# The Networked Building

**_Ken Sinclair_ provides an insight into the evolution of building automation networks to enterprise and web-based networks and onto cloud computing.**

Whether social or physical our evolving building automation networks require the closest attention and need to be carefully nurtured to grow strong while incorporating every sustainable future possibility.

Indeed, as Andy McMillan, president BACnet International, noted recently, celebrating past effort and current success is necessary but not sufficient in our rapidly changing world. "We also need to accelerate development in the BACnet community to address new requirements and accommodate new technologies.

"In several areas, products and applications are pushing the envelope of the current specification. Web service applications, wireless devices and multi-device object models are areas where application requirements are driving suppliers to go beyond the limits of the current standard," he said.

## IP now key

According to LonMark International, the organization behind the LonWorks protocol, the future of building systems seems clear, with IP (internet protocol) becoming a key, pervasive element of networking technology at the enterprise/IT level, and LonWorks technology and products at the field level. And enterprise connectivity, the method for connecting the building control network into the data network – known as the LON-LAN-WAN architecture – ensures that the control system becomes an element of all the data sources available to the enterprise.

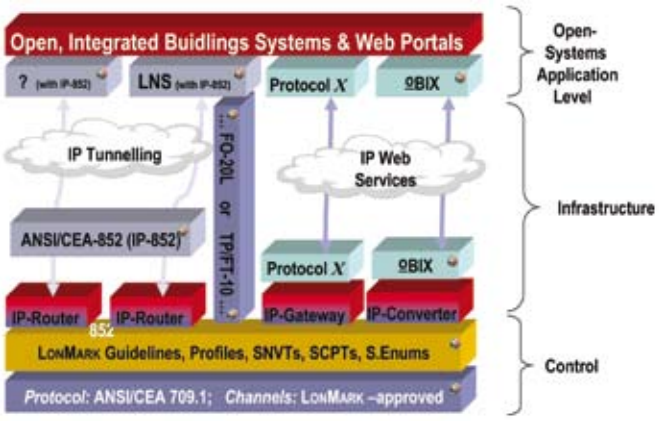
Open interfaces have been developed to ensure data communication between the LON (the building control network) and LAN (local area network) is accessible by a vendor. To provide this connectivity, enterprise-level infrastructure devices are needed, and they must be specified as open. Standard routers are used which means no gateways are required.

IP is important for reasons other than convenience, says George Thomas, president, Contemporary Controls. Building automation systems and information technology are quickly converging with both areas sharing a common IP network. This IP network is the quickest way to gain access to the internet which is the world's wide area network (WAN).

All modern communication networks are IP-based even if communication is restricted to local area networks (LANs). Modern buildings are designed and built with structured wiring in mind with integrated telephone and data wiring that can operate at Gigabit Ethernet speeds. Why run proprietary fieldbus networks when structured cabling is already in place?

Even non-BACnet building automation systems are connecting to IP – including access control systems, security systems, life-safety systems, and lighting systems. LON-based systems are using the IP networks as a tunnel taking advantage of "free" wiring.

"When we think of IP networks we think of Ethernet with speeds of 10, 100 or 1000 Mbps running over CAT 5, CAT 5e or CAT 6 twisted-pair cabling. These same speeds can be achieved over




*IP is becoming a key, pervasive element of building networking technology at the enterprise level.*

multimode or single-mode fiber optic cabling as well. Granted, the higher speed connections are wired, but there are plenty of wireless technologies that attach to IP networks. It is clear that the backbone of choice is IP," emphasizes Thomas.

## Going wireless

For instance, the ZigBee platform is being widely used to create reliable, self-healing and scalable wireless networks that enable solutions in building automation, energy efficiency, HVAC, AMR, predictive maintenance, asset tracking, and other application areas.

Facility managers can use new technology like the Wireless Steam Trap Monitor (WSTM) from Cypress Envirosystems to rapidly detect steam trap failures, and to repair or replace the defective units. This technology non-invasively clamps on top of steam traps, performs monitoring and diagnostics and transmits health status wirelessly to a central receiver and server for monitoring, trending, graphing, alarming and historization.

The WSTM data can be shared with existing building automation systems via BACnet/IP or LON, so no new software or operator training is needed to implement this solution.

