Realizing a leading-edge network supporting the most sophisticated academic research environment

A Lower Operational Burden to Achieve Offensive IT Management

Highlights

Challenge

(1) Build a new research facility network that boasts superior cost performance

(2) Evolve a campus backbone with enhanced scalability and failure-resistance

Arista Solutions

Campus LAN Network

Results

(1) Increase proficiency and reduce operational burden via consistent command lines, interfaces, and other standardized specifications

(2) Build a high-speed network environment based on the latest specifications within a reasonable budget

(3) Leverage open specifications ensuring a low risk of vendor lock-in.

As the home of a Nobel laureate, the Okinawa Institute of Science and Technology (OIST) has earned a reputation globally as a world-class research institute. Situated within the lush natural landscape of Onna, Okinawa, the expansive OIST campus continuously expands its research and development facilities.

In April 2023, OIST fully adopted Arista's solutions to configure the network used to launch operations of its Lab 5 research facility. Concurrently, during the construction of the Lab 5 research facility, OIST conducted a comprehensive review of the network design for the entire campus. With a strong emphasis on redundancy and failure resistance, the new ring network connecting each research area is comprised of two layers, in a multi-vendor environment. OIST specifically selected Arista Networks to provide the products to configure the ring layer that supports the core OIST network.

Customer Data

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World-class Research Facilities

The Japanese government established the Okinawa Institute of Science and Technology (OIST) as an interdisciplinary graduate school offering a 5-year PhD program in Science and Engineering. OIST's mission is to attract leading researchers from Japan and around the world to conduct high-quality research, advance the development of a world-class research hub, contribute to science and technology worldwide and stimulate the formation of a knowledge cluster that will catalyze technology transfer and industrial innovation in Okinawa. OIST acts as a global research institute, adhering to the highest standards for safe and responsible research, employing a cross-disciplinary approach with an international and diverse faculty, administration and student community that uses English as a common language. OIST Professor Svante Pääbo received the Nobel Prize in Physiology or Medicine in October 2022, solidifying OIST's position as a world-class research hub on the international stage.

The network environment serves as the campus backbone, connecting all five research wings and the OIST data center. Additionally, OIST maintains an off-campus network that links to off-campus hubs, including the OIST Marine Science Station, while also providing external connections to the Science Information Network (SINET6), constructed and operated by the National Institute of Informatics (NII)."
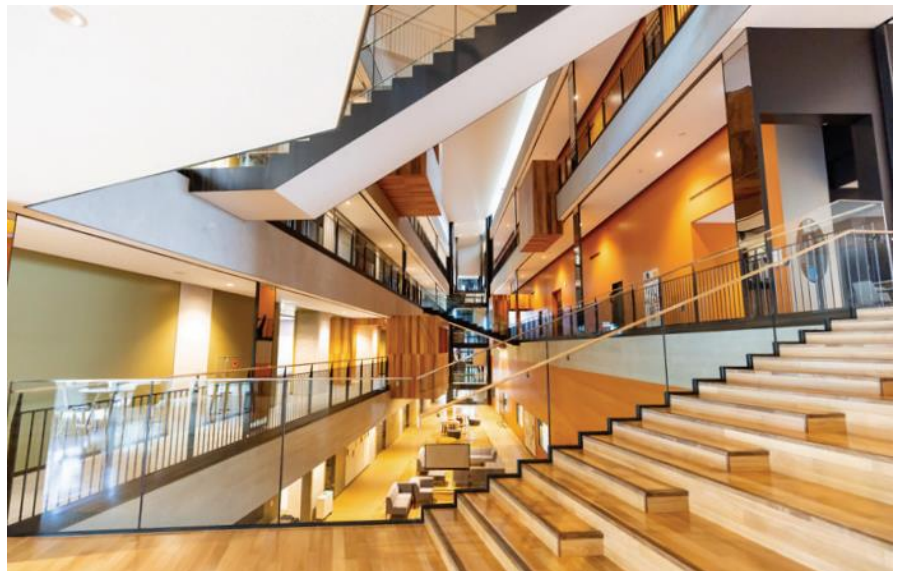
Lab 5 Network

