ARC commissioned its second annual Plant Connectivity survey designed to capture the current practices and future direction of the manufacturing community regarding the access and exchange of information originating on the plant floor.

**Keywords**
OPC, Collaborative Manufacturing, CPM, PLC, HMI/SCADA, Web Services, Unified Architecture, OPC DA, OPC XML-DA, OPC-DX

**Summary**
In today's collaborative manufacturing environment access and exchange of information from plant floor production systems is essential. How manufacturing operations will collect and disseminate that information is a critical concern. To get additional insight into this important issue, ARC developed and commissioned its second annual Plant Connectivity Survey designed to capture the current practices and future direction of the manufacturing community regarding the access and exchange of information that originates from production systems and equipment. As companies move to an environment of real-time event-driven manufacturing where information from the plant floor will drive visibility and production intelligence applications, technologies such as OPC, Web Services and Service-Based Architecture, as well as existing integration methods will provide the interoperability needed to connect the domains of the manufacturing enterprise.

**Analysis**
The initial question posed was: “How important are the following factors to you when it comes to evaluating automation systems”? Not surprisingly, reliability was the factor most selected as extremely or very important in a production environment. However, coming in a close second were several other factors including device connectivity, standards-based automation, and technical
support. Being able to connect devices, sensors, machines, and production control systems at the plant floor level is the basis and starting point for all information that will flow from this tier to upper level production management and visibility systems. Manufacturers are aware that this real-time production information is necessary to drive the visibility dashboards and production intelligence solutions that enable informed decision making at upper tiers. Additionally, adherence to open industry standards is regarded key to fostering interoperability between production equipment and manufacturing process domains.

**Standardization Focused at the Enterprise Level**

ARC asked the question: “In what areas have you determined it is important to enforce plant connectivity standardization across your company”? Having a corporate standard was considered most important at the enterprise level, but drops off steadily moving down to the sensor and subsystem level. Conversely, project choice was selected most at the sensor and subsystem levels, but drops off steadily up to the enterprise level. Site choice was most cited at the control systems and HMI/SCADA levels. These results indicate how important it is for manufacturers to impose standards at the enterprise and production management levels, but the individual plants and specific projects still have final say as to their automation equipment the connection protocols specific to that equipment.

**OPC Dominates HMI/SCADA and Control System Preferences**

“What is your preferred method for providing Plant Connectivity?” was asked. Respondents indicated that OPC was the most preferred choice at the control systems and HMI/SCADA levels, and also the top choice at production management level, an emerging trend. Web Services were considered most preferred at the enterprise level for P2B, but this preference drops off steadily moving down to the sensor and subsystem level. It should be noted that corporate messaging busses and integration servers are the
predominate information exchange at the enterprise business levels where the use of integration servers is clearly the choice for P2B integration. Supplier proprietary was selected most at the sensor and subsystem levels, but drops off steadily up to the enterprise level. These results indicate that OPC is gaining in preference strength at the production management and visibility application layer. However, there is still much debate among the manufacturing community as to the widespread deployment of OPC at the sensor and subsystem levels. Sensor technology is moving towards more embedded intelligence and the emergence of smarter sensors. Embedded Web servers in some high-end sensors and other devices will foster the use of technologies such as OPC XML-DA at that level.

**Corporate Management Most Aware of Web Services**

The survey asked: “Does Corporate Management have a knowledge or interest in the following Plant Connectivity tools” The results clearly demonstrate that corporate management has a greater knowledge and interest in Web Services than OPC. This is most likely due to the fact that management at this level is more aware of integration issues that occur at the enterprise and business tiers than they are with connectivity issues at the factory floor. Interoperability is one of the primary attributes of Web Services, and thus they represent a viable and pervasive method to exchange information at the business process and enterprise level. Corporate management within manufacturing companies recognizes that integration across the enterprise is a significant business challenge today. Accessing and exchanging information between legacy systems and emerging Internet-based systems is becoming a principal focus for these companies. At this juncture it is becoming clear that OPC technologies such as OPC XML-DA are poised to provide the connec-
tion between factory floor production systems and visibility, manufacturing intelligence, and production management systems. Service-based architectures along with the OPC Foundation’s Unified Architecture vision will support and enable integration and interoperability across these domains of the manufacturing enterprise.

**OPC Usage Forecasts Rapid Growth**

Respondents to the survey were asked: “What is the approximate percentage of OPC used for your Plant Connectivity today and in five years”? Today, OPC is used at virtually every system level in the production process. Overall, the leading usage of OPC continues to be at the HMI/SCADA and control systems levels, with production management representing one of the fastest growth areas for adoption in manufacturing. Clear growth plans are being forecast for OPC by the survey respondents over the next five years. At every plant level, the installed base of OPC is expected to increase, with some of the greatest changes taking place at the sensor, subsystem and enterprise levels. At each of these levels, OPC is expected to effectively increase by over 100 percent. However with the limited budgets for many plant operations, the notion of upgrading legacy solutions at the Sensor and Subsystem levels may be constrained by the availability of resources, not by desire, keeping the overall numbers low.

It should be pointed out; however, that it is not likely that OPC accessed information will have a direct interface with most enterprise business system. Plant floor information will most likely be collected in factory database repositories that will be source of information for P2B integration.

**OPC DX and XML-DA Are Fastest Growing Specifications**

The OPC-DA specification, as expected, is the most widely deployed today through the development of a robust OPC server and client application market from a broad base of automation suppliers. This use of the OPC-DA
technology required communications to pass through Windows-based PC platforms that typically hosted HMI clients. Today, with the emergence of Microsoft’s .NET framework, OPC is moving to the Internet and Web Services through the XML-DA specification which allows for loosely-coupled connectivity across the Internet. OPC-DX extends OPC to peer-to-peer communications at the device bus level allowing communication in a heterogeneous device protocol environment. OPC DX and XML-DA provide the mechanisms that enable the interoperable flow of information from the device and controls tiers to production management systems, manufacturing intelligence, visibility applications, and factory information repositories that can interface with enterprise business tiers.

**Recommendations**

- Collaborative manufacturing environments will require manufacturers connect plant floor production systems with multiple domains across the manufacturing enterprise. As manufacturers develop factory architectures that define the interfaces of the manufacturing domains, they should include standard communication specifications such as OPC as an integral component of their architecture in order to insure interoperability across the manufacturing enterprise.

- OPC’s challenge going forward is to focus on their Unified Architecture and Web Services, as a way to increase manufacturing visibility across the enterprise.

*Please help us improve our deliverables to you – take our survey linked to this transmittal e-mail or at [www.arcweb.com/myarc](http://www.arcweb.com/myarc) in the Client Area. For further information, contact your account manager or the authors at cresnick@arcweb.com or dslansky@arcweb.com. Recommended circulation: All MAS clients. ARC Insights are published and copyrighted by ARC Advisory Group. The information is proprietary to ARC and no part of it may be reproduced without prior permission from ARC.*