The Wireless Gauge Reader (WGR), meanwhile, is essentially an "electronic eyeball" which is clamped onto the front of a conventional needle gauge. It optically reads the needle, converts to a digital reading, and transmits it wirelessly to a central receiver/server. The data can then be accessed virtually anywhere via a web browser or PDA, or be transferred to an existing BAS via BACnet/IP, LON over IP or OPC.

And a new patent pending product from Cypress Envirosystems is the Wireless Pneumatic Thermostat (WPT), which accomplishes the same retrofit in less than 20 minutes, for less than 20 percent of the cost of conventional DDC. This means that retrofits can be performed right away, even while a building is fully occupied, and achieve payback periods of about one year.

*The Wireless Gauge Reader from Cypress Envirosystems digitizes the needle reading and transmits it wirelessly to a central server.*

## Open for energy

There is typically a broad range of suppliers making up the "energy ecosystem" for an owner/operator, who may work with utilities, mechanical service providers, alarm monitoring services, bill-pay-audit services, electrical contractors, sustainability consultants, demand-response aggregators and other energy-related product and service providers. Whether these are external suppliers or internal service groups, they are all part of the process of acquiring, using, controlling and managing the use of energy in a building

One way to view an energy ecosystem is to think of it as a building owner/operators supply chain for energy. It includes all of the organizations that impact the sourcing, utilization and management of energy. Just like in manufacturing and retail supply chains, there are substantial value creation opportunities in improving the efficiency of interaction among the stakeholders in an energy ecosystem.

As Andy McMillan, president and CEO, Teletrol Systems, explains, OpenEMS (Open Energy Management Systems) is a philosophy of doing business where energy-related product and service providers collaborate and interact through standards-based solutions to deliver maximum value to building owners and operators.

In an OpenEMS environment, while equipment, software and services may come from different providers they interoperate quietly and efficiently in the background, allowing building owner/operators to focus on their core business.

# Video on the Network

**To optimize the true value of video systems, they should integrate directly with existing building systems to create a comprehensive intelligent building solution.**

Executives today face three key challenges as they look to maximize the performance of their facilities and the safety of the work environment:

1. How do you turn today's traditional isolated security silos into integrated components of a larger building-wide solution and transform conventional facilities into dynamic, flexible Intelligent Buildings?

2. How can you optimize, extend, and protect your current investment in video equipment?

3. And how can you do it quickly and cost-effectively?

With this in mind, I talked recently to Marc Petock, vice president, Global Marketing & Communications, Tridium, supplier of a new generation of integrated security solutions based upon the NiagaraAX Framework.

### Sinclair: What is Niagara Video?

**Petock:** Niagara Video, released on February 15 this year, is our latest application in providing a comprehensive intelligent building solution that integrates all the common building functions – environmental control, intrusion detection, access control, lighting and energy management – with video. It provides seamless integration between today's building applications and digital video recorders, IP cameras, network video recorders, and video management solutions.

### Sinclair: Can you give an example?

**Petock:** Let's use the following scenario:

***2:05 am*** – A facilities BAS system reports a low temperature alarm from the HVAC system.

***2:05 am*** – Simultaneously, as this alarm is being generated and notification is being sent to authorized personnel, the security system automatically redirects a camera to view down the hallway in the direction of the alarm.

***2:07 am*** – Personnel look at live video, turn hallway lights on, see water leaking from the ceiling, shut down HVAC system, and call for emergency repair – all remotely and in real time.

***2:08 am*** – Immediate action is taken, a disaster is averted, overall damage and repair costs held to a minimum and overall risk is mitigated.

*Video creates a new level of real-time visibility into facility events as they occur.*

### Sinclair: What led Tridium to develop this application?

**Petock:** Today's building owners and facility managers are faced with several challenges as they look to maximize the performance of their facilities and look to extend the investment in their video management systems. While many advances have been made in the development and deployment of video-based monitoring systems many of these remain isolated from other critical building systems and therefore are limited to their usefulness and coverage.

To optimize the true value of video systems they need to integrate directly with existing systems such as HVAC, energy management, lighting and security to create a new level of real-time visibility into, and resolution of, facility events as they occur. We believe that turning traditional isolated building video and security silos into part of an integrated, building-wide facility management solution would further optimize these systems. And with Niagara Video it does.

