

Building Automation: Reaching For The Sky

There was a time when industrial controls and building automation were quite distinct markets for automation vendors, but convergence by both industries to IT methods and Internet technologies has greatly reduced the gap. Systems for both now share many of the same components: man-machine interfaces, presentation graphics, controllers, sensors, actuators, etc. Although different communication protocols exist, the network standard for both industries is based on Ethernet – because of its low cost, robust nature and global acceptance.

With the large building automation market rapidly expanding, demand is increasing for systems used to provide functions such as: environmental temperature control, indoor air quality control & reporting, lighting control, energy reporting & control, security control & monitoring, digital signage, elevator control, parking control, fire & smoke control, life safety.

According to a 2002 ARC report, “Building Automation Systems Worldwide Outlook”, the global market

The multi-billion dollar building automation industry is moving on and up as control systems integrate with the latest IT and Internet technologies to create powerful networked intelligence. Ken Sinclair reports.

for building automation systems (hardware, software and services) is set to reach US\$24 billion by 2006, up from the US\$19 billion registered in 2001. As for the business of operating such systems once installed, a 2003 Frost & Sullivan report forecast revenues in the North American facilities management services market alone to hit almost US\$22 billion by 2009, up from US\$12 billion in 2002.

security, energy management/ accounting and facilities management.

There are additional strengths in the fact that Web-based networked control systems can ensure building energy is purchased at the lowest cost from the environmentally correct source and is used to create the greatest comfort for the least environmental impact. To ensure that the original system design intent is

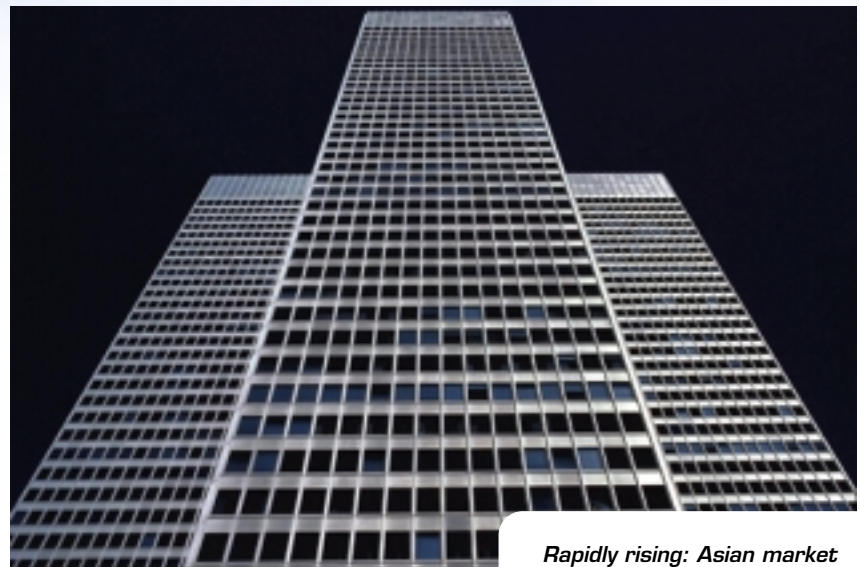
centres, the demand for large buildings is on the increase. In comparison, North America already has in place most of its large building infrastructure, and is now in the process of replacing old building automation systems to leverage existing operational resources with newer presentation and control features.

The Asian market is building at a time when the building automation industry has new cost-effective control capabilities. Web-based, sophisticated networked control systems can greatly enhance buildings while increasing the intelligence and

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The author of the ARC report, David Clayton, noted: "As building automation systems become part of a much larger IT infrastructure, systems for handling energy optimisation, ventilation, fire and water alarms, and security are not only communicating with one another, they are also seamlessly sharing critical information between each other. The ability for the various building systems to share critical information in real time greatly expands the opportunities available to facilities managers."

Well-executed network control concepts can reduce HVAC (heating, ventilating and air-conditioning) energy use by 30-50 percent below the energy requirements for the same equipment using conventional controls. The reach and the value of control networks in intelligent buildings is increasing daily, connecting interrelated infrastructure functions such as lighting, HVAC,



Rapidly rising: Asian market demand for large buildings.

achieved, this same system can provide real-time feedback and interaction to the original designers.

