

Network Design Proposal for Small Office

A COURSE PROJECT REPORT

By

Kondreddy Bhanu Sree(RA2011003010676)

Shashank Rai(RA2011003010678)

Ananya Mishra(RA2011003010679)

RAGUNATH.A(RA2011003010681)

Adhiraj Singh(RA2011003011406)

Under the guidance of

Mrs. Ida Seraphim

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BONAFIDE CERTIFICATE

Certified that this mini project report "Network Design Proposal for Small Office" is the bonafide work of

Kondreddy Bhanu Sree(RA2011003010676)

Shashank Rai(RA2011003010678)

Ananya Mishra(RA2011003010679)

RAGUNATH.A(RA2011003010681)

Adhiraj Singh(RA2011003011406)

who carried out the project work under my supervision.

SIGNATURE

Ms. Ida Seraphim B
Assistant Professor
Department of Computing Technologies

SRM Institute of Science and Technology

SIGNATURE

Dr . M .Pushpalatha
Professor and Head of
Department of Computing Technologies

SRM Institute of Science and Technology

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ABSTRACT

The paper outlined the steps involved in structure network design and deployment for a small office home office need. It presented the steps (or phases) of a structured network design and demonstrated a practical implementation of the steps using a real-life case study. The design was first simulated using Cisco Packet Trace software and. Specifically, the paper demonstrated first hand, how a small network may be set up using the five phases beginning with the needs analysis and ending with deployment/testing. The result of simulation and results of the post deployment test revealed that the network met the client's needs.

INTRODUCTION

Project Scope

A network has to be designed for a small office organization which has 5 users. The organization has a server and 5 users around the main server switch arranged in a small office model.

Extensive planning should go into a network installation/implementation. Just like any project, a need is identified and then a plan outlines the process from beginning to end. A good project plan will help identify any strengths, weaknesses, opportunities, or threats (SWOT). The plan should clearly define the tasks, and the order in which tasks are completed. The main goal of structured systems analysis is to more accurately represent users' needs, which unfortunately often are ignored or misrepresented. Another goal is to make the project manageable by dividing it into modules that can be more easily maintained and changed. Structured systems analysis has the following characteristics:

- The system is designed in a top-down sequence.
- During the design project, several techniques and models can be used to characterize the existing system, determine new user requirements, and propose a structure for the future system.
- A focus is placed on data flow, data types, and processes that access or change the data.
- A focus is placed on understanding the location and needs of user communities that access or change data and processes.
- A logical model is developed before the physical model. The logical model represents the basic building blocks, divided by function, and the structure of the system. The physical model represents devices and specific technologies and implementations.
- Specifications are derived from the requirements gathered at the beginning of the top-down sequence.

LITERATURE SURVEY

Structured Network Design and Implementation for a Small Office Home Office -
Tutorial/Report by Offor, Kennedy J.Obi, Patrick, Nwadike Kenny T and Okonkwo.

- The paper outlined the steps involved in structure network design and deployment for a small office. It presented the steps (or phases) of a structured network design and demonstrated a practical implementation of the steps using a real life case study.

You need to consider the following before designing a local area network:

1. Number of ports required
2. Network speed required; for example 100Mbps, 1Gbps, etc.
3. Media consideration- Ethernet, wireless, token ring, etc.
4. Devices required- Switches, Routers, Access Points
5. Installation and configuration efforts required
6. Ease of management

Smaller organizations have more modest computing and networking requirements. They might have a dozen or so computers and a few laser printers. The network for the small office must allow members of the organization to share information, as well as printers and other peripherals. The computing needs of most small organizations can be met by a single LAN with one or two servers, using off-the-shelf components. Unlike the enterprise network, a small office LAN usually can be managed by one person with only moderate technical knowledge and experience.

