

## Can Ethernet Do It Alone?

Use of Ethernet for industrial control is increasing rapidly. Ethernet is being projected as the solution to every control network problem. Some people even think Ethernet is “the” answer for device interoperability and will become “the” industrial open communication protocol in near future. Do you think this is true? Can Ethernet do it alone?

The answer is no and those people who think that Ethernet can do it alone are missing a very important point. Remember that Ethernet is only the physical & data link layer protocol. Just because you are connecting two controllers (e.g. PLC) using Ethernet doesn't mean that they will start “talking” as soon as you connect them. Interoperability is more than just connecting two devices on a same physical media (wires, in this case Ethernet). Some will argue that I am using TCP/IP with Ethernet! Why can't it interoperate now? The reason is, TCP/IP is a protocol for routing and end-to-end data integrity. Ethernet along with TCP/IP provides a set of physical media definitions (e.g. type of cable, connectors etc.), a scheme for sharing this physical media (electrical characteristics like voltage level etc.), a simple data packet format and addressing scheme for moving data in a network. If we interpret all this in terms of 7-layer OSI model then, Ethernet handles the bottom two layers, Physical & Data Link and TCP/IP handles next two layers, Network & Transport. Thus together, Ethernet & TCP/IP conquers only up to 4 out of 7 layers of OSI model and this is the reason that merely using Ethernet & TCP/IP is not enough for interoperability. It is the upper layer, Application Layer, that determines how and which devices interoperate on the network.

Ethernet to its credit has many benefits and thousands of pages have already been written in several magazines so I will not waste any Keystroke writing about it! Because of all these benefits, every protocol is now trying to use Ethernet as media. Some examples are High Speed Ethernet (HSE) from Fieldbus Foundation, Modbus/TCP, Profinet, Ethernet/IP, CIP over Ethernet etc. Despite the fact that all these protocols use Ethernet, they do not interoperate.

Using Ethernet at the field level has it's own drawbacks, some of them are as follows:

- Ethernet is limited to 100 meters, which is too short for field cabling.
- Ethernet does not allow loop powering of devices.
- Ethernet is not Intrinsically Safe.

Because of these disadvantages, Ethernet based protocols are best used at higher levels i.e. at host system level. But even then, care should be taken in selecting the higher level protocols because there are many contenders and each one has their own advantages & disadvantages and if this is not enough the standard for Ethernet is loose enough to create the “Confusion at the Top”. For the same reasons we need protocols like Foundation H1 at the device level, which are designed by keeping transmitters, flow meters & control valves in mind. These device level protocols can cater the need like loop-powered devices, intrinsic safe wiring, multi-dropping etc., which are very important for the process industries.

In summary, I want to emphasis that using Ethernet is not a problem but at least in its present state, it is not an answer to all the control problems as it is perceived by many people.

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