Introduction to 10 Mbit/s Single Pair Ethernet

Bernd Sostawa/Henry Muyshondt

Microchip Technology



10 Mbit/s in Industrial Applications

- Typical industrial networks use different technologies (EtherCAT, various FieldBus, UART, RS-485, etc)
- Each type of connection is very different in terms of:
 - Hardware interfaces
 - Software Stacks
 - EMC behavior
- An All-Ethernet-Architecture has many advantages
 - Same protocol independent of physical layer speed
 - Well understood security infrastructure
 - Large ecosystem of suppliers and applications



Drawing rom: https://en.wikipedia.org/wiki/Building_automation



Single Pair Ethernet Standards

- IEEE802.3bp-2016: 1000BASE-T1: defines Gigabit Ethernet over a single twisted pair for automotive and industrial applications.
- IEEE802.3bw-2015: 100BASE-T1: defines Gigabit Ethernet over a single twisted pair for automotive and industrial applications.
- IEEE 802.3cg-2019 standard published by the IEEE defines two physical layers
 - 10BASE-T1S: Short Reach (at least 25m), multidrop or point-to-point
 - 10BASE-T1L: Long Reach (1km), point-to-point
 - Both use a single balanced pair of wires as the transmission medium.
 - Higher level Ethernet protocols are used to transmit information without any changes to the Ethernet frames.
 - PHYs have standard interfaces like MII and RMII so they can be used in existing applications.
 - An SPI interface is being standardized by the OPEN Alliance. Originally an automotive group, but now includes some industrial companies.
 - Both can support Power over Dataline in point-to-point applications. PoDL for multidrop applications is the subject of an IEEE Study Group.



10BASE-T1S Adds Multidrop Capabilities

- Ethernet on a UTP bus line
 - 10 Mbps shared
 - Half-duplex
 - 2 to at least 8 nodes
 - Up to at least 25 m cable length
 - No collisions through Physical Layer Collision Avoidance (PLCA) technology

Benefits

- No switch required
- Fewer PHYs and cabling than in star topology
- Inexpensive UTP cable
- Inexpensive analog front end





Introduction to 10BASE-T1S Video



https://www.youtube.com/watch?v=rGpAHc8Rbnk



Interface Considerations



System Alliance

Contacts

 Rainer Neumann – Key Client Manager, Industrial Communication Clients <u>Rainer.Neumann@microchip.com</u> +49 172 8819921

 Matthias Goeing – Senior Embedded Solutions Engineer, Industrial Networking <u>Matthias.Goeing@microchip.com</u> +49 151 116765545

 Henry Muyshondt – Marketing & Bus. Dev., Non-Automotive 10BASE-T1S <u>Henry.Muyshondt@microchip.com</u> +1 512 656 4438

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