Sri Lanka Institute of Information Technology

Design and Management of Computing Infrastructure
IE2071

Year 2 Semester 1

Assignment

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1. Overview

1.1 Identifying customer needs and goals

As in for the requirement gathering of the project, we consulted the owner of the basha Lanka itself to get details about the existing networking configuration and how well the next increment of the particular network should be designed, hence we conducted a brief study and extracted the needs and goals of the networking requirements of the company.

The company expressed that there is a need of recruiting a new group of employees into the company to reach their further requirement of expanding its branch network into expanding its capacity into twice it's current size. Hence to meet the computer usage of the new labor force we understood that there's a need of new networking infrastructure to facilitate the interconnectivity.

Also, the new employee team will consist a new research and development team which will facilitate the further examination of further networking requirements in the changing environmental and business factors.

Hence the company is hoping to expand its branch network into a second branch the owner is aware about the complexity in monitoring two branches at once since everything happening within these two software development branches should co relate and should be updated hence we found the need of the company in the need of implementing a new remote access system to monitor the procedures and also to facilitate the work from home facilities as well.

1.2 Identifying the scope

Hence the company has expressed their needs and goals precisely with us in the natural language we used the networking background and the material to implement a new networking environment to facilitate all these requirements.

Hence, we summarized the need of new switches, routers and access points to co relate with the need of expanding the network. It is clear that these two branches will be within two different places physically but to meet these demands there is a need of using wireless technologies as well. The routers will be used in the connection of the LANS of the core layer equipment altogether with the access points with incarnation points to use the internet connectivity.

Access layers and the distribution layers will be facilitated with new level 3 switches to facilitate the switching facilities within the inter LANS hence the LANS are further divided into virtual LANs as well

Further the security measures will be toughened with the use of a new strong firewall service to get the protection form the harmful malwares into the network since the cyber protection is mandatory in a private network like this in an organization.

1.3 Identifying the networking applications

This particular business is currently using a public mail domain service where there are many email communications which happens in between the office premises and as well as the relevant teams in between the structure. Hence it was suggested that a paid mail hosting service to be acquired from the Sri Lanka's leading mail service provider SLT with their ipv4 networking leasing facility whereas the rented facility will allow the office to use the e mail facility more securely and more sensitive information could be passed along with the safety in mind. Also the network traffic will also be minimum upto a standard since the service is rented.

Also this business is frequently using internet facilities provided by SLT and is extracted to the organizational networking structure. Hence to meet the standards and also to increase the security of the internet accessing facility we suggested that it will be more suitable if another server machine is maintained as the proxy server to filter the network traffic and also the network inflow and outflow.

The firewall services are further analyzed and we suggested on using new technological firewalls like Palo Alto and also Cisco networking applications which will allow the network to be protected from harmful access and also the AI features of the new world will be used in an incorporated manner.

1.4 Analyzing the business constraints

Although the plan of the company is to increase its capacity and as well as the networking infrastructure the company has capped it's budgetary allowance of 30 million rupees for the whole project whereas the networking requirements should also be balanced form the allocated budget without compromising the networking requirements as well.

There is a new project manager assigned for the project of the expanding of the branch. The project manager is responsible for the making of the Gant charts and also the milestone charts of the project. According to these charts the expected date of completion of this project is by the end of the year 2025, which leads to a timely constraint since the networking infrastructure is installed in the final stages of the projects which creates loads of stress on to the project manager and also the networking team as well

2. Analyzing Technical Goals and Constraints

2.1 Scalability

Scalability means the network's ability to accommodate growth and increased demand with time. For Basha Lanka (Pvt) Limited, scalability is important as the company plans to expand its workforce and tasks. The organization handles the addition of new clients, sites, and servers consistently.

- Growth Projection:

The network design must accommodate the anticipated increase in the labor force over the course of the following 5 years, requiring the expansion of a critical number of clients to the organization.

- Number of Users Added in the Future:

By hiring a certain number of employees each year for the next 5 years, the network should be scalable enough to accommodate additional users by the end of the 5 years. More clients mean expanded interest for network data transfer capacity to help their exercises.

- Number of Sites:

Considering the expansion plans, the network must support multiple sites, including the addition of a second branch.

- Server Requirements:

The network design should be responsible for the improvement of additional servers to support the new research and development arm and other business operations. Servers may be required to host development environments and collaboration tools. Additional servers are necessary to support enhanced security measures.