Before you begin designing your network, have a clear sense of what you need it to accomplish. One prerequisite to network design is a complete assessment of expected functionality. Set aside some time to think about all the tasks you want to automate or make more efficient through your computer network. What business applications do you need to support? Do you simply need to provide shared access to word processing files, or do you have multiuser databases to support? Do you need electronic mail? Web servers? Point-of-sale operations? Will you require Internet access? Once you have considered all the business tasks and functions you expect to implement on the network, write them down and assign priorities to each item. As you begin deploying your plan, you might need to consider which parts you can do now and which can be addressed later. Take care of critical business functions first.

PROJECT REQUIREMENTS

Functional Requirements:

While designing Small Office, the IT department solves all types of IT problems and serves the core network. IT creates a core network diagram. This diagram involves all types of usable network mechanisms (Switch, Router, Firewall, Server) etc. Simulation is the most important of any system. An accurate system design, accurate performance and accurate Simulation give the best performance of a system.

HARDWARE REQUIREMENT ANALYSIS

From the given scenario, we draw the following requirements:

For Small Office:

Hardware Required:

Switches:

5 Department Specific Switches

1 Main Server Switch

End Devices:

4 PCs for each Department Specific Switches

1 Printer for one of the Department Specific Switch

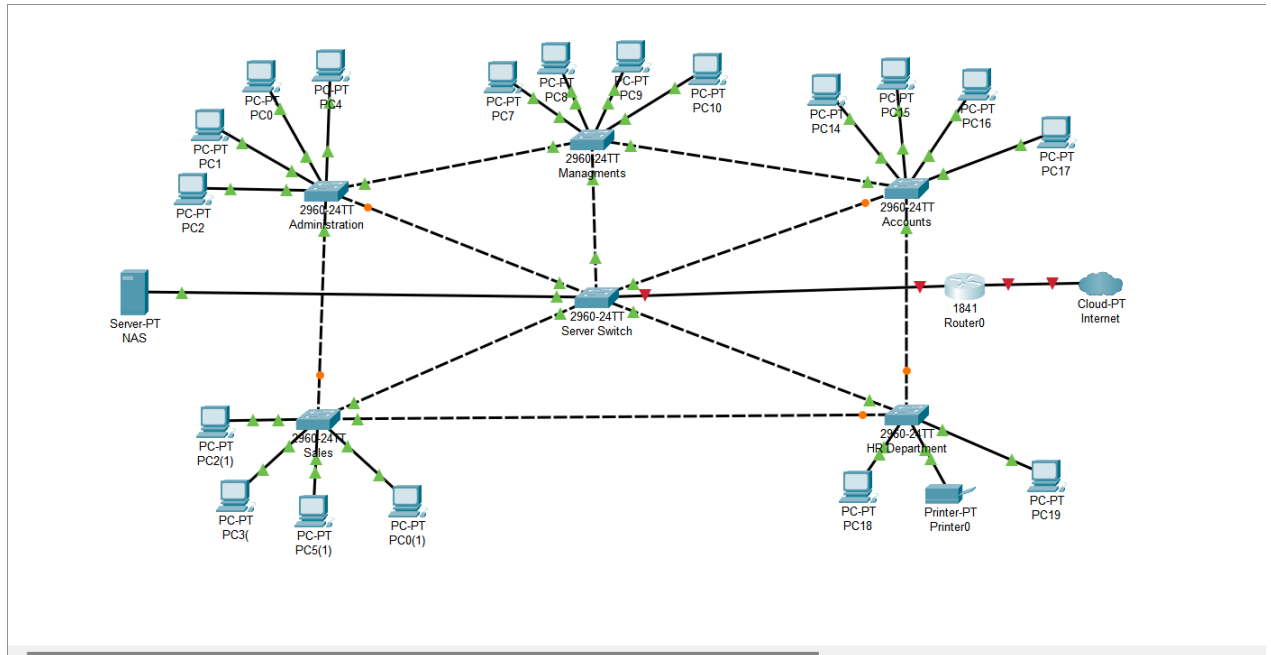
1 Main Server Switch which are interlinked to all the Department Specific Switches

To communicate with each other.

