

SY1S51 - CSNC
Network Design and Disk Analysis

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Part A

Network Design

The network has to be wireless. It will use the IEEE 802.11g standard. Because it uses the 802.11g it is capable of transmitting at a maximum of 54 Mbit/s. This means that it will be able to send 54 Mega bits of data over the network every second. Although that is the maximum speed, the network will very rarely be able to provide this much bandwidth. The average bandwidth speed will probably be around 19 Mbit/s. Because it is a wireless based network we will have to make sure that it is secure so that the data on the network is safe from unauthorised access. This can be done by enabling Wired Equivalent Privacy (WEP) encryption. This will encrypt all data that is sent over the network.

We will also hide the Service Set Identifier, SSID, of the wireless network so that unauthorised people will not be able to pick up the network by accident, although this will not stop someone from finding out the SSID because each time a node connects or transmits the SSID is sent in plain text. Passive sniffers can easily take advantage of this.

I have chosen "BT Total Broadband: Option 3" this will provide the network with a wireless enabled router, BT Home Hub, as well as an asymmetric broadband connection, this means that the download speeds are faster than the upload speeds. This could cause a problem for a small business that does a lot of uploading to the internet. But for a simple home network like this the need for fast uploading speeds is low. If the landline local exchange has been enabled to provide a decent connection then the network will be able to have speeds of 8 Mbit/s. But if the network is situated a great distance from the exchange then it may not be able to get very good speeds, for the best connection speeds you should be in around a five mile radius. I have chosen BT because they are the most reliable in my area.

There are three types of networks. These are Server-based (Client-Server), Peer (Peer-to-Peer) and Hybrid. After looking over the advantages and disadvantages I have decided to use Hybrid. See Appendix A for the advantages and disadvantages of the different types. A hybrid network has all three types of network operating on them. So this means that there is a server which will provide things like printing and backup and there will be a peer to peer network where all of the nodes share disk space and resources.