The new Lab 5 research facility, launched in April 2023, has seamlessly integrated new network devices provided by Arista Networks. OIST conducted an open bid to select the appropriate devices to construct the network. Arista Networks emerged as the leading vendor, surpassing several competitive bids by offering innovative specifications while remaining within the allocated budget.
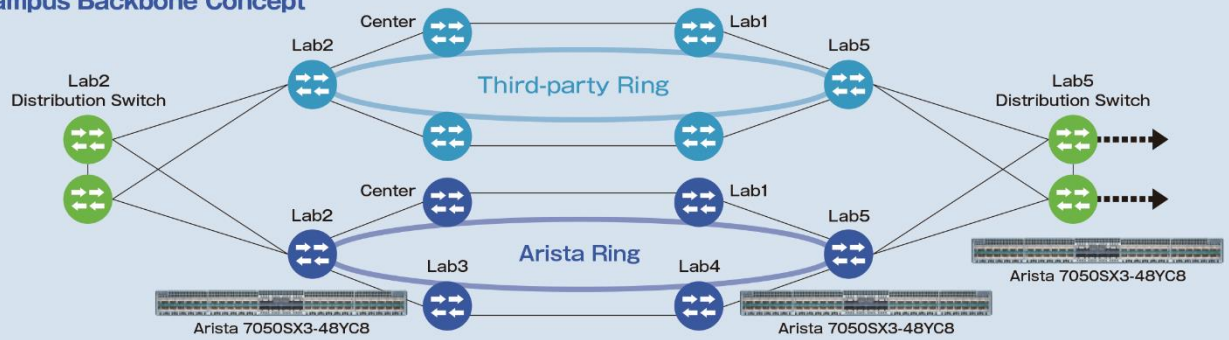
Responsible for designing the network, Network Architect Jun Kato from the Project Planning and Implementation team, explains, "One of the major requirements was to continue to use the network devices already deployed at our four existing research facilities. Other than that, the OIST did not stipulate any other detailed requirements. By delineating only the essential requirements, we aimed to realize a low-cost network that eliminated any unnecessary features or functions.

Generally, many device manufacturers develop and implement proprietary features in order to heighten product appeal and competitiveness of their products. However, heavy reliance on these proprietary features can make it challenging for end-users to transition to alternative third-party products, resulting in vendor lock-in and a limited choice of network devices. To counter this, OIST established a policy to use standardized functionality and minimize additional features to construct a cost-effective network that includes only the essentials. Arista Networks fully met these requirements with a product lineup fully integrated into the new Lab 5 network.
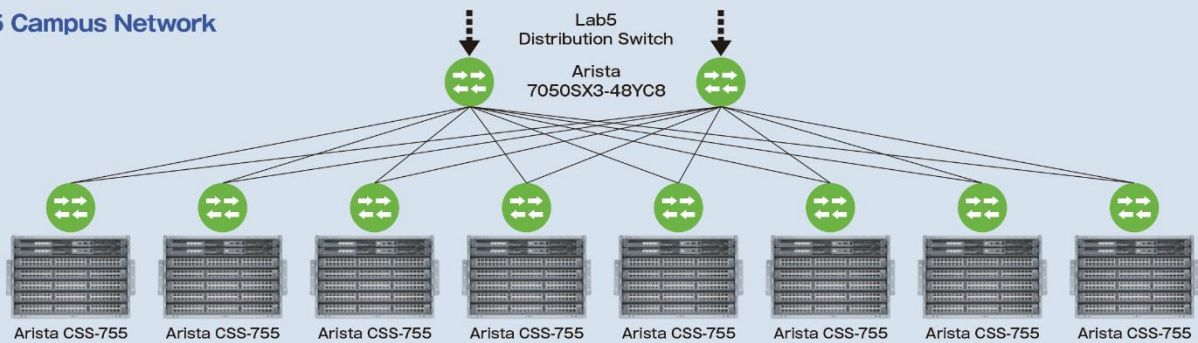