2.2 Availability

Availability refers to the reliability and uptime of the network. Basha Lanka requires a network that is available 24/7 to support its operations effectively. High accessibility guarantees negligible free time, which is basic for continuous efficiency.

- Uptime Requirement:

The network should aim for high availability to ensure uninterrupted business operations. Though users mostly use the network during the day, it should be available both day and night.

2.3 Performance

Performance relates to the speed, responsiveness, and productivity of the network. Basha Lanka's network must be optimized to handle data transmission efficiently, prevent congestion, and maintain low delay. This ensures smooth communication across the network.

- Network Utilization:

The network design should optimize network utilization to prevent congestion and ensure efficient data transmission. This includes user data transfer and access to shared resources such as files and databases.

- Delay:

Low delay is essential for maintaining responsive communication and application performance across the network, particularly for real-time applications such as voice and video conferencing, online collaboration, and remote access.

2.4 Security

Security is essential to protect Basha Lanka's sensitive data, services, and network system from cyber threats. A deep risk analysis is essential to identify vulnerabilities and implement robust security measures, including antivirus software, firewalls, and user authentication mechanisms.

- Risk Analysis:

A thorough risk assessment should be conducted to identify potential vulnerabilities and threats to the network infrastructure. This includes implementing antivirus and antimalware software, application security, and firewalls.

- Data and Service Security:

Robust security measures should be implemented to safeguard sensitive data and critical services from unauthorized access and cyber threats. This includes data loss prevention, wireless security, and web security.

- User Security:

User authentication mechanisms and access controls should be implemented to ensure that only authorized personnel can access the network resources. This includes email security and behavioral analytics.

2.5 Manageability

Manageability refers to the ease of managing and maintaining the network infrastructure. Basha Lanka requires performance, fault, security, and configuration management tools and practices to ensure optimal network performance, minimize downtime, and streamline network management tasks.

- Performance Management:

Network monitoring tools should be employed to continuously monitor network performance and identify any bottlenecks or issues. High-performance network devices should be utilized.

- Fault Management:

Proactive measures should be in place to detect and address network faults promptly to minimize downtime. Regular tracking of availability and performance is essential.

- Security Management:

Regular security audits and updates should be performed to ensure the network remains resilient against evolving cyber threats. Active firewall protection is essential.

- Configuration Management:

Standardized configuration procedures should be established to streamline network management and ensure consistency across devices.

2.6 Adaptability

Adaptability involves designing the network to accommodate future technological advancements and changes. Basha Lanka's network should be flexible enough to adapt to new technologies and support professional needs, such as Quality of Service (QoS) enhancements and fiber-optic infrastructure.

- Future Technologies:

The network design should be flexible to accommodate future technological advancements, such as Quality of Service (QoS) enhancements. Fiber-optic infrastructure should be considered for fast and uncorrupted service.

2.7 Affordability

Affordability refers to maximizing the use of resources and optimizing costs while ensuring efficient network performance. Basha Lanka aims to minimize additional financial costs by maximizing resource usage and introducing efficient traffic management strategies.

