

Introduction:

John's Removals is a medium-sized company that is based in London. The company provides a professional removal service for homes and offices, both in the UK and Europe. They do not have a good Network structure for the company. Recently they have attacked by malware and this time they get rid from a great loss of the company. So they hire to solve this network structure and IT problem. So in this topic there will be discussion of making or providing a stable network structure for the company.

Task-1

a)

Network Infrastructure and Protocols

Ethernet is developed for cabling based networking for Local Area Network. It gives same Internet speed limit using Ethernet port and cable.





Wi-Fi which provides internet via radio wave using adapter/router. Wi-Fi enable specification router coverage of internet has three levels - Excellent, Good and Poor.



Company used Ethernet	Newer version of Ethernet
CAT 5 is a Fast Ethernet using by the company. Its speed is 10 to 100Mbps. Its coverage capacity is 100m. And it is not faster and stronger that company needs. 10base T is a poor cabling . (Cables, 2017)	Name of newer version of Ethernet is Gigabit Ethernet and 10 Gigabit Ethernet. The cable used for them is CAT 5e and CAT6. Gigabit data rate 1000mbps speed and 10 gigabit gives 10gbps with 1000base T cable. And they cover a large area. They are stronger and faster than Fast Ethernet. I recommend taking Gigabit Ethernet with CAT 6 cable for using in company. It gives a good speed and vast range comparing the cost of 10 Gigabit Ethernet and CAT6a. (Basics, 2017)
Fast Ethernet CAT5 - 10 to 100Mbps, 10base T = 10Mbps (Cables, 2017) UTP cables are cheap in price.	Gigabit Ethernet and 10Gigabit CAT5e- up to 1000Mbps CAT 6- 1000Mbps 100 base T= 100Mbps 1000base T= 1000Mbps (Basics, 2017) FTP, STP cables are costly in price.

Cost of CAT5 - \$19.89 (ebay, 2017)	Cost of CAT5e - \$39.98 Cost of CAT6 - \$67.50 (ebay, 2017)
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Points	Used Wi-Fi	Newer version of Wi-Fi
	Router IEEE 802.11g used in the company. Which is very poor in providing speed and range.	The newer version of Wi-Fi is 802.11n and 802.11ac. But company should use 802.11n for better speed and range in a good price.
Data Rate	802.11g – 54Mbps (Intel, 2017)	802.11n - 600Mbps 802.11ac – 1.3Gbps (Intel, 2017)
Range	802.11g – 2.5 GHz (Intel, 2017)	802.11n ,11ac - 5 GHz (Intel, 2017)
Routers	 <p style="text-align: center;"><u>802.11g</u></p>	 <p style="text-align: center;"><u>802.11ac</u></p>

Recommendation:

The company should use Ethernet for network infrastructure. Because they need a better communication with all staffs and office. If they use Wi-Fi than everybody will not get same speed to communicate. As all the computers are desktop so it's easy to put Ethernet Connection. For Wi-Fi they have to buy new USB adapter and Router. They should use Gigabit Ethernet CAT 6 Cables because it has a best speed and for future proof of company. They should use UTP cables because it's cheaper in price and its last long time. Company should use 1000 Base-T for better speed using CAT 6 cable in their infrastructure.

b)

A Hub: Hub which connects computers through which they can directly transmit data to each other. Hub do not have intelligence of data transferring location.

Hub operates Physical layer. Because physical layer is for transferring data through physical devices directly. (Wei, 2002)



A Switch: Switch that's controls the frame of the sender to the receiver by knowing the physical address of both. It transmits the error free and correct data to the correct receiver.

Switch operates Data Link Layer. Because a switch transmits the correct data to the correct receiver by using physical address. (Wei, 2002)



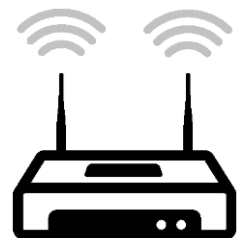
Wireless Access Point: Wireless Access Point is used as a station where it makes the LAN, cabling network to wireless. It provides a wireless network area.

WAP operates Data Link Layer. It transfers data to the appropriate receiver from sender providing wireless network. (Linksys, 2017)



A Router: The main work of router is analyzing, converting and tabling the data and IP. It shows path to the packet/ frame from one network to another.

