

Practicum Module I

Network Media

Competencies:

- ❖ Students know the kinds of cables used as media in computer networking
- ❖ Students can prepare, use, and test UTP cables

Tools and materials:

- 2 meter UTP cable (2 pieces)
- RJ-45 connector (minimum 5 pieces)
- Crimping tool
- Cable Tester (optional)

Theory Review:

Communication in the computer network requires a media to deliver messages from source to destination and vice versa. Media in the network or commonly called network media consists of several types, including copper cables, fiber optic cables (as in Figure 3), and wireless. The copper cable media itself is divided into two, namely coaxial cable (Figure 1) and UTP cable (Figure 2). In this experiment, we will discuss in more depth about the copper cable media in the form of UTP cable.

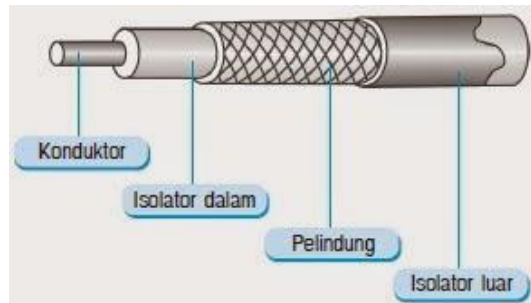


Figure 1. Coaxial

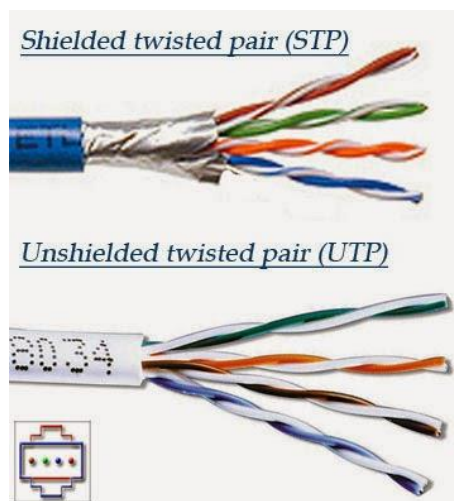


Figure 2. UTP dan STP

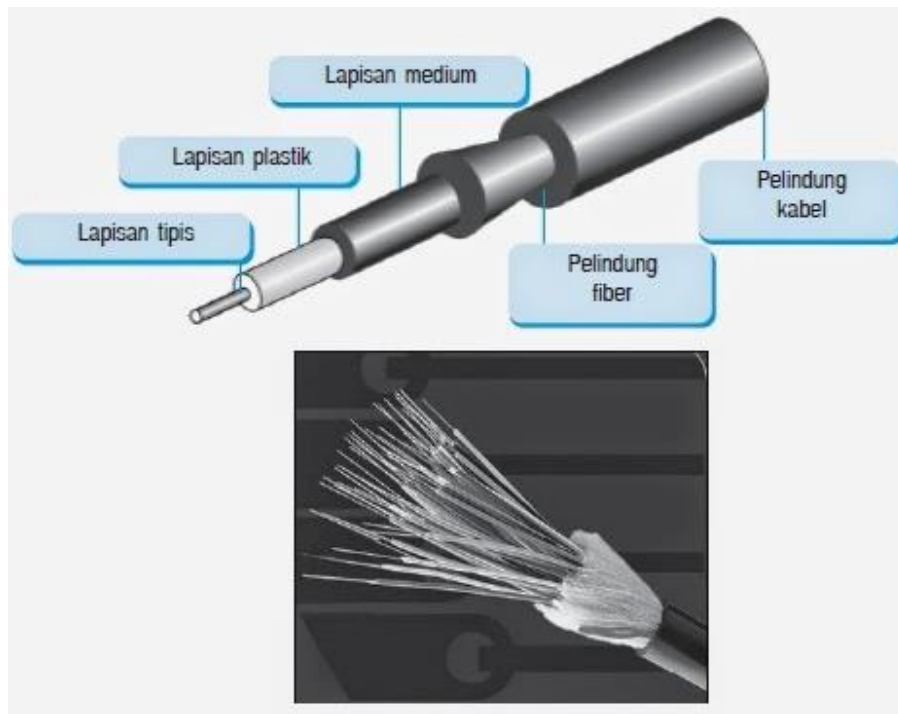


Figure 3. Fiber Optic Cable

Copper cable media in the form of UTP (Unshielded Twisted Pair) cable consists of four pairs of different colors and is twisted in each pair of cables. The four pairs of twisted wires are then twisted together (as in Figure 2). The reason why the pairs of cables are twisted, among others, is to reduce noise and interference around the cable which can degrade the performance of the media. The four pairs of colors are include orange, white orange, green, white green, blue, white blue, brown, and white chocolate.

