Federal Office Building Integration

Legacy BAS Upgraded Without a Single Hour of Downtime

Partner: ATS Automation
Technology: Alerton Envision for BACtalk, S4 Open: BACnet-N2 Router
Customer: Government Services Administration

Facility Background

The U.S. Government General Services Administration (GSA) operates the Jackson Federal Building in downtown Seattle, Washington; it houses 35 agencies with 2,300 government employees and contractors within its 37 stories-- making it the largest Federal building in the Pacific Northwest region of the United States. Construction of the building was completed in 1974 with pneumatic controls. It subsequently went through several upgrades to introduce direct digital control technology. The existing system consisted of an aging JCI system with several generations of controllers, many of which were obsolete, and much of the as-built information was missing, unreadable, or inaccurate. At one point, a previous retrofit project added a smoke control system that interfaced heavily with the HVAC controllers, further complicating the integration and NCM phase out process.

Customer Requirements

The controls upgrade was performed as part of an all-around energy efficiency upgrade of the building. All of the aging mechanical equipment in the building was replaced. Every window was replaced with energy efficient glazing; lighting controls were added as a part of this project. The building was to remain occupied during the upgrade. GSA mandated zero interruptions to tenants' activities. There was no access to VAV boxes and most of the N2 bus wiring, as they were installed above ceilings that were heavily contaminated with asbestos. Zero downtime of mechanical systems and controls was allowed during normal business hours. The requirement was to achieve a completely seamless integration. ATS Automation was called in on the project because of their excellent history of complex integrations and well managed projects.

Solution

The ATS team spent a lot of time gathering information about the existing project and building. Coordination with other contractors and the creation of a master plan for the project was, in itself, a major undertaking. The first step was to mount new Alerton BCM building level controllers and pre-wire

as much as possible. Then, an S4 Open: BACnet-N2 Router was installed with each existing NCM to allow the new Alerton head end to co-exist with the Metasys® NCMs and Operator Workstation during the planned transition period. After these preparatory steps, ATS continued with the integration using the following procedures.

1) They ran the Configure Wizard for each S4 Open: BACnet-N2 Router as it was installed. The wizard automatically discovered the N2 devices on the bus, provided BACnet point mappings, and activated the co-existence capability of the N2 Router-- giving both the NCM and the Alerton BACnet head end equal access to the devices on the N2 bus.
2) ATS began testing by reading and writing the data from Envision graphics, but without truly taking control of anything.
3) ATS wrote their software in the Alerton BCM global controller to control and optimize the JCI VAV boxes, and overnight or on weekends they would install it and test their sequences through the S4 Open: BACnet-N2 Router. Until they were comfortable that everything was perfect, ATS would remove their code and let the NCM run the system during the day. The Downstream Adapters and Upstream Cable provided with the N2 Router facilitated easy changes in configurations as required.
4) After processes were in place and fully tested, the NCM's were removed and a fully functional system remained, with Alerton BCM global controllers running JCI VAV boxes.

The project required 17 of the large (4 port) S4 routers. The ATS team was aware that the JCI N2 trunks were very heavily loaded, so they used the ability to split trunks in several locations where the wiring could support it, thereby improving trunk loading. This move was proactive on the part of ATS. The N2 trunk runs at 9600 baud and would be passing a lot more data than the previous system ever did. ATS also wanted to avoid the risk of coming up short on capacity if unexpected equipment were to be discovered on the network. The hardware gave ATS maximum flexibility. Built-in performance metrics were instrumental in determining where N2 trunks were overloaded and provided a confirmation of improved performance.

Unique Project Challenges

ATS planned on following the S4 Group's recommendation of co-existing with the Metasys® head end during a transition period. As a final step, the plan was to phase out the NCMs one at a time. After all of the Alerton BCM controllers were in place and programmed, it was learned that removing any one NCM triggered the smoke control system. The S4 Group provided a major enhancement to the S4 Open: BACnet-N2 Router to force N2 transactions coming from the NCM to utilize the BACnet Priority Array mechanism. This created the ability to move away from dependence on the NCMs one point at a time and smoothly complete the phase out process while maintaining the integrity of the smoke control

Federal Office Building Integration

system. This Supervisory Controller as a BACnet Client feature is now a standard part of all BACnet-N2 Routers.