Router operates Network Layer. This layer is for transferring data from one network to another using IP address. (Wei, 2002)



c)

NO	Name of the layer	Purposes
7.	Application	This layer provides interfaces through file transfer, Email and network services. It gives the access of network to the user and application.
6.	Presentation	This layer data is given format and represent in an application format. For secure transfer through network data is encrypted here. And this sent to application layer to transfer.
5.	Session	This layer makes a session for transmitting data between two network and hosts. Its exchange data, coordinates the data at last do termination.
4.	Transport	This layer ensures the reliability of data. It detects the error and recovery of data while completing data transfer. Finalized the virtual circuit.
3.	Network	This layer makes the right path to transmit the data from one network to other. It analysis and routes the data, controls IP addresses while transmitting one network to another.
2.	Data Link	This layer makes the link from receiver to transmit error free data to the sender by using Physical Address using the first layer maintaining smooth flow of data transmit.
1.	Physical	Physical layer is for transmitting data, signals. Make the physical medium for sending and receiving data. (Path, 2017)

d)

Ethernet: Ethernet protocols works for transmitting data with high speed. Company will have sent frame of data transform into packet and sent through Ethernet. It operates Data Link layer. (Savvius, 2017)

IP: Internet Protocol's work is giving the address of sender and receiver to the data. It will give the sender and receiver address to the data sent by company staff. It operates Network Layer. (Techopedia, 2017)

TCP: Transmission Control Protocol work for determining how data will be break and build into packets. When company will have sent data TCP breaks and gathers packets during transferring data and send to the receiver application. Its operates Transport layer. (Unuth, 2017)

HTTP: Hyper Text Transfer Protocol makes rules for transfer the file on WWW. It will help the company staff to visit their website through web browser. It operates application layer. (Vangie, 2017)

FTP: FTP is File Transfer Protocol is work for sharing the files. Company will do file sharing with server using it. It operates application layer. (Address, 2017)

SMTP: Simple Mail Transfer Protocol work is transferring the mail from server to server. Company will use it for transferring mail. It operates application layer. (Address, 2017)

HTTPS: Hyper Text Transfer Protocol Secure transfer data from client browser to the server webpage encrypted. It will ensure secure we browsing of company staff. It operates application layer. (Mitchell, 2015)

References

Address, W. I. M. I., 2017. *The Mailman Inside Our Computers*. [Online]

Available at: <http://whatismyipaddress.com/smtp>

[Accessed 28 March 2017].

Address, W. I. M. I., 2017. *What Is FTP and How Does It Work?*. [Online]

Available at: <http://whatismyipaddress.com/ftp>

[Accessed 28 March 2017].

Basics, E. T. – P. I. N., 2017. *Ethernet Tutorial – Part I: Networking Basics*. [Online]

Available at: <https://www.lantronix.com/resources/networking-tutorials/ethernet-tutorial-networking-basics/>

[Accessed 27 March 2017].

Cables, N. & E., 2017. *Network & Ethernet Cables*. [Online]

Available at: <https://www.cableorganizer.com/telecom-datacom/patch-cables-boots-plugs.html>

[Accessed 27 March 2017].

ebay, 2017. *Computer Cables and Connectors*. [Online]

Available at: <http://www.ebay.com/itm/CAT6-1000FT-UTP-SOLID-NETWORK-ETHERNET-CABLE-BULK-WIRE-550MHZ-23-AWG-LAN-BLUE-/121171846098>.

<http://www.ebay.com/itm/1000-Ft-Bulk-CAT5-CAT5E-24-AWG-UTP-Twist-Pair-Solid-Network-Ethernet-Cable-Blue-/350725816950>

[Accessed 30 March 2017].

ebay, 2017. *Computers and Cable Connectors*. [Online]

Available at: <http://www.ebay.com/itm/1000-Ft-Bulk-CAT5-CAT5E-24-AWG-UTP-Twist-Pair-Solid-Network-Ethernet-Cable-Blue-/350725816950>

[Accessed 30 March 2017].

Intel, 2017. *Different Wi-Fi Protocols and Data Rates*. [Online]

Available at: <http://www.intel.com/content/www/us/en/support/network-and-i-o/wireless-networking/000005725.html>

[Accessed 30 March 2017].

Linksys, 2017. *What is an Access Point and How is it Different from a Range Extender?*.

[Online]

Available at: <http://www.linksys.com/us/r/resource-center/what-is-a-wifi-access-point/>

[Accessed 27 March 2017].

Mitchell, B., 2015. *HTTPS*. [Online]

Available at: <https://www.lifewire.com/what-is-https-817971>

[Accessed 28 March 2017].

Path, O. M. a. T., 2017. *OSI 7-layer model and roles of functions modules*. [Online]

Available at: http://markun.cs.shinshu-u.ac.jp/learn/osi/e_learn-a-2.htm

[Accessed 27 March 2017].