To use UTP cable media, it requires a connector located at each end of the UTP cable. The connector is called an RJ-45 connector. The RJ 45 connector has 8 holes that are used to insert a UTP cable (as shown in Figure 4).



Figure 4. RJ-45 Connector

Differs from the installation of connectors on other cables which are generally done by soldering techniques, installation of UTP cables on RJ-45 connectors is done by clamping techniques using crimping tool. The crimping tools can be seen in Figure 4. After clamping using crimping tool, the cable is first checked for connection results using a cable tester. This check is carried out to ensure all cables have been properly attached/clamped in the RJ-45

connector. So that the electricity that flows at one end of the connector can flow to the other end of the connector. This is very important, because if there are one or more cables that are not attached / pinched properly so that the cable cannot conduct electricity and it is certain that data communication that passes through the media will not work perfectly. In addition to checking whether all cables have been installed properly, testing with a cable tester also serves to check whether there is a cable that is installed upside down when installing the UTP cable to the RJ-45 connector. Because if there is one or more reversed cables, it can be ascertained that data communication that passes through the media will not run perfectly and will not run at all. An example of the tester cable can be seen in Figure 5.



Figure 4. Crimping tool



Figure 5. Cable tester

The installation of UTP cable can not be done arbitrarily because there are standards that set the order of cabling in the RJ-45 connector. These standards are EIA/TIA 568A (or commonly referred to as T-568A) and EIA/TIA 568B (or commonly referred to as T-568B). The order of cables in each standard can be seen in the figure below.

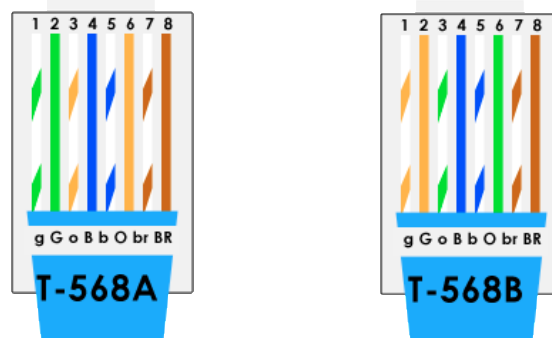


Figure 6. T-568A and T-568B

Based on these standards, there are several types / types of UTP cable. The types of UTP cables are straight through, crossover, and rollover. Each type has different functions and uses.

❖ Straight Through

Straight through cable has the same arrangement of cables at both ends. In other words, if one end uses the T-568B rule, then the other end also uses the T-568B rule. And vice versa, if one end uses the T-568A rule, the other end also uses the T-568A rule. Cables of this type are usually used to connect two different types of network devices. For example, to connect a PC with a switch, connect a switch to a router, and so on.