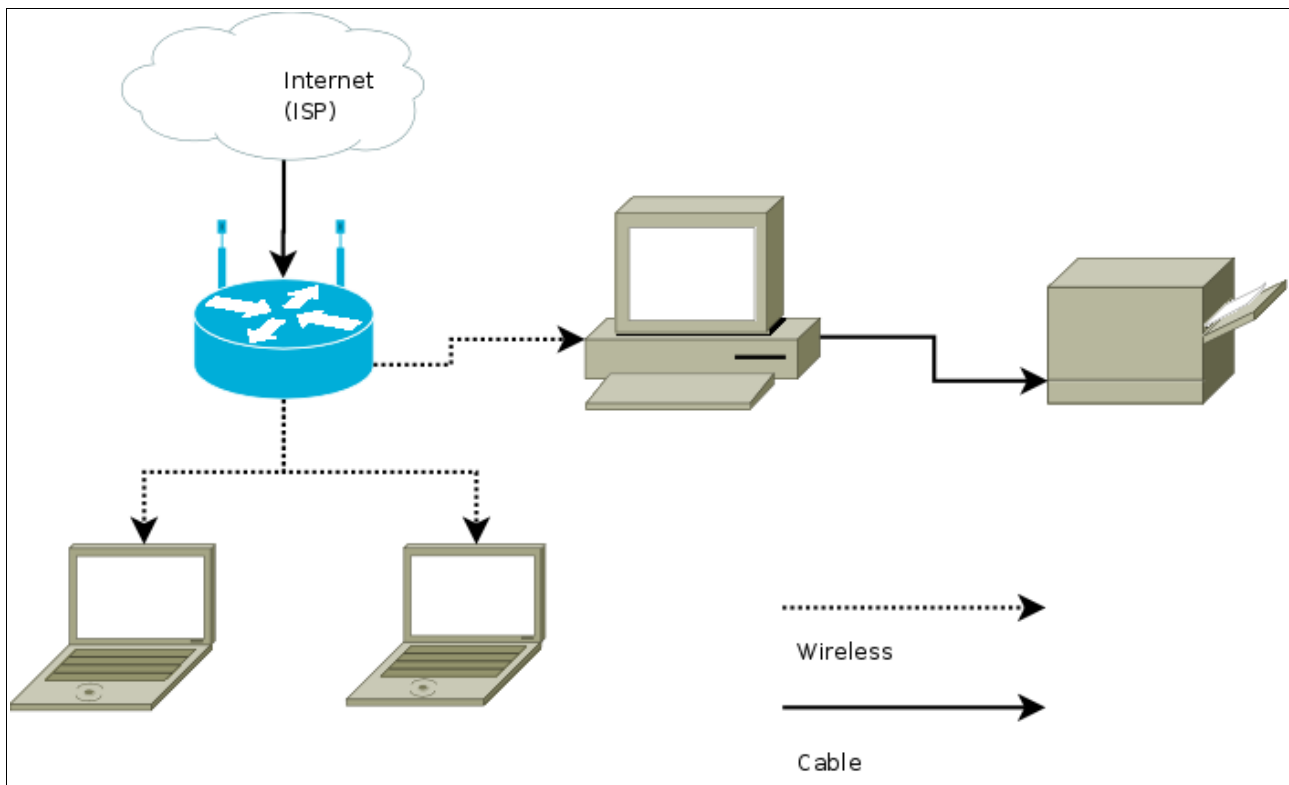


Diagram 1: Basic Network Design

As you can see in diagram 1 the network will be based on a Star topology. This is where all the nodes are connected to one device in the middle of the network. There are five primary topologies which are Bus, Star, Ring, Mesh and Hybrid. See appendix A for more of the advantages and disadvantages of the different types.

The network will use TCP/IP (Transmission Control Protocol / Internet Protocol) to communicate with each node. To enable computers to communicate, they must be able to identify and locate each other. This is done by using IP addresses, e.g 212.219.112.19. A computer can be connected to more than one network, by having more than one address (and network interface card). The IP addressing system is Layer 3 of the OSI model, see Appendix A for more information about the OSI layers.

The way that computers are assign an address is in two ways:

1. Static – Manually assigned by the system administrator
2. Automatic – Automatically assigned by the Dynamic host configuration protocol (DHCP)

Because this is going to be a non-public network we will be using private IP addresses, and this will be a relatively small network it will use the Class C (see appendix A for more information about the different classes) internal Address Range which can be from 192.168.0.0 to 192.168.225.225. This means that we will only be able to have 253 nodes connected unless we change to a Class B

network.

Each of the computers have to have a Network Interface Card (NIC). This can be a wired Ethernet NIC or a wireless NIC. As you can see from Diagram 1 there will be one desktop connected to a printer. The Network is designed for two laptops but it will be able to support more. All of the computers will be wireless connected. Because it is a star network they are all connected to one point in the middle, the router. A router provides layer 3 (OSI model) network connectivity, meaning that the router will assign an IP address to each node on the network.

The main reason for choosing a router is that it will be able to automatically work out if there is a new computer connected to the network and assign it with an IP address. The router is also an ADSL modem which means that it will be able to provide all the nodes connected to it with a connection to the internet. This has a firewall built into it so that only specific ports will be open to the public, any one that is not inside the network, this will stop a malicious person from attacking the computers inside the network. The router has a wi-fi transmitter and receiver built in which removes the need to use a extra wi-fi transmitter, unless we want to make the range of the wireless network bigger.

The desktop computer will be the main server. It will provide the other nodes with a place to store data, it will also act as a web server, proxy server and application server. It could also be used as a dedicated games server. This requirement to provide many different services means the system will have to have a high specification.

The operating system that will be used on the server will be Ubuntu Linux 7.10 Desktop Edition. Software that will be installed on it will be Apache (Web Server) and Squid (Proxy Server). The other services are already installed on the distribution. These are things like CUPS (Print Server) and samba (file server).

