

Differential Signaling

A Brief Introduction

CECS 460

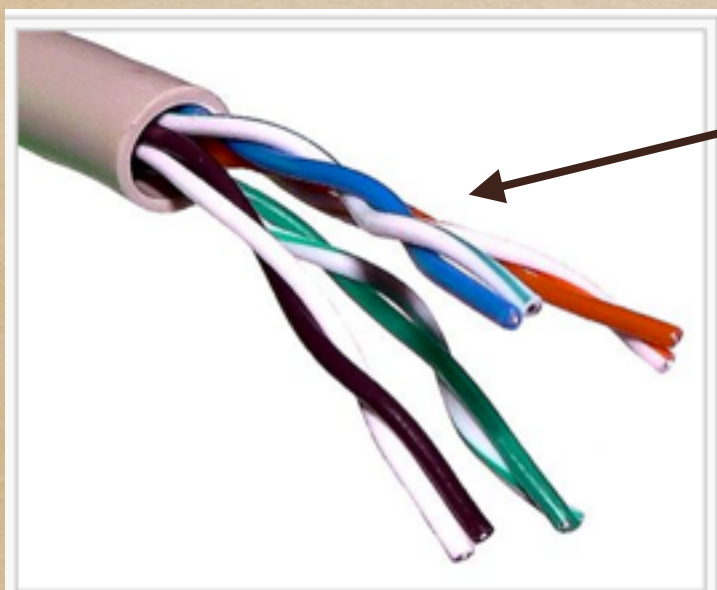
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Differential Signaling

- ◆ A method for electrically transmitting information using two complementary signals
- ◆ The same electrical signal is communicated as a differential pair of signals - each its own conductor
- ◆ This approach is different from "single-ended signaling" where one wire carries one electrical signal
- ◆ Single-ended signaling must include a reference voltage, or ground in order for the receiver to correctly reference the high/low voltages

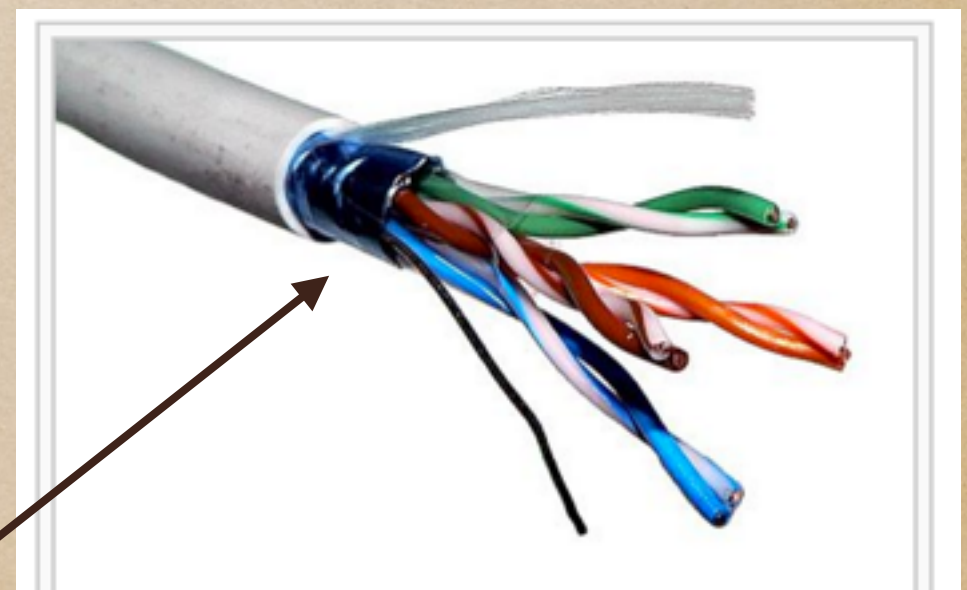
Twisted Pair Cabling

- ♦ A type of wiring in which two conductors of a single signal are twisted together for the purposes of canceling out electromagnetic interference (EMI) from external sources
- ♦ This approach was invented by Alexander Graham Bell
- ♦ Unshielded twisted pairs are cables with multiple twisted pairs contained within a polyethylene jacket (similar to the telephone wiring in a home)
- ♦ Shielded twisted pairs attempt to prevent EMI by including an electrically conductive barrier to reduce the effect of EMI