Asia: Building At The Right Time

In Asia, with rapid economic growth and the development of new urban

reducing environmental impact. This provides a significant 'greening' effect to both new and existing buildings.

The acceptance of many new communication and automation concepts has radically changed the function of large buildings. For example, office hotelling has allowed the sharing of expensive office buildings with an increased number of telecommunicating occupants. To effectively manage such phenomena, coordination of everything is required, ie: phones, workstations, data links, security access etc.

Occupants also must have the ability to interact virtually. The ongoing virtual interaction with the



Siemens

Well-executed network control concepts can greatly reduce HVAC running costs.

Building Standards

Listed and defined below are the main standards for device networking in the building automation industry:

- **BACnet**, by definition, is a "Data Communication Protocol for Building Automation and Control Networks", developed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). Beyond this simple definition, it is the open (ie: non-proprietary) protocol specification that allows building automation controllers (heating and air conditioning equipment controllers, lighting systems, security systems, fire and life safety systems, irrigation systems, elevator systems and any other type of microprocessor based controller in a modern building) made by different manufacturers to communicate and share information with each other.
- **LonWorks** was developed by developed by Echelon Corporation of California to provide communications between devices such as sensors and actuators used in building automation systems. LonWorks technology allows all manner of control devices to communicate with one another through a common communication protocol. Communication transceivers and transport mechanisms are standardised, as are object models and programming/troubleshooting tools, to enable the rapid design and implementation of interoperable, LonWorks-based devices.

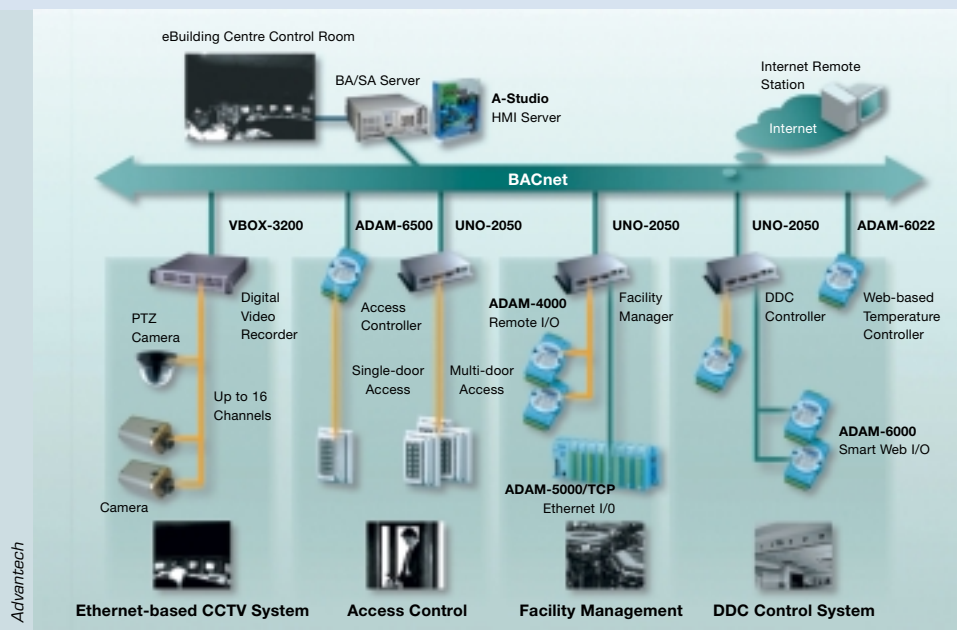
The LonTalk protocol underpins device and system communication, and the LONMARK Interoperability Association oversees aspects of device communication through the creation of device profiles.

- **ModBus** was originally developed by MODICON, now a part of Schneider Electric, and is publicly available and relatively simple, and has been

adopted by thousands of companies, particularly in commercial and industrial controls. There is a significant installed base in the USA as well as Europe, and many control system companies use ModBus for their communication protocols.

- **OPC** (OLE for Process Control) is based on the Microsoft COM (Component Object Model) and OLE (Object Linking and Embedding) software architectures. It was created by a group of industrial automation vendors working together with Microsoft. The protocol enables integrators to connect disparate systems together, creating robust solutions and providing true interoperability, while reducing implementation time and costs. In addition, OPC enables a fully scalable solution for future changes and expansion.