Savvius, 2017. *Ethernet Protocols and Packets*. [Online]

Available at: https://www.savvius.com/resources/compendium/ethernet/ethernet_packets

[Accessed 27 March 2017].

Techopedia, 2017. *Internet Protocol (IP)*. [Online]

Available at: <https://www.techopedia.com/definition/5366/internet-protocol-ip>

[Accessed 28 March 2017].

Unuth, N., 2017. *TCP (Transmission Control Protocol) Explained*. [Online]

Available at: <https://www.lifewire.com/tcp-transmission-control-protocol-3426736>

[Accessed 28 March 2017].

Vangie, B., 2017. *HTTP - HyperText Transfer Protocol*. [Online]

Available at: <http://www.webopedia.com/TERM/H/HTTP.html>

[Accessed 28 March 2017].

Wei, P. S. a. J., 2002. *Hubs, Switches, And Routers*. [Online]

Available at:

<http://web4.uwindsor.ca/units/its/insight/insight.nsf/e273c4953677f35c852567d700713e04/01c9>

[12740433787285256c25006c137c!OpenDocument](http://web4.uwindsor.ca/units/its/insight/insight.nsf/e273c4953677f35c852567d700713e04/01c912740433787285256c25006c137c!OpenDocument)

[Accessed 27 March 2017].

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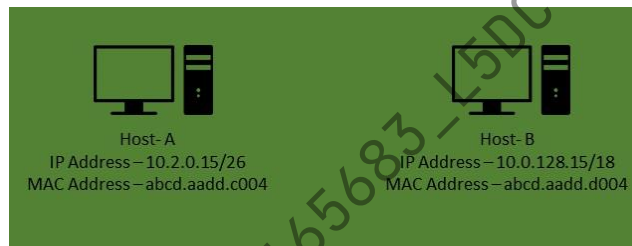
Task-2

Addressing

a)

Network Components need Address because it gives an own identity to the network Components. By which one components can send data/ anything directly to other by knowing the Address.

MAC Address	IP Address
1. Known as Physical Address.	1. Known as logical Address.
2. Use 48 bit Address.	2. Use 32/128 bit Address.
3. Use Hexadecimal Address.	3. Use decimal for IPV4 and hexadecimal for IPV6 as address.
4. Operates Data Link Layer	4. Operates Network Layer.
5. Address is Unique.	5. Address can be changed by changing of Internet.
6. 00-A0-C9-06-A5-11	6. 192.168.001.006 (TheyDiffer.com, 2015)



Name	IPV4	IPV6
Length	32 bit	128 bit
Appearance Look	In decimal number	In hexadecimal number
Security	Has lack of security	Has strong security - Authentication - Encryption.
Header	20 bytes	40 bytes
Fields	13 fields	8 fields
Packet size (Without fragmentation)	576 bytes	1280 bytes.
Broadcast	Available	Not Available
Multicast	Available	Available
ARP	Uses ARP to convert into MAC address.	Use NDP instead of ARP.
IPSec support	Optional or External	Supported
Address Configuration	Use DHCP to configure	Auto Configuration (Sabarinath, 2017)

b)

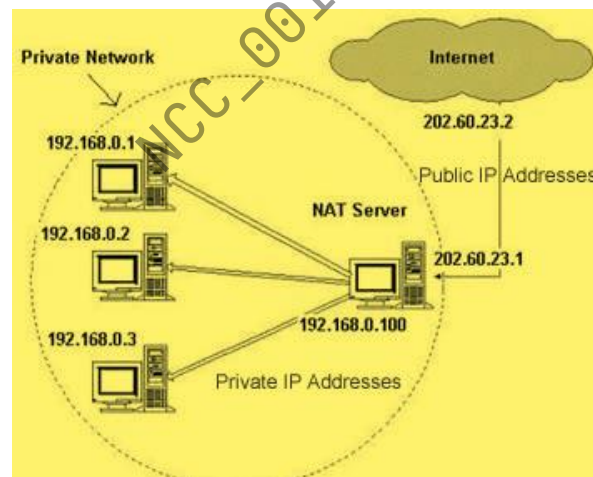
Private IPV4

- Connected with LAN or Private Network.
- IP Address assigned by the client or client's switch like router.
- Cannot communicate with web server directly.
- Do exist in System Data Center.
- Connect with internet by using NAT
- Same kind of IP can be seen in different LAN.