The reasons for the print and file server is to enable other computers, nodes, on the network to print to the printer and to share files in a client server manner with the desktop computer. Apache enable the server to act as a web server, which will serve web pages to nodes that request them from it, this could be used as a local place for users to develop web sites. Squid will enable the system to cache items from other servers to speed up access to web sites, this could be used for authorised users to connect from a public hotspot and securely use the internet.

The other clients that will be on the network will also use Ubuntu 7.10. The main reasons for this is that Linux is much more secure and reliable compared to Microsoft Windows. By using Linux there is no risk of a network virus. The laptops will have a built in wireless network interface card

which they will use to connect to the network. If the user wanted to add a laptop to the network that does not have built in NIC then they would have to buy a Personal Computer Memory Card International Association (PCMCIA) wireless network interface card, see appendix A for more information.

Possible Network Use

There are lots of uses for a network of computers. Here are some that are specific to this network.

- Each node connection to the internet
- Peer-to-Peer data storage
- Client-Server data storage
- Ability to share expensive equipment such as printers, plotters etc
- Web Server
- Application Server
- Proxy Server
- local/Internet Network Games
- Share music

This network would be useful for users that may want to develop internet applications that use many different server side technologies, without having to pay for the extras that a web host might provide. **[Needs More]**

Network Configuration

Because the network will be using a class C IP addressing system the IP address for all computers on the network will range from 192.168.1.2 – 192.168.1.253. The IP address 192.168.1.1 will be used for the Router., and will have the name 'main-router'. If the network was to have another router a suggestion for that name could be 'secondary-router' and have an IP address of 192.168.1.254.

Here is a network Diagram showing the naming system.