OIST Campus LAN Network

Assessment by the Team Responsible for Operation and Management

OIST aims to become one of the foremost research institutions in the world that attracts faculty, researchers, students, and administrates from every corner of the globe. Clearly, IT systems and networks are vital to nurture the best international human resources. A system shutdown would bring all OIST activities to a halt. Operation and Support Section Manager Takanori Matsuura, who is in charge of overall network and IT infrastructure management and support, explains, "As a research and development hub, OIST would be unable to accomplish anything without a fully operational network. The network backbone is mission critical infrastructure for OIST, a shutdown would impair every research facility on our campus. The two-layer ring topology constructed using network equipment from different manufacturers ensures a design that prevents a total functional shutdown in the event one ring fails. Another benefit that we emphasized in our evaluations was a low operational and management burden".

Network Engineer Udaya Sankar Palani describes the concept behind the basic operation and management, "OIST is still expanding its infrastructure, updating its network devices every couple of years. We are careful to select open systems because OIST wants to avoid becoming locked into any specific product or manufacturer to guarantee OIST can always adopt the best equipment for our needs. Transitioning to equipment provided by a different manufacturer changes the way networks and systems are used and places additional burden on the users of these technologies. Arista Networks provides industry-standard products, from universal command lines to interfaces, along with measures to streamline the learning curve. OIST has given high praise for the smooth, trouble-free implementation of these Arista Networks products."

Consistent interfaces across a combination of core switches, distribution switches, and access switches is vital to the internal operations of Lab 5. Network Operator Yusuke Umeda expresses his appreciation, saying, "Arista Networks provides consistent interfaces and in turn, ensuring the same user experience across operating system for all its products". Network Operator Toubaru added, "Interface profiles that can apply the same settings to multiple ports, and other such user-friendly features, reduce the tediousness of daily operation and management". Arista Networks consistently implements such conveniences to streamline operations and management. Network Engineer Udaya Sankar Palani further emphasizes the focus on operational and management efficiency in the OIST network, stating, "We wanted to reduce the

financial and human resource costs required to operate and manage this network. OIST also sought to automate setting changes and other daily operation and management processes as much as possible, which then allows us to allocate our time to high priority tasks".

OIST links its authentication server with the interface profile feature described previously to automatically apply dynamic port setting changes. This proves particularly beneficial for researchers who frequently move within OIST. Interface profiles let these researchers use their own computers because these profiles automatically apply the appropriate network settings when the researchers connect to the network used at each new site. Notably, this automation has eliminated the need for the Operation and Support Section to handle any manual setting changes. This is not only convenient for the staff but also the researchers who use the network, as these automated processes eliminate the need for frequent manual user tasks typically necessary to handle these kinds of changes.
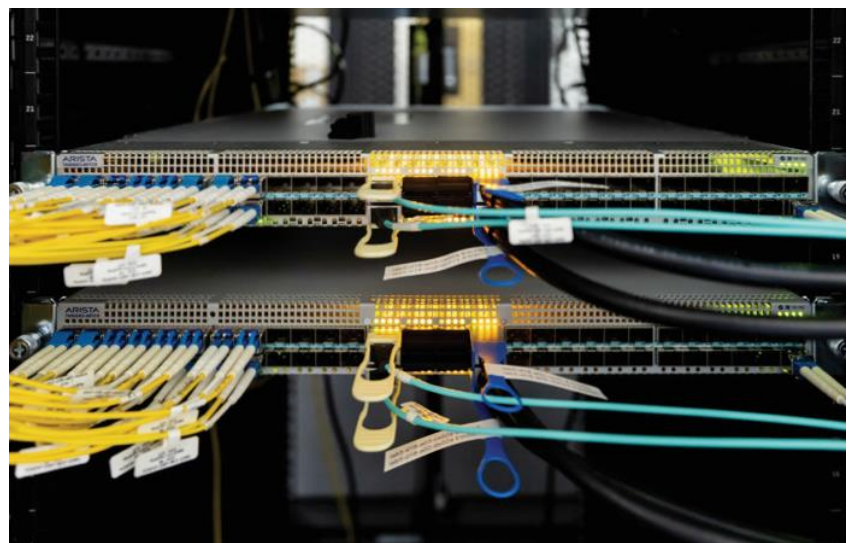
Ongoing Development of the Network Environment

