University Custom Demand-Response

BACnet compatibility and system flexibility facilitated application integration

Partner: Grand Canyon University, [3300 W Camelback Rd, Phoenix, AZ 85017](#)
Technology: Tridium N4, S4 BACnet ecobee Integration, GCU Developed Demand-Response application, ecobee thermostats, Distech controllers, Carrier controllers, Mitsubishi controllers
Customer: GCU self-supported integration and development
Project Size: 250 ecobee thermostats

About the Customer

Grand Canyon College was chartered on Aug. 1, 1949, with 16 faculty and approximately 100 students in Prescott, Arizona. In 1951, the college relocated to a 90-acre tract in West Phoenix.

In May of 1984, college trustees voted to prepare for transition to university status on the school's 40th anniversary.

The university grew its campus student body from fewer than 1,000 students in 2009 to over 25,300 campus students in 2022. GCU's non-traditional student body increased from approximately 22,000 students at the start of 2009 to over 86,000 online and evening cohort students in Fall 2022.

In Fall 2023, GCU had over 77,000 bachelor's-level students, over 35,700 master's-level students and over 5,400 doctoral-level students.

To support this vigorous growth between 2009 and June 2022, the university invested over $1.7 billion dollars — and today, continues to invest in full-time faculty, improved technology infrastructure, new facilities and programmatic expansion in areas such as engineering, computer science and IT. The university has been able to self-fund these investments with only nominal increases in tuition for non-traditional students, while not increasing campus tuition in 15 years. This continuous growth is expanding the need for proactive facility management services, a move towards embracing smart building technologies, and associated energy management initiatives.

Customer Requirements

GCU previously invested in installing ecobee WiFi thermostats in many of their commercial and administrative buildings. As a result, they experienced greatly improved energy efficiency and end user

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acceptance of the technology. The installed base of ecobee thermostats of various models is currently at 250.

- The ecobee thermostats were accepted by the end users for their aesthetics and functionality.
- The ecobee thermostats provided effective control of the mechanical equipment they were connected to.
- The ecobee SmartBuildings Portal was a part of the campus environment and operational procedures, but they needed to expand upon its capabilities.
- Campus buildings were instrumented with BAS control technology from different manufacturers. The campus level solution must accommodate the unique needs of each building environment.
- They needed a unified user interface and campus control logic. Integration into the existing Tridium BAS was mandatory.
- One of the main driving factors was the need to implement a customized demand-response algorithm reflecting the greatly varied uses of GCU buildings and the temperature extremes in the Phoenix region.

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Overall Solution

GCU committed to using ecobee WiFi thermostats a long time ago. They were also making substantial use of the ecobee SmartBuildings portal. They were looking to expand on this early success with using thermostats designed for the light commercial marketplace in this large university campus. They now wanted to go to the next level.

- They wanted a unified BAS user interface and system level control environment based on Tridium for their ecobee, Distech, Mitsubishi, and Carrier systems.
- They wanted to implement a customized demand-response algorithm that reflects the uniqueness of the GCU campus, existing infrastructure, and the varied usage of campus buildings.
- They were looking for technology to help them achieve these expanded needs.

When S4 Integration Solutions (S4IS) approached GCU about being the Beta test site for our S4 BACnet ecobee Integration, it was a perfect opportunity to address the above needs with minimal risk and minimal disruption to current operations.

GCU Developed Demand-Response Application

GCU Energy Management / Controls Office developed their unique demand-response application within

the Tridium environment. It includes the following features, many of which go beyond what commercially available demand-response applications could offer.

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- The application's graphical user interface is standardized. The details unique to each building's infrastructure are handled by application logic.
- The application is integrated into the Tridium BAS calendaring system. Demand-response events can be scheduled in advance of the actual event.
- Depending on the severity of the event, actions can be scheduled on a global campus level or for individual buildings.
- Minor events result in a setback being applied to each area.
- Major events have the flexibility to completely shut down mechanical systems.
- When events are anticipated to be longer lasting, the algorithms implement pre-heating or pre-cooling to minimize the impact on occupant comfort.
- The S4 BACnet ecobee Integration enabled the demand-response application to control spaces with ecobee thermostats as if they were open BACnet technology.

Beta Test Site Selection

GCU provided a unique and almost perfect environment for a Beta test site:

- A large installed base of ecobee WiFi Thermostats
- An academic environment supportive of experimentation and learning
- The ability to start out simply and expand the integration as confidence improved
- In-house technical skills and flexibility to work closely with S4IS during the Beta test
- A clear intention of making the Beta test successful and moving to a production environment

The Integration Process

The integration process was very intuitive. S4IS delivered the S4 BACnet ecobee Integration product hosted on an industrial PC. Installation and setup were orchestrated by the S4IS Setup Wizard. The wizard requested the ecobee SmartBuildings credentials for GCU, presented the default properties for the system, TCP/IP, ecobee, and BACnet/IP with the ability to customize those properties to meet the project requirements. When the wizard completed, each building and thermostat in the GCU ecobee SmartBuildings service was published as a local BACnet/IP device. Bringing these devices into Tridium was straight forward using standard device discovery capabilities.

