# Improve the Integrated Computing Service Capabilities of Scientific Research Institutions

--BingoCloud Integrated Scientific Research Solution

## [2] About Bingosoft

Guangzhou BingoSoftware Co., Ltd.("Bingosoft")was established in 2003 and currently has nearly 900 employees, of which more than 81% are engineers accountable to cloud computing product research and development, industry software development and technical service.

The company began to develop infrastructure cloud products in 2008, and successfully released the first cloud operating system BingoCloudOS V1.0 in 2010, becoming one of the first domestic vendors to release cloud operating systems. After years of research and development, the company currently own products include cloud-centric products BingoCloudOS, BingoFuse, BingoInsight, BingoLink and BingoCMP. The types of products and services include cloud product sales, cloud leasing services, cloud solutions consulting service, and industry information services.

After the release of BingoCloudOS V1.0 in 2010, Bingosoft and Intel Corporation conducted in-depth research in the field of cloud computing and high-performance computing, and pioneered the "HPC in Cloud" application model in China, combining high-performance computing with cloud computing. In 2013, Bingosoft officially passed the Intel global ICR high-performance computing cluster authoritative certification.

In 2013, BingoCloudOS successfully adapted and realized the ability to run cloud services on the domestic supercomputer Tianhe-2, and realized the service-oriented computing of big data and 3D rendering.

In the ITAI (INFORMATION TECHNOLOGY APPLICATION INNOVATION) field, Bingosoft won the bid for government technology projects as early as 2014 and began to deploy the ITAI track for 7 years. Which currently can provide external cloud solutions with full-stack ITAI technology stacks including integrated scientific research clouds.

As the first batch of practitioners in China to implement the "HPC in Cloud" application model and a pioneer in the heterogeneous integration technology route, Bingosoft can build a converged cloud platform that meets the clients' needs.

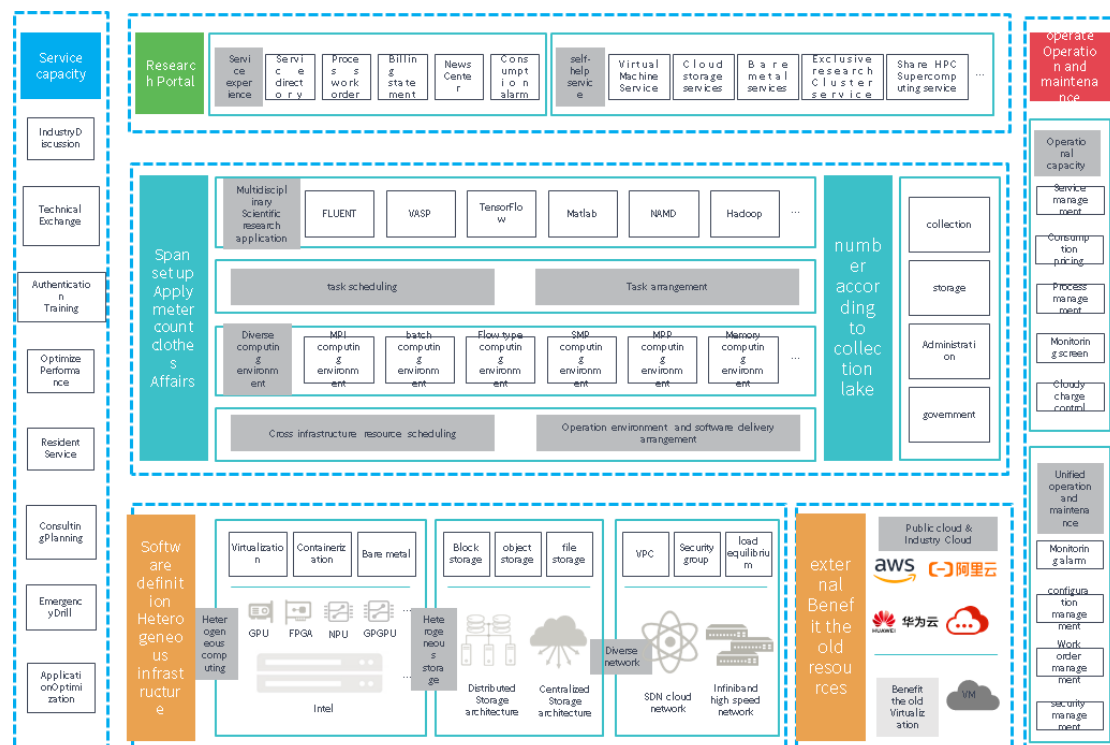国际软件研发成熟度最高级CMMI5认证　　ITSS云服务能力一级（全国仅9家）　　云计算大数据研究中心　　高性能计算集群认证Intel Cluster Ready

