Report

Introduction

This Report is to improve the current Barclay Bank in Manchester, it has multiple floors. The network in this location needs urgent need of replacement. The office does not meet to the current stringent demands for the availability and performance that is expected of current banks. All of the Bank's hardware and cabling will require updating along with the network design. This report will give a solution that will not only meet the needs but it will also meet the future needs of Barclay Bank's office.

The goals and objectives for the build of this new network, the main reason is higher performance and higher availability to the employees. The network I am designing will need to be more cost effective to run and I will provide the Total Cost of Ownership (TCO) at the end of the report.

The purpose of this project is to lay out the details for the requirements for the new network.

NETWORK ANALYSIS

Technical Environment

The current technical environment of the Barclay Bank site are listed below:
- The workstations are currently running with Windows Vista
- The 5 Servers are a mixed OS which are Windows and Linux
- The current system is using the TCP/IP and running IPv4
- The networks details are listed below:
    - The network is running on older layer 2 switches, and router, which don't help with the 5 year plan (IPv6)
    - The network is running and using OSPF or the EIGRP for the internal routing of the traffic
    - Then using the ISDN for internet connectivity

The Future for the technical environment which I think will be better for the company, than a current system. The first thing is to upgrade the desktops from Vista to Windows 10, as Vista has stopped been supported by Microsoft and windows 10 is a new OS which has the best support from any of the other OS from windows.

The 5 servers are a mix of the Windows and Linux OS, and they should be upgraded to the newest version with better support, for the servers. By doing that the performance of the new system will be a couple time faster and reliable beast of the support from the owning companies.

Using TCP/IP is still good and using IPv4, is cheaper than changing to IPv6, but does not mean the company can start to upgrade their equipment for the cross over in a couple years to IPv6, for example having layer 3 switches which support IPv6 addresses, upgraded the router's and making sure the firewall is configured correctly

Current Business System

The current business systems that the older bank network is supporting are listed below:
- Using email application and web applications
- The banking software for the Barclay company
- The current financial systems
- Payroll software for their employees
- Buying and selling stock
- Finally current office application that are specific for the department

By upgrading the current technical environment they software the above use should be quicker and more efficient, to get work completed and the performance will be better as well, So updating the software above will future proof the banks system.

Scope the of the system

The location of the bank that wants the network is located in Manchester and has 6 floors, it includes the network service for the in house banking and also provides online banking.

The bank in Manchester will support 100 officers, they will also be 15 support staff and senior management team of 8. There will be 20 networked printers that will be used and spread out within the site, the bank will hold 5 servers (web, file storage, database, domain server and email). The bank will be operating during the core hours of 9am in the morning to 6pm at night but this is only on site and it will also be supporting the online access and services for banking at all hours (24 hours), unless it is for maintenance periods, when the online and in house will be closed.

Key Requirements that will be needed.

Performance is a big deal in the banking industry. The performance of the network must include the requirements below.
- All of the banking floor transactions like deposit and withdrawal should be completed as quickly as possible like 1ms
- And all other supporting transactions for the bank should be completed in under 5ms after the request is given

Plus by updating and upgrading the hardware and software, with newer and better cabling this can be reached without effort.

The availability (on a monthly basis) needs to be near perfect

- The banking availability needs to be the best it can get and be no less than 99.999%
- And the support services need to be the same as they go hand in had no less than 99%

The bank can purchase backup servers and use VPN for virtual desktops in case of hardware and software failure.

The security is the most important bit of any company's network, and needs that have no cracks in the security.

- The system will also be needing a very secure external internet link to the system
- It will also need to have secure connection for the remote employees
- It will also need the internal security mechanisms which includes the access controls

The bank will have its own external link to the internet and only allow the user to do certain things, and Windows 10 can help and support the remote workers and access controls for the internal security.

Then the cost effective best for the system to use at its best.

- The overall TCO should be lower than the current TCO of the system (and I will make assumptions)
- It should have a manageable services which will reduce the power usage, outage and maintenance that is requirements than the current system.

Having better equipment means it costs a lot, but buying in bundles can help to lower the price, but an upside is reduced power usage as the equipment is better and will run at better performance meaning, needs less power to run.

Functional Requirements

The bank requires the new network that will be able to meet the requirements shown in the key requirement section above. The new network should be able to handle all of the new data traffic from the banking officers and other departments themselves and it will be handled with the highest performance and the highest availability requirements, but the new requirements for all the other traffic don't need to be held at that standard.

