Introduction

Aim

I have recently been hired by the Communications Advisory Agency, CAA and have been asked to examine the current system used by A.A Builders and advise them on their LAN requirements.

A.A Builders is a company, that designs/manufactures and sell household fixings and furniture. They have a number of sites situated across the country and a main headquarter on the outskirts of the city.

This report contains a suitable network system designed for A.A. Builders to suit their present and future needs.

This report is based upon my recommendations and will be discussed when the advisory teams meet to finalise the situation and make recommendations.

Overview of the present scenario

The A.A Builders main site covers 16 acres of land, and has some PCs on the site, as well as a mainframe. The mainframe runs the database for stock control, and is very limited and not connected to a network.

On the same site there is a an Office Block, which accommodates 40 people with a variety of admin duties, such as, Accounts, Typing Centre, Pay Department, and Credit Control.

The Executive block is also on the same site, and has 11 offices, each with their own PCs. Included are 3 secretary terminals, which are connected with the mainframe.

The supply department has 15 PCs, which do all the stock control and some of the stock movement (Admission/Retrieval) is computer controlled.

There are 6 different workshops that produce double-glazing, kitchen units, bathroom units, fitted wardrobes, building material and gardening products. The workshops have no computer facilities.

There are also 6 different stock buildings, which carry different materials, such as wood, plumbing, building etc.

Just outside of the city, 1.5 miles away from the main headquarters to be precise, is a small design office. The team of designers have their own offices, who produce architectural drawings for kitchens, glazing and building extensions, and they use advance CAD packages to produce them on.

There are 10 subsidiary firms within the country that treat A.A Builders main site as their H.Q. The firms are for customers that wish to view products and other services offered by the company.

Analysis

Present Scenario

A customer walks into one of the subsidiary firms situated across the country. The customer finds a kitchen they like and approach one of the staff for help.

The staff member notes the design of the kitchen, and requests for measurements of the customers kitchen at home, this is then faxed to the design team, who design the kitchen so it fits exactly to the customers requirements and area.

The design team produces an architectural drawing using the CAD machine and fax two copies, one to the firm and one to the manufacturing department. The firm requests for prices and stock from the main HQ, and calculates the cost and approximate delivery of the kitchen. The firm then posts a copy of the design with an estimate to the customer, or telephones them with the order. The customer likes the design and decides to purchase the kitchen.

The firm orders the manufacturing department to produce the kitchen and the manufacturing department requests for material from the supply department, who amend the stock records at the same time.

The payment invoice is faxed to the accounts department at the main site.

After a week the kitchen is ready, this is then faxed to the firm with the delivery date. The firm phones the customer who then makes sure they are at home that day to receive the kitchen.

Communications between various departments are via normal mode, i.e. telephone, fax, etc.

As you can see this method is very slow and time consuming, if you want to send a design proposal to the design team, you have to fax them the design. The limitation apposed on this method is that the picture quality may deteriorate when the fax is received. If stock control is executed over the phone, it may be hard to keep track of all the stock, due to human errors, i.e. heard the wrong number etc.

There is no network being used by the company.

Requirements of the company

The company requires a network that covers all the relevant offices, departments and firms. They would also like to implement the existing main frame into their new network.

New computers are required for the office block, and a new database system for the stock control. Subsidiary firms, and supply department are hoping to use the POS terminals to access the database for prices, stock control and transactions
The team of designers require to communicate their plans regularly to the relevant workshops.

The subsidiaries rely on communications with the HQ for accounting facilities and the database for prices and stock records as well as design capabilities.

As no network is in place we have to design from scratch.

Site/Building layout

For a map of the A.A Builder Company across the UK, please refer to Appendix A.

For a map of the layout of the sites, please refer to Appendix B and C.

Assumptions

I have made several assumptions that would help me in completing this task.

- The departments are separated to four different floors, in the office block.
- The office block, executive block, supply department, stock control, and the 6 different workshops are all situated in the main HQ site.
- The executive block is split up in three floors, each floor has a secretary, and there are 2 floors with 4 executives, and 1 floor with 3.
- My present scenario is also an assumption.

Design

Network Design

For my network design I recommend using the Cisco VPN solution. A definition of a VPN would be 'any network built upon a public network, such as the Internet, and partitioned for use by individual customers'. VPN uses the Internet to send and receive network traffic therefore we could easily connect different subsidiary firms from across the country and all the office blocks, design centres, etc. I chose this network design as it had many advantages over an actual dedicated medium to each site. With the use of VPN the company could benefit from:

- Secure connectivity – less connections, therefore increased security
- Reliability, performance, and scalability – offers Just-In-Time business communications, so when we need prices, stock request, we can do it very quickly and offer shorter sales cycles.
- Options for high availability – we can easily add on extra sites, if the company wishes to expand
- Authentication of users and devices in the VPN – We can be confident that we are dealing with whom we think we are dealing with. We can check the

identity of other buildings/firms across the country using passwords, digital certificates, smart cards, and biometrics.

- Secure management – ISPs offer services such as managing VPNs, they operate day-to-day tasks, and offer operate helpdesk, so the company would not need to hire local expertise to manage the network.

With VPNs the company can reduce costs and increase revenue.

The network should be a client server model, as most of the data will be kept on the server, with clients (POS, workstations at offices) able to access information from the server when required.

Topology

The topology I intend to use will be the star topology. All the information, regarding the stock, prices, is to be kept on the mainframe computer, which the company would like to keep and implement in their new design. The server will contain a database for stock control.