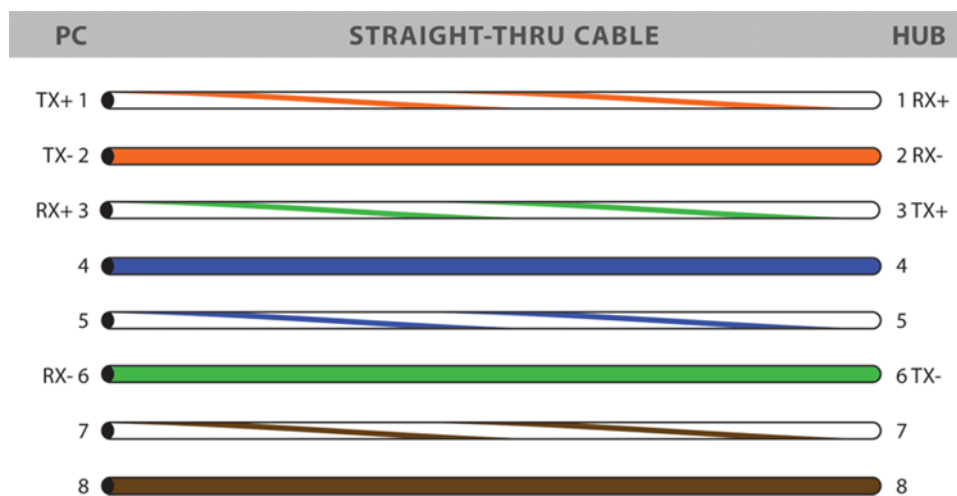


Figure 7. Example of Straight Through Using T-568B Standar

❖ Crossover

This type of cable has a different arrangement of cables at both ends. In other words, if one end uses the T-568B rule, the other end uses the T-568A rule. And vice versa, if one end uses the T-568A rule, the other end uses the T-568B rule. Cables of this type are usually used to connect two network devices of the same type. For example, to connect a PC with a PC, Switch to a Switch, a Router to a Router and so on.

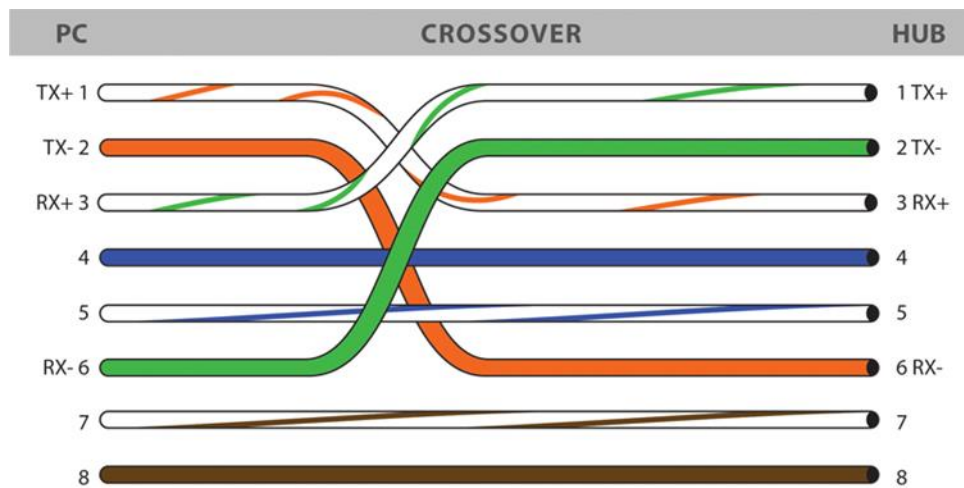


Figure 8. Example of Crossover using T-568B - T-568A

❖ Rollover

Rollover cable has a different cable arrangement at both ends and is not the same as the crossover cable arrangement. The arrangement of the cables is reversed from one end to the other. If at the other end of the orange cable is on pin no. one then at the other end of the orange cable is on pin no. eight. If at the other end the orange-white cable is on pin no. two then at the other end of the orange-white cable is on pin no. seven. And so on. For more details, see Figure 9. This type of cable is usually used to connect a PC to a CISCO device via its console port.

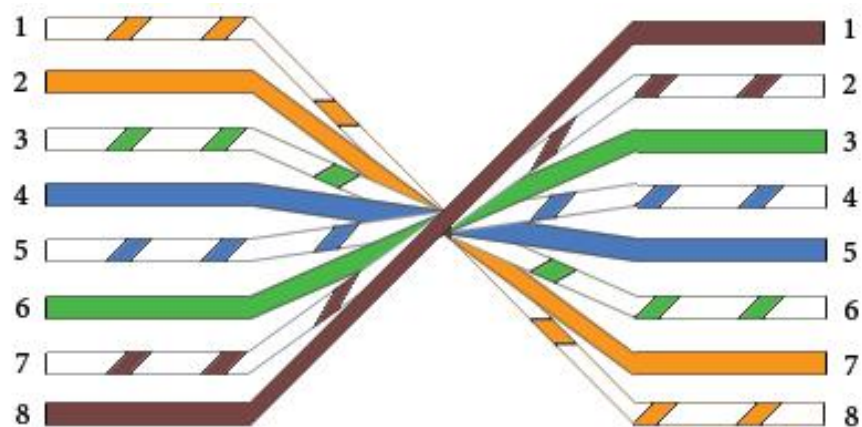


Figure 9. Crossover T-568B

Practical Steps:

In this practicum, two types of cables will be made. The cable types are Straight Through and Crossover.