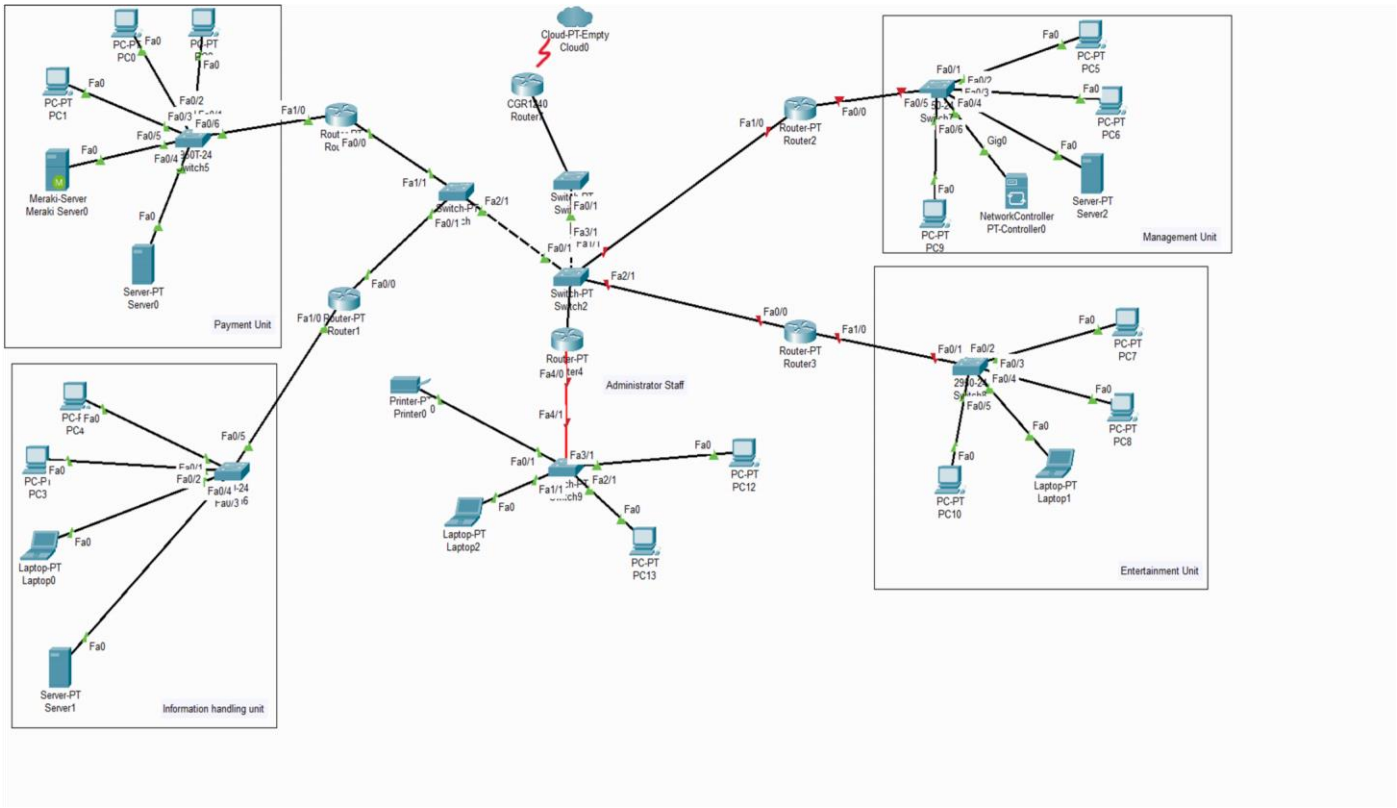
- Resource Optimization:

The network design should maximize the utilization of existing resources to minimize additional financial costs.

- Traffic Management:

Efficient traffic management strategies should be implemented to optimize network performance while keeping costs within budget constraints.

2.8 Network Map



In our network map, we have five units. Such as,payment,information handling, entertainment, management and administrative unit.

There is a meraki server in the payment unit to protect the high sensitive data.

This network is consists of two 24 port switches and two 48 port switches to increase the network performances.

This has made for 40 end devices as per the requests from the company. Currently they are having two units such as payment unit and information handling units. They want to add another three units , entertainment , management and administrative. And also within the same location they want to implement this.