The new network must be able to provide that level of service for at least a minimum of 5 years and needs to be designed with this in mind for future development. So by doing all the upgrades for the new building on all the floors needed, it will provide the minimum service of 5 years and more. Another point is that the network must be cost effective solution and will be showing a simple costing table will be showed in the network implementation part of the report.

Technical Requirements

The technical requirement that can be used are as followed below:

- IPv4 Protocol and subnetting can be used within the network. I will choose from Class C IPv4 address. VLSM (Variable Length Subnet Mask) The subnetting will be done by showing the optimal IP address allocation and the subnetting table will be showed in network design section of the report

- The Ethernet (IEEE 802.3) is required and can choose from the cable that's suites the situation like, cat6, fibre optic etc. the fibre optic will be from the servers to the switches and routers, giving the best speed for the right department, and cat6 is from the subnet to the switches which the subnets will be using before going through the optic cables to the servers. The VLAN designs on the switches can be implemented and can also use the STP (spanning Tree Protocol) with the switches. The subnet topologies will be star protocol.
- The backup and restore are very important, the functionalities and options for the disaster recovery. One option can be off-site (using the multiple or single type of) networks options for the backup. You can use EIGRP, RIPv2, OSPF or any AIRP, which can be used to connect to multiple sites or you can use the static routes method. The company can have its backup and disaster recovery plans that are the same as their other branches, or they can do a small backup at midnight every night, then re backup at the end of the week then a bigger backup at the end of each month and store the data in a backup server, or can use disk storage or cloud. Disaster recovery is using the backup plan to restore the system is a disaster happens. Like mass data loss, flooding, power shortages.
- The security measures must be explained, including Firewall/IDS/IPS. Firewalls will be implemented and configured correctly for the best security, on switches, routers and servers.
- The internet connection must be very good so using a plan with fibre optic technology or ADSL will be the best option for that. Using fibre optic is the way to go for ISP as they have the best data transfer rate, so playing out for the best plan is the best thing for the bank.
- Finally a detailed network design will be provided by showing all the subnets within the LAN and the connection to the internet also including optional remote backup site. This will be shown in the network design section of the report.

Policy Requirements

The policy requirements that the bank wants, to address the backup, disaster recovery and ethical and professional issues that are involved in the admin and management of the LAN.

The storage and the disaster recovery policies will include:
- Server backup and the restore measures for the company
- The disaster recovery and the business continuity
- Then the availability management

The backup and the restore policies will include only backup after work hours, to help minimise data conflict. Restore only needs to happen if data is deleted or software has corrupted so the company can restore to a previous backup. The availability management is when the network or system is under maintenance and this should be done of hours.

The ethical and professional issues policy for the LAN will include:
- No Software piracy of any kind

● And making sure the company has the correct and up-to-date licensing keys

Make sure all software is legit and has receipts for all of them. If they don't and your bank gets found out they will be a hefty fine to pay and making sure you keep updating the licensing keys will also do this. So paying for the software will save you lots of money in the long run.
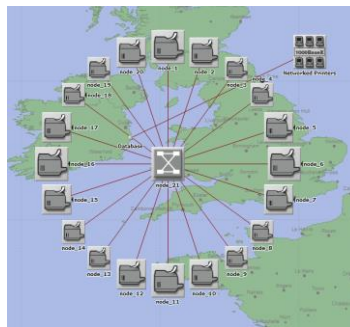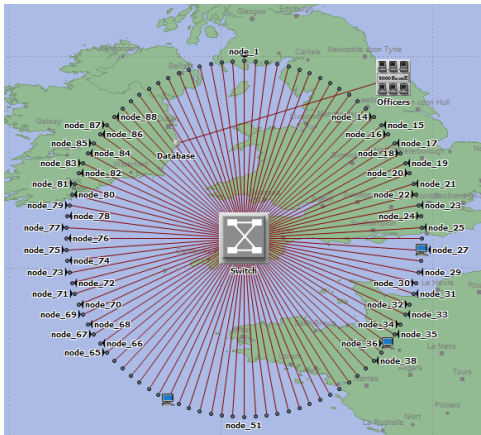
Network Design

In this section I will be talking about the river modeller, the topologies diagrams used for the subnets, the subnets IP addresses (table) I will be using and have applied to the subnets.

