.cn

Staff – Scientific Software Framework
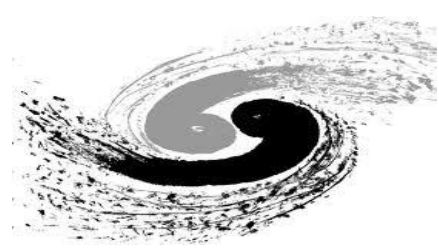
- Mission: a general large-scale basic software architecture with good expansibility
  - Shield the complexity of computing architecture and the diversity of computing resources
  - Support the integration of multi-domain scientific algorithms, software tools and artificial intelligence applications,
  - Address the demand of growing scale and throughput of scientific experiment data.
  - First focus on serving High Energy Photon Source (HEPS), then apply to other scientific area, such as space astronomy, life science.
- Responsibilities
  - Develop scientific data processing software framework and data processing application system for the next generation light source, space astronomy and other disciplines.
  - Design and develop the distributed parallel computing framework and stream data processing framework
  - Work with domain scientists to develop data analysis algorithms and tools
- Requirements
  - Doctoral degree in computer science, physics, mathematics, synchrotron methodology, or other related fields
  - Proficient in programming languages such as Python or C++/C

Contact with: Dr. Yu Hu
huyu@ihep.ac.cn

Staff – HEP Artificial Intelligence Computing Platform

- Mission
  - Build the High Energy Physics AI Platform (HepAI)，see: https://ai.ihep.ac.cn/
 - Develop DL/ML algorithms and large models for HEP
- Responsibilities
  - Utilizing the powerful capabilities of AI to accelerate HEP scientific discoveries
  - Provide AI support for particle physics, astrophysics, synchrotron radiation, and neutron science
  - Develop HepAI software and system.
  - Develop DL/ML algorithms for HEP simulation, reconstruction, analysis, and implementation processing.
  - Train large language model (LLM) for HEP. Develop AI agent for scientific research.
  - Explore large science model (LSM) of HEP, including new pre-training methods, unified representation of particle data, and physical feedback reinforcement learning.
- Requirements
  - Extensive international academic influence or mastery of key core technologies in the fields of HEP, AI, or their interdisciplinary fields,
  - Doctoral degree in computer science, physics, mathematics or other related fields
  - Ability to solve key technical problems, and possesses

Contact with: Dr. Zhengde Zhang
zdzhang@ihep.ac.cn

Postdoc – Quantum Computing
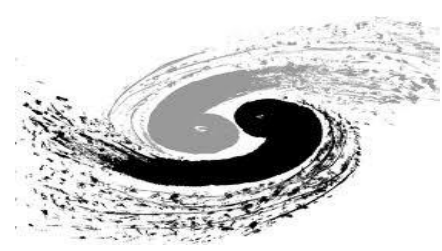
- Mission
  - Develop quantum computing platform for high energy physics research and explore the quantum machine learning and quantum simulation algorithms.
- Responsibilities
  - Collaborate with colleagues to develop the quantum computing platform for HEP research
  - Collaborate with experimental and theoretical physicists on the application of NISQ era quantum machine learning and quantum simulation algorithms to HEP
  - Research on the state of art quantum information science and technologies from academia and industry, and seek for the potential application to high energy physics
  - Develop the software framework to interface the quantum algorithms and real world quantum computers with different architectures
  - Research of quantum algorithms on classical hardware
- Requirements
  - PhD or equivalent professional qualifications and experience in theoretical physics / mathematics / theoretical computer science / computational science or a related field

Contact with: Dr. Wei Sun
sunwei@ihep.ac.cn

Postdoc – Scientific Data Management
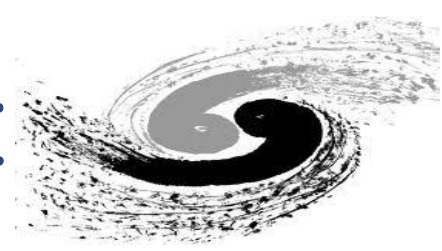
- Mission
  - Design and build a big data system for HEP and related disciplines
- Responsibilities
  - Develop applications for managing and integrating massive data supporting multiple experiments
  - Research knowledge graph technology based on high-energy physics data, develop knowledge graphs and knowledge mining applications
  - Design and develop big data products to promote discipline applications
- Requirements
  - Proficient in programming languages such as Java/Python or C++/C;
  - Preferred for those with the experience in scientific data management, knowledge graphs, and data mining

Contact with: Hao HU
huhao@ihep.ac.cn

Postdoc– Computing Technology for HEP
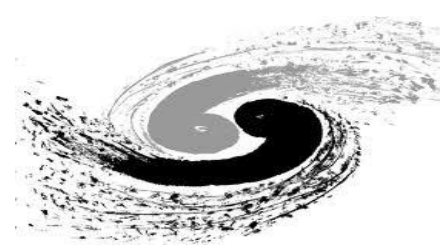
- Mission
  - Study the key technology of "high throughput computing" and the "high performance computing" for HEP and related disciplines
- Responsibilities
  - Research and develop scheduling algorithm on large scale of distributed computing system
  - Performance optimization on high performance computing for HEP applications
- requirements
  - Proficient in programming technologies such as C/C++, and have a good understanding of the Linux kernel and distributed computing
  - Majored in computer science, HEP experiments, or other related fields.

Contact with: Dr Jingyan Shi
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Postdoc – Data Storage Technology for HEP
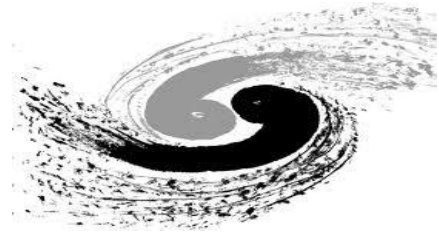
- Mission
  - Research and develop a large-scale distributed storage system with the capacity of hundreds of petabytes, supporting high concurrency and global data access across data centers
- Responsibilities
  - Study and develop the key technologies in distributed storage systems
  - Performance optimization of storage systems for HEP applications
  - Research on the application of integrated storage and computing technologies
- Requirements
  - Proficient in programming technologies such as C/C++, and have a good understanding of the Linux kernel and file system designs
  - Majored in computer science, HEP experiments, or other related fields.

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Contact with: Dr Haibo Li
lihaibo@ihep.ac.cn

Welcome

Join US!

Contact Now!

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Yaodong Cheng chyd@ihep.ac.cn +86 10 8823 6008