### Sinclair: Is it built using the Niagara Framework?

**Petock:** Yes, so it can merge with other security and video products to provide a complete building automation, card access and video monitoring system or it can be used as a standalone system providing a video window that identifies an incident and notifies the proper personnel who can manage the response from anywhere.

Niagara Video can be combined with other NiagaraAX applications to deliver a unified, intelligent facility-wide management system that is easy to use, easy to understand and easy to commission.

**Sinclair: I understand that Niagara Video contains "bidirectional alarming". What does that mean?**

**Petock:** The alarming component of Niagara Video is bidirectional so it can initiate video recording of critical events based on Niagara alarms as well as control building functions and view live video in Niagara based on video system events.

For example, a flame event in a boiler room can automatically redirect cameras and record the event, storing the critical video clip in a protected video alarm database for future reference. Conversely, an alarm from a video device, such as a video motion detection alarm, can initiate control logic sequences-such turn on the hallway lights or building lockdown when a camera sees unauthorized motion activity.

**Sinclair: Does it work in local and remote buildings?**

**Petock:** Niagara Video works with local and remote buildings equally as well. The flexibility and scalability of the solution also provides users with visibility into an entire facility or group of facilities via a single browser-based user interface. This allows system users to manage facility events and information from any location without requiring dedicated computers or thick client software.

⇨ Improving the efficiency of interactions through links among business processes and information systems serving stakeholders in an energy ecosystem yields maximum owner/operator value.

OpenEMS is the most cost-effective way to link these systems and share required business and technical information among the broad range players. This will result in substantial gains that flow to all of the stakeholders and benefit everyone through lower overall costs of doing business. The animations on the OpenEMS website (www.openems.com) provide a clear picture of all the advantages.

## Clouding your networks

Cloud computing is a name for putting computing services, such as web services and software as a service, (SaaS), on computers up in the wider network.

Traditional control systems have no clouds – only towers in the sky. Whether or not it makes sense, building systems from one building or many have traditionally gone up to a central point; they have been a silo reaching up into the clouds.

According to Toby Considine, technology officer, Facility Services, University of North Carolina (UNC), for buildings, only the core processes, those elements on the traditional low voltage protocols such as BACnet and LON, should be on the ground. Anything off the ground is in the clouds. Anything in the clouds should interact using internet protocols.

"In the UNC Enterprise Building Management (EBMS) project, we restrict all low level controls to the building. All communications outside the building are using internet protocols. Each building has its Enterprise Building Local Gateway (EBLG) speaking traditional standards and proprietary protocols on the building side, and web services on the outside.

*Up in the clouds: except for core processes involving elements on traditional protocols such as BACnet and LON, other IT needs should be serviced by the outer wide network.*

"We keep the EBMS close to the buildings as a business decision, but there is nothing on the architecture that would prevent us from moving this service up into the higher up stratus cloud layer, or even up into the high flying cirrus layer," Considine explains.

At UNC, the middle tier of stratus clouds is outside Facilities Operations and hosted in the wider enterprise. The plan is for the Registrar's Office, in the stratus cloud, to submit room schedules and head counts for every classroom down to the buildings. Although this communication is currently with the cumulus layer, it should eventually be pushed down to the ground at the building gateway.

"We have long used building analytics products like Packrat at UNC, bolted onto the silo. It would be far better for these services to live in the cirrus clouds, under the direct control of someone with the in-house expertise to process the data into information.

"The processing necessary to turn operating data into predictive maintenance work orders is intense, but only needed sporadically. The whole purpose of cloud computing is to reduce costs by sharing expertise and resources so they are fully utilized. Building analytics should move up into the highest clouds, with the highest expertise," says Considine.

The remotest services all belong in the cirrus clouds. Demand/Response, energy markets, third party maintenance, all are cirrus tier cloud services. Keep some clouds close to you, Considine recommends, ones in which fast response and control are the most important. Let some clouds drift up into the atmosphere, where forces out of your control may determine their performance and availability, but where superior resources or specialize knowledge can be purchased. And put services where enterprise identity and line of business interaction are the most important in the stratus layer.

Just remember, changing business conditions can move any cloud up or down. The protocol for communication to any cloud layer should be the same; internet ready, secured, and standards based, ready for e-commerce. Nothing but web services belongs anywhere in the clouds. **CEA**

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