1. Prepare a cable that you have brought and select one end of the cable to work on first.
2. Peel the outer skin of the cable using the cutters on the crimping pliers. Peel about 1 to 1.5.



Figure 10. Stripping Cable Using Crimping Pliers



Figure 11. Results of Stripping Cable Using Crimping Pliers

3. After peeling the outer skin, separate each twisted cable and arrange it in order of color according to the standard cable arrangement you will be using (T568 A or T568B).

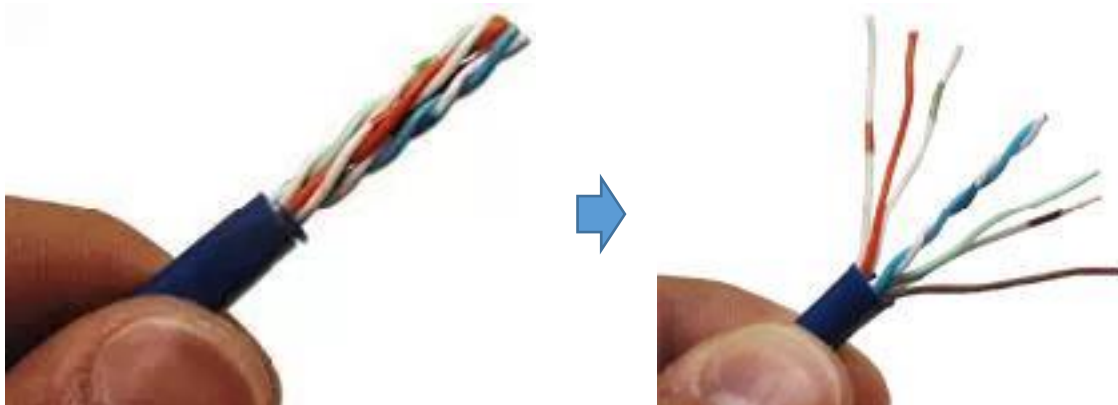


Figure 12. Separate the twisted cable

4. For preparation, the cable on the far left side is the cable with the smallest sequence, which is the order no. one. Where for cables with standard T-568A cables that are on

the far left side is a green-and-white cable. As for cables with standard T-568B, the cable on the far left side is an orange-white cable.

5. Once sorted, straighten the small cable in parallel and flatten the surface of the cable until it looks like it's in Figure 13.

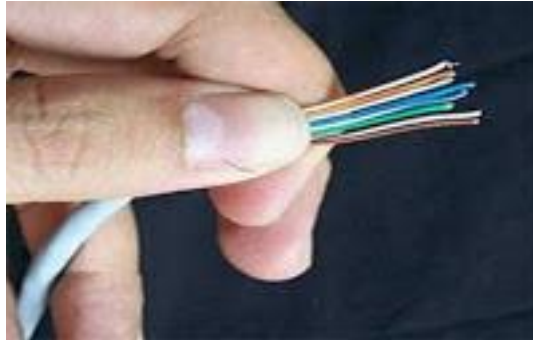


Figure 13. Examples of Cable Alignment and Alignment Results

6. Once confirmed the surface is flat and straight, align the length of the end of each cable by cutting it using a cutting tool on the crimping tang. Flatten until all ends of the cable are flat.

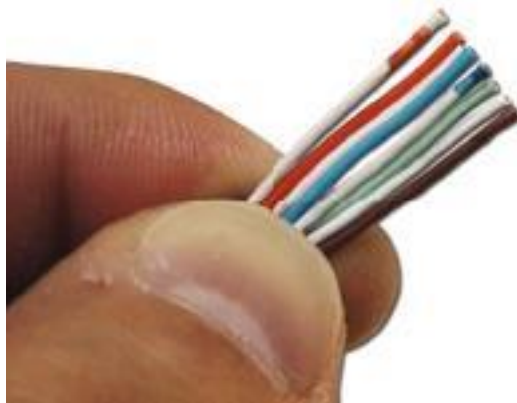


Figure 14. Examples of Cable End Alignment Results

7. After that insert the cable into the RJ-45 connector with the connector locking position on the lower side of the connector.

