Industry 4.0 and the next generation of interconnects

Questions and answers

Question 1

Customers won't necessarily switch over from RJ45 or other interfaces to these new interconnects immediately. How do you see this rolling out?

Answer 1

Any time a new interface is introduced, it can take time to be adopted. There are many interfaces in use now for a variety of protocols, in millions of applications.

In general, we see there being 3 phases to this.

a) The first is where users start using ix or SPE in isolated applications, so they are adding them into their system.

b) The second is where they are actively migrating exiting systems to these new interfaces and protocols so they are changing their existing architecture, but there will be a mix.

c) the third is full integration, so new systems are built entirely around these protocols and interfaces.

All this will take time, so we expect to see a ramp over the next couple of years. We are certainly seeing evidence of all 3 stages taking place depending on the customer.

Question 2

Can you tell me a bit more about the standards governing these new interfaces?

Answer 2

ix Industrial is controlled by IEC61076-3-124. This IEC standard governs the mating interface and form factor of the plug and receptacle connectors with all the specific dimensions, specifically for the IP20 version. The electrical, mechanical and Signal integrity performance are all specified, with parameters such as insertion loss, return loss, near and far-end cross talk, propagation delay and other key performance characteristics. Wiring and pin assignments for the free and fixed connectors (or cable and pcb mount versions) are specified, and all test requirements and methodologies are laid out.

IEC 61076-3-124 does not prescribe the requirements for the IP67 versions of the connector, so sealed versions are not covered, although for these versions, all requirements of the standard still apply.

Single Pair Ethernet is similarly covered by IEC standard 63171-6. SPE is a little more complicated in that there are several versions of the 63171 standard, with different dash numbers, such as -1, -2, -3, -4 and -5. While similar to each other, these all have different interfaces, and some are better suited to different markets and applications that others. In addition, there are some specific manufacturers aligned with different versions of SPE. Amphenol is part of the SPE Industrial Partners Network, which supports and provides the -6 version, which we believe is the best suited for industrial applications due to its form factor and mechanical characteristics.

Question 3

Is Amphenol the only company providing these products?

Answer 3

There are other large, very well established manufacturers supporting these standards in addition to Amphenol, and as such, are all intermatable with each other to ensure that customers have choice, and can confidently design these products into their systems knowing that that will be able to always have more than a single qualified source.

Question 4

What are some of the obstacles to these being adopted in the market and how do we overcome them?

Answer 4

A number of factors come into play. One key one has been the pandemic, which has created a lot of delays in the market and caused equipment manufacturers to put new product development programs on hold. We are starting to see this ease up now, as the world comes to terms with the situation and things gradually improve.

Another is the current supply chain situation, ultimately caused also by the pandemic and the impact it has had on key component suppliers for chips, which is causing delays in programs that rely on these, the result being that demand for other parts are affected. As supply chains recover, we expect to see demand for new products such as ix and SPE to grow rapidly.

From a technology perspective, adoption can always take some time, so our approach to this is to be very present with our existing and potential customers, ensuring that they have our full support, access to samples and technical information, and that we are very responsive to their needs. We are aggressively and proactively promoting these interfaces, and are finding that customers are receptive, but we also have to respect that it takes time for some new technologies to find a foothold. We believe that as momentum increases, we will see substantial, rapid growth with these interfaces.

Question 5

A common question considering new wireless technologies: why continue to focus on Ethernet? (except 'power for the device' and security / integrity). For network backbones possibly?

Answer 5

Wireless technologies certainly play a strong role and will increase in use in factory and process automation, specifically for applications that are more difficult to address using wired technologies. However, I don't believe wired technologies like Ethernet will be totally displaced by wireless. They will work in concert depending on the needs of the application. For instance, wired solutions will always provide high security and robust connectivity for sensitive applications, as well a those requiring power to the device, something wireless can't provide.

Question 6

Do you see also building automation as a market for SPE?

Answer 6

Absolutely. SPE is ideal for building automation, and we are seeing more a more devices that would use this connectivity such as HVAC control, security and access systems, lighting control, and a whole host of related applications.

The IEC 63171-6 standard is ideal for these applications, as it provides compact, ruggedized design, and is extremely easy to use and terminate for custom cable installations. There are "competing" SPE standards, some of which are more focused on building automation initially, but which may also have some inherent limitations in terms of their design, so we see the -6 version being highly applicable for all SPE requirements in all markets.

Question 7

Are there converters between ix/SPE and RJ45? In order to be backward compatible with systems using conventional RJ45.

Answer 7

ix Industrial and RJ45 are both used for 8wire, 4 pair Ethernet, so there is no conversion required, just a mechanical interface between the 2. Amphenol provide "Adapter cables", ie ix Industrial on one end and RJ45 on the other, which can directly connect devices together using to 2 different interfaces with no protocol conversion required. SPE is also a form of Ethernet, but over 2 wires instead of 8, and typically equipment that has both ix and SPE connectivity will provide any conversion required between the 4 pair and 1 pair protocols.