- The most advanced CMMI5 certification for international software R&D maturity
- ITSS Cloud Service Capability Level 1 (only 9 companies nationwide)
- Cloud Computing Big Data Research Center
- High-performance computing cluster certification Intel Cluster Ready

# [3] BingoCloud Integrated Scientific Research Solution

BingoCloud (the cloud computing brand of Bingosoft) integrated scientific research solution can use heterogeneous infrastructure to build scientific research computing resource pools, and provide unified external services through the scientific research portal. It is compatible with traditional HPC scientific research and simulation task habits, and integrates support for new scientific research computing such as big data and AI. Mission requirements. Combining the operation and maintenance capabilities accumulated in the industry for many years in cloud operations and the cloud service capabilities that meet the highest maturity of the ITSS of the Ministry of Industry and Information Technology, assisting customers in the construction and operation of scientific research clouds, realize the appreciation of scientific research assets and upgrade the scientific research service capabilities.

| Service capacity | Research Portal | Service experience | Services directory | Process work order | Billing statement | News Center | Consumption alarm | self-help service | Virtual Machine Service | Cloud storage services | Bare metal services | Exclusive research Cluster service | Share HPC Supercomputing service | ... | operate Operation and maintenance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| Service capacity | | Operate Operation and maintenance |
|---|---|---|
| IndustryDiscussion | Span set up Apply meter count clothes Affairs — Multidisciplinary Scientific research application: FLUENT, VASP, TensorFlow, Matlab, NAMD, Hadoop, ...; task scheduling; Task arrangement; Diverse computing environment: MPI computing environment, batch computing environment, Flow type computing environment, SMP computing environment, MPP computing environment, Memory computing environment; Cross infrastructure resource scheduling; Operation environment and software delivery arrangement; number according to collection lake: collection, storage, Administration, government | Operational capacity: Service management, Consumption pricing, Process management, Monitoring screen, Cloudy charge control |
| Technical Exchange | | |
| Authentication Training | | |
| Optimize Performance | | |
| Resident Service | | |
| ConsultingPlanning | Software definition Heterogeneous Infrastructure — Virtualization, Containerization, Bare metal; Heterogeneous computing: GPU, FPGA, NPU, GPGPU, ...; Intel; Block storage, object storage, file storage; Heterogeneous storage; Distributed Storage architecture, Centralized Storage architecture; VPC, Security group, load equilibrium; Diverse network; SDN cloud network, Infiniband high speed network; external Benefit the old resources — Public cloud & Industry Cloud: aws, 阿里云, HUAWEI 华为云, Benefit the old Virtualization, VM | Unified operation and maintenance: Monitoring alarm, configuration management, Work order management, security management |
| EmergencyDrill | | |
| ApplicationOptimization | | |

## [4, 5] Program Features

● One-stop scientific research portal, two usage modes

The integrated scientific research cloud provides a one-stop scientific research portal, and quickly obtains the application capabilities required for scientific research through the service catalog. It also supports shared and exclusive computing modes. The shared graphical task management for traditional HPC, simulation and scientific research habits is more convenient; the exclusive allows users to apply for the isolation of computing, storage, and network required for scientific research with one click Resource usage is more flexible.

