EVALUATING FIELDBUS NETWORKS

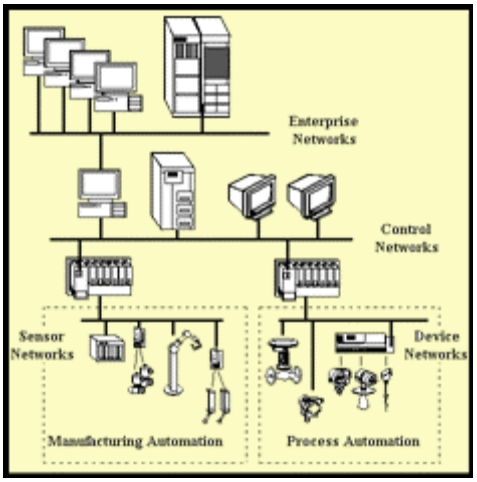
Choose the Right Tool for the Job

By Wally Pratt

There are a growing number of open communications protocols available to instrument engineers today. Because there is no single "perfect network," there will always be many different viable networks in the process industry. Communications solutions just don't come in a "one size fits all" package. Communication protocols are tools, each with its own distinct function.

Comparisons are inevitable, especially when attempting to sort out the diverse protocols vying for your attention. Understanding networks classification should allow you to choose the right tool for the job. Here, we will classify some common industrial communication protocols by focusing on the native application domain and placing them in four basic categories.

- Sensor Networks-protocols initially designed to support discrete I/O
- Device Networks-protocols originally focused on process instrumentation
- Control Networks-protocols typically used to connect controllers and I/O systems
- Enterprise Networks-protocols that focus on IT applications



Sensor level protocols, with a principal focus on supporting discrete sensors and actuators (i.e., digital), are the simplest networks available today. These busses target three specific areas: actuators (i.e., solenoid valves and motor starters); manufacturing automation; and sensors (i.e., limit switches and pushbuttons). Sensor level protocols tend to have very fast cycle times and, since they are often promoted as an alternative to PLC discrete I/O, the cost of a network node should be relatively low.

Device level protocols support process automation, more complex transmitters, and valve actuators. Activities in the process automation domain are fundamentally continuous and analog. Transmitters typically include pressure, level, flow and temperature. Actuators can include I-P controllers, motorized valves and pneumatic positioners. In device level protocols, data is floating point and status information is usually available. Since the functions performed in these protocols are more sophisticated than in a simple discrete device, the cost per node will be higher.

Control level protocols are the backbone for communications between I/O systems, controllers, operator stations and supervisory systems. As such, they move huge chunks of heterogeneous data and operate at high data rates. Today, there is a very blurred line between control networks and enterprise networks. With such a large number of industrial networks, control systems are evolving from simple input/output toward bi-directional communication with "smart" field devices. As bi-directional communication moves from the field up the automation pyramid, enterprise networks are dropping ever further down into the historic domain of the control system.

Enterprise networks are a collection of LANs, Wide Area Networks (WANs), and a wide range of communication protocols. In these networks, several protocols are frequently in simultaneous use on the same physical connection. The data carried are diverse and can include everything from process and

production data to e-mail, music, images or a wide range of business and financial transactions. The number of network-capable applications continues to grow rapidly and add to that network traffic. Since there is such a large and ever-growing number of nodes, the cost per node is very inexpensive.

Dividing communication protocols into these categories may be an oversimplification because separation between the categories is often unclear. In many cases, a protocol placed in one category can perform some or many of the functions from another. For example, AS-i (developed for discrete I/O) can communicate analog data (like temperature), and some process instruments support MODBUS.

CHOOSING THE RIGHT NETWORK

When reviewing the many open communications protocols available today, you can clearly see that they each have strengths and weaknesses. Each has grown out of need for a solution to a particular problem. Within their native problem domain, each is strong and many have capabilities that extend their usefulness into other application areas.

Warning: do not be seduced by the technology. Take a pragmatic approach to your problem-solving situation. When evaluating your needs, possible communications alternatives, and vendor offerings:

> Focus on your application far more than the technology. This is paramount. You understand your problems better than anyone else does. The specific, measurable benefits you seek must drive your selection process.
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> Consider the costs. All networks claim to save time and money. But the competition for capital is fierce and initial costs should be weighed carefully against the less tangible promise of future savings.
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> Assess the network connectivity. The bottom line is that you want your data. Connectivity is how you get it. In this area, the network is critical. Once you have the data, the network used in one area or another becomes less important.
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> Understand hidden changes and impacts. It is people who make the worst technology successful or the best technology fail. All communications networks cause changes that affect people and practices in the plant. Although the actual changes can be very difficult to foretell accurately, the affect of these changes must be realistically considered.
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> Evaluate the real interoperability. All networks claim to be interoperable; the very word "interoperability" has become twisted until it has little or no real meaning. Insist on specific and tangible definitions and examples of interoperability. Take a "show me" attitude. If the interoperability is abstract and difficult to "touch and feel," it may not really exist.

Most of the information provided here is "common sense." Applying normal evaluation practices can show you the way through this maze of networks. Just remember when all is said and done, communication protocols are simply tools, each with its own distinct function. There is no single "perfect network" and communications solutions don't come in a "one size fits all" package. Understanding what each network can do should help you choose the right tool for the job.

Additional Information

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