As the company want to implement the old mainframe in the network design, we could make the mainframe a file server, with the entire database on there with prices. So subsidiary firms can connect to this file server when requesting stock information and prices.

We need a VPN 'server', so it can act as a gateway to a whole network. This will be 'always on' and listening for VPN clients to connect to it.

At the client end, a VPN Client, which will be software initiates a 'call' to the server and logs on. Then the client computer can communicate with the server network as they are on the same 'virtual' network. This enables firms and other offices to establish secure, end-to-end encrypted tunnels to the VPN server.

Media / Cabling

The media I intend to use from the main server to the Internet will be a Category 5, twisted pair cable, which is good for new cable installation. The unshielded twisted pair cable can support a data rate up to 100 Mbps line.

Subsidiary firms, design buildings, office blocks, executive blocks, etc, will use a 10Base T cable, offering a data rate of 10 Mbps link.

To connect different levels of the building, such as the office block I intend to use fibre optic cables to connect each hub.

Interconnectivity of Networks

The networks connect to each other by dialling the ISP, which makes a LAN – LAN connection over the leased lines. VPN's data travels across the Internet, but it is secure because of very strong encryption. If anyone 'listens' to the VPN communication, they will not understand it because all the data is encrypted.

New sites can be added to the network easily, by dialling the relevant ISP, and with the VPN Client software you may make a connection.

The office block requires new PCs, so I have designed an Internal VPN inside the Office Block, which connects to the switch and then the main server. The office block will have 10 PC workstations per floor connected to a VPN hub, each hub then connects to the switch on that building. Connection between different floors will be a fibre optic cable linking them together See Appendix C

The same design strategy will be used for the other buildings, different floors are connected by a hub, the hub connects to the switch, and the switch then connects to the mainframe in the executive building. For a diagram of different connections, please refer to the Appendix.

The POS can connect to a to a 10 Base T line to VPN Client servers at each subsidiary firm. This will then connect to the VPN Server as the main headquarters and be able to access prices, and stock details from the dedicated main frame.

Design firms will also connect to the VPN, allowing all the different departments to communicate with each other, this will shorten, the sale, and manufacturing cycle.

Outside connections

By using VPN, we can design a remote access. This could enable chief executives to work from home, monitor security when network cameras are installed, but that is for future planning.

Protocols / Software

As described in the topology we have to use VPN Server and VPN Client software to create a gateway, so the VPN clients can connect to it. Other software to take into consideration is the database software, as the one used on the mainframe is outdated.

I propose using SQL applications to design the database. The database will be accessible by POS terminals, at subsidiary firms, and supply department.

Protocols worth considering for this design is IPsec with encryption in either tunnel and transport modes. The security associations can be set up either manually or using IKE with either certificates or preshared secrets.

IPsec inside of L2TP has significant deployment for client-server remote access secure VPNs.

Both of these technologies are standardized in the Internet Engineering Task Force, IETF.

Another protocol I wish to put in place is the ESP (Encapsulation Security Payload), which is a part of the IPSec protocol suite designed to provide 168-bit encryption. This will stop anyone from eavesdropping.

Summary

Advantages in using VPN over a private leased line are numerous. The reduced cost is one factor. You don't need access servers, large backbone routers and switches as these can be managed by Internet Service Providers, eliminating capital expense.

The Internet is an inherently redundant network, with several pathways to any given destination. Thus this system can go wherever the Internet goes.

With this design we manage to link all the different offices, in the main site, design, and the ten subsidiary firms together. All data is secure, and the scope of expansion is good.

Future Proposition

The VPN system is expandable, and may benefit from extra features such as CCTV. The company could use web cams to communicate across a network with the aid of a computer, but that is not desirable, if the computer goes down, the cameras may aswell, which will make it worthless.

We could use a network camera, which is different from a web camera that attaches to a PC or a traditional CCTV camera. A Network camera is a stand-alone camera that has its own IP addressable communications protocols (TCP/IP) with or without a built-in web server. Some of the features included are: motion detection capability, alarm alert, pan/tilt/zoom, infrared (IR) sensitivity in low light, password protection, e-mail trigger interface, and automatic image upload to a server or to a digital video recorder.

With Network cameras, security personnel at A.A Builder can remotely monitor any environment. The executive of A.A Builder can engage in remote activities including office meetings and general surveillance of the business in the privacy of his/her home.

Unlike Web Cams, Network Cameras communicate directly across the network without the aid of a dedicated PC and use an IP compatible format

Installation of these cameras is easy, as they have unique identities on the network when installed and are now physically small enough to fit in small places.

Security staff can benefit from a number positive features from network cameras, such as monitoring and recording, which can be done with ease. Having the images stored in a digital date/time format, simplifies searching through the archive.

Identifying an incident and distributing the evidence is a simple matter of attaching a document to an email.

These cameras can be connected directly to the network and be protected with a password and user ID.

There are many benefits from installing a network camera, you don't need to run extra wires anywhere, and your CCTV footage can expand as much as the network. Installing network cameras is as easy as installing another workstation.

Conclusion

VPN network is the ideal technology for this company. They don't have to hire expensive leased lines, lay down any expansive transmission media, they don't require a Network Expert to manage the network.

This model reaches across the UK, and its only limitation is the Internet. The company may expand and not worry about the network as it is simple to add new partners.

It offers flexibility, you may access the network from anywhere, and it can be set-up to provide excellent security facilities.

The companies network is all connected together with this model, every department may communicate with each other and access information only relevant to them, by using internal VPNs.

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