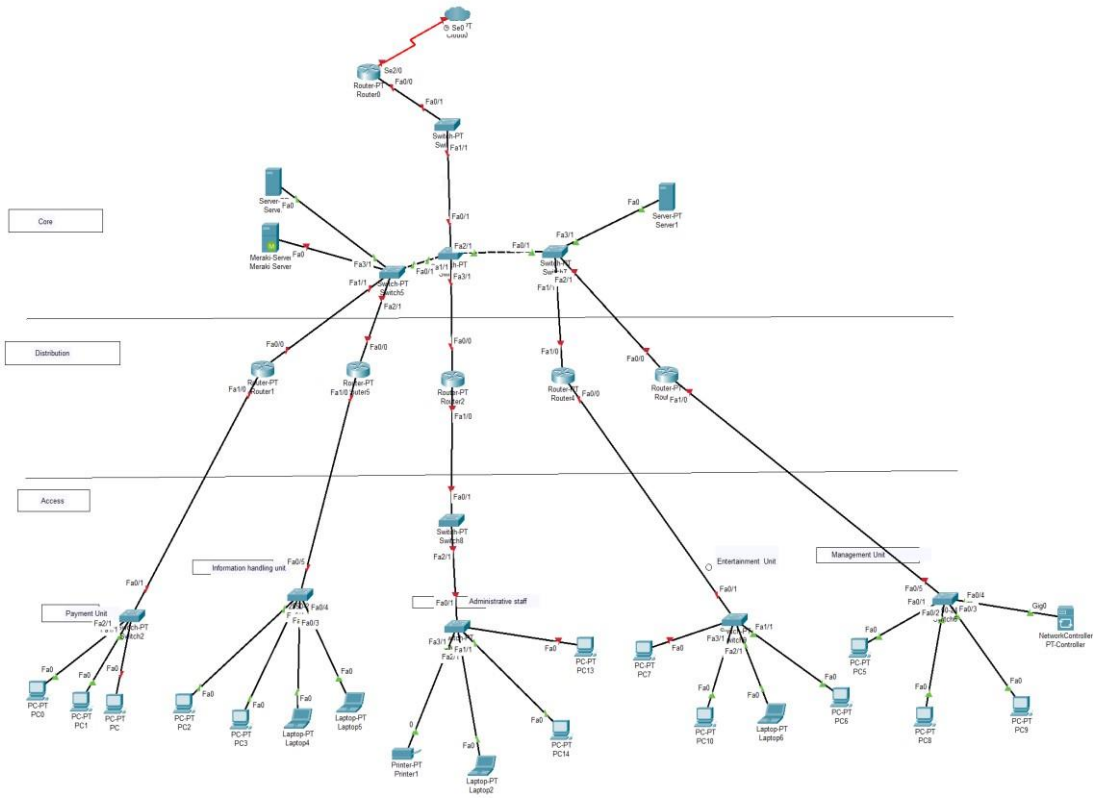
2.9 Characterizing Network Traffic

- Network traffic can be categorized as follows, using techniques of traffic flow, traffic volume, QoS (Quantity of Service), and protocol behavior.
- QOS requirements; 1. Reliability of all applications to prevent packet loss or lost acknowledgment to avoid data transfer

2. Network availability
3. Transmission delays at least especially for voice requests

3. Logical and physical network design

3.1 Hierarchical network design

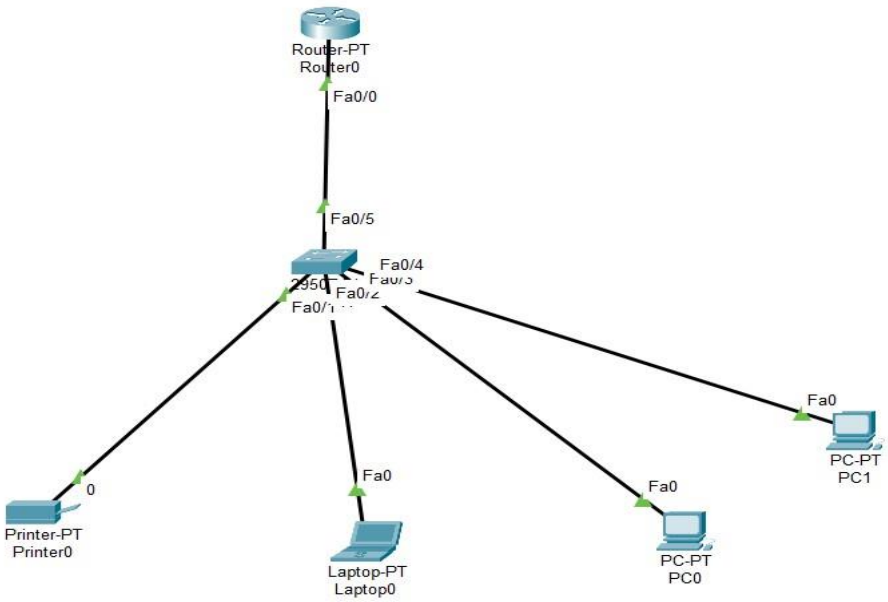


The core layer consists of the servers and the switches and it is not accessible for the access layer. The core layer consists of all the data which needs to secure.

The distribution layer is the layer which forms a connection between the core layer and access layer. It provides connection for the samaller LANs and end devices.

The access layer consists of all the end devices which are accessible for the users. Users interact with the system using access layer.