NETWORK TOPOLOGY DIAGRAM

Network Architecture

The network architecture is as follows:



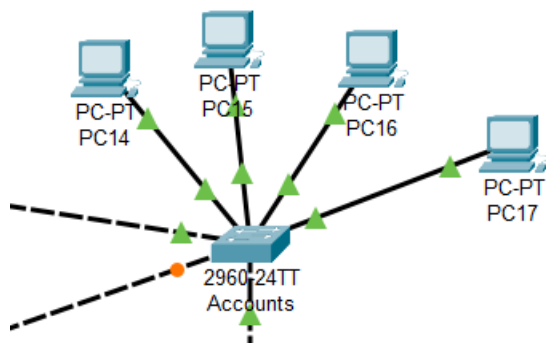
The architecture consists of the following networks:

- Switches
- PC's
- Network maintained by the Internet Service Provider

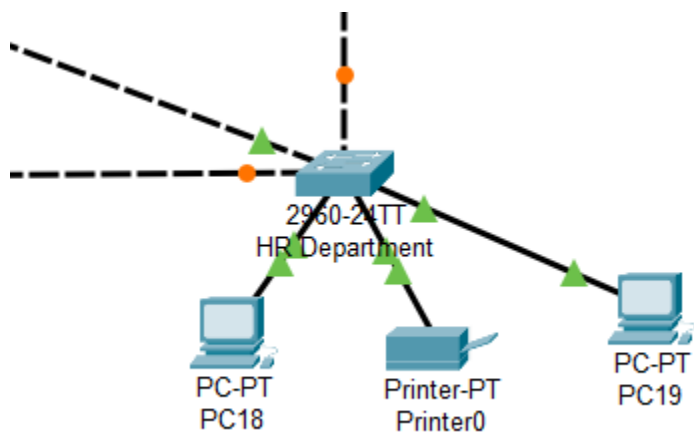
These networks are interconnected with each other with varying degrees (discussed in the implementation chapter).