● Fully heterogeneous computing power support, accelerating the speed of scientific research calculations

The Fusion Research Cloud supports almost all CPU architecture systems commonly available in the market that are available for HPC, including X86, Haiguang C86, Kunpeng ARM, Feiteng ARM, and Shenwei Alpha; It supports common acceleration devices on the market, including GPGPU, FPGA, IB, PHI, domestically produced AI acceleration chip.

● Lossless bare metal service, unused scientific research resources management

For extreme performance and long-term mission requirements, Fusion Research Cloud supports the use of physical servers for direct delivery as a scientific research application operating environment, and automatically installs and deploys the required systems and related software, and can support old servers to enter the cloud and to maximize scientific research equipment investment benefits.

● Hybrid cloud scientific research computing, supporting multi-private/multi-public/multi-level resources

Converged scientific research cloud not only supports the creation of scientific research clusters on local resources, but also supports the creation of scientific research cluster capabilities on public clouds such as Alibaba Cloud, AWS, and the construction of scientific research computing capabilities of hybrid clouds.

● Visualized arrangement of scientific research environment, quicker response to individual needs

Converged scientific research cloud has the ability of "one-click delivery of HPC application clusters", which can virtualize cloud host clusters suitable for different HPC applications in existing fixed servers, and automatically complete the installation and deployment of

software, such as big data Hadoop/Spark, Simulate Matlab, Ansys, LS-DYNA, artificial intelligence TensorFlow, and support custom methods to customize more other HPC applications.

- The large-scale display of scientific research and operation displays the results of the organization's services and boosts confidence

The integrated scientific research cloud provides a large screen for scientific research operations, which can fully reflect the richness of the scientific research cloud platform supporting business and the ability to contribute to scientific research through information such as resources, billing and metering, scientific research application types, and scientific research task completion.

- Personal service, unite more research and simulation partners to empower customers

In addition to providing rapid response, professional service team, customer training and other capabilities required for general projects, the integrated scientific research cloud solution can also cooperate with experts to provide various additional service empowerments such as application performance evaluation, application optimization, and expert training for scientific research application scenarios. Customers, so that users can focus on scientific research itself.

## 【6】Customer Benefits

- Both new and old servers can be connected to the cloud, scientific research resources are managed in a unified manner, and the investment benefit of scientific research equipment is maximized.
- Self-service delivery of scientific research computing environment to improve the delivery speed of scientific research results.
- The platform automatically manages scientific research assets, simplifies operation and maintenance actions, and enables users to focus on scientific research itself.
- When local resources are insufficient, public cloud resources can be used for computing power expansion to avoid excessive investment in local resources.
- Public cloud resources are available for high-end hardware, which can be purchased after large-scale operation, reducing trial and error costs.
- The scientific research service can be measured and billed, and the ratio of scientific research input and output can be quantified.
- The operator transforms from the resource provider to the operator to enhance the value of the department.

[7]

## BingoCloud's HPC and Simulation Application Enabling Partners

| HPC Application Manufacturer | Ansys    MathWorks    ALTAIR |
| --- | --- |
| Chip Computing Power | AMD    intel    HUAWEI    NVIDIA.    SUNWAY 申威    中科曙光 Sugon    飞腾 PHYTIUM |
| Public Cloud Computing Power | aws    Azure    HUAWEI 华为云    曙光计算云 | Sugon |
| HPC Service Partner | 聯科集團 CLUSTERTECH    景派科技    Lenovo 联想    安世亞太 PERA CHINA    曙光计算云 | Sugon |

## Supported Scientific Research and Simulation Software

| Oil exploration | Promax、CGG、Geodepth、Omega、GeoEast、Focus、Eclipse、VoxelGeo、RMS |
| --- | --- |
| Meteorological | MM5、GRAPES、ARPS、WRF、CAM、Regcm3、CCM3、IFS、CGCM、AREM、CCSM |
| Computational Chemistry | NAMD、VASP、GAUSSIAN、CPMD、Material studio、QCHEM、NWCHEM、GAMESS、Amber、Molpro、WIEN2K |
| Computational Mechanics | NASTRAN、ABAQUS、LS-DYNA、ANSYS、FLUENT、STAR-CD、CFX |
| Biology | Blast、mpiBlast、Hmmer、ClustalW、DOCK、FlexX |
| Other | Matlab、HFSS、FEKO、Hadoop、Spark、Tensorflow |