Riverbed Modeller
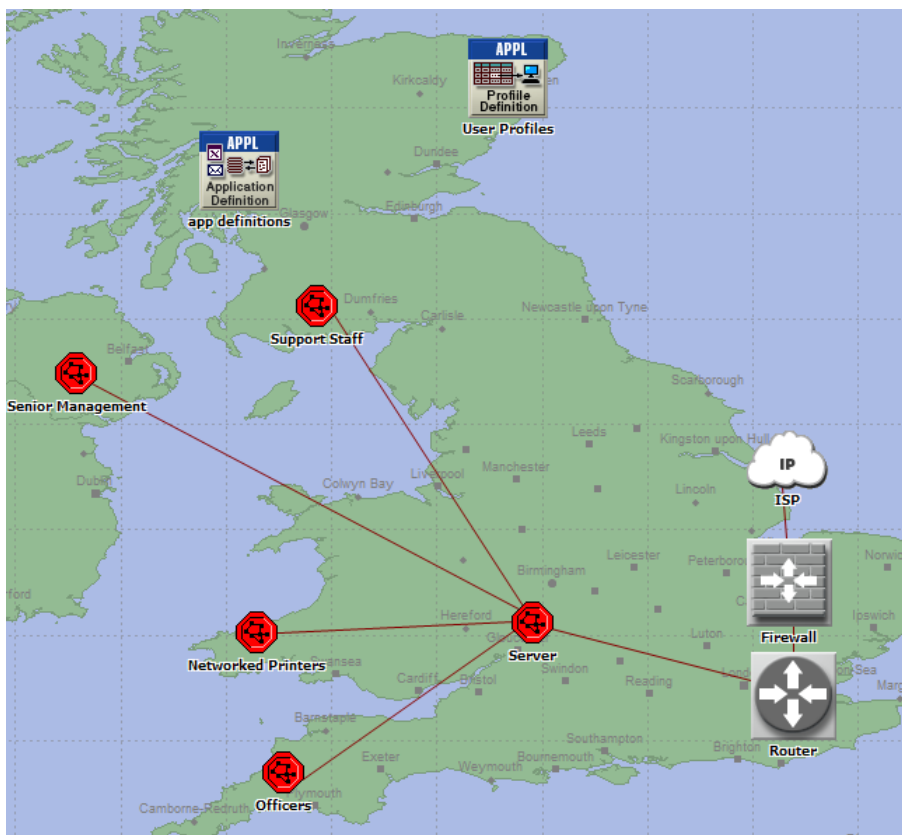
The image above shows the finish system diagram with the server's, and subnets displayed, each subnets. The subnets go through the server to the router, then the firewall then off to the ISP and follows the same way back.

The topologies I used on the subnets are a star topology, the images show the officers with 100 nodes and the networked printers with 20 printers connected going to a switch then of the server. The reason for star topology is that it is very reliable, for example if a node goes down it does not take the full subnet with it.

Visio network design
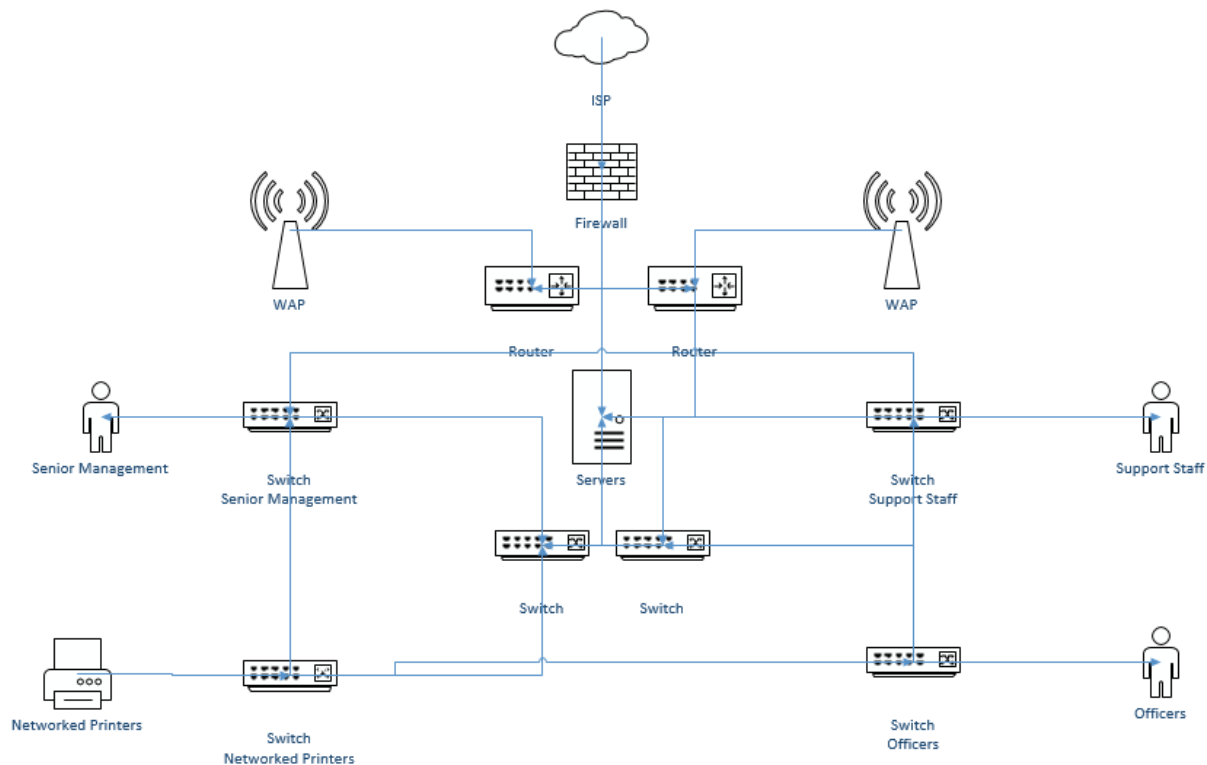
The diagram shown above is what the network design will look like on paper form, going from the ISP, through the firewall, then to the two routers. For better performance and a backup in case one router decides to go down the other one can handing the traffic until the down one can