NETWORK INTEGRATION ANALYSIS

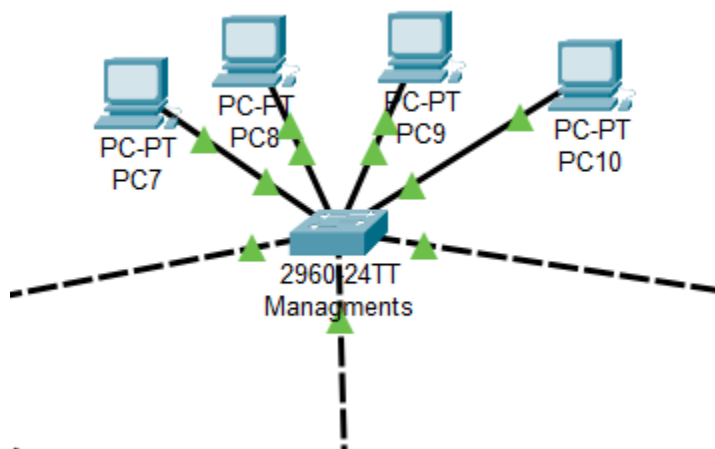
Accounts



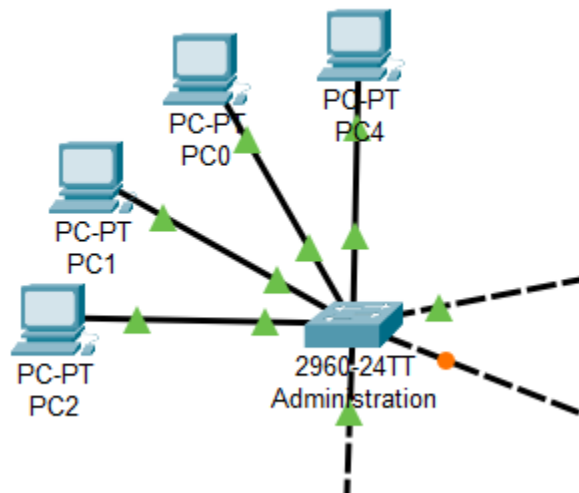
HR Department



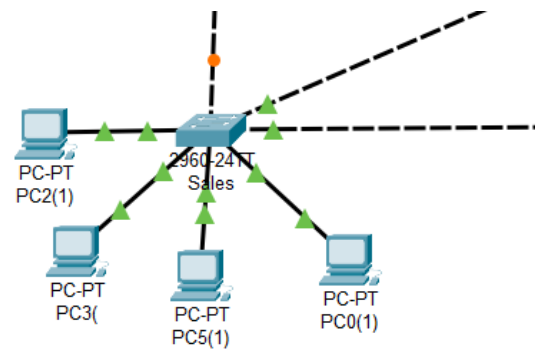
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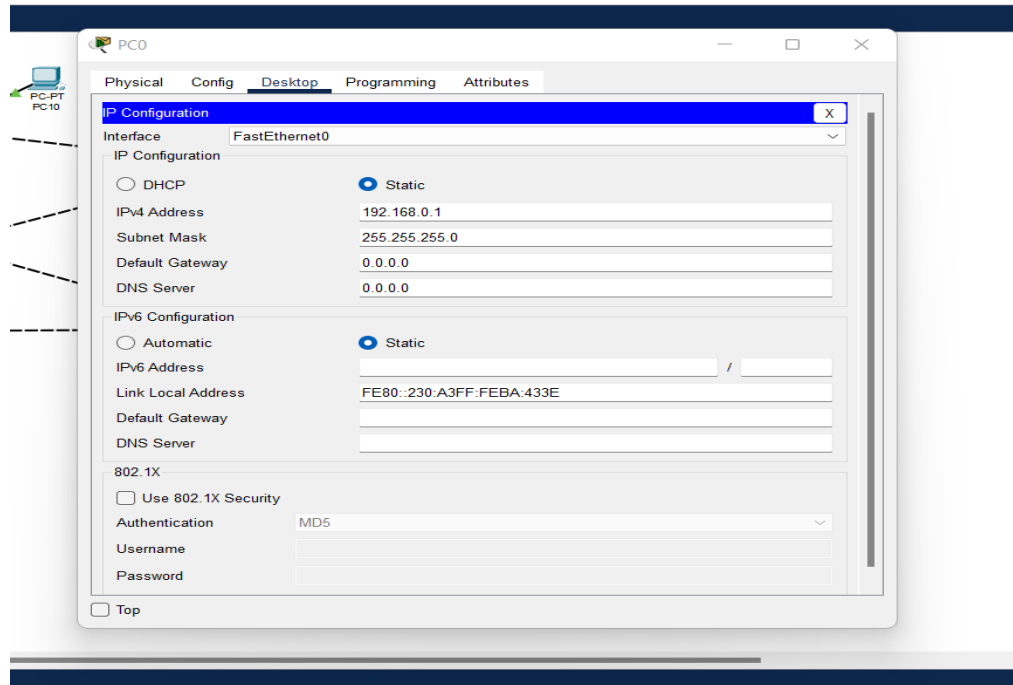
Administration



Sales



IP NETWORK DESIGN



IP CONFIGURATION FOR THE CLIENTS

Address Table

The address table is as follows:

Device	Interface	Address
Main Server	Fa0	192.16.0.2
Administration Server	Fa0/0	192.16.0.1
	Fa1/0	192.16.0.1
	Se2/0	10.0.0.1
Management Server	Fa0/0	192.16.0.2 to 192.16.0.7
Sales Server	Se2/0	10.0.0.2
	Fa0/0	192.168.10.1
Hr Department Server	Fa0/0	192.168.10.2 to 192.168.10.4

The Company Router has configured with an ACL.