Another unique challenge encountered involved a conflict between the field devices and Envision. Envision for BACtalk appropriately assumed that when it puts an entry into the highest active priority of the BACnet Priority Array, the Present Value would assume that value. However, the N2 field devices, knowing nothing about BACnet, were modifying the Present Value independently of Envision. To handle this conflict, The S4 Group provided an enhancement to optionally disable the BACnet Priority Array. Without a Priority Array in play, both Envision and the N2 device directly accessed the Present Value of the point and stayed in sync. This is now a standard point-level option in the N2 Router.

The ATS team made extensive use of the ComBus Quick Tester to validate the N2 buses before starting the integration process. In some cases, changes were detected in the status of the N2 bus during the project. Since asbestos abatement made repairs prohibitively expensive, the alternative solution was to install a RS-485 repeater immediately in front of the N2 Router to boost the power on outbound transmissions and clean up the signal on inbound transmissions. This didn't fix out-of-spec N2 buses, but in all but one case it compensated for the problems and provided reliable communications. The one exception was due to incorrect N2 bus wiring. This required a small amount of asbestos remediation in order to repair the bus wiring. After the repair this bus also worked fine.

Other Approaches Considered

ATS considered Tridium and FieldServer, but neither can co-exist on the N2 Trunk with an NCM. Additionally, these options would have required a significant amount of system outage to complete the transition which was unacceptable.

The Building Today

The new system is completely operated by an Alerton BACnet front end. All new Alerton controllers were installed on large built up AHU's, chiller plant, steam heat exchangers, existing boilers, but ATS was able to make use of the existing JCI VAV controllers on 1200 Dual Duct boxes, a half dozen or so computer room units, and one NCM with a dozen JCI controllers downstream providing smoke control functionality. Alerton BCM global controllers bring in energy data from dozens of electrical steam and water meters. S4 Open: BACnet-N2 routers are installed on every N2 trunk.

Success

The end user is quite happy with the new system – a state of the art Alerton BACtalk control system that is much easier to operate, allows for E-mailing of alarms, energy reporting, secure web access, all while saving several million dollars on asbestos abatement/control issues that would have been required to

Federal Office Building Integration

replace all of the VAV box controllers. Federal agencies are looking at this as a model retrofit / upgrade project.

About ATS Automation

ATS Automation has multiple office locations in Washington, Idaho, Alaska, Montana, and Colorado.

The ATS management team has a strong local history of meeting customer commitments. This reputation and demonstrated commitment spans a quarter century in our local marketplaces. All ownership is local, and the entire management team shares a long history and trust in the building automation industry.

Their Seattle area office has created a unique work environment for our employees, combining tradition with modern technologies and innovation. The office is located in the historic "Old Milwaukee Substation" which produced DC power for the Burlington Northern rail line dating back to 1916. A recent addition incorporated many contemporary architectural and energy conservation strategies which further reinforce the ATS commitment to both employees and customers.

ATS Automation's Mission Statement:

Establish industry recognized excellence in the Facility Systems Business, by providing distinct and preferred products, installations, engineering, integration, and service support.

About The S4 Group

Delivering seamless open systems integration solutions for non-IT and building automation systems.

Our unique automation solutions enable new system architectures, compartmentalization of component upgrades, clean integration with existing BAS, as well as seamless integration with IT & enterprise management systems.

With S4 Group technologies, channel partners deliver better value to their clients. Our primary business model is to engage design/build teams, resellers, and mechanical, electrical, and HVAC contractors to extend systems' lives, enhance buildings' value, and create cost-effective solutions for the industry.

www.thes4group.com