Unshielded twisted pair cable with different twist rates

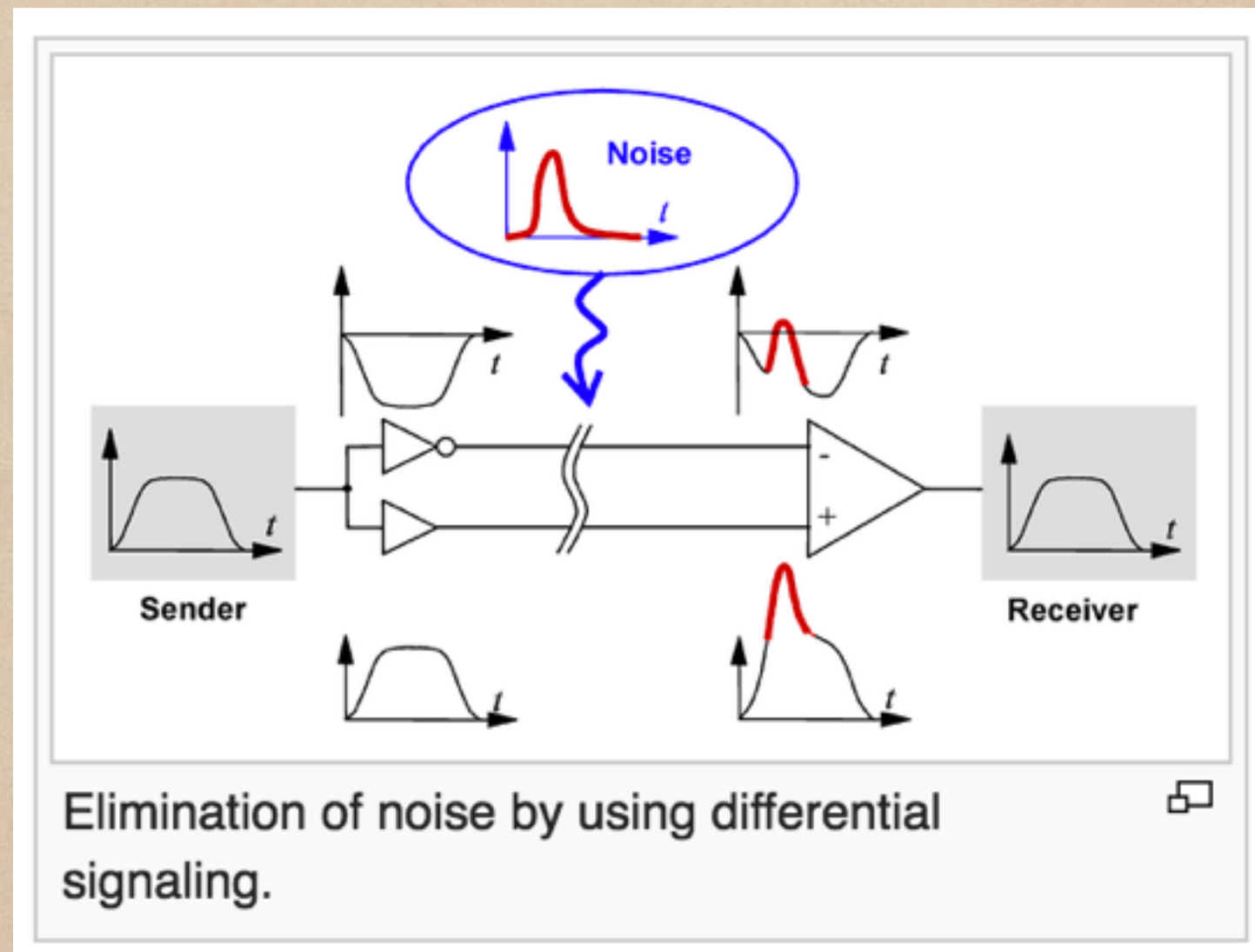
unshielded



shielded

F/UTP cable

Differential Signaling Graphic



On the left the signal is sent from the sender. It is then run through a differential driver to produce a positive and negative component. During transmission of the signal noise (red) is injected equally on both differential signals. Since the receiver is measuring the difference between the two signals the effect of the noise is cancelled.

Low-Voltage Differential Signaling

- ◆ Low-voltage differential signaling (LVDS) is a technical standard that specifies the electrical characteristics of differential, serial communications protocol
- ◆ LVDS runs at low power and very quickly using twisted-pair copper cables
- ◆ Typical applications are high-speed video, graphics, video camera data transfers, and general purpose computer buses
- ◆ SERDES (Serializer/Deserializer) interfaces convert parallel data to serial for communication of differential signals to achieve high-speed low-power communication