be fixed or replaced. Then the packets go through the correct servers, then to the two switches which handing half of the work force in case one goes down again the other can handle the traffic in that down time. Then off to the subnets switches then to the user. It has six wireless access points one for each floor. The company can add more switches and routers in case of down time, or to make traffic go quicker.

Subnet (table)

Subnet	Subnet Mask	Subnet Address	First Usable Host	Last Usable	Broadcast Address
100	/25	192.168.2.0	192.168.2.1	192.168.2.126	192.168.2.127
20	/27	192.168.2.128	192.168.2.129	192.168.2.156	192.168.2.157
15	/28	192.168.2.158	192.168.2.159	192.168.2.187	192.168.2.188
8	/29	192.168.2.189	192.168.2.190	192.168.2.219	192.168.2.220
5	/29	192.168.2.221	192.168.2.222	192.168.2.251	192.168.2.252

The bunch of subnets I have used are 100, 20, 15, 8 and 5. The IP addresses I will be using are from 192.168.2.0 to 192.168.2.256. In the table above, the table headings are subnet, subnet mask, subnet address, first usable host, last usable host and broadcast address.

The improvement that I think will improve the current technical environment of the site. With the upgrades to the network, software and system, that are displayed throughout the report it will make the network more reliable, better performance and less cost, as newer hardware and software are reducing in price the past couple of years.

