Control System Independence

The Need for a Fundamentally Different Approach to Control System Design

Overview

Today's commercial controls market is in the midst of an evolution. Not long ago, life was simple. A controls contractor represented a single manufacturer and that company provided everything they needed to create an effective control system solution. But, today controls contractors find themselves faced with a dizzying array of choices in controller hardware, protocols, applications software, and tools. And, they are looking for ways to adapt to the evolving market and compete successfully. This paper addresses the changes taking place in the commercial controls market and what typical controls contractors might need to make them competitive.

Today's Commercial Controls Market

Although some amount of integration has always been a part of the controls market, today's commercial controls customers are demanding more sophisticated levels of interoperability in their control systems. Not only are customers demanding that control systems components from multiple manufacturers operate seamlessly, but also there is a level of expectancy evolving to provide integration between higher level systems in virtually every part of business operations.

There are a number of factors driving the evolution of the market:

- The prevalence of the personal computer in the personal and business lives of the customer has created a plug-and-play mentality. Customers can take virtually any combination of hardware and software and assemble a computing solution for either home or work.

- The Internet has created a level of expectation by the customer for simple, low/no cost access to global information.

- Mergers and acquisitions have caused a growth in responsibilities for building managers. In the past, managers have been responsible for a

single site with controls installed by a single control system manufacturer. More recently, managers are being assigned multiple sites with a variety of control system designs, which need to be managed efficiently.

- Increasingly each day, the world around us is being monitored and controlled remotely through smart devices. The low cost of microprocessors is allowing electronic intelligence (smart devices) to be built into everyday consumer electronics. A fully integrated, programmable world will shortly become a reality and that world will offer many new conveniences, services, and opportunities.

- Utility deregulation is allowing companies to look at aggregating energy consumption at multiple sites, regardless of location, to leverage their purchasing power when buying energy. Typically, these sites are controlled by different control systems, which must be integrated to facilitate access to consumption data for the purpose of implementing business-wide control strategies.

Impact on the Controls Contractor

The evolution of the controls market is having a profound impact on controls contractors. These changes are creating challenges to the contractor as they strive to become more competitive, but they are also creating new opportunities for business growth.

The impact of the changes in the marketplace are resulting in the following:

- Advances in PC technology and open protocols are driving hardware costs down to the point where virtually every hardware component in a control system is being viewed as a commodity item. Hardware design and feature set, which once differentiated one manufacturer from another, now merely defines the minimum acceptance criteria. As a result, more buying decisions are being driven strictly on price.

- The Internet offers everyone easy-to-use, low/no cost access to a world of information. Controls customers see the Internet as a means to access their control systems from anywhere at anytime. Why should they pay for and maintain expensive client software, when a simple Web browser can do the same job?

- Mergers and acquisitions are creating a new breed of customer. These new customers have a broader scope of responsibilities, they are more technically savvy, and they are more demanding. They are driven to cut costs and they require that their systems provide them efficient means to manage costs across the entire enterprise without the need for custom applications and integrations.

- Utilities, faced with finding new ways to generate revenue and profit in a deregulated world, are jumping into the service business and competing head-on with controls contractors. Energy service companies (ESCO), also known as energy service providers (ESP), are being created by the acquisition of mechanical service and controls contractors by utilities in their desire to compete in the service market. The new entity enters the market with an established customer base for which they can bundle traditional controls and service with the sale of energy. Moreover, by virtue of the size and shape of its parent, service providers are not necessarily limited by geographic territory, allowing them to service customer sites anywhere in the country. Finally, many service providers can leverage their size to gain access to multiple control system manufacturers, creating a competitive advantage with which traditional controls contractors have difficulty competing.

Integration Today

Until recently, most controls contractors represented a single manufacturer of control systems. For the most part, these systems are built upon a proprietary design including proprietary communications protocols, system architectures, data structures, software applications, and so on.

Integration to these proprietary designs usually involves a custom gateway solution or special communications driver. The inherent problem with this approach is that as technology changes on either side of the gateway or driver, the integration must be upgraded. This is often an expensive venture and if not done, the customer becomes stranded at the level of technology for which the gateway or driver was designed. Another deficiency with gateways and drivers is that they typically translate data from one protocol to that of the proprietary system – they map data stored on one side of the gateway to a data structure that exists on the other side. This is sufficient in some applications, but more often than not, this design results in significant limitations in either performance or dependability.

Recently, two open protocols have emerged in the commercial controls industry: LonWorks and BACnet. While each of these protocols provide the promise of allowing different devices and systems to communicate by means of a common language, the actual implementation of an integrated system using these protocols has proven to be less than routine. The protocols themselves provide the necessary guidelines for manufacturers to produce interoperable components, but their implementation of those guidelines varies significantly.

Whether their devices utilize a proprietary or open communications protocol, control systems manufacturers often feel the need to protect their hardware design. In doing so, manufacturers limit the implementation of the open

protocol resulting in solutions that range in performance from cumbersome and complex to unserviceable.

A New Approach

Given the current state of integrations and the impact that the evolving controls market is having on controls contractors, a fundamentally different approach to cost effective integrations is needed. In the evolving market, the scope of control system integrations must be rethought. It is no longer an issue of device specific or protocol specific integrations. Integration must be provided at the information level. Tomorrow's controls contractors require an integration framework that is flexible and powerful enough to support a broad range of solutions, but not overly technical in its implementation – it must be powerfully simple.

An innovative software solution that leverages the power of mainstream technologies without the constraints of a proprietary design or implementation is in order. An ideal solution would include a low/no cost and easy-to-use user interface (Web browser), provide for rapid application development (reusable software objects), and support ubiquitous network access (HTTP and TCP/IP).

The key elements of the solution include:

1. A framework or architecture that supports a variety of protocols and devices on the fieldbus side, while at the same time supports widely used and accepted methods of information integration on the applications side. In effect, the framework acts as *middleware* between field devices and enterprise level applications.

2. A highly scaleable component software structure that allows the controls contractor to easily model HVAC equipment and other devices in software such that components developed by multiple vendors can be quickly assembled into applications that integrate the control system with the enterprise information infrastructure and/or the industrial and power system architectures.

3. Object libraries and integrated network management tools that allow controls contractors to plan, design, configure, install, and maintain integrated solutions based on LonWorks, BACnet, Internet, and various other system networks quickly and easily. A complete engineering environment that minimizes the learning curve and eliminates the need for programming expertise in order to build integrated solutions.

Conclusion

Virtually every control system manufacturer is trying to solve the problem of integration. But, without exception, and regardless of how those solutions are represented, they are merely extensions of an existing proprietary design. As previously described, any approach that is built upon a proprietary design is by definition limited in its capacity to integrate. Furthermore, any solution that is founded upon an existing design will eventually lead to higher engineering and support costs.

What is needed is a fundamentally new approach to integration – an architecture and software model that is hardware independent, protocol independent, and uses the power of the Internet for networking and access to information. In real terms, the solution combines a feature-rich desktop software suite that includes an extensive library of applications and protocol drivers, network management tools, database administration functionality, and a graphical real-time control system user interface that delivers to controls contractors a powerfully simple solution to the problem of integration.