Public IPV4

- Connected with Internet directly.
- IP Address assigned by ISP.
- Direct communicate with web server.
- Exist in System Data Center.
- Directly connect with the Internet.
- IP address is unique. (Between, 2017)

I would use these in the company network. These IP addresses are required for the network to communicate in LAN and Internet. Company should use Private IPV4 address to communicate in their office staffs. And to communicate with other office or regional office they use Public IPV4. When company will communicate in its office staff than in Office router/LAN connection will use private IPV4 to communicate. And when staff use to communicate with district/regional office or web server of it than it will use the Public IPv4 in Ethernet.



Range of Private IP Address

Range Class	Start Address	End Address	Hosts
A	10.0.0.0	10.255.255.255	16,777,216
B	172.16.0.0	172.31.255.255	1,048,576
C	192.168.0.0	192.168.255.255	65,536 (Location, 2017)

c)

DHCP- Dynamic Host Configuration Protocol gives a IP Address to the Network devices which is unique. DHCP server works with client. Server gives the default gateway, Subnet Mask, IP address to the client and client read this and get access to the network. (TechTarget, 2015)

Company should use DHCP in its Networking Infrastructure. Basically DHCP server situated in router but we can make DHCP server in any kind of PC. In company Network Infrastructure a pc of any client can make DHCP server. And this server will give the IP address to the devices or packets while data comes from other office. If there is no DHCP in network infrastructure of company, then there will no device to give IP to devices or packets that transferred or received. Another problem is IP address will be get same and IP address conflict can be seen. So company should use DHCP to prevent IP conflict between networking devices.

d)

ARP – Address Resolution Protocol which converts the internet protocol address to its corresponding MAC address while using internet to send data/information using network devices. (Mitchell, 2017)

ARP is needed to the company because when company will send data or communicate with other network than the MAC address of company network device need to converted into IP address or other network devices communicate or send data to company's network device than IP address need to be converted. So for this reason company need ARP.

e)

Default Gateway- By which computers of one network can send data/information to other computer of another network default without getting any local network. (TechPedia, 2017)

- Help to send data to one staff's pc to another when there is no route in their router.
- Help to access webpage when there is no route in staff's pc router.
- Help to share data with regional office without any route.

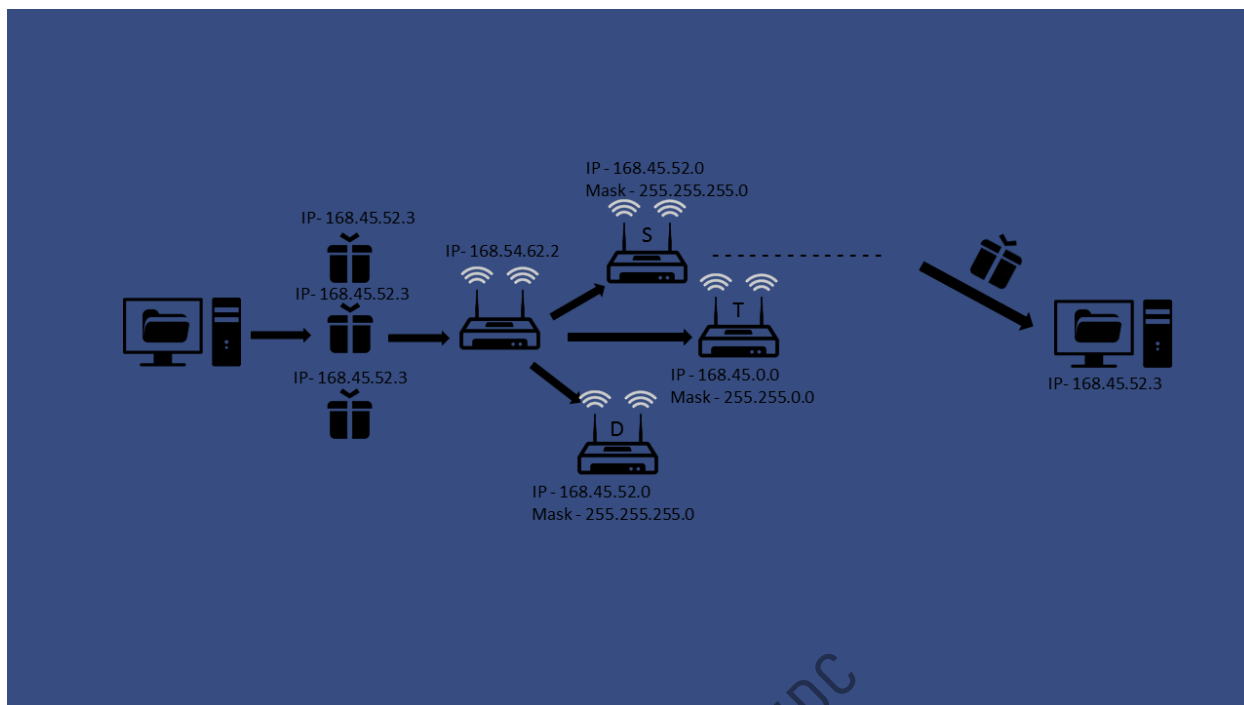
Subnet Mask- The main work of subnet mask is it divides the IP address. Subnet divide the IP address into two parts one is network address another is host address. It divides the host address onto more subnet if needed. (Location, 2017)