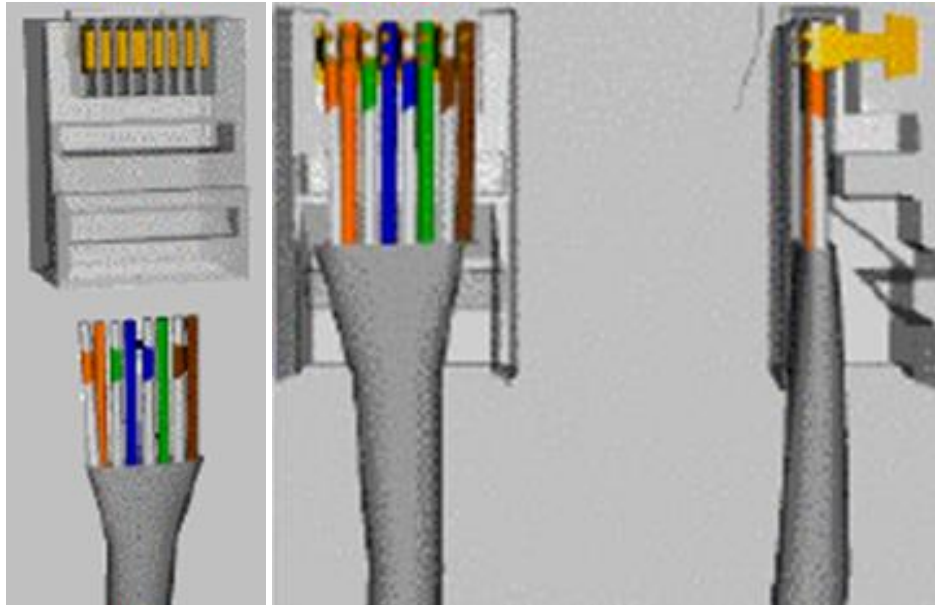


Figure 15. UTP Cable Position on RJ-45 Connector

8. Once the UTP cable is inserted into the RJ-45 connector, the RJ-45 connector clamps using a crimping plier. While clamping, push the cable in the direction of the connector so that all the cables get into the connector in the proper position so that all cables can be pinched perfectly. Try to push the cable in the position closest to the connector to be clamped to avoid missing the cable from the connector. Pinch the connector until a clicking sound is heard.



Figure 16. Clamping RJ-45 Connectors Using Crimping Pliers

The result of a good wiring process is a cable sheath wedged in the cable lock inside the connector. Also all incoming cables are flat, pegged and pinched by the copper connector at the end of the connector. Examples of good wiring results can be seen in the Figure below.



Figure 17. Examples of Good Wiring Results

9. Once the RJ-45 connector and UTP cable have been clamped, repeat the first step up to eight for the other end of the cable.
10. After both ends of the cable have been clamped using a crimping plier, test the results of the crimping using a tester cable. Insert the connector into the tester cable. Then turn on the tester cable by moving the switch in the on position. And look at the tester cable lights that will run in order from no. one to eight.



Figure 18. Testing the Results of the Crimping Process Using a Tester Cable

What needs to be considered here is the light on the small part of the tester cable. If the light on the tester cable is small and the tester cable on the largest part all lights up well then it can be ascertained that the cable that has been made has been well connected. The next stay we examine again the sequence of tester cable flames is appropriate or not with the type of cable that is made. The point is that if the cable made is a type / type of Straight Through cable, then the flame on the tester cable must be sequenced from no. one to no. eight on both sides. If not, then the cable must be repaired and viewed again at the end of whichever cable is located incorrectly.

After finding the wrong side of the cable, cut the cable next to the connector on that side and repeat steps one through eight. And keep in mind, the RJ-45 connector that has been squeezed can no longer be used and must be discarded. If all the sequence of flames on the tester cable has been in accordance with the type / type of cable made, then the wiring process has been completed and the cable can be used as it should be.

Assignment

1. Make a Straight Through cable using the T-568B standard.
2. Make a Crossover cable using the T-568B – T-568A standard.
3. Write your Name , NIM, and class on each of the cables you make and give them to Lecturer.