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Success

All 250 ecobee thermostats are now integrated into the GCU Tridium BAS environment which provides uniform access to all BACnet devices on campus. The custom demand-response algorithm has been developed in Tridium and is being rolled out to all buildings on campus incrementally.
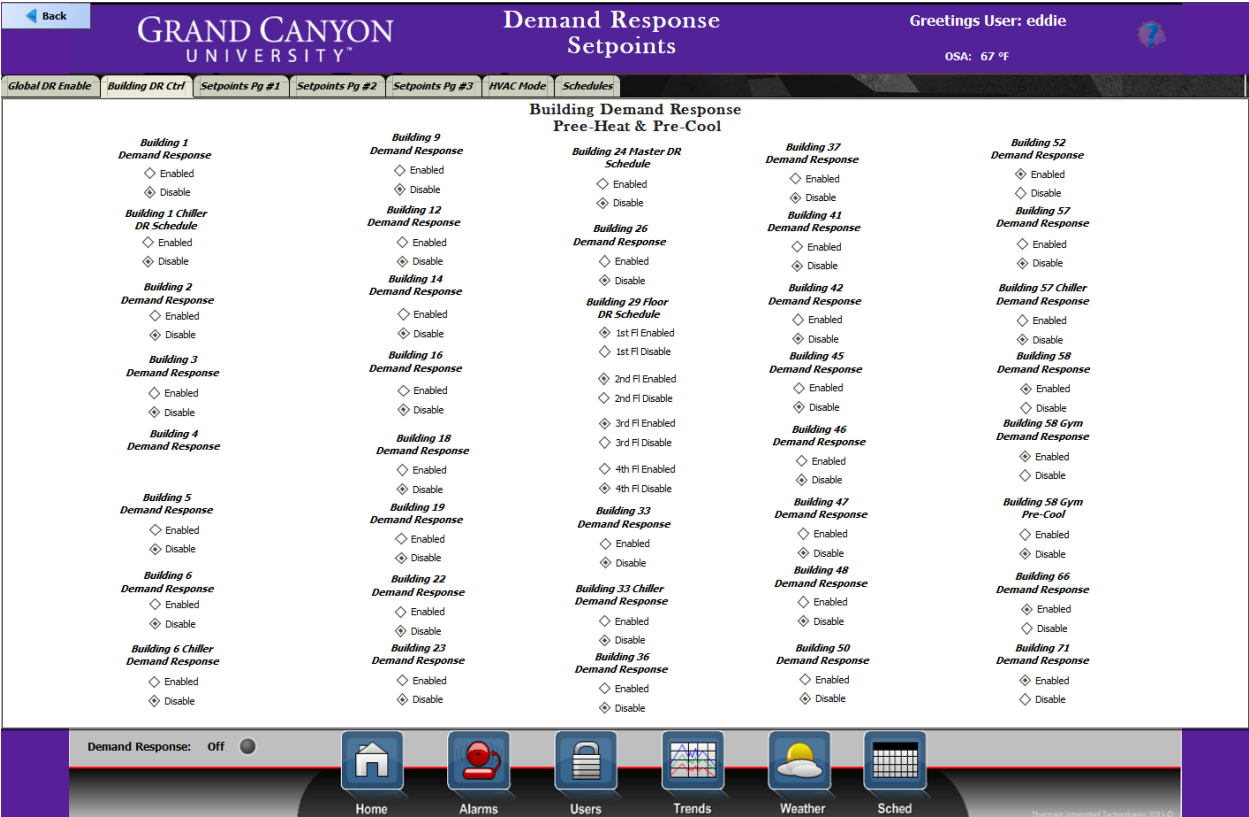
The overall value received from the S4IS solution included a reduction in operations and training costs due to having a unified interface and procedures. The custom demand-response algorithm provides maximum cost savings when the utility requests demand reduction actions while minimizing the impact to student and administration comfort.

During the Beta test process, we discovered that Tridium applications liked to work with the BACnet priority array in a unique way. S4IS adjusted our product to accommodate this unique situation.

About Grand Canyon University Facility Operations

James Kossler, Vice President Facilities Planning & Organization, oversees campus development, facility management and construction, environmental health and safety, transportation and emergency management.

The Energy Management/Controls office within Facilities Planning and Organization is responsible for

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deployment and support of all HVAC technology, associated controls, and value-added applications. For more information, contact Eddie Gazzaniga, Office Phone 602-639-8339, email edmund.gazzaniga@gcu.edu

About S4 Integration Solutions

S4 Integration Solutions provides the enabling gateway technology to upgrade and/or transition legacy or proprietary building automation systems in commercial buildings (including multifamily housing and multitenant facilities) to BACnet-based smart building technologies, including the introduction of 3rd party value added applications like demand-response, analytics, energy management, and fault detection and diagnostics (FDD) to meet customer requirements.

To discuss your own integration project with S4 Integration Solutions, contact Steve at sejones@s4integrationsolutions.com or call (801)621-1970.