- While communicating or sending data with other staff or office if there is big network than to make into small network this used.
- To organize multiple network into proper way while transferring or communicating with other office by staff's pc.
- To ensure company's pc security in the network.

f)

IP Routing Table: In which all the IP address and IP address range for transmitting packet from sender to destination all are stored. This stored IP addresses are given to router to transfer the packet. (CCNA, 2016)

Example: When one staff want to send a file to head office pc. Than at first file will be broken into packets and all will contain the IP address of the destination than it will goes to router/LAN where routing table exist. Than routing table will show the possible route that the packet can take to reach the destination. In the routing table the possible router by whom they can go their IP address, Subnet Musk, Metric, Interface and Router Name are stored. Than putting the Musk we will get more matching IP address with destination IP. Than we will match more matching length of Destination IP. Than if there is also multiple than we will see the Metric which is small by that router we will send the data to the destination. If there is no option in touting table than file will go through Default Gateway.



Row	Subnet/Network	Mask	Metric	Interface	Router
1	168.45.0.0	255.255.0.0	1	1	T
2	168.45.52.0	255.255.255.0	2	1	D
3	168.45.52.0	255.255.255.0	1	2	S
4	0.0.0.0	0.0.0.0	0	1	Local

The file will go through row 3.

References

Between, D., 2017. *Difference between Public and Private IP Address*. [Online] Available at: <http://www.differencebtw.com/difference-between-public-and-private-ip-address/> [Accessed 4 April 2017].

CCNA, S., 2016. *What is IP routing?*. [Online] Available at: <http://study-ccna.com/what-is-ip-routing/> [Accessed 5 April 2017].

Location, I., 2017. *What is a Subnet Mask?*. [Online] Available at: <https://www.iplocation.net/subnet-mask> [Accessed 4 April 2017].

Location, I., 2017. *What is the difference between public and private IP address?*. [Online] Available at: <https://www.iplocation.net/public-vs-private-ip-address> [Accessed 4 April 2017].

Mitchell, B., 2017. *ARP - Address Resolution Protocol*. [Online]
Available at: <https://www.lifewire.com/address-resolution-protocol-817941>
[Accessed 4 April 2017].

Sabarinath, 2017. *What is the difference between IPv4 and IPv6*. [Online]
Available at: <https://techlog360.com/ipv4-vs-ipv6/>
[Accessed 2017 April 2017].

TechPedia, 2017. *Default Gateway*. [Online]
Available at: <https://www.techopedia.com/definition/2184/default-gateway>
[Accessed 4 April 2017].

TechTarget, 2015. *DHCP (Dynamic Host Configuration Protocol)*. [Online]
Available at: <http://searchunifiedcommunications.techtarget.com/definition/DHCP>
[Accessed 4 April 2017].

TheyDiffer.com, 2015. *Difference between a MAC address and an IP address*. [Online]
Available at: <http://theydiffer.com/difference-between-a-mac-address-and-an-ip-address/>
[Accessed 4 April 2017].

Task-3

a. The list of seven measure should take for keeping the network secure.

1. Authentication:

Those allowed to company's network they would give a challenge and user those are allowed will to be response to the challenge and will be authenticated. There are some authentication method like User and Password, Pin, Biometrics and personal information.

2. Encryption:

The works of encryption is formatting the data and sending to the receiver and this data format is known by only receiver. Therefore, any third party cannot read the data while transferring data on network.

3. VPN:

Company can use VPN to secure their network connection. VPN make a traffic to communicate securely. Company should use VPN Remote Access. Here any regional office or other office can access the internet securely by using VPN connections. VPN will helps to do Encryption on Internet.

4. Firewall:

Firewall can make a secure network for the company my putting a wall in the network. It will filters all the data, IP, Ports, Domain names, protocols and the user while transmitting data. Firewall use to block the traffic. The main work of firewall is to protect network.

