Enterprise Network of business corporation
Suleyman Demirel University

Students:

Abay Aruzhan 180107020
Zhumabekov Kanat 180107035
Serik Sanzhar 180107045

Instructor: Shoganova Inkar

Bachelor of Engineering, 2nd course
Computer Science
Suleyman Demirel University

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ABSTRACT

This document is in addition to the Packet Tracer project for designing a business corporation enterprise network. In the first part of the article, literature was reviewed and the relevance for building a business corporation enterprise network was identified and justified. This section also includes site selection and data collection. The main part of the project shows the result of network design. STP, OSPF, EIGRP, ACL, HSTP are used to ensure network security, redundancy and routability. The location and number of access points and end devices were calculated for the facility and a decision was made on their use.

In conclusion, the weaknesses and future growth of the network were discussed. Mentioned team efforts, as well as attached photos.

LIST OF ABBREVIATIONS

ACL - ACCESS CONTROL LISTS

DHCP - DYNAMIC HOST CONFIGURATION PROTOCOL

DNS - DOMAIN NAME SERVER

VoIP - VOICE OVER INTERNET PROTOCOL

EIGRP - ENHANCED INTERIOR GATEWAY ROUTING PROTOCOL

RIP - ROUTING INFORMATION PROTOCOL

OSPF - OPEN SHORTEST PATH FIRST

BGP - BORDER GATEWAY PROTOCOL

VLAN – VIRTUAL LOCAL AREA NETWORK

LAN – LOCAL AREA NETWORK

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Part 1

Introduction

Since the past all the major of success is depending on the efficient transmission of the information and communication. Time by time the method of sending information and communication used to change, and now we're in the 21 century where technology is developing very fast. All big corporations and organizations are using the most useful and efficient method to make all this stuff with transmission files accessible to all people, to reach the new highs and gain from this process good results. Now, the world of technovation is becoming so widely, that there are more than a thousand types of IT fields. We have the opportunity to study anything and to learn many things. The class of Computer Networks gives us the chance to understand how this system of networking works and use it in daily life. The main purpose is to use all acquired knowledge from Computer Networks class then create an enterprise network for business corporation and configure each device, which has to work properly and safely. Network plan standards and models can enable a system to design structure and construct a network that is flexible, versatile, manageable

1.1 Background

The current object of this project is a business corporation, which has a big building with 6 different departments. The main purpose of this project is to give access to the internet to each department and give an opportunity to transmit any files between them. There are the accounting department, managers' department, financiers' department, IT- department, designers' department, operators' department.

1.2 Aims and Objectives

All frameworks ought to have the option to forward and take the data, also recover the data. Moreover, physical frameworks and gadgets ought to have the option to keep up and give good execution, unwavering quality and security.
Our mission is to create an enterprise network of business corporations on Packet Tracer. The

design is based on hierarchical architecture with a model of standard corporations as an example.

1.3 Methodology

During the planning to create enterprise network we followed these steps:

1) Make up a concept of business corporation
2) Visualize the network architecture
3) Analyze the network sketch for reliability and safety
4) Make uninterrupted Internet connection

1.4 Project Outline

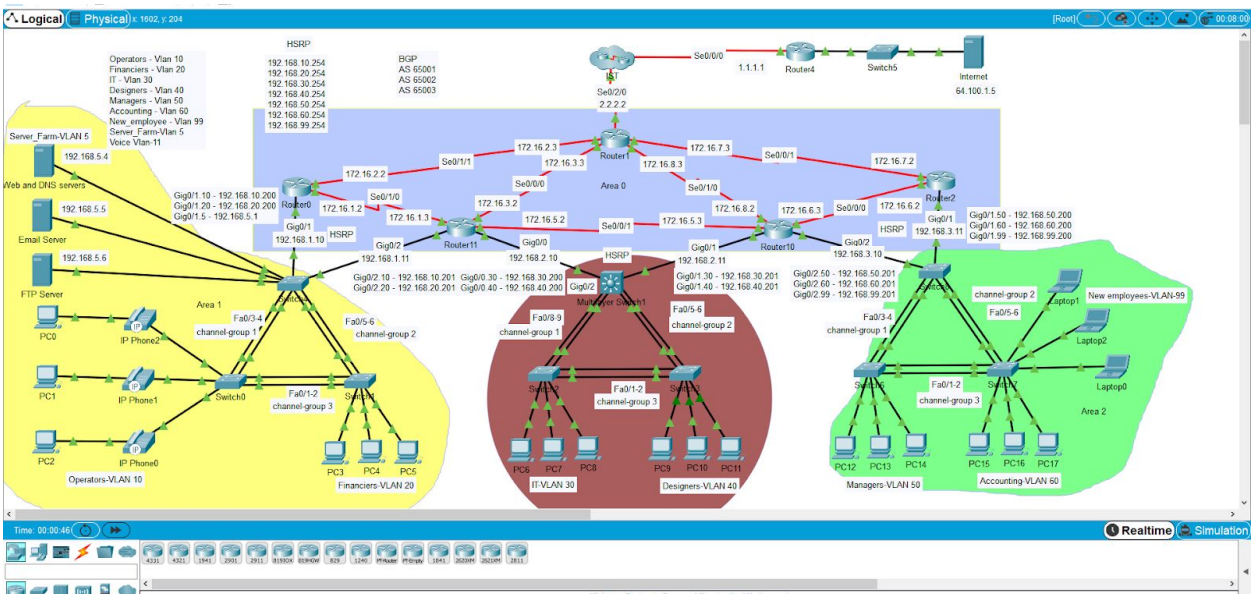
Part One demonstrates a brief introduction, background, scope and methodologies which were used. Second part mostly emphasized the literature review where the main concepts were performed. In the third part there were more accents made in the methods used in the project's implementation. Wide simulation and network troubleshooting including their various results are presented in fourth part.Fifth part of documentation concluded with short conclusions.

