



## **BACnet White Paper**

### **The right integration at the right level**

#### **Introduction**

There is now an increasing focus on managing the entire building as an integrated system. Fortunately all major vendors have now embraced IP as the networking solution of choice. This presents an opportunity for closer integration based on a common building automation standard. While there are a variety of protocols available to provide interoperability between two given systems, only BACnet/IP provides solution for complete building system integration.

#### **About BACnet (Building Automation and Control Network)**

Supported by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), BACnet was adopted as an ANSI standard in 1995. It has also been adopted as ISO 16484-5 and as European standard EN/ISO 16484-5. It is a software based protocol so it can run on current and future hardware platforms. BACnet/IP has been developed to allow the protocol to use TCP/IP networks and this is now the standard integration platform for BACnet. The use of BACnet/IP decouples the logical network from the physical network and provides maximum flexibility of physical network choice now and in the future.

Developed specifically for Building Services, BACnet defines how all the elements of the Building Management System interoperate. In BACnet terms, interoperate means that two or more BACnet devices may share the same communications networks, and ask each other to perform various functions on a peer-to-peer basis. Although BACnet does not require every system to have equal capabilities, it is possible for designers of system components at every level of complexity to have access to functions of other automation system peers.

There are two key concepts in BACnet that are critical to understand. First, is the idea that BACnet is applicable to all types of building systems: HVAC, Security, Access Control, Fire, Maintenance, Lighting etc. The same mechanism that gives BACnet this flexibility has other important benefits: vendor-independence and forward-compatibility with future generations of systems. This is accomplished using an object-oriented approach for representing all information within each controller. The second key idea is that BACnet/IP can communicate

with different Local Area Network (LAN) technology for transporting BACnet application messages via BACnet routers. These type of supplier and LAN choices give the system designer or owner significant flexibility in choosing the best fit among price/performance options that suits each situation.

Thus the key part of BACnet is its application layer and it defines the following:

- a method of abstracting the functionality of control and monitoring devices (objects)
- application layer messages (services)
- the encoding of BACnet application layer messages

The combination of these components delivers important benefits to owners and specifiers of BACnet systems.

## **Benefits of BACnet**

### **Focus on the Management and Automation Level**

Field Level integration at floor or unitary controller level is possible to other manufacturer's controllers but is often not practical because of different I/O configurations, physical sizes and power requirements. BACnet focuses on integration at the management and automation levels which delivers the real benefit.

### **Ease of Integration**

Integration of external systems by allowing additional third party building automation networks to connect to the BACnet network. Owners and specifiers need only ensure that additional vendors provide a BACnet/IP interface to their distributed control equipment.

### **Flexibility in Fieldbus Technologies**

Manufacturers can use optimised protocols at the field bus level providing enhanced system communication performance and reliability. Integration with other BACnet network technologies (e.g. MS/TP, Ethernet, and Arcnet) or proprietary networks is provided using appropriate BACnet/IP routers or gateways.

## **Standard Support and Openness**

The BACnet/IP protocol has already been adopted as the new CEN (European) and ISO (Worldwide) building management standard. It uses Ethernet and TCP/IP and will run on all current and future hardware platforms.

## **Future Proof**

BACnet is an evolving standard which allows users to shape its future direction through a structured system of public review of draft standards. An example of this openness and flexibility is seen with the adoption of support for 'life critical' systems. As a result we are increasingly seeing BACnet/IP support as mandatory with European tenders