5. Antivirus:

Using antivirus software company can secure the internet. In market, there are many antivirus software but the paid software gives more security. So company can use that for their network.

6. Update and Backup:

For secure network, company should give the daily update to make updated connection of their network. And they should have the backup for all this so that the connection becomes more stable and less loss of data in network.

7. Remote Access Policies:

Company can use many policies as making remote access polices which will identify the user by name and password. Policies on the identification like password should have number uppercase and lowercase. Password length etc.

b. Most Significant Threat of the System.

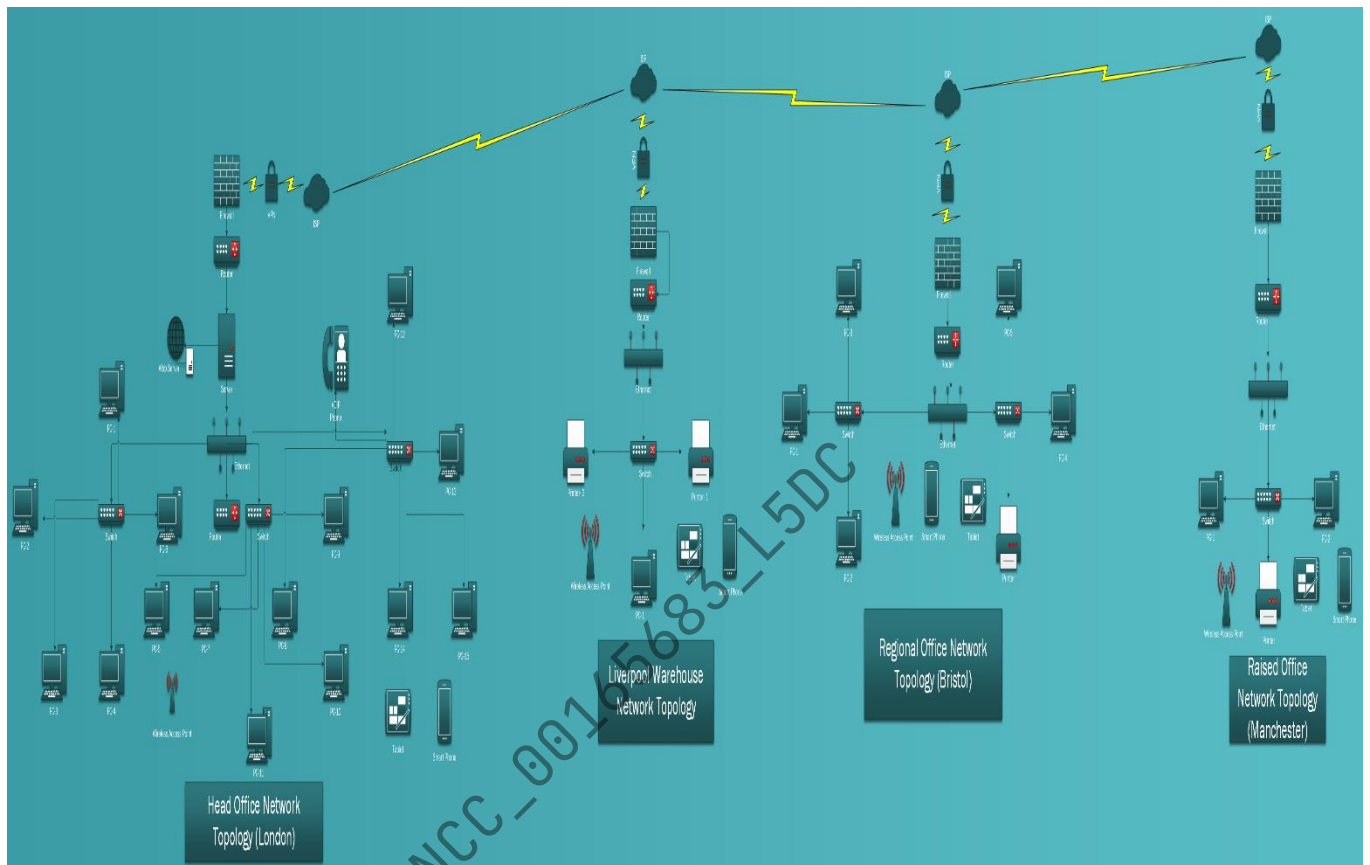
The biggest threat of the company is virus attacked. As they have experienced this problem in the past. So this malware attack chance to this company is more. sWhile transferring lots of data between the network some Trojans can be entered to the network. And while Remote access is used than from tablet or mobile devices this Trojan can enter into the system. And it will not caught by the antivirus because it can be inactivated for long time. So when all works stops it can start damaging all the networking system. So the most significant threat of the company's network is attacked of virus.

