Control, Instrumentation and Automation in the Process and Manufacturing Industries

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Connectivity in real-time

IO Link, and the Automation Platform Network

A profitably disruptive energy strategy

Functional Safety: a technology challenge

Making digitalisation work!

IO Link, and the Automation Platform Network

When a combination of networks becomes attractive

It is critical that suppliers of remote I/O systems can connect to the most important networks used in industry today. PROFINET, EthernetIP, EtherCAT® and Modbus are all common networks used in Industrial Automation but how does a manufacturer of machines standardise, when their various customers specify different networks in their factories? *Nigel Dawson*, head of Business Development Electric Automation at Festo explains.

The Festo automation platform:

The idea of standardisation becomes even more complex when we consider the different architecture levels. A machine can carry IO Link at the base layer, PROFINET in the middle automation layer and OPC-UA over Ethernet with the communication to the cloud.

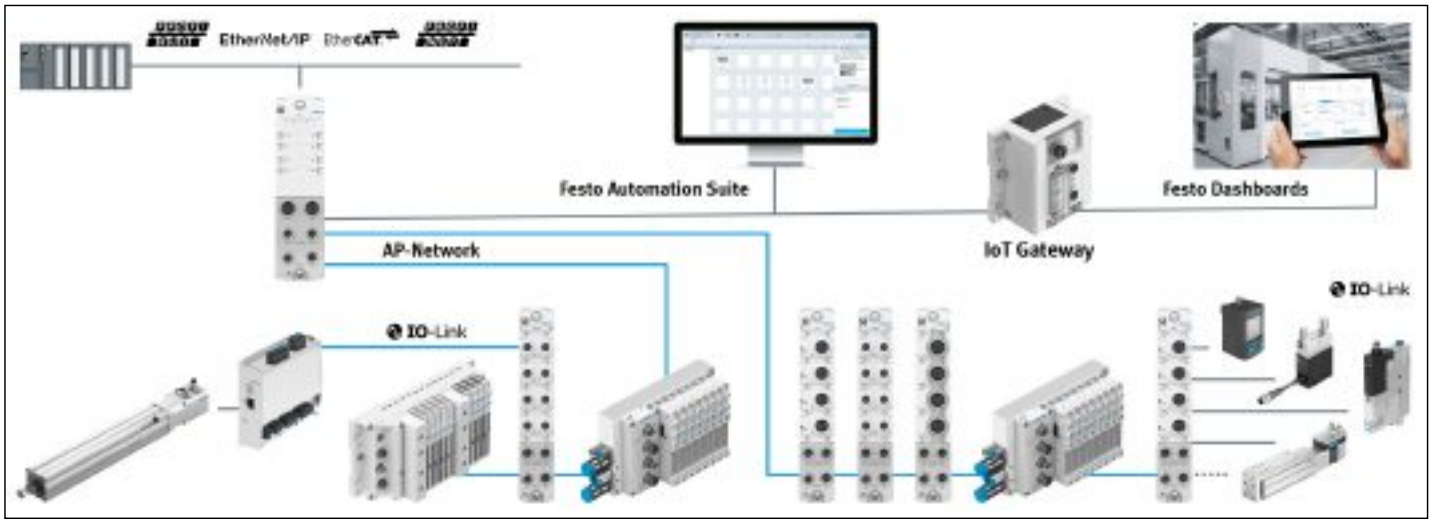
The new Festo CPX-AP-I system using their new AP communication technology helps to solve some of these challenges, integrating IO Link, high speed data transfer to the cloud and intelligent connectivity to the host PLC in one simple package.

The backbone of the system is the new Automation Platform (AP) protocol which is embedded on Festo's own AP-ASIC. By embedding the protocol directly on the silicon, Festo can achieve impressive speeds of 200Mbaud/sec on each of the ASIC's three ports. To put this into perspective, this is twice the speed of equivalent Ethernet based networks available today. Our team has developed the ASIC and protocol internally meaning that integration in our equipment is simple and cost effective with the flexibility of connecting 500 different devices each containing the ASIC, to the same network node.