The Access Control List contains the entire broadband network. Any request from that network is translated to the private IP of the server.

Static Routing is used on all the routers to interconnect the networks.

REQUIREMENT ANALYSIS

From the given scenario, we draw the following requirements:

1. Identifying the appropriate hardware which would be used (Cisco Packet Tracer)
2. Users on the internet should be able to access only https on the switch server.
3. Users on the internet should have access only to the public IP address of the server and not the private IP address.
4. The users in the organization should have full access to the server.
5. TCP/IP Network design with IP addressing
6. Features and configuration required on the hardware with explanation

We need to configure a network design keeping the following requirements in mind.

SOLUTION EXPLANATION

In the above design, all desktop computers and one of the router's Fast Ethernet ports were connected to the switch (a 16-port Linksys Switch). The Internet Port of the wireless router/access point was connected to the 600mW outdoor Access Point. Since there is no server available, the router acts as a DHCP server and assigns IP addresses in the 192.168.4.1 – 192.168.4.49 range to the wireless clients and 192.168.4.100 – 192.168.4.150 range for the wired clients. To ensure security of the network, the main Server is Used as the medium of the communication. For the physical cabling, the cables were passed through the main server and the rest of the department specific servers. The cables were terminated with a patch panel nailed to the wall. The cables were bundled together using low cost cable managers instead of using trunks in order to save costs. Nevertheless, the cabling work was neatly done and aligned along the wall. The 400mW Outdoor Access point/Bridge was firmly mounted on a pole already fixed to the roof. The device is aligned to the line of sight of the digital centre for maximum reception.

SERVICES AND FEATURES

An appropriate small business network design is important for business owners. A small network is often more susceptible to viruses and spyware than larger networks, due to software vulnerabilities. Up-to-date software built to manage these risks is just as important as having high quality routing systems and hardware.

Knowing how to design a computer network is not always easy. Everything from the position of the router in a signal chain to the number of computers in the network will affect the flow of information within an organization.

Setting up a network for the office requires the following:

- A secure Internet connection from the Internet Service Provider (ISP)
- A router with a high-speed Internet connection
- A modem
- Firewall capabilities
- One or more switches (allows computers to link to one another over an internal network)
- Phone line/cable/fiber optic linking (wired or wireless)
- Ethernet hubs
- Management and security software

