Ethernet Protocol Over Fibre

This document summarise the way of using Ethernet protocol over fibre versus copper.

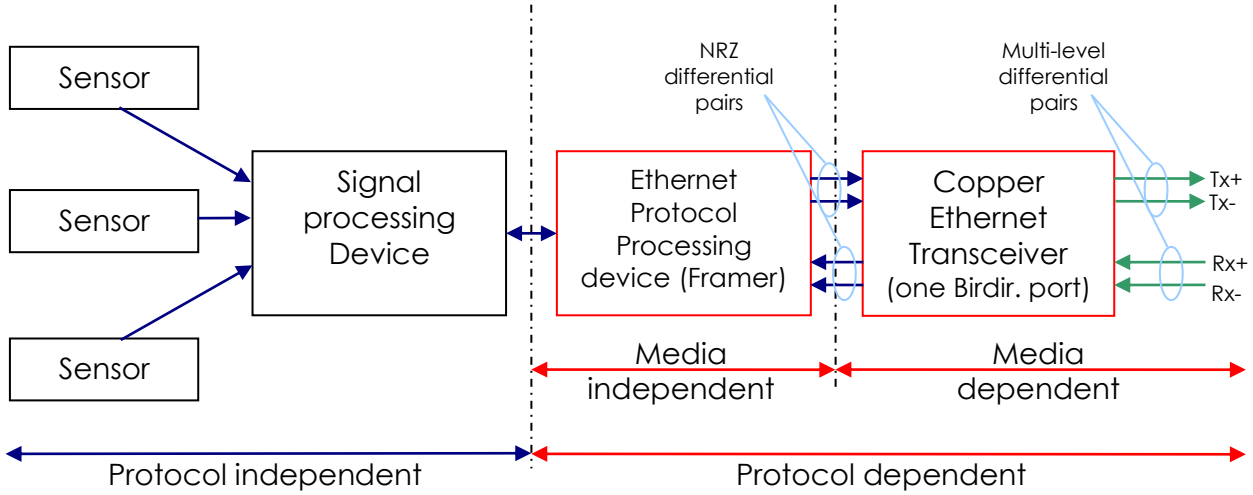
1 Copper implementation.

The following figure gives a brief overview of a typical system based on Ethernet (Fast, Gigabit or 10GEth). The system is generally based on two different parts:

- A protocol independent part, related to the application itself. This part regroups the sensors, the signal and data processing nodes and the memories.
- And a protocol dependent part, related to the communication protocol used (Fibre channel, FDDI, Ethernet, etc…)

This second part – i.e. the protocol dependent one – can be also sub-divided in two parts:

- A media independent part, which implements the protocol itself (Ethernet, etc…). This part is also called the Framer.
- And a media dependant one, related to the type of the media. This part is also called the Transceiver. Depending on the media, the modulation will be different and adapted to fulfill the media performances. For example: Fast Ethernet implement a multi-level signal encoding/modulation (MTL3) to transmit the base band data on copper.