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Task-4

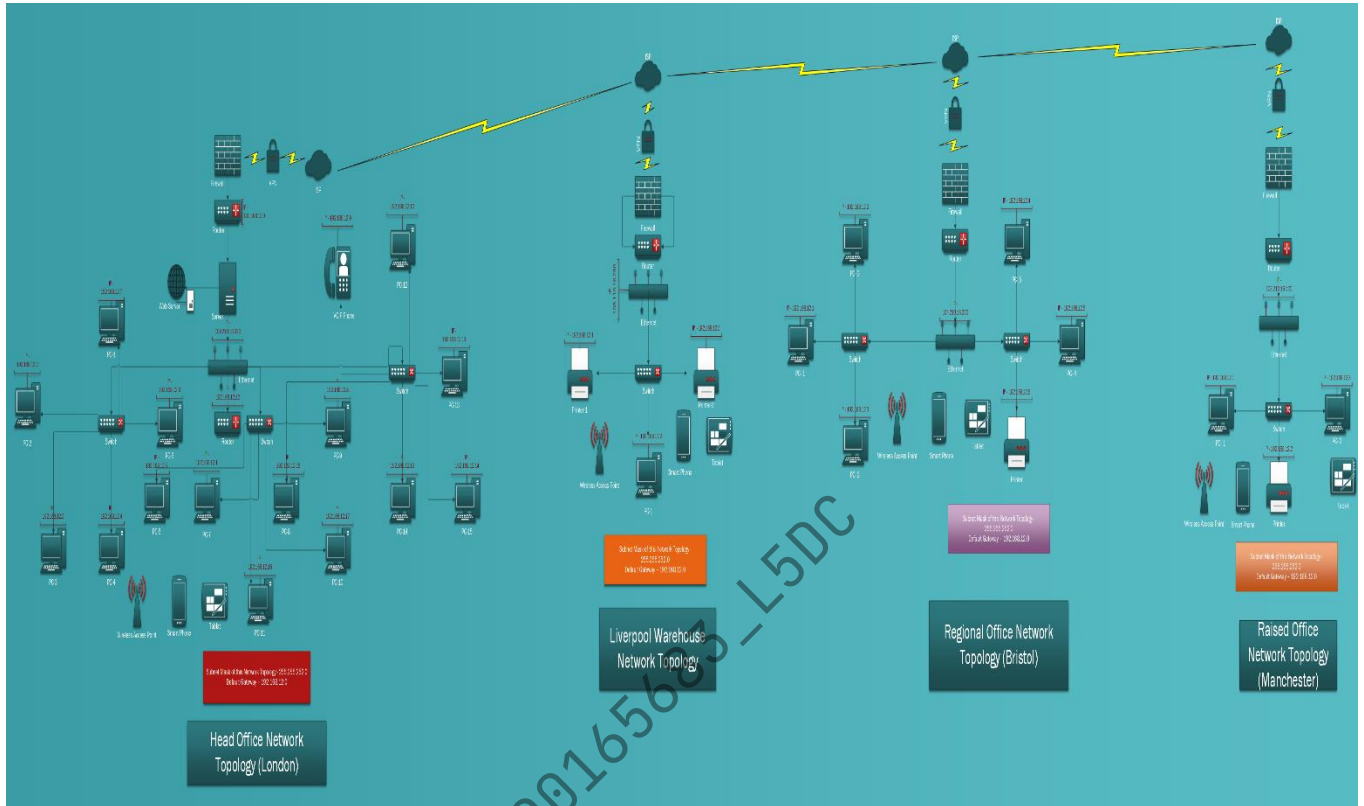
a)

Draw a logical network diagram (topology) that shows the main components of the network



b)

Invent and allocate suitable IPv4 addresses and add them in the diagram. You should ensure you include the subnet mask and identify those that need providing by the ISP



c)

Explain why you have chosen the particular hardware components and why you have connected them together in that way

In networking topology, I used hardware named PC, Ethernet, Router, Switch and printer. I chose this hardware because the components of Company all have to connect this way for better communication with the staff of the company and other staff of the regional office. There was 15 pc in the main office and one or more than one pc to the other branch of the office and have some printer there. So all have to provide Internet and make able to communicate to other

staff and office. So that I used Ethernet to provide internet for the pc. For secure connection between the pc, I used switch to connect. In addition, It is use to connect the devices through switch from Ethernet. Also used switch to connect the printer to this network. I connected them like this because all the staff have to connect to each other and they have to use Internet so that I used Ethernet. Then I used switch to connect the pc and printer to the Ethernet for secure file transfer. I also used wireless access point for providing internet those staff use tablet in the office. All components I connected for the better communication between the staff and other office and providing internet to every staff of the office.

