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ECE 453
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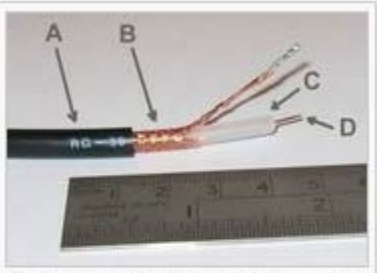
Task 1: Make an Ethernet cable yourself.

You are required to make the cable within 20-minute period of time in FH422 (the networking lab). The TA will be there to check you out. You can gather as many references as you can prior to the checkout. The checkout time is Sep. 11, 13, 18 (10:00am-12:00pm).

Report: Write a 1 to 2 page report describing the following:

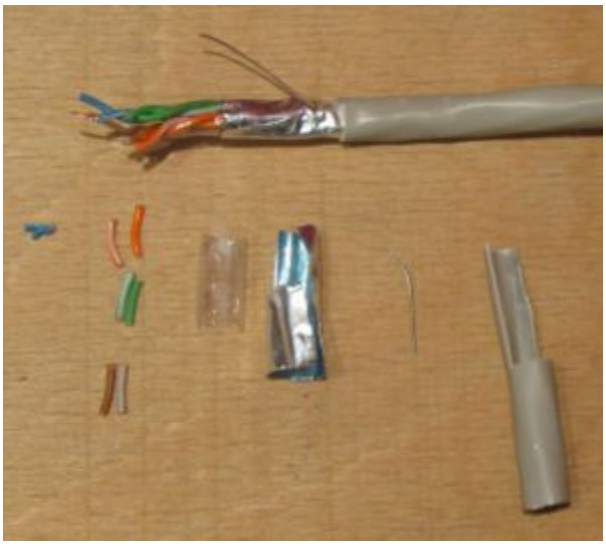
- What are the pros and cons between twisted pair and coaxial cable? What kind of application use which media?
- So far, how many different twisted pair technologies have been implemented with what kind of bandwidth?
- Which of the 8 pins of RJ45 are for transmission and which are for receiving? And which pins are connected to which color-coded wire?

There are many different types of transmission cables, two of the major ones that have been studied thus far in this class are twisted pair and coaxial cable, each with their own pros and cons. The first cable that will be discussed in this report is the coaxial cable. Coaxial cable is an electrical cable consisting of a round conducting wire, surrounded by an insulating spacer, surrounded by a cylindrical conducting sheath, usually surrounded by a final insulating layer. It is used as a high-frequency transmission line to carry a high-frequency or broadband signal (wikipedia.com). A picture of the coaxial cable can be seen to the right. The benefits of this type of cable is that Because the electromagnetic field carrying the signal exists (ideally) only in the space between the inner and outer conductors, it cannot interfere with or suffer interference from external electromagnetic fields. Another benifit is because it can handle high-frequency transmission the bandwith is quite large. The downside to coaxial cable is Despite being shielded, interference can occur on coaxial cable lines. Eventually, the insulation degrades and the cable must be replaced, especially if it has been exposed to the elements on a continuous basis. The copper screen is normally grounded, and if even a single thread touches the inner copper core, the signal will be shorted out. Short coaxial cables are commonly used to connect home video equipment, in ham radio setups, and in measurement electronics. They used to be common for implementing computer networks, in particular Ethernet, but twisted pair cables have replaced them in most applications. Long distance coaxial cable is used to connect radio networks and television networks, though this has largely been superseded by other more high-tech methods (fibre optics, T1/E1, satellite). It is still common for carrying cable television signals. Micro coaxial cables are used in a range of consumers devices, military equipment, and also in ultra-sound scanning equipment.



Radio-grade flexible coaxial cable.
A: outer plastic sheath
B: copper screen
C: inner dielectric insulator
D: copper core

The second type of cable is the twisted pair cable. Twisted pair cabling is a common form of wiring in which two conductors are wound around each other for the purposes of canceling out electromagnetic interference which can cause crosstalk. The twist rate (usually defined in twists per meter) makes up part of the specification for a given type of cable. The greater the number of twists, the more crosstalk is reduced. Twisting wires decreases interference because the loop area between the wires (which determines the magnetic coupling into the signal) is reduced as much as physically possible, and the direction of current generated by a uniform coupled magnetic field is reversed by every twist, so that the currents in successive twists cancel each other. Twisted pair cables are often shielded to prevent electromagnetic interference. Because the shielding is made of metal, it also serves as a ground. This shielding can be applied to individual pairs, or to the collection of pairs. When shielding is applied to the collection of pairs, this is referred to as screening. There are several applications of twisted pair cabiling two of them are Data Networks. Twisted pair cabling is often used in data networks for short and medium length connections because of its relatively lower costs compared to fiber and coaxial cabling. In telephone applications, UTP is often grouped into sets of 25 pairs according to a standard 25-pair color code originally developed by AT&T. A typical subset of these colors (white/blue, blue/white, white/orange, orange/white) shows up in most UTP cables. A picture of a screened shileded twisted pair can be seen to the right. There are several different types of the twisted pair cables.