SOFTWARE AND HARDWARE

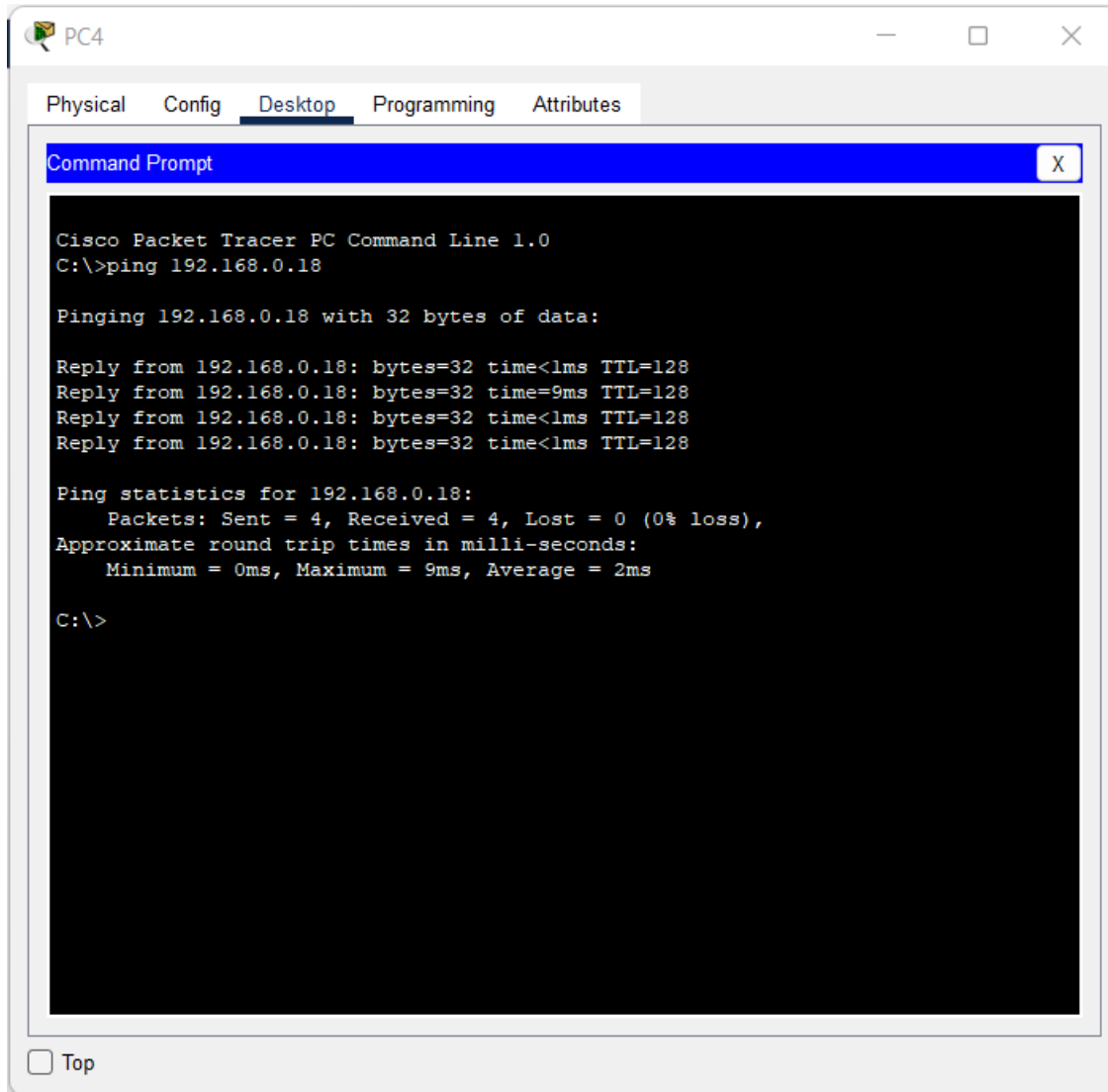
Here is the list of devices needed to set up a computer network for your business:

- Modem
- Router
- Firewall
- Switch
- LAN Cable / Patch Cable
- Access Point
- Repeater
- Patch Panel

RESULTS AND DISCUSSION

Connection Check

The network connections were checked by ping requests:



The screenshot shows a window titled "PC4" with tabs for "Physical", "Config", "Desktop", "Programming", and "Attributes". The "Desktop" tab is active, displaying a "Command Prompt" window. The command prompt shows the execution of a ping command to 192.168.0.18, resulting in four successful replies with 0% loss and an average round trip time of 2ms.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.0.18

Pinging 192.168.0.18 with 32 bytes of data:

Reply from 192.168.0.18: bytes=32 time<1ms TTL=128
Reply from 192.168.0.18: bytes=32 time=9ms TTL=128
Reply from 192.168.0.18: bytes=32 time<1ms TTL=128
Reply from 192.168.0.18: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.18:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 9ms, Average = 2ms

C:\>
```


CONCLUSION AND FUTURE ENHANCEMENT

The paper outlined the steps involved in structure network design and deployment for a small office home office need. It presented the steps (or phases) of a structured network design and demonstrated a practical implementation of the steps resultant configuration in place of the desktop computers. The design was first simulated using Cisco Packet Tracer. The only problem encountered was the issue of unavailability of power at the site for configuration of the devices. However, UPS systems were used to overcome this issue since the devices are not high-power devices and a laptop was used to configure and test the resultant configuration in place of the desktop computers

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