3.2 Designing an Addressing Model



3.3 Developing network security management strategy

There are several network security management in the existing network.

- Anomaly discovery is very important to understand how the network should work and an Anomaly Discovery Engine (ADE) helps to analyze the network efficiency.
- Firefighters that can be used to protect the boundaries between the network and the internet.
- VPN tool used to authorize the connection between a secure network and storage devices.
- Remote access VPN uses IPsec or socket layers (SSL)Secure authentication

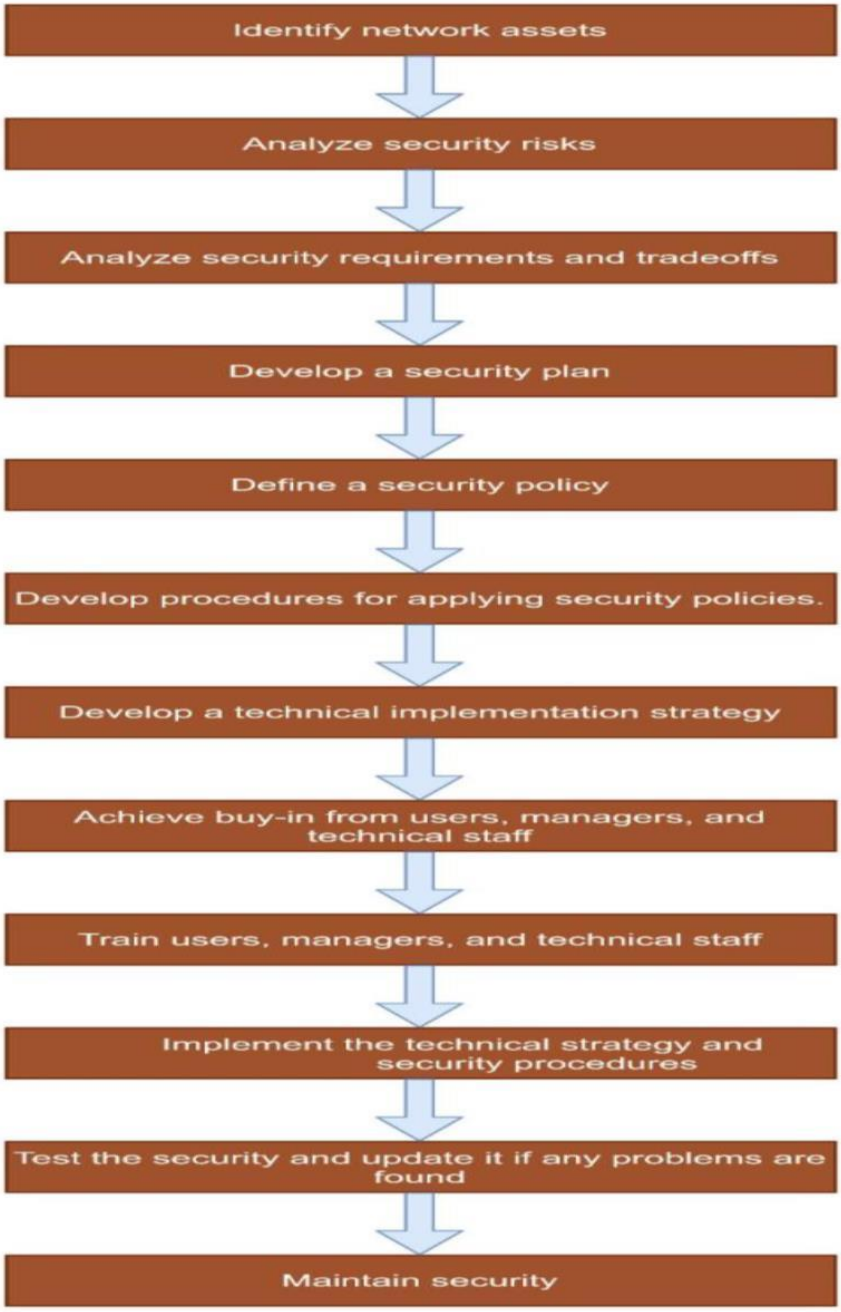
The other threads that may attack network security are as follows,

- Cybersecurity attacks
- Phishing
- Man in the middle attack
- SQL injection attack

