PROPOSAL - ACN SOFTWARE SOLUTIONS

ACN Software Solutions is an e-commerce startup based out of India. They started off with 5 employees with no specific roles. However, they have now secured funding from a venture capitalist and plan to expand their operations. So far they had a flat network topology which was sufficient for their needs. Their e-commerce website was also hosted on an on-premise web server.

They are now moving to a new facility and have hired and restructured as follows -

- 3 employees are in the Finance department,
- 5 employees are in HR,
- 4 employees are in Marketing and
- 4 employees are in Software development

Every department of the organization is on different floors: Finance on the first floor and HR, Marketing and Software development are on the second, third and fourth floors respectively. Ground Floor takes care of Walk in customers, who can use organization networks in their smart devices but along with the following constraints:

- customers can access the internet only on smartphones
- customers cannot access any social media sites
- the only mode of internet access is Wi-Fi.

You can also provide 2 computers in this section where customers can find more information about the organization.

Constraints with respect to Departments:

- No one can access the data related to the Finance Department but vice versa is possible.
- The HR department can access Marketing and Software development department but vice versa is not true.
- Marketing and software departments can communicate with each other over network and data is transparent to each other.
- Provides adequate security for all of the company communications and documents (especially sensitive sales documents)

- Fast and have additional capacity as the company grows
- Provides for centralized printing on every floor.
- Provides customers with a general information Website and a secure Website where clients can buy services, and products.
- Provides for 3 9's availability
- Provides for centralized management and control, so that you can maintain the network from remote location.
- Provides for long-term cost-effectiveness
- Provides a suite of software tools for the employees to effectively communicate. Google search, Office 365, Outlook for email

Assumptions

1. One centralized printing section on each floor (2 printers per floor).
2. 3 9s availability implies that they have a budgetary concern, as e-commerce sites would ideally have very high availability.
3. A computer for each employee and all of them are located close to each other on each floor.
4. Read-only access for files that exist on the ground floor, and hence they do not need internet access.
5. Top floor is the server room.

Business Goals

1. Scope : This proposed network is designed to serve the employees and customers of the ACN Software Solutions startup. The design aims to restructure the entire network design to accommodate scalability and long-term cost-effectiveness. The design is for management and administrative purposes and is not responsible for the specific tools and facilities required by the employees; other resources have been allocated for this purpose.

2. E-commerce startup implies that they would like increased revenue and profits

3. Offers the best customer service
4. Expand their market
5. Support smartphones
6. Make communication easier for employees

Business Constraints

1. Policies - The proposed network design must match with the companies ideas, and any specific preferences (such as working with a particular vendor) must be taken care of.

2. Budget - Being an e-commerce start-up, the application needs to always be available, but a great deal of importance should be given to the overall budget of the company.

3. Staffing - Additional costs of hiring, training and adding more people to the company (existent staff members may not have the required knowledge to maintain the smooth running of the network) need to be taken into account.

4. Scheduling - Implementation of any projects should be completed within the deadline specified by the company, it should not conflict/interfere with any other ongoing/upcoming projects

Technical Goals

1. **Scalability** - Scalability is very important, as the company aims to expand and increase the number of employees and departments and may want to expand again in the future.

2. **Availability** - Being an e-commerce start-up, availability is of great importance since the application needs to be up and running and available almost all the time (needs to be resilient). Redundancy should be included in case a service breaks down. A disaster recovery plan is also required. 3 9's (99.9%) availability is required at all times.

3. **Network Performance** - The network must be resilient, it should be able to handle the large traffic and minimize errors and delays as well as improving speed. An e-commerce site would require these as they have to handle

transactions as well as user information and to make the website convenient to use for the customer.

4. **Security** - Security is highly important as some of the departments (such as the finance department) would have sensitive information related to the company. The company's constraints also include exclusivity of information to certain departments which need to be considered. Since it is an e-commerce website, customer information (credit card numbers, date of birth, etc.) need to be guarded with utmost security.

5. **Manageability** - Since there are at least four different departments, manageability is important to a certain extent.

6. **Adaptability** - The network must adapt to any changes required (such as upgrades) and must be able to deal with any changes in requirements or changes in technologies. Since the company is just beginning to expand, they will have to deal with prospects of change.

7. **Usability** - Usability is needed to make the network and services easy to use by both the customers and the employees.

8. **Affordability** - Being an e-commerce site, the network must be able to handle a huge amount of traffic at the lowest cost possible.

Tradeoffs chart

Technical Goal	Percentage
Scalability	25 %
Availability	20 %
Network Performance	15 %
Security	15 %
Manageability	5 %
Usability	5 %
Adaptability	5 %
Affordability	10 %
Total	100 %

Since this is an e-commerce website, it needs to be readily available (needs a server where millions can access it at the same time). The costs will increase and affordability will be compromised. So, there is a tradeoff between availability and affordability.

Another tradeoff is between security and affordability. Since it is an e-commerce website, security is extremely important. This requires a lot of money. Affordability is again compromised.