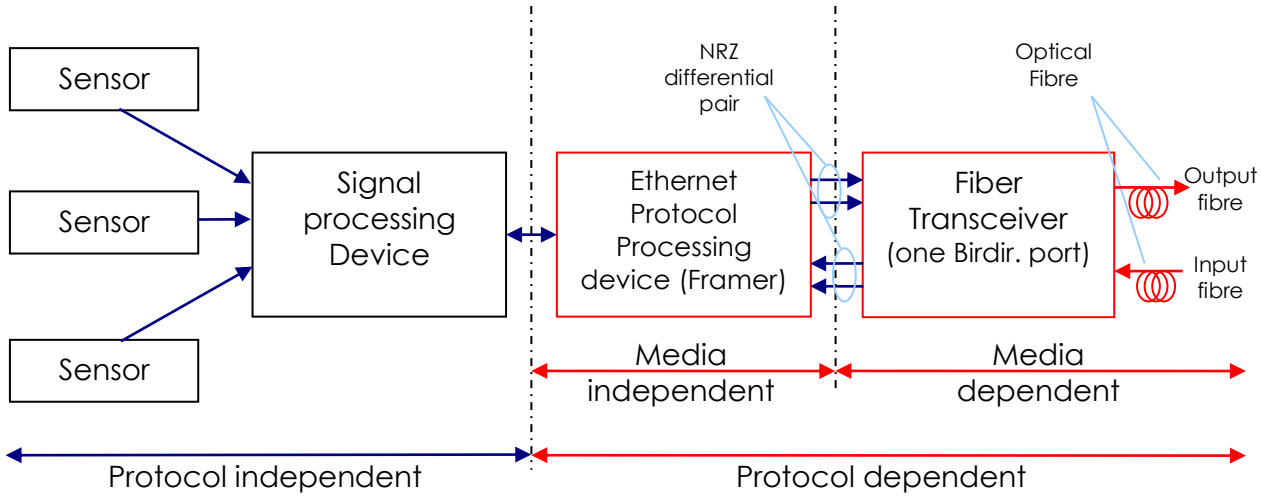
Copper based Ethernet data transmission

Generally the data transmission at high bit rates is done over **several differential pairs** to reduce the line bit rate and complies with the cable bandwidth (For example Gigabit Ethernet 1000 Base-T use four differential pairs each one at 250Mbps encoded in 5-Level signal).

2 Fibre implementation.

The fibre implementation of the previous Ethernet data transmission is presented on the following figure. All the protocol independent parts are the same, as the media independent one. Only the transceiver is modified to accommodate the media characteristics and performances :

- The Transmitter part of the transceiver gets the differential NRZ based band data flow and modulates the optical power of a laser source to transmit the information.
- The receiver part of the transceiver demodulates the information from the light intensity modulation and delivers back the differential NRZ based band data flow corresponding to the transmitted one.



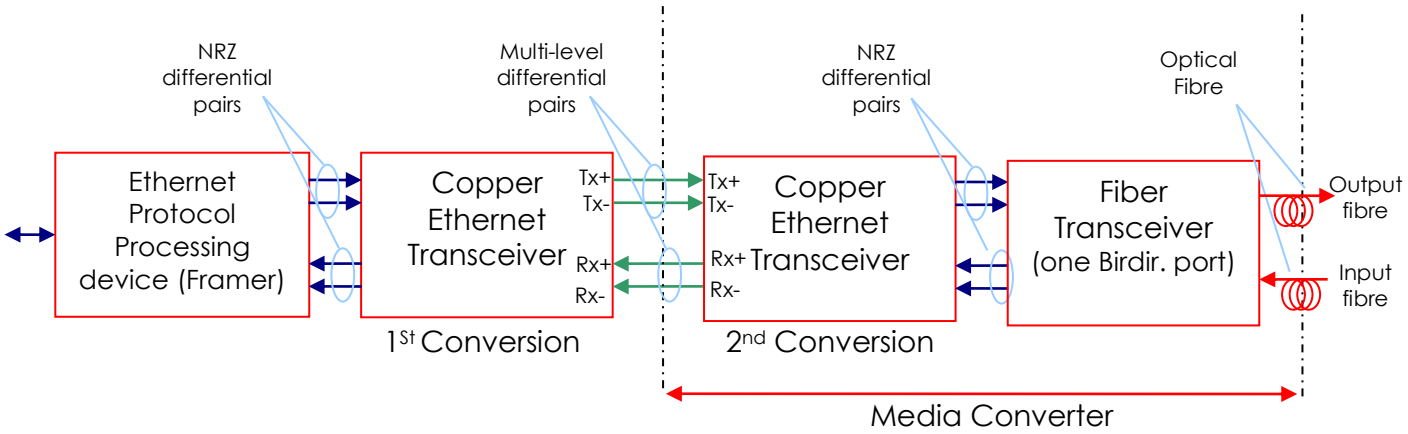
Fiber based Ethernet data transmission

There is, in this case, only one fibre per unidirectional channel. Generally an Ethernet port (Fast, Giga or 10GEth) is composed of the transmitter channel (a differential pair if copper implementation) and of the receiver channel (a differential par if copper implementation).

3 Media converter implementation.

The Media convert approach is not the optimized solution to convert Ethernet over Fiber: The PHY conversion is done twice resulting in excessive power consumption and accumulation on modulation demodulation scheme that add jitter to the link. However this approach can be used to update/upgrade legacy copper based Ethernet link to fiber without modifying the existing hardware.

A Media converter is composer by the line transformer and an Ethernet PHY that convert back the multi-level modulation differential pair into a base band NRZ differential pair compatible with fiber Transceivers.



Ethernet to Fiber Media converter