## [8] Application Scenarios

BingoCloud integrated scientific research solution can use heterogeneous infrastructure to build scientific research computing resource pools, provide users with a one-stop scientific research portal, and quickly obtain the application capabilities required for scientific research through the service catalog. It also supports sharing and exclusive computing modes. The shared graphical task management for traditional HPC, simulation and scientific research habits is more convenient; the exclusive mode allows users to apply for the isolation of computing, storage, and network required for scientific research with one click Resource usage is more flexible. It is compatible with traditional HPC research and simulation task habits, and it also integrates and supports the requirements of new scientific research computing tasks such as big data and AI.
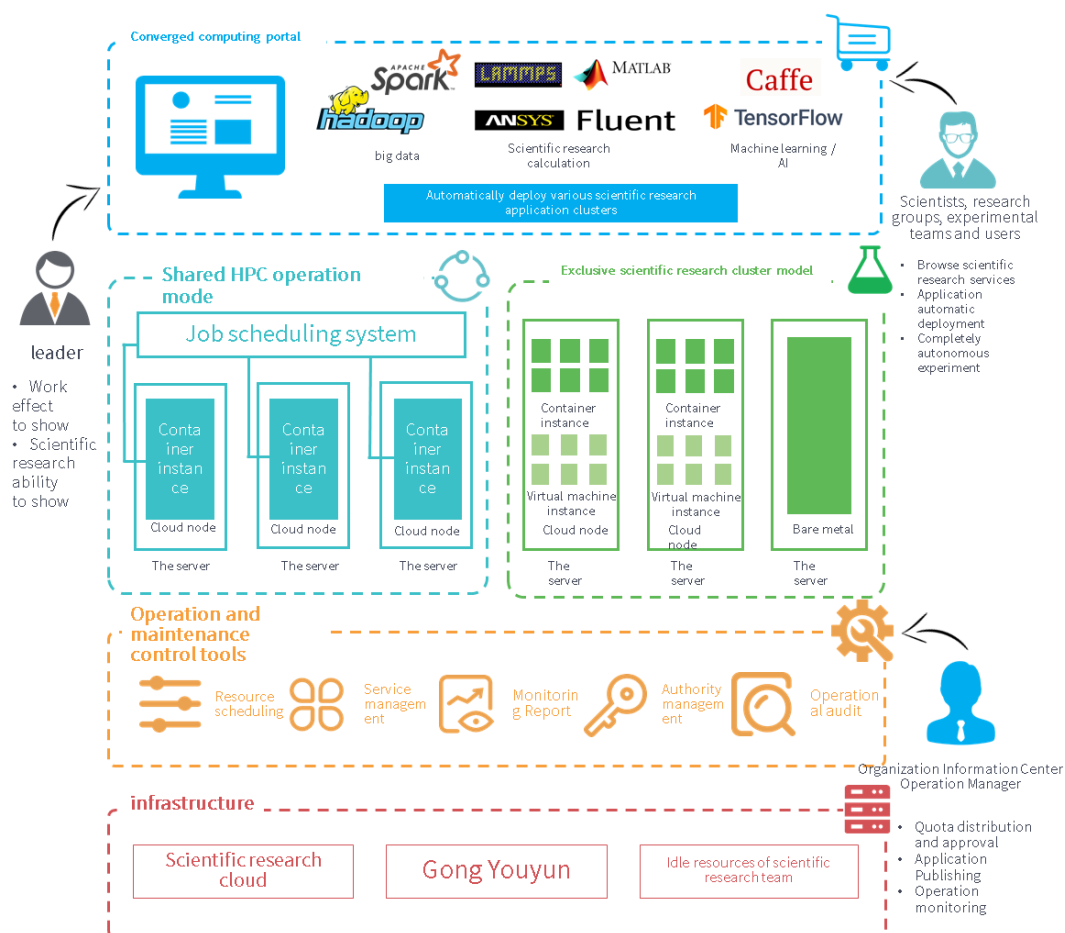
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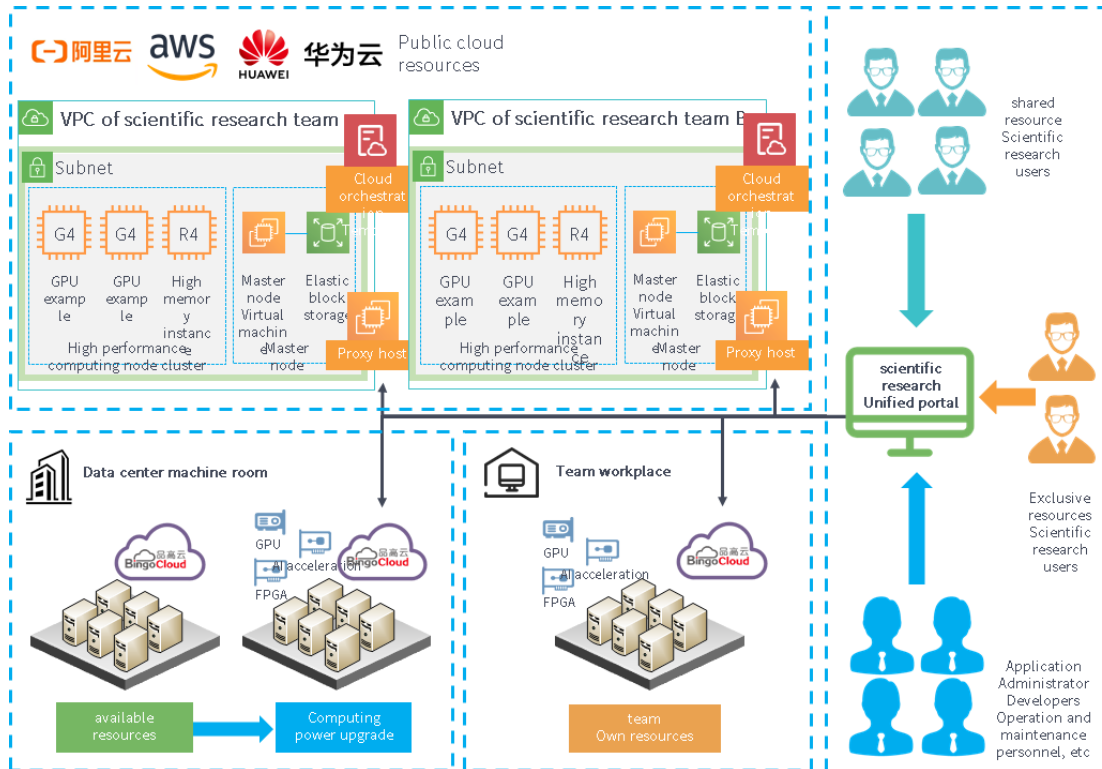


