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1) What do you consider to be the most obvious change (or changes) that data exchange between the process fieldbus and enterprise network [based on Ethernet] has brought to Process Automation during the last ten years?

Improvement of communication speed and connectivity is a big benefit for the process industry. Operating condition and diagnostic information of field instruments gathered directly from field networks enable integrated management of field devices. Unfortunately, at first, only a few people considered the negative effects of the improved connectivity. An increasing threat of attack to security weak points brings new issues about automation system security.

There are two sides to the data exchange story, in the past there was almost no exchange at all. The good side is the advantages it brings on data exchange between historians, connections to an ERP, remote engineering etc. What all underestimated is the security risks this brought into the plant. Although these risks can be managed by a good security programme, we still see that not all users have this in place. The most obvious change is that the connection has now been made in the first place.

***(MK)** The adoption of OPC technology as the standard mechanism to transfer data between systems, has removed the need for bespoke application programming interface (API).*

2) What might be the most significant developments that Ethernet-based technology is likely to bring to Process Automation over the next decade?

Integration of various multi-vendor subsystems into one control system will enable unified operation and management. It is necessary to be aware of possible security issues caused by integration of multi-vendor subsystems.

Wireless technology adoption will increase fast. Operators walking in the field with tablets or phones, having full access to the DCS and PAM information, will be able to start and stop a pump while standing next to it. Loop testers will be able to force values next to the instrument through a PAM solution and watch the result in the DCS on the tablet, while typing in the results on these same tablets as well.

***(MK)** Other areas developments will focus on field signals integration via the concept of controller-less IO, using flexible electronic marshalling techniques to enhance brownfield refurbishment of existing production plants.*

3) Could there be any circumstance in which Ethernet-based networks might displace traditional fieldbus SCADA/telemetry presently using serial wired topology such as RS485 or 4-20mA signal loops?

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The Ethernet-based networks will not displace the traditional fieldbus unless problems such as cost and intrinsic safety are solved. On the other hand, a wireless field network that uses the Ethernet-based network as a backbone will be used in parallel with traditional fieldbus networks.

***(MK)** For Process Automation there will always be a demand for 4-20mA signals even with the advent of wireless technologies. For Emergency ShutDown (ESD) systems it is currently not envisaged wireless or fieldbus technologies will be used. However, recent development of a wireless gas detector based on ISA100.11a wireless standard, will enhance the protection of personnel when carrying out temporary maintenance work on operational plants.*

4) Wider industry talks about the Internet of Things for low power, low data rate system control. Might there be any application for [directly] IP-addressable sensors, transducers and valves within Process Automation?

Some wireless field networks including ISA 100.11a use IPv6. These wireless sensors, transducers and valve positioners are IP-addressable and already used in Process Automation. The IP addressability is a great improvement in field networks, though, it may be vulnerable to abuse and requires security enhancement.

***(MK)** The current focus for Process Automation is on wireless communication using ISA100.11a or WirelessHART technologies. IP addressable devices were considered during the establishment phase of Foundation Fieldbus, but subsequently abandoned since its performance and functionality could not match that of FF multi-sensing field devices.*

5) The last five years have seen major federal/governmental investments and initiatives for both smart grid and smart metering. Are there any technology spin-offs applicable to Process Automation? [for instance low power IPv6 applications, energy harvesting, etc]

Yes, there are technology spin-offs applicable to Process Automation. For example, there are communication protocols such as 6lowpan and CoAP for resource restricted devices, low power wireless communication standards such as IEEE Std 802.15.4g, and energy harvesting technologies for wireless sensors.

6) Do conventional network to fieldbus gateways throw up any commonly experienced obstacles when interconnecting process fieldbus and enterprise networks?

As an individual gateway for each network protocol is necessary, cost and maintenance are common obstacles for interconnecting fieldbus and enterprise networks.

***(MK)** Widescale adoption of OPC technology has minimised any bottlenecks in process to enterprise networks. With the introduction of OPC Universal Architecture (UA) the drawbacks of this nearly twenty years old technology such as; lack of security mechanism, DCOM configuration issues and support for only Microsoft Windows platforms, is overcome.*

7) Are there likely synergies between Process and Factory Automation systems and, if so, what might they be?

Adoption of Ethernet based networks might bring possibilities to use a part of the communication protocols: these could guarantee real-time communication and/or provides network redundancy in both the Process Automation and Factory Automation systems.

8) Does wireless LAN technology based on IEEE802.11 derivatives have any role to play in Process Automation?

In some cases, a wireless field network system uses a WLAN based on IEEE Std 802.11n as a backbone.

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