Currently there are hundreds of commercial off-the-shelf OPC products available that will provide connectivity to every major control system on the market. OPC servers are available for many systems and protocols, including Modbus, BACnet, LonWorks, Johnson Controls, and others. Furthermore, there are hundreds of OPC client-enabled applications to choose from including HMIs, visualisation and reporting tools, preventive and predictive maintenance packages, HVAC, lighting controls, security applications and many more.



BACnet enables interoperability between building automation control products.

building by both occupants and designers leads to improved sustainability while increasing the overall real and perceived value of the building.

These concepts are a part of not only intelligent buildings, but also intelligent communities, and intelligent facility management. The new market in Asia has the opportunity and potential to lead the world with exciting new, fully implemented intelligent communities. This is possible through the expansion of the large building infrastructures during a time of never before available technologies. However, it requires careful planning and global communication with many new players to achieve these goals.

Importance Of Industry Standards

Standards in the building automation industry facilitate the interconnection the many systems necessary for automating intelligent buildings. As standards become established, no longer are integrators tied, or locked in, to a single vendor. Integrators are now able to deploy control systems and applications, regardless of vendor, and build best-of-breed solutions. Building automation is no longer dominated by a few large companies. The playing field is now open for many developers to offer far more advanced and superior solutions, while reducing the total cost of ownership.

An open letter to the Building Controls industry turned into a reality at the **BuilConn Forum 2003** in Dallas. BuilConn is the annual event that brings together players in the Networked Building Systems industry. The letter proposed the establishment of a consortium that would work on the creation of a guideline for use of XML and Web services in building automation and control applications. Being in attendance at this groundbreaking meeting, this writer can vouch for a real sense of purpose and co-operation over the issue.

The first paragraph of the letter

is reproduced here:

“The Building Controls industry has made great strides over the last 10 years in the creation of communications standards. Both BACnet and LonTalk are now viable, commercially accepted solutions that provide owners with open communications. Yet while we have made great progress in these areas as an industry, there has been an emergence of a larger, more globally accepted standard created by the world of Information Technology. In particular the broad acceptance and ever lowering cost of Ethernet/TCP/IP/XML communications is finding its way into our industry.”

Enter The Internet



At BuilConn 2003 – a strong consensus for establishing guidelines for the use of XML and Web services in building automation.

The Open Building Information Xchange, or **oBIX**, is a focused effort by industry leaders and associations working toward creating a standard XML and Web services guideline for the building automation industry. The goal is to evolve the oBIX guidelines into a standard protocol for building systems, allow building professionals to enjoy such benefits as enterprise-wide facility management and open systems integration based on IT standards.

At the December 2003 launch of the initiative, Ronald J. Zimmer, CEO of CABA (Continental Automated Buildings Association) said, “The knowledge and control oBIX puts in the hands of facility managers gives

the oBIX guidelines the potential to become the standard of choice to unify operating data from diverse systems

Similarly, at the AHR (Air-Conditioning, Heating, Refrigerating) Expo show in Chicago in 2003, there was unified acceptance of Web-based solutions in addition to a strong acceptance and connection to the evolving digital office standards, by all automation hardware and software vendors. In addition to the direct IT solution for the industry, new concepts such as networked Digital Signage Systems are opening up new communication conduits with the

exciting medium of inter-building communications.

There is also an intense focus by non-control companies on Machine To Machine (M2M) interfaces. These interfaces are about enabling device -to-IT and IT-to-device information flow. This market is estimated to grow to US\$100 billion by 2010. As a ‘connecting industry’, building automation vendors should be prepared.

Technology Challenges

Evolving communication standards and the rapid migration to Web-based control by building automation hardware manufacturers are together eroding away pieces of the

hardware's traditional functionality and transferring it to software. Hardware becomes simpler and less unique. Companies then need to look at how they can build the new breed of controls cheaper, or make as part of their existing device infrastructure.

With the hardware complexities of the industry disappearing, existing control capabilities are increased several times with new functionality that can be created in software easier and at a lower cost than hardware. Furthermore, globalisation and

industry crossover of the marketing of these software applications increases volumes, allowing costs to drop even further.

In the past, it was not so apparent that the building automation industry would be so affected by information convergence. It is not sufficient to wait until convergence occurs and then get involved with how it gets marketed, because it will be too late. The industry's presence in creating a marketing convergence plan changes everything.