- **Utilize the old for local computing power upgrade:** You can use the organization's existing equipment to purchase a small amount of accessories to complete the computing power upgrade, and you can start the research mode exploration.

- **Automatic delivery of scientific research clusters:** support the ability to deliver scientific research application clusters with one click, quickly complete the deployment and configuration of scientific research environment, and improve the speed of scientific research tasks.

- **Sudden use of public cloud resources:** When local resources or computing power are insufficient, public cloud resources can be used on demand, and released on demand to avoid waste.

- **Coexistence of exclusive and shared models:** research federation cloud operations can be carried out, unified delivery standards, shared resources and team exclusive resources can be unified management and control, exclusive resources can be opened on demand by communicating, and the overall research asset investment cost performance can be improved.

- **Multi-type metering and billing methods:** support the pricing of local scientific research resources, and synchronize public cloud bills to quantify the ratio of scientific research input and output.

# 【10】Customer Cases

## A Double First-Class Department (School of Automation), Using Old Assets to Upgrade and Integrate Scientific Research Cloud
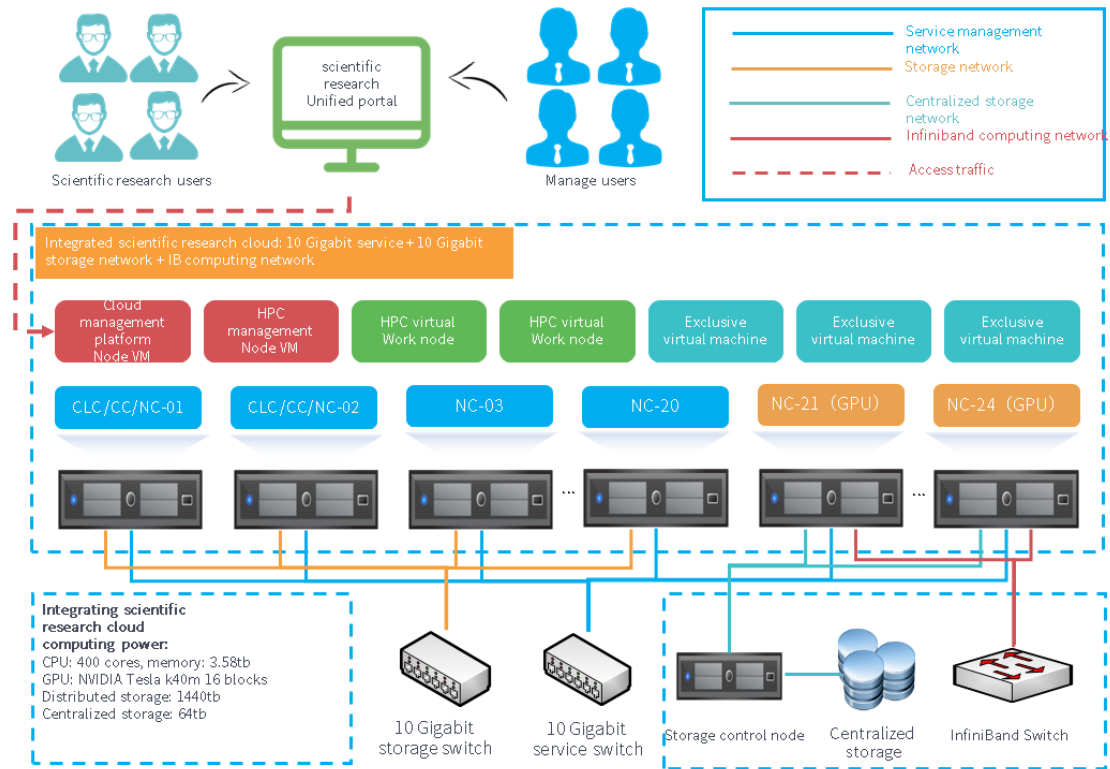


- **Project background:** The customer big data platform was built in 2016 and cost more than 20 million. After 5 years of development, the original platform can no longer support the daily use needs of teachers and students of the college. The equipment was shut down and idle for a while, unable to emerge the value.
- **Solution:** Based on the existing idle equipment, select 24 servers, IB switches, and centralized storage from the old resources to build a converged scientific research cloud platform, so that heterogeneous scientific research resources (including GPU, IB) can be provided to the teachers and students of the college Network and other high-performance resources, continue to support the scientific research requirements of teachers and students.
- **Customer benefits:** Based on the use of old scientific research resources, it can provide teachers and students with scientific research resources of 400 cores, 3.5TB memory, 1.5PB storage, and 16 GPUs; teachers and students can quickly obtain scientific research resources or directly submit scientific research through a unified portal tasks are calculated; based on the high scalability

of the platform, subsequent resource expansion can be seamlessly performed.

- **Applications:** Matlab, Hadoop, Caffe, Spark
- **Platform scale:** 24 servers, IB switches, GPU resources.