- Unshielded Twisted Pair (UTP)
- Shielded Twisted Pair (STP)
- Screened Shielded Twisted Pair (S/STP)
- Screened Unshielded Twisted Pair (S/UTP)

The pin layout for a networking ethernet cable can be seen below. This type of cable is twisted pair. The color wire is twisted with the striped wire of the same color.

RJ45 Pin #	Wire Color (T568A)	Wire Diagram (T568A)	10Base-T Signal 100Base-TX Signal	1000Base-T Signal
1	White/Green		Transmit+	BI_DA+
2	Green		Transmit-	BI_DA-
3	White/Orange		Receive+	BI_DB+

RJ45 Pin #	Wire Color (T568A)	Wire Diagram (T568A)	10Base-T Signal 100Base-TX Signal	1000Base-T Signal
4	Blue		Unused	BI_DC+
5	White/Blue		Unused	BI_DC-
6	Orange		Receive-	BI_DB-
7	White/Brown		Unused	BI_DD+
8	Brown		Unused	BI_DD-

Task 2: Design a Home Network

Assumptions:

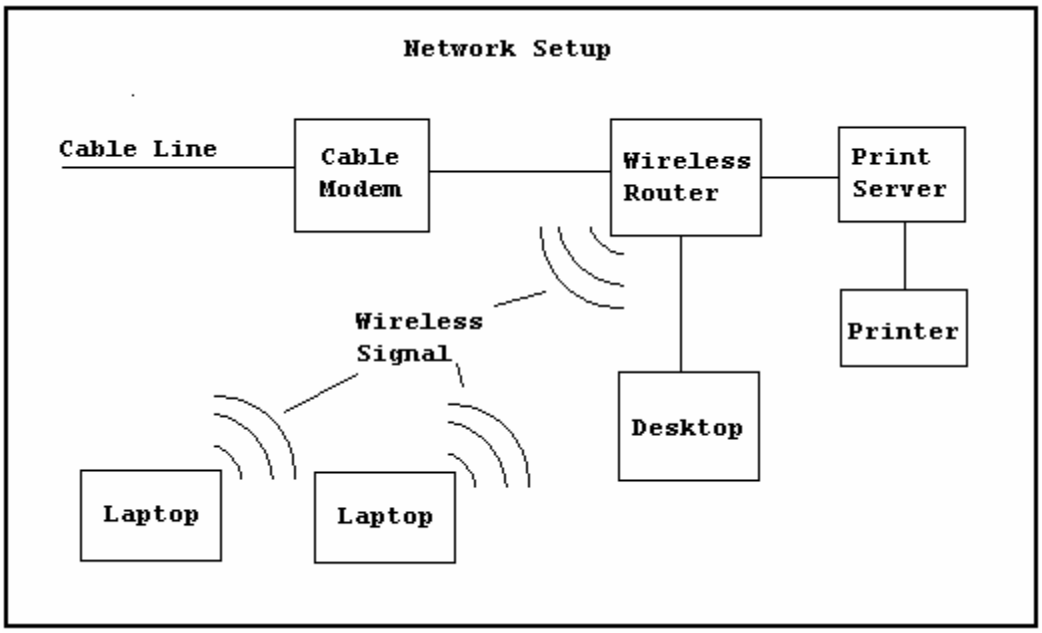
- There are two laptops (with built-in network card and wireless card, 2 USB ports, built-in modem), one desktop (with modem only), and one printer in the house. (Note that the operating system installed on these computers shouldn't affect your design. The assumption is that if the design works under windows, it SHOULD work under Linux as well.)
- The house has one telephone line.
- The house has cable TV.

Requirement: Design a home network such that multiple users can access the Internet and the printer at the same time.

- Budget: initial setup should cost no more than $350 (not including monthly fees)
- Easy to construct (that is, not much reorganization of the house needs to be made)
- A downstream data rate of at least 1 Mbps (in theory)

In order to solve this problem I chose the simplest possible setup that I could think of. I would order a cable modem and use the existing cable line to plug into it. Next the modem would go to the wan port on the wireless router. I used a wireless router so that the two laptops could access the internet wirelessly. The wired ports on the router would split off to the print server, and to the desktop computer which now has a network interface card. The reason a print server was used for the printer was because it could be set up such that the laptops could print wirelessly which is very convenient. Also aside from being a very simple and efficient setup it is also relatively inexpensive. A diagram of the network setup can be seen below in figure 1.

Figure 1.



The following parts would need to be picked up at the local CompUSA:

	Motorola SB5120 SURFboard Cable Modem - Product Number: 329425 - Mfr. Part #: 505788-006-00 - Brand:	**$79.99**
	NETGEAR WGR614 Cable/DSL 54 Mbps Wireless Router, 802.11g - Product Number: 302517 - Mfr. Part #: WGR614NA - Brand:	Was: ~~$59.99~~ **$29.99** SAVE $30 after: $20.00 instant savings $10.00 mail-in rebate(s)
	TrendNet TE100-PCIWN 32-bit PCI 10/100Mbps N-way Fast Ethernet Card - Product Number: 50243697 - Mfr. Part #: TE100-PCIWN - Brand:	**$8.99**
	D-Link DP-G310 AirPlus G High Speed 2.4GHz Wireless Print Server, 802.11g - Product Number: 311815 - Mfr. Part #: DP-G310 - Brand:	**$99.99**
Total Price:		**$218.96**