A central part of the industry's business involves collecting, acting on, and distributing real time data such as temperature, pressures, energy usage, client comfort, humidity, video, etc. But the industry is only just starting to grasp the concept of how this real time data converges with the clients' information enterprise. And clients are also just starting to discover how information that is presented easily (and anywhere) can be extremely useful for enterprise growth and for staying competitive.

Building Automation Suppliers

Listed below are several of the major manufacturers and suppliers of building automation systems. Some names may be unfamiliar as many of the companies are relatively new having grown out of the Direct Digital Control (DDC) revolution. These companies and their dealers and representatives supply the majority of large building automation globally, although new companies are appearing daily. Most partner with specialised equipment suppliers to complete their total building automation integration packages.

Andover Controls

<http://www.andovercontrols.com/>
Makes the intelligent building a reality

Alerton Technologies Inc

<http://www.alerton.com/>
A leading manufacturer and pioneer of Direct Digital Control (DDC).

Automated Logic Corporation

<http://www.automatedlogic.com/>
Complex controls made powerfully simple.

Computrols

<http://www.computrols.com/>
A New Orleans based Building Automation Systems manufacturer.

Delta Controls

<http://www.deltacontrols.com/>
Based in Vancouver, Canada

Distech

<http://www.distech-controls.com/>
Develops solutions for computerised control of buildings on open protocol.



Honeywell

<http://www.honeywell.com/>
Honeywell control solutions

Johnson Controls

<http://www.johnsoncontrols.com/>
Building control systems.

Reliable Controls

<http://www.reliablecontrols.com/>
Stand-alone BACnet compliant Direct Digital Controllers

Richards-Zeta

<http://www.richards-zeta.com/>
Manufactures flexible, powerful and inexpensive controls for building automation

Siemens Building Technologies

<http://www.sbt.siemens.com/hvp/>
Is an international industry leader.

T.A.C

<http://www.tac-global.com>
CSI and TAC have combined to create a new company

Tridium

<http://www.tridium.com/>
The inventor of the Niagara Framework.

SUPPLIERS

Navigating The Road Ahead

New directions, new capabilities, and new relationships are set to impact the large intelligent building automation industry, it will be a time of self-discovery for all, navigating new roads, and meshing dynamic data and real time interactions with the building occupants' standardised network interfaces.

This new direction will not only change industry players but will have significant impact on how the building owners approach building management and optimisation. The guidance of successful convergence will become a valuable art. The practitioners that can create this dynamic interface art, while making the myriad of complex technologies used to create this reality all but invisible, will be the clear winners.

To the companies and their artisans who move the industry ahead with successful demonstrations will go increased market share. New relationships and partnering will

About The Author

"I welcome the opportunity to provide IAA this overview of our large building automation industry," says **Ken Sinclair**, the editor/owner of **AutomatedBuildings.com** an online B2B magazine for the intelligent buildings and large building automation industry. Based in Canada, Ken has been in the building automation industry for over 35 years as a service manager, building owner's representative, energy analyst, and consultant.



He has been directly involved in over 100 conversions to computerised control.

Ken says he is constantly asked if there a complete list anywhere of the best examples of intelligent, fully automated, well connected buildings? His reply: "Well no, not that I am aware of, but I have prepared a page to provide linkage to the industry's online resources of documented building intelligence, this can be found at www.automatedbuildings.com/connectedbldgs/list.htm.

"Keep focused on the fact that the latest and greatest in intelligent, fully automated, well connected buildings are still under construction and have not yet been documented. The fact that our industry's integration capabilities are increasing exponentially widens this gap. "

The reality is that the convergence of industrial automation and facilities management and information technology is well underway.

abound. Smaller and smaller companies will provide greater impact on the industry through online interactions that become available with Web-based presentation.

The concept of partnering to provide clients' requested complex software functionality will become common. These partnerships will lead to significant cross-pollination with completely new technologies and concepts, all of which will feed the convergence fire. New interface

mediums for the industry such as cell phones, PDA, digital signage systems, etc will also appear.

The reality is that the convergence of industrial automation and facilities management and information technology is well underway. It is a convergence that heralds the inevitable move of environmental monitoring and control onto the building information infrastructure. Though it is often the technological issues that are stressed, it also involves a convergence of both technology and working relationships. ■



Reflecting on the future: convergence of technologies will have a big impact on the building automation industry.