

NCHC creates shared supercomputer resources for Taiwan's researchers



Software and services

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Taiwan's National Center for High-Performance Computing (NCHC) runs the only shared, large-scale computing platform and academic research network facility in Taiwan. It sought to build a new platform, Education Cloud, to share supercomputer resources across Taiwan's education sector. Using Red Hat OpenShift, NCHC created a scalable, easy-to-manage foundation for Education Cloud. The organization can now provide widespread access to education resources for students while simplifying development, management, and deployment of new and updated features.



Government

200 employees

Benefits

- ▶ Established widespread access to supercomputer resources
- ▶ Automated routine configuration and management tasks
- ▶ Gained technology insight with expert guidance

"Our most important goal is to share resources so universities can benefit from powerful computing capabilities. Red Hat helped us accomplish this."

Dr. Shih-Hao Hung

Deputy Director General, National Center for High-Performance Computing (NCHC), and Department Chairman, Information Engineering, Graduate Institute of Taiwan University

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Serena Pan
Researcher, National Applied
Research Laboratories

Building a scalable education and research platform for Taiwan

Located in Hsinchu, Taiwan, the National Center for High-Performance Computing (NCHC) is a research institution funded by the Taiwanese government and affiliated to the National Applied Research Laboratories. It aims to help students share supercomputing resources and cultivate technology talent. Professors and students use the NCHC’s three supercomputers—Taiwania 1, 2, and 3—to conduct research in science, engineering, artificial intelligence (AI), and big data.

In 2020, NCHC wanted to expand researchers’ access to these powerful machines. It designed the Scientific Computing and Artificial Intelligence Education Promotion Cloud (Education Cloud) to provide the necessary resources for big data analysts who require high efficiency and fast processing speeds.

“Our focus is to share resources so universities can benefit from powerful computing capabilities,” said Dr. Shih-Hao Hung, Deputy Director General, NCHC.

To support this work, Education Cloud needed a stable, reliable, and easy to use platform for a large number of students to access their coursework, including learning about cloud computing. Additionally, the platform needed to be easy to maintain to let teachers and assistants focus on curriculum design and content, rather than configuration or management.

NCHC initially used community open source technology to build its Education Cloud platform, because many researchers were already familiar with open source tools. However, the organization needed to support growing and more diverse research needs—without drastically increasing costs.

Balancing open source innovation with enterprise support from Red Hat

NCHC adopted Red Hat OpenShift, running in a private on-premise cloud environment. Red Hat OpenShift is an enterprise open source Kubernetes container platform with comprehensive automation capabilities for managing cloud deployments. This solution lets developers automatically install, upgrade, and manage containers in the cloud. With this flexibility, including rapid deployment and resource allocation, NCHC has the flexibility it needs to scale and adapt to researcher needs.

“There are many different container solutions available. We chose Red Hat without hesitation, because Red Hat is the main code contributor of the many open source tools we use,” said Serena Pan, Researcher, National Applied Research Laboratories.

To optimize its Red Hat OpenShift environment, NCHC engaged Red Hat Consulting and Red Hat Technical Account Managers (TAMs). Prior to deployment, Red Hat and NCHC’s teams participated in discussions and hardware configuration exercises to plan the architecture and solve any potential issues. For example, Red Hat helped the organization remove communication bottlenecks between private and public domain name systems (DNS). Additionally, the Red Hat TAMs helped NCHC build and optimize a graphical processing unit (GPU) cluster, from network architecture to storage configuration.

Simplifying resource sharing across multiple universities to support innovative research

Established widespread access to supercomputer resources

The NCHC Education Cloud currently includes more than 12 servers and 200 GPUs and can support more than 20 courses simultaneously by taking advantage of its scalable, responsive Red Hat OpenShift foundation.

Students can complete in-class exercises, homework assignments, and more complex projects using shared, easy-to-access computing, storage, and network resources.

As a result, Taiwanese students have a better educational experience. “Students at many universities will have a better experience when they take courses in science computing and artificial intelligence,” said Hung.

Automated routine configuration and management tasks

By taking advantage of Red Hat OpenShift’s [operator-centric model](#), NCHC can easily adopt and build cloud-native applications through Red Hat Marketplace, powered by IBM. This hub provides add-on capabilities that can be installed quickly with minimal configuration or additional information.

For example, NCHC’s onsite administrators can use these operators to automatically complete many system management tasks, such as managing website Transport Layer Security (TLS) and physical host settings. Without such automation, the onsite administrators would have to repeat many routine management tasks, which took up a lot of time.

Close integration between Red Hat OpenShift and Operator SDK, an open source framework component for managing Kubernetes-native applications with Operators, also helps NCHC balance its enterprise open source adoption with existing internal proprietary requirements.

For example, course scheduling on Education Cloud is completed by a specialized operator. By decoupling this function from the main program, NCHC has simplified development, debugging, and deployment to OpenShift and Kubernetes platforms.

Red Hat OpenShift also provides comprehensive monitoring and alert capabilities to help NCHC maintain the performance of its environment as it adds new operators and functions.

“We found that the most valuable part of Red Hat OpenShift is the cluster and container management,” said Hung. “To maintain optimal performance, we need to continually track each cluster’s health. Configuration and management are key, because they affect the operation of the entire Education Cloud.”

Gained technology insight with expert guidance

Following the deployment, NCHC and its Red Hat Technical Account Managers hold biweekly online discussions to share new knowledge and review the latest updates to open source technology. This ongoing collaboration helps NCHC not only maintain the high stability and performance of its Red Hat software, but also gain insight into upcoming enhancements.

“When our team encounters an urgent issue, they can directly message Red Hat’s technical consultants through the instant messaging ticket system,” said Ms. Pan. “They always get a quick response. We definitely sense the high level of thoughtfulness in the technical support provided by Red Hat Technical Account Management.”

Extending cloud platform capabilities to government needs

Sharing Taiwan's supercomputer resources, with extensive support from Red Hat, is creating opportunities for new IT development in various fields of academia and government.

For example, NCHC is now developing a government cloud platform using Red Hat OpenStack® Platform for government agencies to take advantage of shared computing resources to protect sensitive information. In addition to its original private cloud, NCHC is providing government units with a hybrid cloud proof of concept to try out public cloud computing and storage resources, while meeting information security and confidentiality requirements.

"With Red Hat technology, NCHC will continue to expand and improve Education Cloud services, providing more resources to support researchers, students, government agencies, and others," said Ms. Pan.

About the National Center for High-Performance Computing, National Applied Research Laboratories

The National Center for High-Performance Computing (NCHC) Consortium of the National Applied Research Laboratories was established in 1991. It boasts the only shared large-scale computing platform and academic research network facility in Taiwan, and pioneers forward-looking, cutting-edge cloud technology in computing, storage, network, and platform integration. It also specializes in providing cloud integration services such as high-speed computing, high-quality networks, high-performance storage, big data analysis, and scientific engineering simulation for multiple end users in Taiwan. <https://www.nchc.org.tw/>






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Red Hat is the world's leading provider of enterprise open source software solutions, using a community-powered approach to deliver reliable and high-performing Linux, hybrid cloud, container, and Kubernetes technologies. Red Hat helps customers develop cloud-native applications, integrate existing and new IT applications, and automate and manage complex environments. [A trusted adviser to the Fortune 500](#), Red Hat provides [award-winning](#) support, training, and consulting services that bring the benefits of open innovation to any industry. Red Hat is a connective hub in a global network of enterprises, partners, and communities, helping organizations grow, transform, and prepare for the digital future.

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