DATA TRANSPORT

Single Pair Ethernet (SPE) as data transport for Operational Technology (OT) networks.

Compared to using traditional field buses, using an Ethernet architecture simplifies system implementations since a single software framework can be used from the lowest to the highest speed ranges.

Diagram shows a typical Ethernet architecture with Ethernet interconnecting various layers of an OT infrastructure.

Legend:
- ● Legacy 4 mA to 20 mA/DO/0 V to 10 V
- ● 100 Mb/Gb Industrial Ethernet
- ● Standard Ethernet
- ● 10BASE-T1L Industrial Ethernet
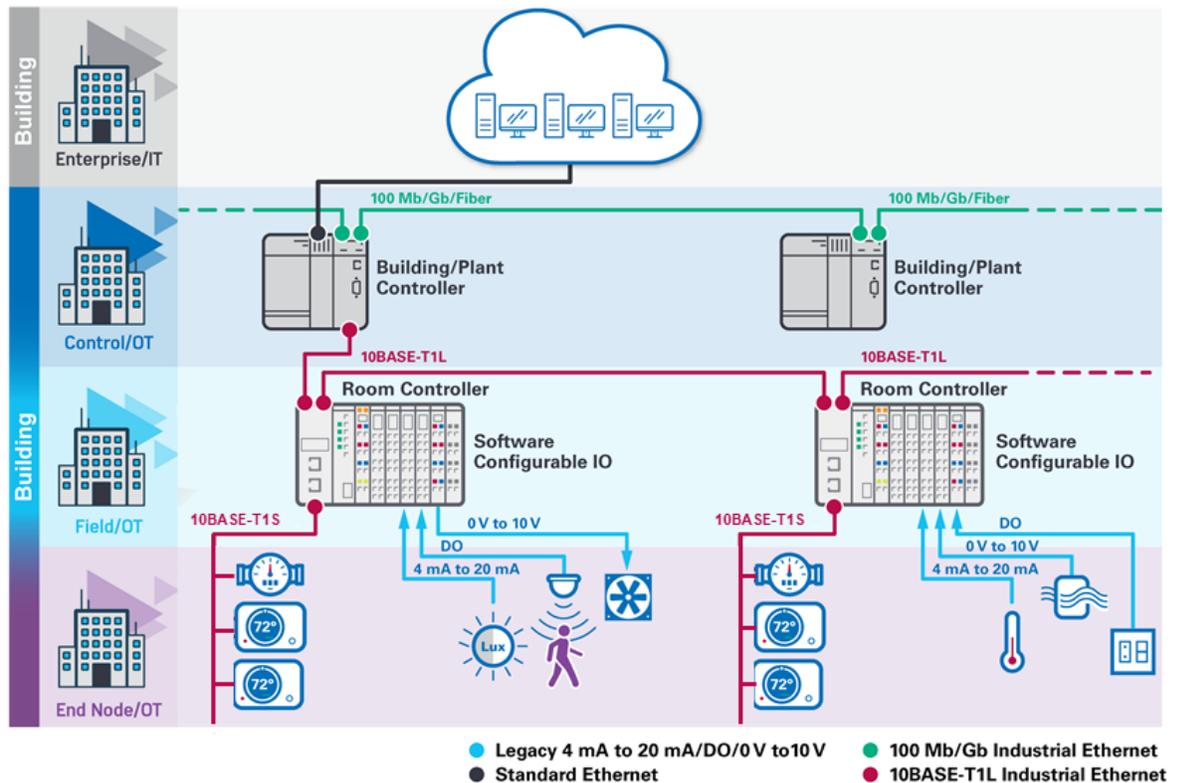
SINGLE PAIR ETHERNET OVERVIEW

IEEE 802.3cg-2019™ standard encompasses two different physical layers geared towards transporting data at 10 Mb/s over a balanced pair of wires.

10BASE-T1L:
Used for point-to-point communications over long distances (up to 1000m).

10BASE-T1S:
Built for short distance point-to-point communications (up to at least 25m) and mirrors many fieldbus protocols by providing option of multidrop Ethernet architecture.

In combination, 10BASE-T1L and 10BASE-T1S technologies provide capabilities that address challenges in the field such as power, bandwidth, cabling, distance, and data islands. With added engineered solutions, 10BASE-T1L can bring Ethernet into intrinsically safe Zone 0 (hazardous areas) applications.

For more information about the Ethernet Alliance, please visit ethernetalliance.org, follow @EthernetAllianc on Twitter, visit its Facebook page, or follow its LinkedIn company page.

PRESENTED BY
EA MEMBER

PANDUIT®

BENEFITS OF SPE FOR OT NETWORK DATA TRANSPORT

- **Seamless Ethernet to the Edge:** Ethernet standards ensure that all higher protocol layers used over with 10BASE-T1S and 10BASE-T1L work just as they do with 10BASE-T, 100BASE-TX and -T1, and 1000BASE-T and -T1, eliminating the need for complex gateways.

- **Higher Bandwidth:** At the edge, up to 10 Mb/s is a major advance for most applications that were previously limited to a data rate of less than 30 kbps. A higher bandwidth communications link is required to deliver richer datasets from field devices to plant-level infrastructure or up to the cloud for processing.

- **No Gateways:** With 10BASE-T1S and 10BASE-T1L, Ethernet packets move from the field level to the control level, and eventually to the cloud, without gateways, realizing the goals of an Industrial 4.0 unified IT/OT network.

- **Simplified Configuration:** With Ethernet connectivity, it is possible to configure sensors with a laptop or mobile phone, regardless of whether the sensor is on the desk or is deployed in a manufacturing plant.

LEARN MORE HERE ›

TECHNICAL DETAILS

Protocol	Cable Length	Bit Rate	Compatible with Power Delivery	Number of Conductors	Connector
BASE-T Ethernet: 10/100/1000/2.5G/ 5G/10GBASE-T	100 m	10 Mbps to 10 Gbit, full duplex	Yes, up to 90 W	4 to 8	RJ45
10BASE-T1L	1000 m (2.4 V) with up to 10 joints (terminal boxes)	10 Mbit, full duplex	Yes, up to 60 W via SPoE	2	LC style IDC connector or terminal screw
10BASE-T1S	25m	10 Mbit, half duplex/ full-duplex	Yes (point-to-point only) via SPoE	2	LC style IDC connector or terminal screw
PROFIBUS PA	1200 m	31.25 kbps, bus, half duplex	Yes	2	M12, terminal screw
Modbus RTU and Other RS-485 Protocols	1200 m (up to approx 185 kbps, at 375 kb 300 m, at 500 kb, 200 m)	Typically 19.2 kbps, bus, half duplex	No	2	DB9, M12
CAN (DeviceNet)	500 m 100 m	125 kbps, half duplex 500 kbps, half duplex	No (on separate wires)	4	Custom tap, M12, terminal screw
I/O Link	20 m	Max 230.4 kbps, half duplex	No	2	M12
4 mA to 20 mA	>10 km	-/-	Yes, 36 mW	2	Screw
HART	>1500 m	1200 bps, bus, half duplex	Yes, 36 mW	2	Screw

Comparison of Existing Communication Standards with 10BASE-T1S and 10BASE-T1L

ABOUT THE ETHERNET ALLIANCE

The Ethernet Alliance is a global consortium that includes system and component vendors, industry experts, and university and government professionals who are committed to the continued success and expansion of Ethernet technology. The Ethernet Alliance takes Ethernet standards to market by supporting activities that span from incubation of new Ethernet technologies to interoperability demonstrations and education. The organization's plans for 2020 may be found on the Events page of its website.