

COMPUTER NETWORKS 1 PROJECT

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Assignment:

Design, implement and test a local area network as instructed in the assignment brief.

Design:

The main point of the design request is to insure that the network would be able to handle the arrival of new staffs. Toward this objective, switches with at least 8 ports each have been allocated to each office to facilitate the set up of new hardware as well as their wiring. It would set up the company for even further staff growth that the one already planned, also all switches should have their own cabinet in their respective offices to simplify future connection. A 16 port switch has been selected for the production and quality control area to cope with any staff growth. All the switches are equipped with VLAN ports which will allow to connect one VoIP phones and one PC on the same port as shown in Figure 1 and at the same time accommodate the printers.



Figure 1 - Example of VoIP phone PC connected on the same port

All the wireless routers will also be connected to switches, namely the reception switch for the wireless access point of the reception and the building 2 switch for the manufacturing wireless access point routers. Also, the main connection router by which the internet connection arrives will be situated in the communication cabinet and is connected to the hub.

A 8 ports hub near the reception will be connected to all the building 1 switches, the optical fibre cables linking building 1 to building 2, the server and the main connection router.

Two 500 meters simplex, multimode optical cables are required to link building one and two, the optical fibre cables have been picked because the cables will not need to be spliced at any point as they offer very little data losses; their sturdiness, durability and cost are also a reason for this choice. But given that those cables are simplex, two of them are required to insure the communication in both directions, a duplex optical cable could also be

considerate which means there would be only one cable between building 1 and 2 but it is also much more expensive.

Cat5E cables are advised to link the PCs, printers, server, VoIP phones and wireless routers to the switches else except if specified cat6 cables should be use. The choice of those cables might seem a bit of an overdesign but with the ever growing use internet in businesses and the constant increase of the files size this would set up the company for the year to come. Also the cat5E cables will be able to power up the VoIP phone from the switches if the client desires so, some extra cables may be needed as the designer does not know if cables will be supplied with VoIP phones and they may be needed to connect them to the PCs. For technical reason **none of those cables should span more than an 100 meters**, if they do splicing will be required as shown in:

<https://www.youtube.com/watch?v=gAsVuC2v2mY>

For a more detailed breakdown of the hardware required for this project, please consult the excel file joined to this document (Equipment.xlsx).

Implementation:

Please find the topology diagram of the local area network in the following page (Figure 2).

Toward the IP addressing problem, it would be advisable to static routing to allocate IP addresses to the hardware in the network as the IP addresses of the devices would stay the same at all time contrarily to DHCP routing where the IP addresses of the devices would change to each new connection to internet. This would greatly facilitate the communication between devices inside the company network as pre-assigned addresses for each device would be much quicker and more efficient than to have to fetch the new address of the device you are trying to communicate with mostly if working with a range of addresses for each office (i.e. range 192.168.101.100 to 192.168.101.199 for the engineering office, 192.168.101.200 to 192.168.101.299 for the management office and so on). It would also facilitate the testing and debugging of the network if it is needed. It is to be underlined than even though the wireless routers can be assigned static addresses, it would be wise to keep their own internal routing tables in DHCP mode as setting up static IP addresses for the great number of mobile devices used by either the staff or visitors would prove itself to be very challenging and time consuming.

The static option is only possible because of the small size of the business. In case of a very large expansion in the future, it would be preferable to use DHCP with reservation where the ISP will allocate the IP address for the devices but where a DHCP server would reserve them for a determinate amount of time. The choice would be depending of the vision of company growth in the next few years by the client.

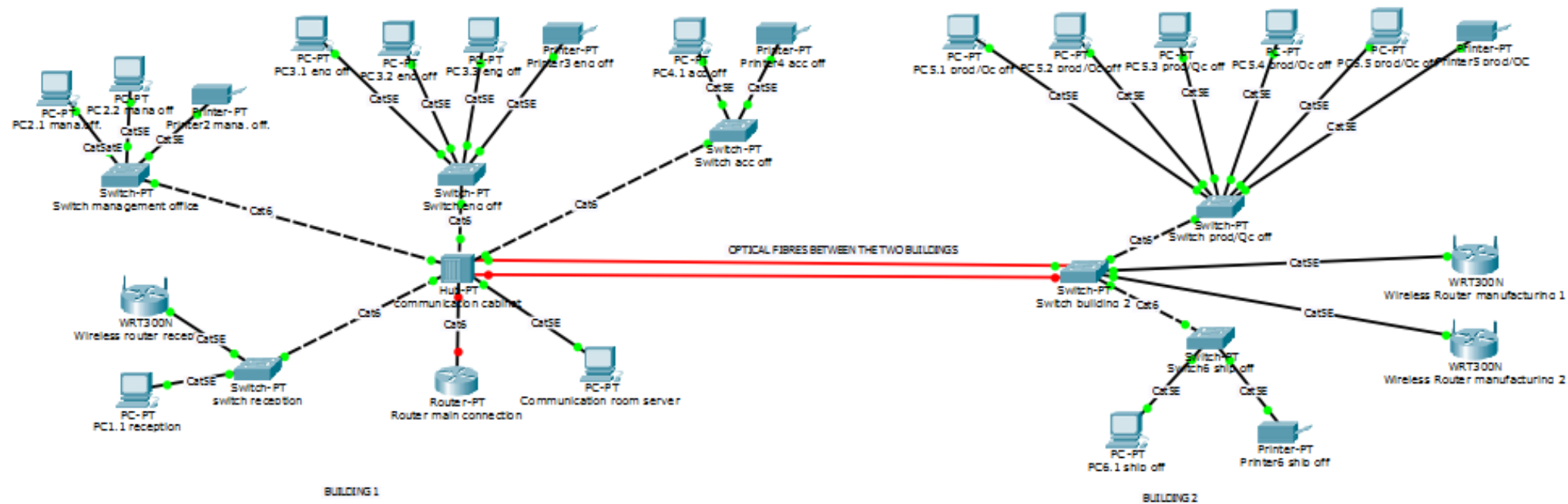


Figure 2 - LAN topology diagram

Test:

First thing to do when testing is to assert the IP address of the PC you are using by typing in the command prompt window the **ipconfig/all** command.

The second step is to "ping" all the other devices of network which have been attributed an IP address using the command **ping <IP address>** (i.e. ping 192.168.101.203). The IP addresses should be already known if the network routing tables have statically set. If one device does not answer the ping command, the cable connections to the switch and the device should be check and the ping operation repeated, if it still does not work unplug the cable going to the device and plug it to another device (i.e. laptop) and run the **ipconfig/all** command and if the IP address appears the device is at fault and should be reconfigured, if not change the cable leading to the switch (even though the company electrician should have check the cables). If a whole cluster is missing (i.e. the engineering office devices), the connections to the switch and the hub should be checked and make sure that the switch is turned on then repeat the ping command to the devices in the cluster, if the problem persist change either the switch or the cable running from the hub to switch.

Thirdly, the connection speed can be tested by installing specialised software on the PCs and detect if there is any drop of speed in the network, if it happens troubleshoot it and fix it.

For the wireless internet access in the reception area and the manufacturing floor, a few mobile devices should try to connect them to the wireless network, if does not work the wireless routers set up and their connections should be checked. If successful, the IP addresses of the mobile devices should be determined and a ping command should be send to determined if they are connected to the network, if unsuccessful once again the routers set up and their connections should be checked. The mobile devices should also be installed with specialised software to determine if there is any drop in the speed of the connection.