## **Cylon Implementation**

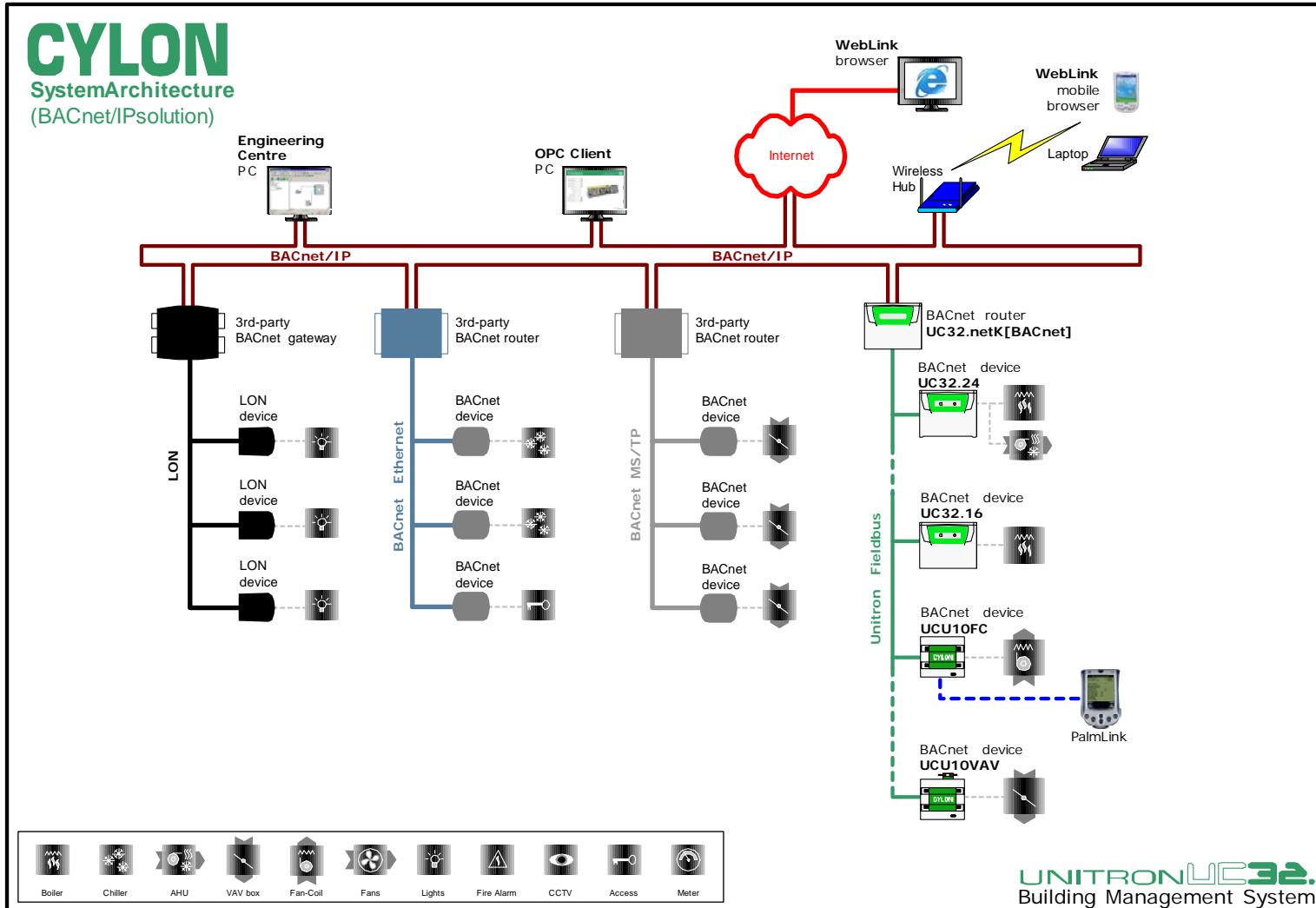
BACnet's design allows multiple BACnet networks to be connected in order to create a BACnet internetwork. This capability is most often used in order to allow networks employing different data link layer technologies to be linked together through routing devices. For example, a large building could have multiple programmable controllers and operator workstations connected by an Ethernet network, and each programmable controller could be connected to low-cost application-specific controllers using a master-slave RS-485 bus or other low-cost bus. The combination of BACnet and TCP/IP allows distributed control and monitoring to occur over the Internet and intranets.

In the Cylon implementation, represented by the diagram below

- You can specify BACnet objects available for all field level controllers
- You can specify BACnet objects available for all automation level controllers
- There is one integration level in the building

The BACnet enabled version of the UC32.netK co-ordinates communication between i/o controllers on its fieldbus as well as acting as a BACnet/IP router. The existing fieldbus controllers are now presented to the BACnet/IP network as BACnet devices. Importantly the BACnet routing is part of the Cylon communications controller and no separate PC gateway is required. This provides a highly robust yet low cost solution.

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In this sample solution architecture the supervisory application is assumed to be an OPC Client, most likely a SCADA package. The UC32.netK communications controllers acts as a BACnet/IP router and supports standard object types for all field controllers including

- Device Object
- Analog Input
- Analog Output
- Analog Value
- Binary Input
- Binary Output
- Binary Value

Based on the solution architecture diagram a practical example of an integrated BACnet solution for cooling is as follows. The Cylon UnitronUC32 BMS monitors outside air temperature and inside air temperature. Based on these inputs, the setpoint and time schedules the strategy will change a status point to request cooling for the fan coil units. The OPC client monitors the points across the entire integrated building system. Based on the change in status of the BMS cooling request point the OPC client will enable the chiller and cooling will be provided to the fan coils.

## Summary

Cylon now provides easy integration between disparate building automation components utilizing BACnet. The implementation leverages the flexibility and high performance of the Cylon fieldbus and yet exposes all controllers as BACnet devices.

The value to owners and specifiers of the BACnet suite of standards is at the Management and Automation Layers. TCP/IP is now pervasive and integration at this level removes the dependency on physical networks which evolve over time. BACnet/IP is the recognised BACnet standard to integrate an overall building automation system. BACnet/IP provides the right integration at the right level.

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## **About Cylon**

Cylon Controls Limited provides smart energy control solutions for buildings. Founded in 1985, Cylon has grown into a multi-million dollar corporation and has become the largest privately owned manufacturer of building control systems in Europe. As a focused global provider of uniquely flexible, web enabled HVAC technology & solutions, Cylon understands buildings better than anyone else. Our product range has been installed in all categories of buildings across Europe, North America, Asia, the Middle East and Africa to maximise comfort, productivity and energy efficiency. For more information visit [www.cylon.com](http://www.cylon.com)