Network Implementation

In this section I will be talking more detail of using the simulation tool with the graphs with traffic along with cost of the new system and will be expanding on the policy requirements.
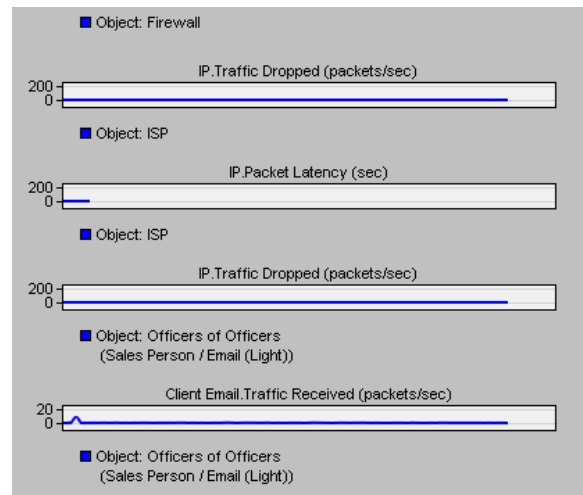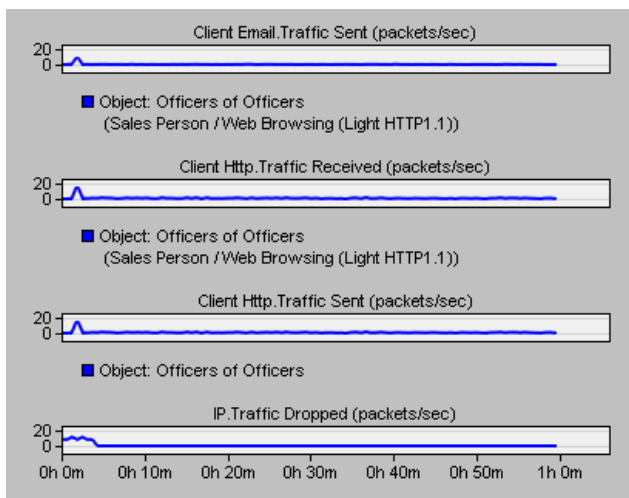
The riverbed modeller simulation output graphs
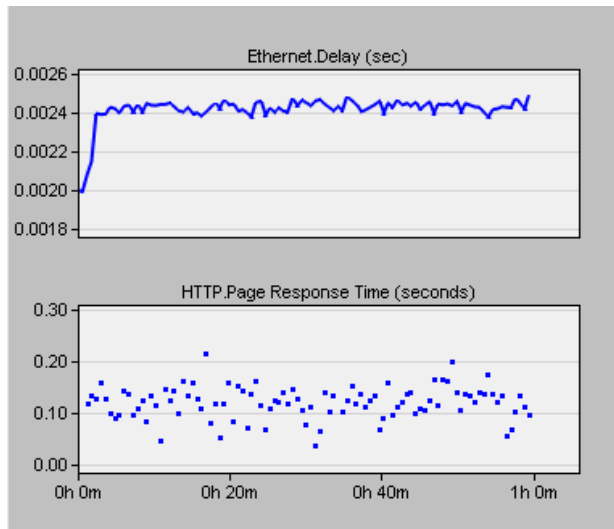
The screen grab above shows the Ethernet delay and the HTTP page response time (sec). This the data transfer speed though the cables and how long it takes for the page to response to a request
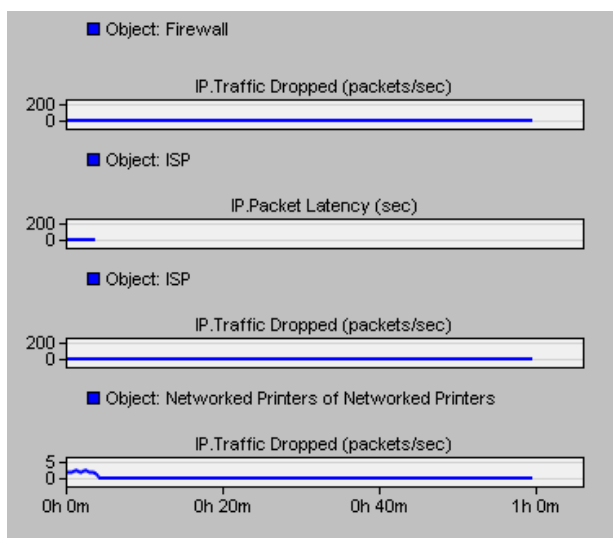

The image grab shows the firewall's IP traffic, packet latency, traffic dropped (packets/sec). For Networked Printers.

The two image grabs shows the client email traffic sent, Client HTTP traffic received, client HTTP traffic sent, traffic dropped, IP traffic dropped, IP packet latency, IP traffic dropped and Client email traffic received. The graphs shows low on all and very little movement, this is best i got the subnets very close. The closes the subnets, server, firewall the lower the graphs are and better performance for the bank. For Officers (packets/sec)
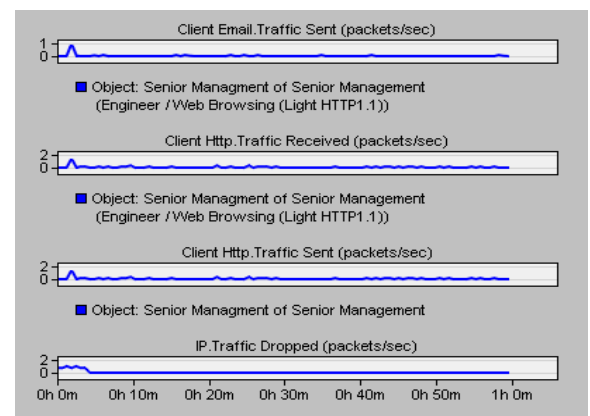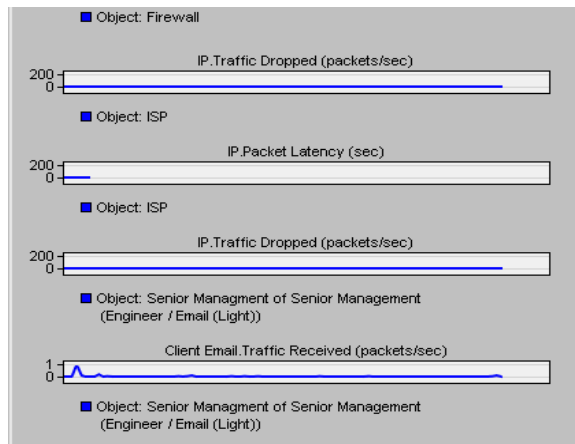

