Is your network holding you back from creating a Smart Factory?

Increasingly advanced automation using robotics, AGVs, smart machines and integrated logistics means that having a Smart Factory is becoming a necessity to remain competitive. However, none of this can happen without an effective means of carrying the data and control signals required to create an autonomous, interconnected, responsive and flexible factory. Thus, the real protagonists are industrial networks.

John Browett, General Manager at CLPA Europe, looks at how the right industrial network can jumpstart your Smart Factory.

Connectivity is the keyword when talking about Industry 4.0 and the rest of the digital revolution. In fact, communication is the backbone of all the industrial components used to realise the Industrial Internet of Things (IIoT), as it brings together different entities on the factory floor, e.g. hardware devices, software tools and people. It allows them to collect, communicate and analyse data. By doing so, the industrial machines - and consequently the entire enterprise - become intelligent systems, able to improve plant performance, productivity and flexibility.

Within this framework, a suitable network technology can go a long way in boosting the capabilities of a given factory, as it enables direct communication between manufacturing and management systems, resulting in the ability to control and make adaptive decisions based on real-time information. This is an essential prerequisite to achieving manufacturing-on-demand for a range of increasingly user customisable products.

The foundations of a network for the future

As a large volume of devices should be seamlessly interconnected in the Factory of the Future, keeping the costs down while ensuring good connectivity is essential. Currently, the most attractive physical layer available is Ethernet. Compared to traditional fieldbus, this network technology is economical and faster. Therefore, Industrial Ethernet provides a better price/performance ratio. In addition, Industrial Ethernet offers the possibility to create different plant topologies and it is generally easier to configure and expand, factors that are crucial when defining the enterprise's automation strategy.

Not any kind of Industrial Ethernet is sufficient, though. In order to establish an IIoT-enabled manufacturing line, large amounts of data from multiple devices need to be collected and transferred in real-time. Therefore, having enough network bandwidth capacity is critical to the successful operation of these systems. More precisely, full gigabit networks are becoming the standard for industrial automation going forwards.

In addition, the networking solution should be able to address different standards, as factories tend to adopt field devices and machines from different manufacturers to satisfy their factory needs. As a result, open networks are key, as they provide the only solution to accommodate products from multiple vendors.

Looking ahead, it is safe to assume that in many cases the network of the future will be an Ethernet-based, 1 Gbps technology offering real-time communications, with an open protocol structure to allow collaborative future development and hence futureproofing. Currently, the only industrial network to meet all these requirements is CC-Link IE, developed by the CC-Link Partner Association (CLPA), the first open industrial network offering gigabit Ethernet performance.

The CLPA has also increased CC-Link IE's openness by developing specifications that increase the network's interconnectivity and compatibility with other solutions. For example, an interoperability specification allows CC-Link IE and PROFINET to communicate with one another, thus allowing individual devices to be connected to either network. Also, the companion specification between the CLPA's CSP+ for Machine technology and OPC UA enables further communication options.

Seamless communication across all levels of automation

An open architecture is a must for networks to accept devices from a number of manufacturers. However, this is not enough for the network of the future, which should maximise its compatibility on different fronts.

Not all installations are new and compatibility with legacy systems and devices is often required in 'real world' applications. Plus, there is always a transition period to be managed for any existing plant and machinery, which can include 100Mbit only connections. A variant of CC-Link IE, CC-Link IE Field Basic (or "IEFB") supports these 100Mbit devices and is easily implemented on devices or master controllers by software alone, enabling compatibility to be added to existing products without any hardware modification. This compatibility feature broadens the practical options when implementing upgrades or new equipment.

Secondly, it is essential to ensure that the data generated on the plant floor is accessible across all higher-level systems, from the control, supervisory and enterprise levels. This requires seamless vertical network integration, which can be obtained by using a single protocol that can span across all levels of the enterprise.

CC-Link IE embraces field networks, control networks and higher-level connectivity together with its two versions: CC-Link IE Field and CC-Link IE Control. The first is intended to link controllers to field devices for I/O- and motion- control as well as safety functions; whereas CC-Link IE Control acts as a factory-wide data transfer backbone, providing good connectivity between PLCs, HMIs and PCs. However, a key point here is that no matter which level is being considered, gigabit performance is standard.

In addition, CLPA's network technology establishes reliable communications between the field devices and the enterprise level by allowing easy integration with network layers such as Supervisory Control and Data Acquisition (SCADA) systems or Manufacturing Execution Systems (MES) to fully monitor, manage and report plant production processes.

A future orientated and scalable network technology

The key design principles for Industry 4.0 are real-time capabilities and extended interoperability, which can be established through the right industrial network. CC-Link IE offers a fast and economical solution that can create a highly interconnected factory and promote IIoT-enabled manufacturing. With over 22 million installed devices worldwide and a double-digit year-on-year growth, the industrial network technologies developed by the CLPA is turning the Factory of the Future into today's Smart Factory.

Image captions:

Image 1: Connectivity is the keyword when talking about Industry 4.0 and the rest of the digital revolution.

Image 2: CC-Link IE embraces field networks, control networks and higher-level connectivity together with its two versions: CC-Link IE Field and CC-Link IE Control.

About The CC-Link Partner Association (CLPA)

The CLPA is an international organisation founded in 2000 dedicated to the technical development and promotion of the CC-Link family of open automation networks. The CLPA's key technology is CC-Link IE TSN, the world's first open industrial Ethernet to combine gigabit bandwidth with Time Sensitive Networking (TSN), making it an ideal solution for Industry 4.0 applications. Currently the CLPA has over 3,600 member companies worldwide, with more than 1,900 certified products available from over 300 manufacturers.

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