D) Local Price list and specification of suitable Hardware/Software:

Name of the Hardware/Software	Specification	Price
Price of Ethernet Cable CAT 6 (25 feet)	Transfer Speed- 1,000 Mbps (1 Gbps)	£6.99
Price of Router (ASUS)	Speed-1,000 Mbps (1 Gbps) model number - RT-N66U Color – Black Wireless Type - 802.11A, 802.11B, 802.11G, 802.11n	£79.99
Price of switch (TP-LINK)	Brand - TP-LINK model number - TL-SG108 USB 2.0 Ports – 1	£21.49
Price of Wireless Access Point (TP-LINK)	Brand - TP-LINK model number - TL-WA801ND Wireless Type - 802.11B, 802.11G, 802.11n Ethernet Ports – 1	£26.43
Cisco 3 Line IP Phone	Brand- Cisco Model Number- SPA303-G3 Color- Black Screen Resolution- 128 x 64 pixels Ethernet Ports- 2	£60.41

(Amazon.co.uk, 2017)

Bibliography

Amazon.co.uk, 2017. *Cisco 3 Line IP Phone*. [Online]

Available at: https://www.amazon.co.uk/Cisco-Line-Phone-Display-Port-x/dp/B0045IJN92/ref=sr_1_1?s=computers&ie=UTF8&qid=1492773750&sr=1-1&keywords=ip+telephone

[Accessed 21 April 2017].

Amazon.co.uk, 2017. *Ethernet Cables*. [Online]

Available at: https://www.amazon.co.uk/AmazonBasics-RJ45-CAT6-Ethernet-LAN-Patch-Cable-0-9-m-Feet-Mbps/dp/B00N2VISLW/ref=sr_1_4?s=computers&ie=UTF8&qid=1492772595&sr=1-4&keywords=ethernet+6+cable

[Accessed 21 April 2017].

Amazon.co.uk, 2017. *KVM Switches*. [Online]
Available at: https://www.amazon.co.uk/TP-LINK-TL-SG108-Gigabit-Ethernet-Switch/dp/B00A121WN6/ref=sr_1_4?s=computers&ie=UTF8&qid=1492773084&sr=1-4&keywords=switch
[Accessed 21 April 2017].

Amazon.co.uk, 2017. *Network Equipments*. [Online]
Available at: https://www.amazon.co.uk/ASUS-RT-N66U-802-11a-Multimedia-Wireless/dp/B007W16SMO/ref=sr_1_2?s=computers&ie=UTF8&qid=1492772944&sr=1-2&keywords=router+802.11n
[Accessed 21 April 2017].

Amazon.co.uk, 2017. *Wireless Access Points*. [Online]
Available at: https://www.amazon.co.uk/TP-LINK-TL-WA801ND-Wireless-Access-Point/dp/B004UBU8IE/ref=sr_1_4?s=computers&ie=UTF8&qid=1492773276&sr=1-4&keywords=wireless+access+point
[Accessed 21 April 2017].

Task-5

a. The way of securing a Remote Control System is

- I. Creating Authentication: Giving some challenges to the remote access user company can authenticate their user.
- II. Providing Username and Password: For remote access user they should provide their user name and password while accessing the network.
- III. Providing Pin: For accessing different place there should provide different Pin to access by the remote access user.
- IV. Different access key: Company should give different and unique access key for the remote access user. Like for VPN and Web Server of the company.

b. Remote access device mobiles impact on network security:

There will be a great threat for the network security it will affect a great loss of the company. If remote access device of user of company is lost or stolen than the security of the network and data will be insecure. The user name and authentication key of the user will be known by the other people. And they can use that and make unsecure the company network. By using the data of company, they can make lots of crime like they can use the VPN for different crime. They can use the data of users for the crime. So the remote access device will make a great impact in network security of the company.

Conclusion:

Here as the recommended product is used by the company this will be fruitful for the company. Now there will be no loss of data. Every staff will get equal network connection. And other office and proposed office can access the head office data and can direct contact with the head office at any time. And there is a scope of using VOIP phone. So company can do better business to the city. And they will be more secure in internet and in storing data.

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