As we constantly develop new automation products like servo drives, motion controllers, pneumatic valve terminal and sensors, integrating the ASIC becomes simple, enabling real time behaviour and the collection of big data with very little additional cost.

The CPX-AP-I system

The remote I/O system from Festo, consists of a bus module which will connect to networks such as PROFINET, PROFIBUS, Ethernet/IP, Modbus and EtherCAT®, ensuring that customers can integrate the system irrespective of their host PLC of choice. Below this bus module, the system then becomes standard and communicates on AP. This ensures that customers can maintain a standardised architecture and bill of materials and all I/O is seen as being on the host network, irrespective of the customer's choice of PLC. Modules available include digital I/O, analogue Inputs, incorporating temperature measurement, IO Link masters and unique to Festo, pneumatic valve terminals.



IO Link, and the Automation Platform (AP) Network.

CPX-AP-I with EtherNet/IP fieldbus module, as 4-way IO-link master and digital input/output module.

Integrating valve terminals in the system, reduces the integration cost and complexity for customers. It allows them to avoid connecting hardwired valve terminals to remote I/O or adding costlier PROFINET or Ethernet/IP valve terminal modules.

Each module is connected via a CAT6e cable that meets the high electromagnetic requirement of a 125MHz system and is already prepared for high speed cable chains. By separating the protocol and load supply, designers can flexibly decide on the system behaviour during an emergency stop. The system is prepared for tree, line and star topologies with a maximum cable length between modules of 50 metres. Up to 500 modules could be connected to one bus module, ensuring the limiting factor is never the AP protocol.

IO Link integration

No modern I/O integration system would be complete without IO link capability. The CPX-AP-I system is no exception, integrating an IO link master directly on the AP protocol. This allows companies to take digitalisation down to actuator and sensor level. Data and parameterisation pass seamlessly through the AP, all the way to the host PLC and even to the cloud if our IoT gateway is used.

It is no surprise that there is more focus on IO Link than Analogue devices in a new system like CPX-AP-I. Many machine manufacturers are choosing to swap analogue devices for IO Link devices to improve diagnostics, installation time and make commissioning more efficient. The IO Link range from Festo such as extra low voltage servo drives, valve terminals, proportional valves, motion controls, flow, pressure and position sensors all connect to the CPX-AP-I to ensure seamless connectivity from the actuator to the cloud.

Big Data

It is not normal practice to stream HD video over the network on a machine. However, if progress has taught us anything, it is that the requirements for bandwidth on a network, accelerates exponentially with time. The Festo AP protocol not only is fast enough to deal with video, its multichannel approach ensures that the user can parameterise the size of the cyclic date channel and the non-real time data channel. This ensures the cyclic data is never adversely affected and deterministic behaviour is guaranteed. This makes acyclic data available for predictive maintenance features such as monitoring cable quality or actuator travel times and future additional functions. The customer can use these tools to minimise maintenance costs and to optimise machine availability and cycle times.

Upcoming AP products are therefore equipped for the demands of the digitalised factory and have the advantage over today's performance-limiting standard solutions, such as IO-Link or EtherCAT®.

IoT-Gateway CPX-IOT for Cloud communication.

Software

The Festo Automation Suite is a new and uniform tool that forms the basis for parameterising, programming and maintaining devices from Festo. These include mechanics, drives and motion

Festo Automation Suite as the intuitive and seamless software provides intelligent connectivity works.

controllers, in a single software package. CPX-AP-I is no exception to this and with AP-I comes a new plug-in for the Festo Automation Suite. Customers will still be able to use their existing tool landscape, e.g. TIA Portal, without having to use the Festo Automation Suite. This software allows customers to commission parts of the machine before the PLC is even installed.

The Future for the AP?

With a network speed of 200Mbaud and a cycle time of 15µs the system is fully capable of synchronised motion control and not just simple I/O connectivity. It is no co-incidence that Festo are also a full-scale designer and manufacturer of servo drives and motors and with the AP ASIC, the future of low cost IoT connected motion controls, pneumatic devices and drives seems certain.