Due to the above reasons, these factors may occur,

- Device configuration may change
- Password can be changed
- Loss of data

With the advent of illegal and security issues, they set themselves up to develop an effective security management strategy, as follows



Anyone who enters the system must enter the username and Password to enter the system

3.4 Physical Network Design

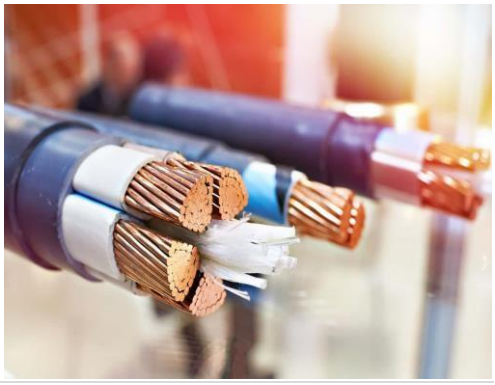
Cabling technology

Two methods for installing the cables in the system that link one or more computers to a network interface.

1. Backbone cabling
   - provides interconnection between telecommunication rooms, entrance facilities, equipment rooms, or buildings.
   - Use coaxial cables to get a high signal for cable TV

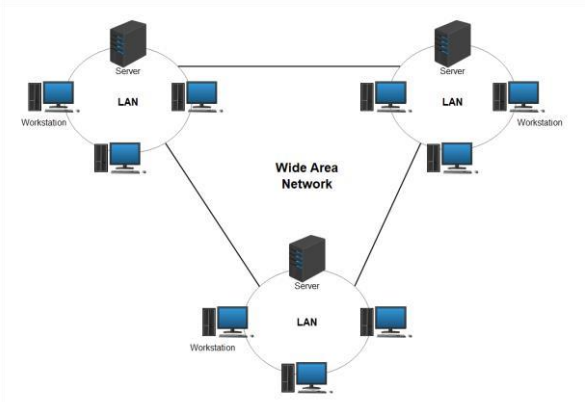
2. Horizontal cabling

   - connect a variety of workstations and devices to information outlets.
   - use twisted pair cables to connect devices over the building.



LAN & WAN technologies

- In this company there are 3 main local area networks
- The main local area network is located in the head office and the other 2 local area networks are located in two different branches.
- WAN network systems could be a connection to a LAN that connects with other LANs using telephone lines and radio waves.



3.5 Implementation

There are six steps to implement the network:

Stage 1

we need to design a physical network get approval from the top managerial staff of the department and explain the system to be assembled.

Stage 2

Inform the installation details(when will be the system installed and how much time)

Stage 3

Using cloud computing and Setting up the virtual private network with a VPN server, VPN client, and VPN router.

Stage 4

Develop LAN (using switches, and routers). Then interconnect LAN with WAN. Implementing the packet switching that consists of protocols.

Stage 5

Pre-configure network equipment and test it before execution.

Stage 6

Finally, when it comes to the evaluating and implementing stage, they can implement the selected process as and when it is needed

3.6 Operation & maintenance

There are several steps used to operate and maintain the network. They are:

- Regular checks
- Check utilization and latency
- Network performance in the department will be monitored on all LAN and WAN links so we can know when things go wrong.
- Quality of Service will be configured on the appropriate interfaces.
- Security policy for preventing from cyber-attacks, viruses, and threats and implementing it by using firewalls.
- Maintenance and operations are mainly done by the Technical network assistant of the department.

3.7 Budget plan

Equipment	Number of equipments	Cost per one unit	Total cost	Vendors
Dell Pcs	20	250,000	5,000,000	Softlogic
Dell Laptops	20	159,999	3,199,980	softlogic
24 port switches	4	48,750.23	195,000.92	Senso micro
48 port switches	4	77,219.20	308,876.80	Senso micro
Synology RT2600AC Routers	6	89,750	538,500	mmsrilanka
Labor cost		500,000	500,000	
Transportation		50,000	50,000	
Coaxial cables	700m	9,100 (100m)	63,700	hikvisionsolution
Twisted pair cables	600m	17,950(300m)	35,900	Bnshardware
MerakiMX 67 server	1	896,020	896,020	desertcart
Printer	1	57,500	57,500	Senso micro
Network controller	1	83,367	83,367	Senso micro
Dell PowerEdge T40nServers	3	369,900	1,109,700	dellstore
Total			**12,038,544.70**	