CASE STUDY

PENN STATE

Reduce carbon footprint with smart campus building automation

Pennsylvania State University is a public research-intensive university with campuses and facilities throughout Pennsylvania. Ranked as one of the top 50 colleges by U.S. News, Penn State serves 80,000 students and 50,000 faculty and staff.

PennState

Customer
Penn State University

Location
Pennsylvania

Requirements

- Implement innovative solutions to reduce carbon footprint and greenhouse gas emissions
- Reliable network that can support
- 300 buildings on the University Park campus and 170 buildings across the state

Solution

- Deployed ICX 7750 switches at the core and ICX 7450 to deliver reliable and scalable L3 routing between the access and the core, and an ICX 7150 12 port compact switch is deployed in each building

Benefits

- Network can support all the buildings throughout the campus and across the state with flexibility to grow with the university's future needs
- Reduced power consumption in the buildings
- Reduced carbon footprint while saving millions of dollars

RUCKUS' ICX Family Delivers More Efficient Connections

Pennsylvania State University is a public research-intensive university with campuses and facilities throughout Pennsylvania. Ranked as one of the top 50 colleges by U.S. News, Penn State serves 80,000 students and 50,000 faculty and staff. The University Park campus, comprised of several hundred buildings and nearly 32 million square feet, is a city in itself. Penn State is dedicated to implementing innovative solutions and is committed to reducing its carbon footprint and greenhouse gas emissions. A large portion of that has come from its Energy Savings Program that has already reduced its energy use to 2003 levels despite an increase of over one million square feet of building space.

Using separate IT teams for different areas of the university, the facility automation team is innovative in its management of the infrastructure that supports buildings on the University

Park campus and the Commonwealth campuses throughout the state. The building automation IT department has implemented the network in over 300 buildings across the University Park campus and up to 170 buildings across the state, controlling such things as heating and cooling, lighting, elevators, vibration monitoring, and anything building related. Tom Walker, network administrator at Penn State, stated, "Anything that deals with control of the building and how the building operates is coming across my network infrastructure and servers at the data center."

The Challenge

Struggling with their legacy network, Penn State was facing some challenges. Using a protocol called BACnet, an open industry standard used in Building Automation and Lighting Systems, Penn State was struggling with the control of broadcast traffic. "We were seeing up to 90,000 packets per hour of broadcast traffic, which caused random buildings to drop offline due to the broadcast storms," stated Walker. "We needed to change our flat Layer2 daisy-chain design. If I turned off one building, up to 10 more buildings would shut down, which caused even more problems when I just needed to isolate the one that was causing the issues."

Also, with the BACnet protocol being a user datagram protocol (UDP), there was no confirmation of messages being received. Communications to start or stop tasks sent within a maintenance window were lost. Faculty and staff would arrive at a building only to discover that it was not cooled down or heated. Tom Walker and team felt it was time to install their own infrastructure internally.

The Solution

What, exactly, makes a campus "smart?" At the highest level, a Smart Campus links devices, applications, and people to deliver two key value propositions: enabling new experiences and improving operational efficiency.

A Smart Campus starts with a reliable network. However, while that kind of connectivity may once have been a goal in itself for many colleges, it's just the beginning of a Smart Campus. When all of buildings and infrastructure on campus share a common technology infrastructure, they can interact with

"We isolated one small section of the campus buildings as a test bed. This allowed us to have visibility into how we wanted to replace the existing switches and re-configure the network. Through this testing, the RUCKUS solution gave us the capability to be able run independently of the campus-wide network and allow us to schedule maintenance windows that would not disrupt our operations."

Tom Walker
Network Administrator, Penn State

each other to enable efficiencies that weren't possible before. This was the approach Penn State undertook.

Working alongside the Enterprise Networking and Communications Services (ECNS) team and looking to update the network, the Penn State team looked at several vendors. They wanted a layer 3 switch at the edge to help isolate the high volume of packets that could be generated from within each building. They only needed a limited number of ports per building so their preference was to find a low port density switch. Other requirements included competitive pricing, scalability and a mix of fiber and copper Ethernet ports.

After doing extensive research on all the vendors, RUCKUS was chosen as a vendor who demonstrated the capacity to deliver ease of configuration, cost optimization and layer 3 capability in a smaller form-factor with low port density. The goal was full network redundancy, ability to isolate each building, greater control over network traffic and reduced power consumption. With a design in mind, Penn State decided to validate the new solution on a specific section of the campus first to get a better understanding on how to proceed with the broader deployment.

The new Penn State smart-campus building automation network solution is based on the RUCKUS ICX platform and provides reliable enterprise-class stackable switching and routing to meet the current demand while offering plenty of room to scale-up for future extensions.

At the core, a pair of ICX 7750 switches delivers rich layer 3 features with chassis-level performance and reliability in a flexible scale-out design that fits perfectly at the core of Penn-State's building automation network to route traffic. The ICX 7750 pair connects down to the distribution layer through redundant 10G links and up to the datacenter through redundant 40G links.

The network distribution layer uses ICX 7450 L3 switches deployed at numerous "hub" locations on the University Park campus. These switches are all dual-pathed to deliver reliable and scalable L3 routing between the access and the core.

At the access layer, an ICX 7150 12 port compact switch is deployed in each building. It uses gigabit Ethernet links to connect to a variety of equipment, including the building lighting control system, elevator, chimes systems, electric meter, HVAC system, and other control and automation devices. The ICX compact switch connects up to the aggregation layer with redundant 1G L3 fiber links.

The ICX 7150 12 port compact switch ability to deliver L3 routing in a small and fan-less form factor while offering a mix of copper and fiber ports (for long distance uplinks) and reduced power consumption makes it perfectly suited for this application.

"The ICX compact switch itself uses very little power," added Walker. "That's a perfect fit for our objective to reduce overall power consumption across the university while saving money at the same time."

> "The RUCKUS solution provided us with a quality product at a low cost, smaller form-factor and lower power consumption."
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> **Tom Walker**
> **Network Administrator,**
> **Penn State**

The Open Shortest Path First (OSPF) protocol is used across all L3 links between access and aggregation and aggregation and core to maximize traffic isolation between network layers and between individual buildings and to control broadcast storms.

"Having layer 3 at the edge gave us a simple deployment method," stated Walker, "and allowed us to isolate each building to eliminate disruption from broadcast storms."

RUCKUS provided Penn State with a platform that can support all the buildings throughout the campus and across the state with the flexibility to grow with the university's future needs.

"The RUCKUS solution provided us with a quality product at a low cost, smaller form-factor and lower power consumption," said Walker. "Our group maintains energy efficiency and sustainability so our goal is to reduce power consumption in the buildings. We look at ways to run the buildings more efficiently and still provide the same comfort while reducing our carbon footprint and saving millions of dollars for the university."

About RUCKUS Networks

RUCKUS Networks builds and delivers purpose-driven networks that perform in the demanding environments of the industries we serve. Together with our network of trusted go-to-market partners, we empower our customers to deliver exceptional experiences to the guests, students, residents, citizens and employees who count on them.

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CS-117597-EN (03/23)