## [11] A Central City University, Inheriting the Old and the New to Build a School-Level Integrated Scientific Research Cloud
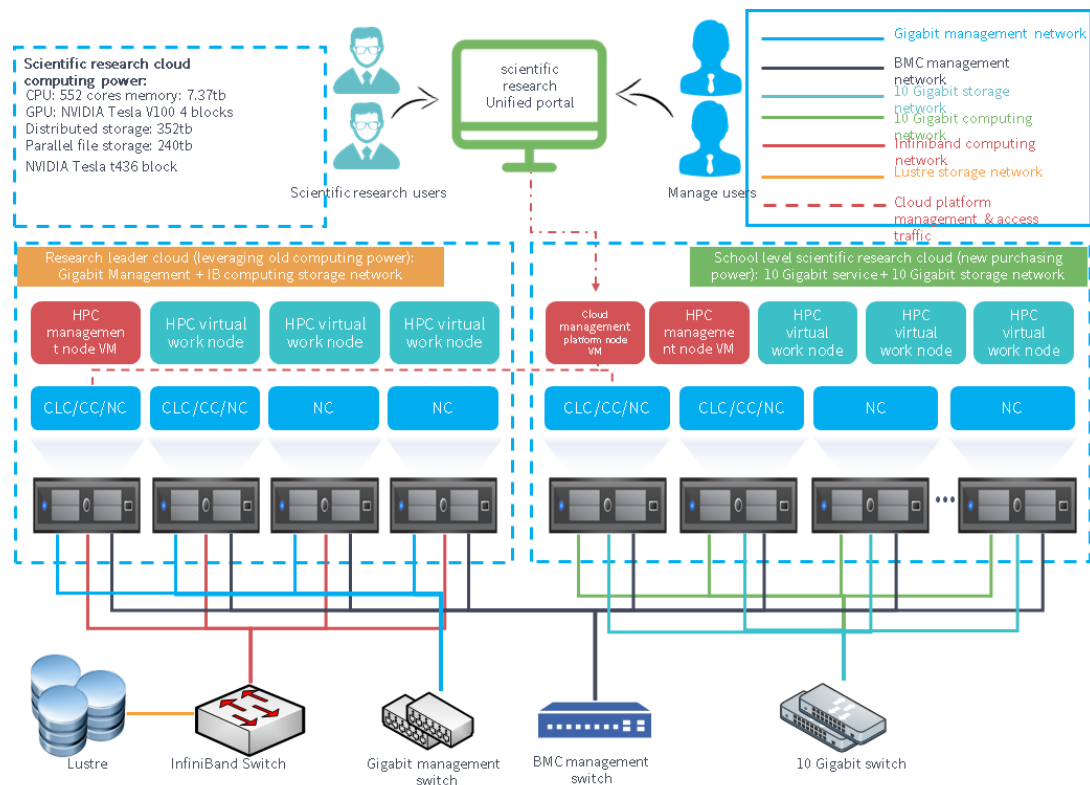


- **Project background:** The client started to build a school-level cloud platform in 2013 to support various management systems of the school. Starting in 2019, in response to the demands of the school's scientific research users for scientific research resources, the school has tried to build a scientific research cloud platform to provide scientific research services for various departments, but due to the complex scientific research environment, it has not been realized.
- **Solution:** The customer builds the scientific research cloud platform based on the idea of quick effect and smooth migration, builds a scientific research pilot cloud platform based on the use of old high-performance equipment for rapid promotion, and gradually purchases more hardware for smooth expansion and upgrades to the school. Class-level scientific research cloud, with the help of the integrated scientific research cloud platform's operation

and management capabilities and built-in scientific research application components, is open to some schools and departments to provide scientific research services.

- **Customer benefits:** overall construction resources 552 core CPU, 7T memory, 40 GPU card scientific research resources, overall storage capacity 590TB; the school uses the cloud platform to simplify the management of the scientific research environment, and can quantify the scientific research input-output ratio, and provide the direction from resources the operator is transforming; users focus on the scientific research itself, flexible use of resource, simple task submission, and speed up the delivery of scientific research results.
- **Applications:** Matlab, TensorFlow, Ansys, Fluent, ABAQUS
- **Platform scale:** nearly 20 high-profile physical servers, 40 GPU cards (including A100).