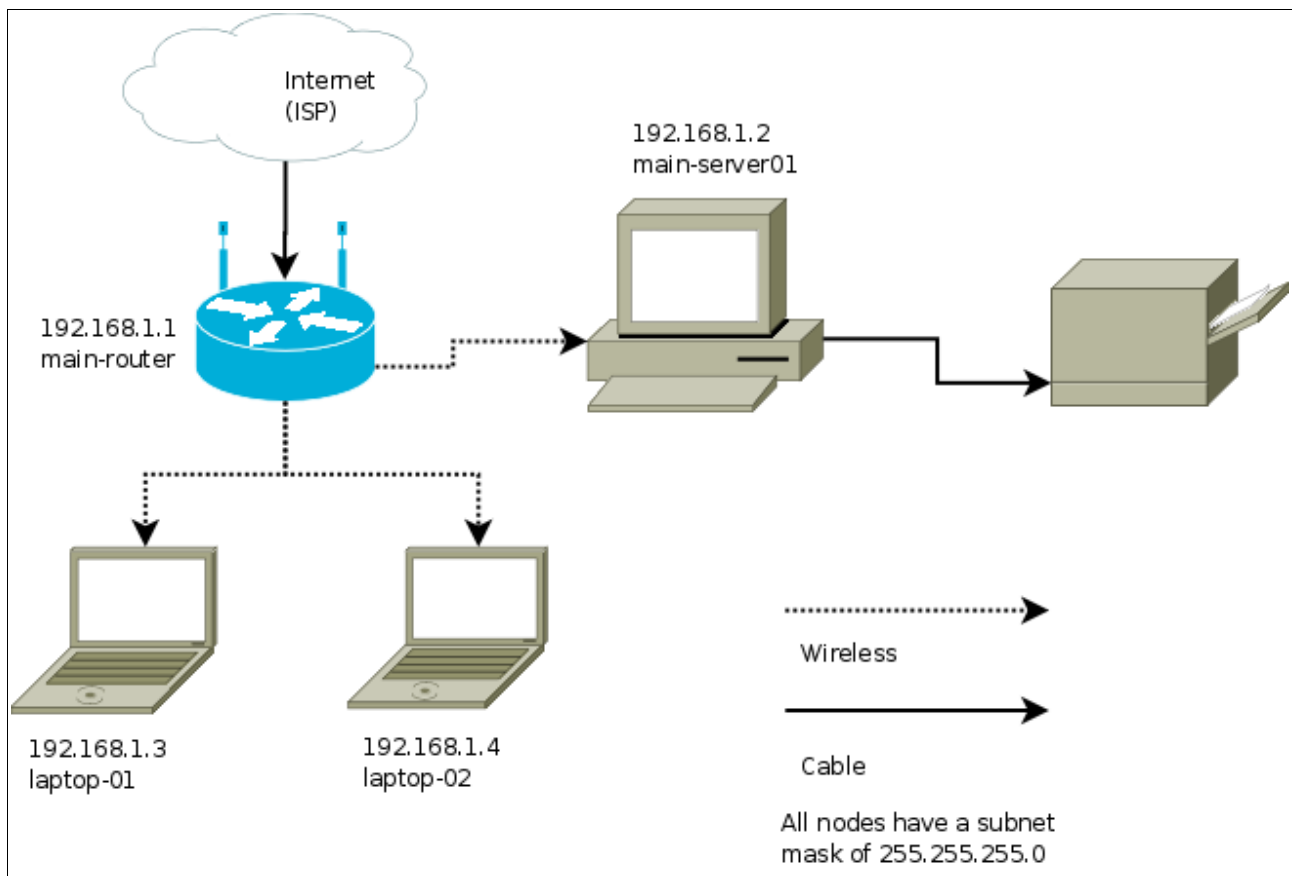


Diagram 2: Network Design showing IP address and naming scheme

The desktop computer will be configured to use a static IP address of 192.168.1.2. The other two laptops will automatically assigned by the router using DHCP. The naming system will be specific for each computer e.g a laptop will be 'laptop-92'. The number will be the number of the laptop, we have two laptops, they will be called 01 and 02, so there names are laptop-01, laptop-02. The desktop which will provide the network with some services will be called 'main-server01'

The Desktop, Router and Printer could be in the same room. This would mean that if the network

needs some maintenance all the equipment will be in the same room, it would also mean that the server would have a stronger connection to the network, as the further away from the router the weaker the signal becomes.

Conclusion

Below is a table that shows some of the advantages and disadvantages of having a wireless based network compared with a completely cabled network.

Advantages	Disadvantages
Easy and quick to set up	Slower bandwidth speeds
Not hard to make fairly secure	Not as secure as wired
Easy to add new nodes	Anyone can connect
Less equipment required so cheaper	Not as reliable as wired
Easy to move computers around	If you have thick walls you might not be able to get a signal

Because of the way that wireless network is done there is not much way of stopping other people from connecting to your network. Where as if you were using a wired network only people with physical access to the network equipment would be able to connect to the network. Some of the advantages of using a wireless network rather than a wired network is that it is possible for computers to run in ad-hoc mode where they are able to communicate with each other without any extra equipment, apart from a wireless network interface card. By using ad-hoc you are able to create a very cheap network that can support many computers but without any extra equipment, such as routers and server.

Part B

Directory Encoding

FAT Operations

Appendix A

Advantages and disadvantages of network types

Peer
Server
Hybrid

Five primary topologies advantages and disadvantages

Bus
Star
ring mesh hybrid

Explain about different private IP classes

Class A 10.0.0.0
Class B 172.16.0.0
Class C 192.168.0.0

PCMICA Information

<http://en.wikipedia.org/wiki/Subnetwork>

<http://en.wikipedia.org/wiki/WPA2>

http://www.linuxformat.co.uk/wiki/index.php/Set_up_your_printer

http://en.wikipedia.org/wiki/Hacker_%28computing%29#Black_Hat_Hacker

http://en.wikipedia.org/wiki/Ad_hoc

http://en.wikipedia.org/wiki/PC_card

<http://www.productsandservices.bt.com/consumerProducts/displayTopic.do?topicId=15764>

<http://www.samknows.com/broadband/>