The next two image grabs above shows the IP traffic dropped, IP packet latency, traffic dropped, client email traffic received, client email traffic sent, client HTTP traffic received, client HTTP traffic sent and IP traffic dropped. This is for Senior Management subnet. (Packets/sec).
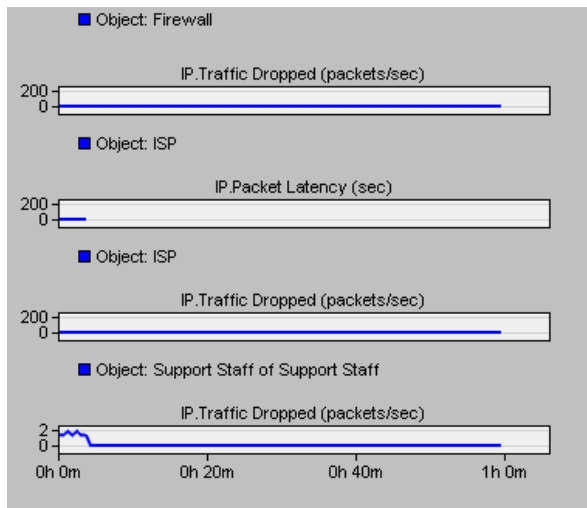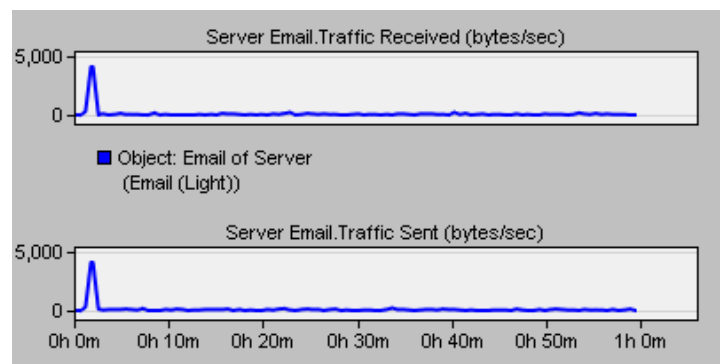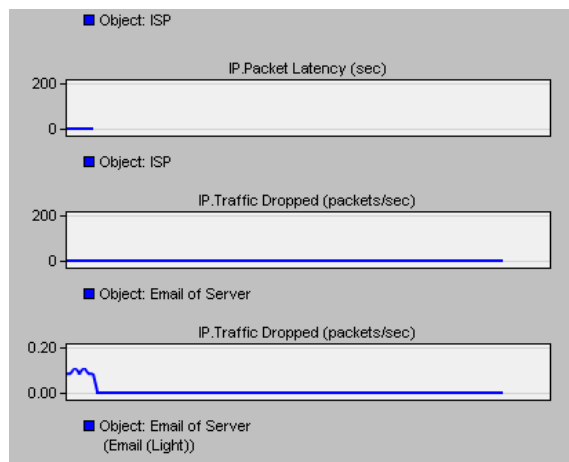
The image above shows the IP traffic dropped, IP packet latency, IP traffic dropped. For Support staff subnet (packets/sec).
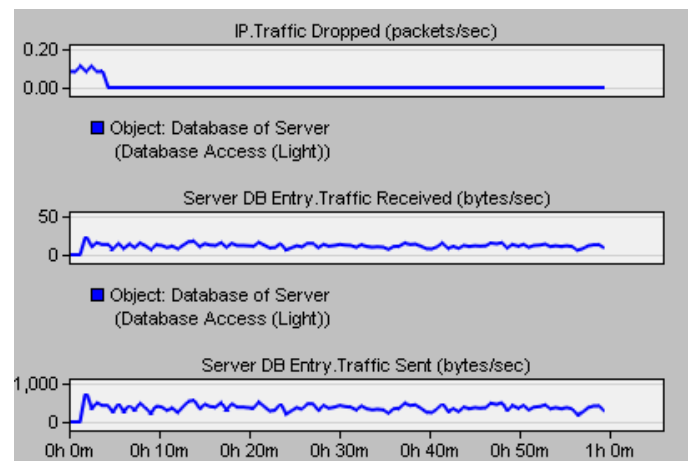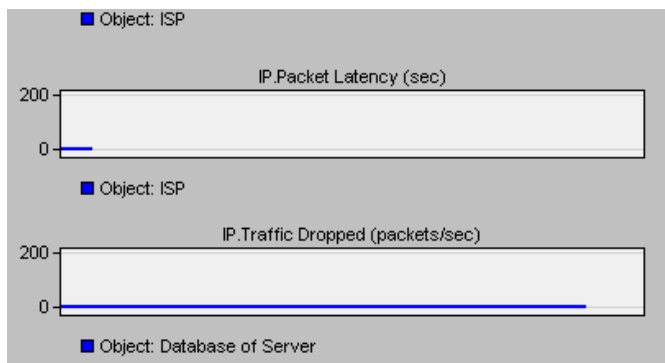

