M2M in Manufacturing

by Tony Paine

M2M technology in manufacturing allows exchanging and gathering information between sensors and controllers during collaborative machining process and motion control. In a manufacturing environment, industrial M2M serves an integral component of a much larger and more complex manufacturing infrastructure. Industrial M2M can mean intelligent bi-directional plant floor communications to PLCs (Programmable Logic Controllers) to SCADA (Supervisory Control and Data Acquisition) systems to MRP (Manufacturing Resource Planning) systems or often ERP (Enterprise Resource Planning) systems. At the very core in any manufacturing facility, M2M is typically the initial component and the infrastructure builds out from there.
Prior to M2M in manufacturing, industrial automation has used direct wire connections between the sensors, actuators and the controlling PCs. Today, examples of M2M in manufacturing can be seen through the use of analog sensors to measure real-world conditions and where process control systems perform analysis and control of manufacturing processes. Another instance can be illustrated through control commands converted to analog signals to control actuators.

Using standard logic and control hardware, machines today are starting to be built as modular components. The manufacturer has a lot more choice in the options of what machine components the manufacturer can choose such as cappers, conveyors, loaders or labelers, which can be manufactured and tested separately, then plugged into the completed machine at the customer site. M2M comes into play once the components are installed and then recognize each other once the bus connection is made. Then communication between controllers typically starts immediately and automatically without additional programming or configuration.

There seems to be a new generation of intelligent component-based automation machines and devices that are beginning to emerge. Industrial M2M will enable distributed intelligence and local control. To help improve a machine's response times, logic functions are pushed down to the device level to achieve better local control. Local control can be used for safety functions such as light curtains and safety doors, eliminating the need for a safety bus. Controllers communicate laterally to other local controllers in sequential manufacturing operations, or send and receive status and command signals from a central controller.
Thanks to IT technology advances, manufacturers are able to deploy low-power, low-cost wireless communications. Wireless communications have become a desirable alternative to direct wired connections. Low-powered wireless systems enable connections to machines and devices not easily monitored with previous technologies. In fact, almost all production facilities around the world now use some form of M2M to achieve industrial automation in the manufacturing facilities.

As it stands today, industrial M2M plays a key role in the automation of manufacturing processes that are usually under the control of PLCs. In terms of automation, industrial M2M can be applied to both discrete and continuous manufacturing processes. With continuous manufacturing, it is also called process control.
As part of any M2M in manufacturing, there always needs to be a focus on connectivity within all manufacturing operations and between all the systems within a manufacturing facility.

As experts in communication software for automation and M2M since 1995, we have seen OPC and embedded device communications evolve tremendously, specifically in the areas of communication drivers for automation controllers, I/O and field devices. Additionally operating systems that support M2M manufacturing have expanded to include Microsoft Windows Desktop, Server and Embedded (Windows CE and Windows NT/XP Embedded. In order to support the rapid advancements of M2M seen in manufacturing, Kepware Technologies has developed some 150 plus communication protocols to support the M2M initiatives in the manufacturing sector.

As part of this M2M initiative in manufacturing, the OPC Foundation is playing a crucial role because the foundation adapts and applies fundamental standards and technology specifications of the general computing market but for manufacturing industry-specific needs. OPC is known as the open connectivity in industrial automation and the enterprise systems that support industry. It is based on open standards and specifications to ensure interoperability can be achieved for M2M communications in manufacturing. Kepware is working closely with the OPC Foundation as it continues to create new standards as needs arise such as OPC-UA. OPC-UA is designed to be platform independent and operating system independent, supporting Windows, Linux, and a variety of Embedded Operating Systems that M2M technology vendors will be able to leverage. The OPC Foundation is developing and managing a standard set of operating system independent communication interfaces (Stacks). It is anticipated that the OPC UA will cross into new markets including medical devices, the Smart Grid in addition to the manufacturing sector.

The M2M trend in manufacturing automation is to use data more effectively in order to achieve improved operations and efficiency. What this means for OPC drivers and interoperability technologies is that they will become more intelligent in acquiring data from equipment, and using the data to auto-generate content within the driver, for improving its use in client applications and how it uses data from the server applications. For instance, assets can come from standardized tags, device models, the types of equipment and any sets of data collected that is triggered from the source. Our drivers are typically "Auto Configuring", which means they can automatically configure a lot of the data on their own and automatically generate the name space from information retrieved from either a program file or interrogated from the device itself. Our Automatic Tag Database Generation feature of KEPServerEX allows the end-user to configure all of the necessary tags for their device automatically at startup or with the simple press of a button. The OPC Foundation anticipates that their OPC-UA format will unleash a great deal more sophistication in how "Information" is represented, transferred and utilized.

Within the last 10 years, OPC has become a widely accepted M2M communication standard in manufacturing. The key benefit to OPC is that it can enable the exchange of data between multi-vendor devices and control applications without any proprietary restrictions or limitations and make continuous real-time communication possible.

OPC is typically implemented in server/client pairs and otherwise distributed in client/server architecture. An OPC Server, a software application that acts as an API (Application Programming Interface) or protocol converter, can connect to such devices as Remote Terminal Unit, Programmable Logic Control, Supervisory Control System, Distributed Control Systems, etc. Basically it can integrate with any data source such as a

database or graphical user interface, and translate that data into a standard-based OPC format. Once translated into an OPC form of communications, it can by-directionally send M2M device data to an historian, a spreadsheet, a trending application, a human machine interface – any hardware and software from different vendors of OPC compliant applications. The OPC client is able to display data or send commands but uses the OPC server to retrieve M2M data. Overall plant floor communications networks have been rapidly evolving and now embrace the use of open connecting equipment, such as that meet standard protocols like OPC.

Most software vendors simply include OPC client capabilities because it can make them instantly compatible with thousands of hardware devices that typically embedded in manufacturing equipment, machines and controllers. This gives the manufacturer the ability to choose whichever OPC client software they need, resting assured that it will communicate seamlessly with their OPC-enabled hardware, and vice-versa.
One of several major advantages of OPC and how it has affected the M2M market in manufacturing can be noted by the increase in collaboration among M2M technology vendors. OPC is helping the industrial M2M market leverage an open communications platform which has given end-users more choices and freedom to develop more sophisticated and robust automation applications.
Kepware sees this as an exciting time in the M2M industry; interoperability, open solutions, and choices are paving the way for automation professionals around the world to maximize their M2M investments. Kepware engineers is supporting this M2M trend in manufacturing automation by developing and maintaining communication products according to the OPC Foundation's OPC Data Access specifications. With our recent announcement of KEPServerEX v5 which represents over 10 man years' worth of development, we will be bringing one of the most advanced communication technology and OPC Server on the M2M market for manufacturing.

M2M is being driven by the emergence of new technologies such as wireless communication and embedded systems and its reach is extending beyond its domain. Budget constraints and leaner manufacturing operations have reduced the number of people manufacturers employ in both discrete manufacturing and process industries. Due to the fact that we have to do more with less, there are greater demands being placed on control architectures to adopt a more connected manufacturing environment and decentralize ongoing silos of automation and intelligence. M2M relies on this decentralization in order to allow machinery to be able to make decisions locally while intelligently communicating crucial data to where-ever its needed. In line with M2M's interoperability framework, Kepware has and will continue to make significant investment in OPC and driver communications development to support M2M in manufacturing. Drawing from its 150,000 plus applications per year which is exponentially growing, Kepware will be a pioneer in leading the way in creating interoperability standards for the industry.

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