Setup

The company initially started off with a flat network topology that met their needs pretty well. There were 5 employees with no specific roles and an on-premises web server for the website.
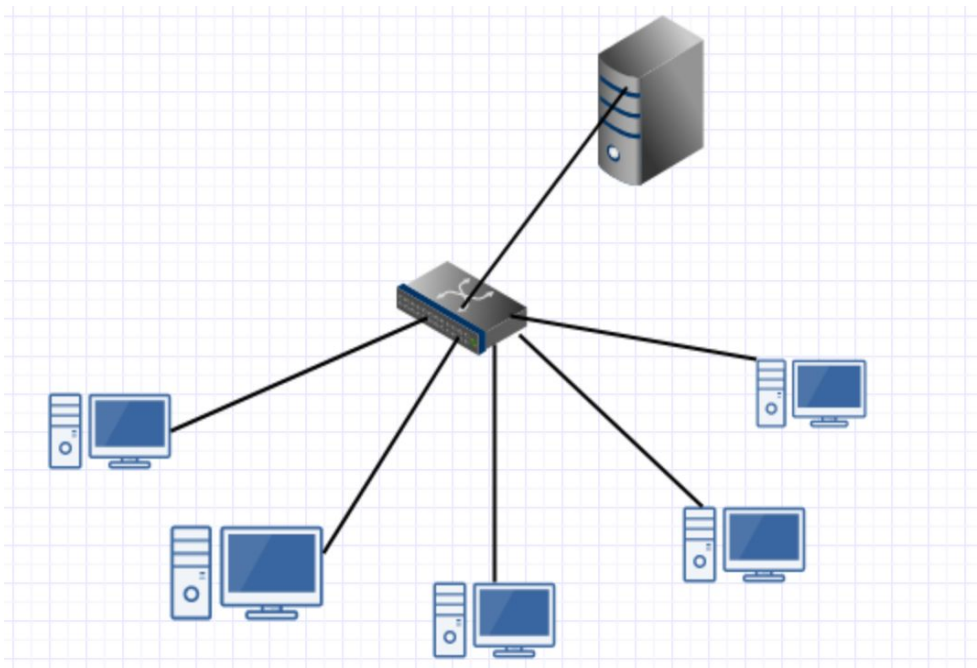
But now, they plan on expanding their operations with the help of the funding from the venture capitalist. They now have a new facility and have hired new employees and organized them into departments. The flat network topology is no longer sufficient for their needs. Scalability is extremely difficult on flat networks, and scalability is a very important goal for the company. Moving to a cloud based network architecture would be feasible for the company.

PaaS would work the best for the company's requirements :- Platform as a Service or PaaS is a set of cloud-based services that enable business users and developers to build applications at a speed that on-premise solutions cannot match. As it's a cloud-based service there's no need to worry about the set-up and maintenance of servers, patching, upgrades, authentication so users can focus on creating the best user experience possible while being economical. There are many solutions available from companies like Amazon with AWS and Microsoft with Azure. The cloud services acquired by the company includes two web servers connected to a load balancer along with a database server. As availability is one of the most important tradeoff, each server will contain copies of both the websites so as to avoid a single point of failure. The load balancer is in place to help direct traffic efficiently, to increase both availability and responsiveness.

Since all the departments are in the same building, a Local Area Network (LAN) would be most suitable.The connection to the public domain will be through a router which is owned by an Internet Service Provider (ISP) Company.

Since there are 6 floors in the building and a maximum of 7 devices on each floor (assuming each floor has two printers), each floor will house a router which connects to all the devices on that floor.

There are two database servers with one as the backup. The servers contain the crucial information about the customers and employees and are located on the 5th floor of the building so as to avoid data loss in the case of a natural calamity such as an earthquake or a tsunami. There are efficient cooling systems in place to take care of the heat dissipated by the servers.

A hierarchical network can be implemented in order to include redundancy in case of failure. Furthermore, a hierarchical network is reliable,scalable and cost efficient.

ACL can be used to restrict access to the departments.An **access-control list** (**ACL**) is a list of permissions attached to an object. It pecifies which users or system processes are granted access to objects, as well as what operations are allowed on given objects. This can be used to satisfy the various constraints regarding the departments.

Ground floor - This floor is to take care of walk-in customers. An additional Wi-fi router can be placed on the floor to give internet access to customers. The access should be restricted to only smartphones, this can be implemented using NAC - the top NAC products on the market today support IOS, Android and Windows. Since the customers should not be allowed to access any social media sites, a network security service (OpenDNS, for example) is installed on the router. This is designed to block out all the websites which are not to be accessed by the customers.

First floor - The finance department of the company are on this floor. There are three employees in this department, so there are three desktops and two printers on this floor. Since the finance department cannot let any other department access their data, they require a higher degree of authentication. NAC can be used to provide role based access i.e to provide network access only to areas of the network that allow that particular owner of the device to perform their job role.

Second floor - The human resource (HR) department of the company are on this floor. There are five employees in HR. So, a total of seven devices on this floor (including the printers). The HR department can access the data of all departments except the data of the finance department. Can be achieved using NAC as mentioned above.

Third floor - The marketing department is on this floor. There are four employees, so a total of six devices on this floor.

Fourth floor - The software development department is on this floor. There are four employees, so a total of six devices on this floor.

The marketing and software development departments should be able to communicate with each other other the network and can access each other's data using role based network access using NAC.

Security - Will be implementing appropriate IDS and IPS technologies to create a secure work environment.To implement physical security - by installing cameras in the server room, having only one entrance that also works as an exit and a biometric/ID card scan for employee authentication.