The two image grabs above are from the server subnet and database server. They involve IP traffic dropped, IP packet latency, server DB entry traffic received, server DB entry traffic sent. (Packets/sec/bytes).
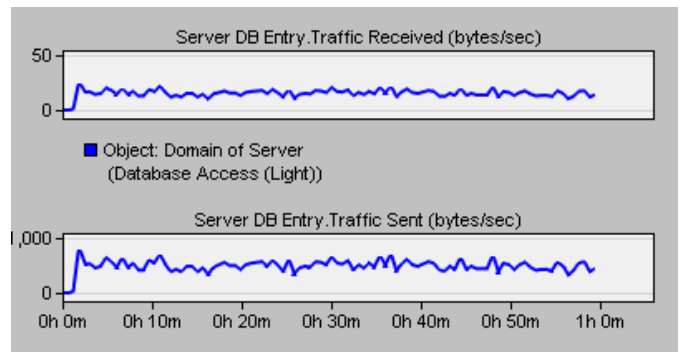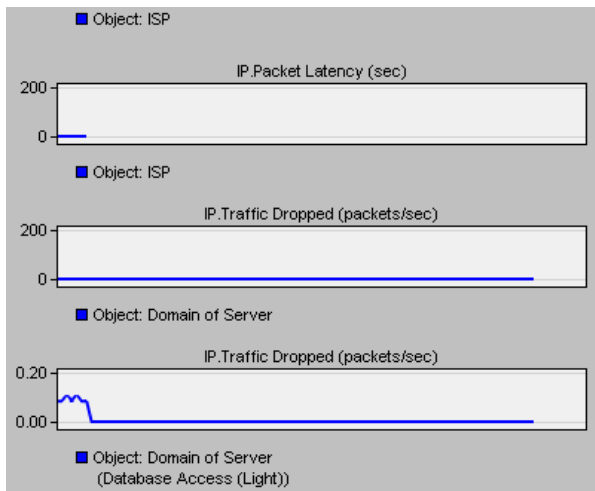
The images above shows the graphs for server domain which includes IP and server DB entry. It shows the IP packet latency, IP traffic dropped for IP and for the domain server, the server DB entry traffic received and server DB entry traffic sent. (Packets/bytes/sec).