OIST will continue to develop and further expand its network in the future. For example, OIST currently has plans to build a second data center in fiscal 2025 to enhance the capacity of the campus data center in the Lab 1 research facility. Although the specifics of this new data center are still in the design stage, OIST anticipates implementing a two-layer ring network structure into these new campus backbone in anticipation of innovating and migrating the existing data center. Typically, a star network design with data centers in the hub is chosen as the core network topology for campus, however, this topology could make relocation of the existing data center difficult. The shift from a star to two-layer ring network, offers the opportunity to relocate the data center, while at the same time ensuring the flexibility to easily install the new data center anywhere on campus.

OIST's policy to adopt a prudent design that prevents vendor lock-in places a strong emphasis on manufacturers demonstrating sincere efforts to enhance standard features and functionality, as well as to sustain and improve cost performance, rather than rely on an arsenal of proprietary features. Arista Networks is able to provide these standard products at a reasonable cost and demonstrates a genuine commitment to reducing operational and management burdens. This alignment with OIST's network needs underscores the compatibility and shared values between OIST's strategic approach and Arista Networks' offerings.

Comment
Okinawa Institute of Science and Technology
IT Division
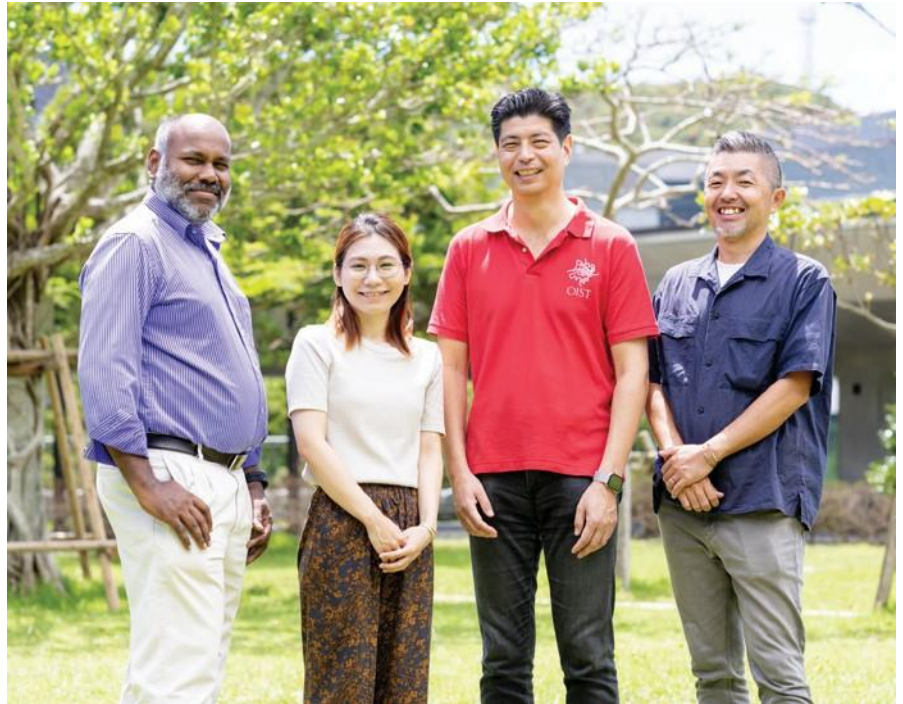Operation and Support Section
Manager
Takanori Matsuura

Left to right in photo:
Okinawa Institute of Science and Technology
IT Division
Operation and Support Section
Network Engineer
Udaya Sankar Palani

Okinawa Institute of Science and Technology
IT Division
Operation and Support Section
IT Support Network Operator
Toubaru

Okinawa Institute of Science and Technology
IT Division
Project Implementation Section
Senior Network Architect
Jun Kato

Okinawa Institute of Science and Technology
IT Division
Operation and Support Section
IT Support Network Operator
Yusuke Umeda