The two image above show the IP packet latency, IP traffic dropped, server email traffic received and server email traffic sent. This is for the email server in the server subnet. Running (packets/bytes/sec).
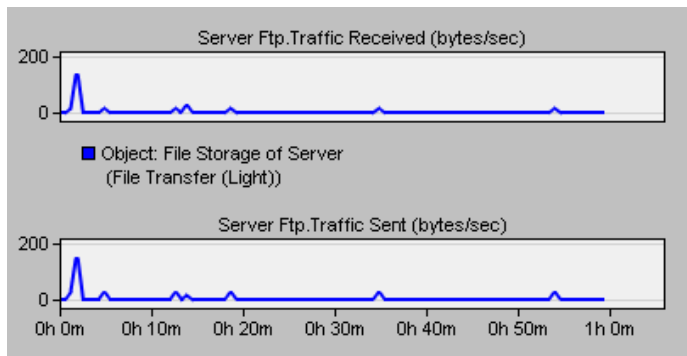
The image above shows the server Ftp traffic received and server Ftp traffic sent. This is for the file storage server. (Bytes/sec).
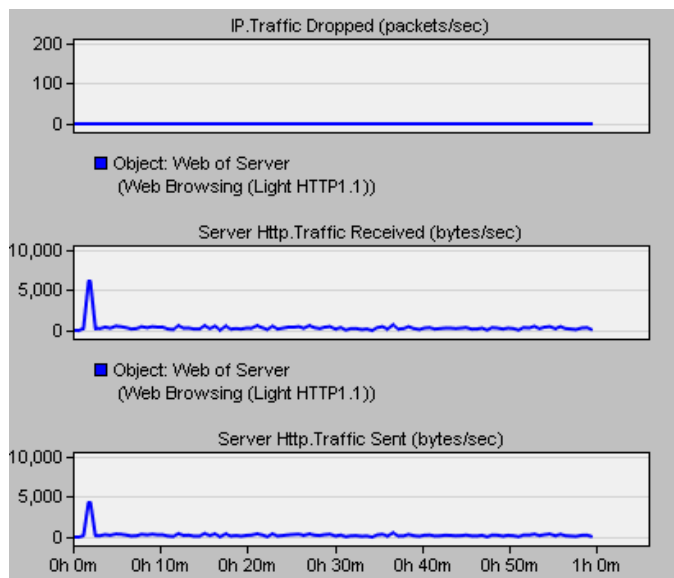
The graph to the left is showing the IP traffic dropped, server HTTP traffic received and server HTTP traffic sent. This is from the Web server in the server subnet. Running at (packets/bytes/sec).

Cost (table)

The table below will show the cost of each hardware or software need, the quantity need and the total cost of each component then the total cost references for these are at the end of the report.

Component	Brand Name	Cost	Quantity	Total Cost
Routers	Cisco 881 Ethernet Security - Router - Desktop	£296.40	2	£592.80
Switches	HPE 1950-48G-2SFP+-2XGT-PoE+ - switch - 48 ports - managed - rack-mountable	£1705.92	6	£10235.52
WAP (wireless access points)	Cisco Aironet AP1142N Standalone Wireless-N Access Point (300Mbps)	£410.40	6	£2462.40
Fibre Optic Cabling	BROADCOM LIMITED HFBR-RUS100Z Fibre Optic Cable, Versatile Link, 1 mm, 1 Fibres, Black, PE, 2.2 mm, 328 ft	£81.79	20 feet	£81.79
Cat 6 cable (Ethernet)	MULTICOMP SPC13947 ETHERNET CABLE, CAT6, 100FT, BLUE	£69.20	100 feet	£69.20
Windows 10 OS	WINDOWS 10 PROFESSIONAL	£24.99 (sale)	123	£3073.77
Overall Cost				£16515.48

Conclusion

This section I will be concluding the report up in a couple of sentence.

The current network, with older hardware and software is very unsafe and unsecure, because the company that developed them are not supporting them in this year. So this means if hackers find a way to break windows vista for example they can hack their way into any system with the OS on the desktop and take very sensitive data, which will lose the company millions. I have talked about the network analysis, analysing the old network, network design should my new design for the bank with topology diagrams, Visio network design and riverbed design and subnets IP address. Then the network implementation which shows the results of the riverbed, then the cost of the design. With references below

References

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Unknown. (2016). *WINDOWS 10 PROFESSIONAL.* Available: https://softwaregeeks.co.uk/product/windows-10-pro/?gclid=Cj0KEQiAh4fEBRCZhriIjLfArrQBEiQArzzDAfIXCeyrPb5qN-IkQ-cwkxVLXm43l6fmacATSJj1uXgaAuhy8P8HAQ. Last accessed 20/01/2017.

Unknown. (2015). *BROADCOM LIMITED HFBR-RUS100Z Fiber Optic Cable, Versatile Link, 1mm, 1 Fibres, Black, PE, 2.2 mm, 328 ft.* Available: http://uk.farnell.com/broadcom-limited/hfbr-rus100z/cable-fibre-optic-1-fibre/dp/1247714?mckv=YO18ZYDl_dc%7Cpcrid%7C78108376509%7C&gross_price=true&CATCI=pla-41477300408&CAAGID=14406255429&CMP=KNC-GUK. Last accessed 20/01/2017.