Part 2

Review

2.1 Network Design

In order to design the topology of the corporate network for a start, it is worth considering several very important issues. What does the hierarchical network structure include? How will key department units be interconnected? What is the best structure of devices that will provide a good transfer of files, ip addresses, domain names etc. The campus will be set as a three-layer hierarchical model comprising the core, distribution, and access layers.



Fig… Enterprise Network -Topology

Modularity

The departments of the network are good to use expandable, clustered devices that are easily upgraded to enhance scope. Devices can be added to the existing equipment to support new features and devices without requiring major equipment upgrades. Some arrangements can be combined in an aggregation to act as one device to make management and configuration easy.

Flexibility

This hierarchical network is flexible because it can include new VLANs that can be added, upgraded, and changed, as needed, without touching the design of the other functional areas of the network.

The structured hierarchical design essentially allows for a good flexibility because it provides step-by-step changes to each department in the network enough independently from others.

2.2 Enterprise Networks

An enterprise network is a set of end devices, routers, switches and etc. connected together in a particular area, which can communicate with each other while maintaining

reasonable performance, security, and reliability. All these systems are owned by the same organizations.

Thanks to Internet protocols and web technologies, the corporate network has achieved its goal, at lower cost and fewer configuration problems, which ensures a good result for network users. There are two types of network models: OSI and TCP/IP models, which are binding together internetwork protocols that lets organization integrate workgroup and division LANs, and interface with the Internet. For the email server, we use two protocols: SMTP and POP3. They are necessary for the client to be able to receive the letter and also send it in the future so that the server later stores it in its database.

A Web browser resembles a universal customer, and Web servers can give information to any of those customers. Web servers are circulated all through the enterprise, following disseminated compute. An enterprise network would interface all the separate departmental or LANs into an intercompany network, with the potential for permitting all PC clients in an organization to get to any information or compute. It would give interoperability among independent systems and have the possible objective of decreasing the quantity of protocols being used.

2.3 Requirements of an Enterprise Network

1. Provide a good secure connection (High level of Security)
2. Properly connected devices
3. Accessibility is the system uptime
4. Flexibility to change and make up every needed time
5. Reliable is the system uptime

2.4 Network Protocols

Network protocols are the main and vital part of communication between computers which are also called as a standards of communication process.
Protocols are need the following situations:

- To determine computer's characteristics on a network, the form that the file should take in transit
- To define how the data processed after the arrives its destination
- To handle in the case there are damaged files, packets during the transmission
- To enable internetworking
- To establish the internet

2.5 Network Devices

Routers

A router is a network device that is used to connect several parts of a network to a single network or an existing large network to smaller subnets. Routers operate at the network layer 3 of the OSI model and combine several parts of the physical network into a single logical network, understanding how to redirect traffic from the sender in order to ultimately reach the intended recipient. Routing is heavily influenced by the protocols used. protocol behavior. The router routes the packet to its network or destination on the Internet, using routing protocols to exchange information and determine routing decisions.Routers use a routing table that must be redirected to one interface or segments to another. Routes can be manually added to the routing table - a very secure but less manageable method. Depending on the size of the network - or is updated automatically using routing protocols such as: RIPv2, EIGRP, OSPF, IS-IS, BGP

Switches

Switches - a device designed to connect several nodes of a computer network within the same network segment. The switch stores in memory a switching table (stored in associative memory), which indicates the correspondence of the node's MAC address to the switch port. This information allows the switches to repeat incoming data frames only to those computers to which the frame is addressed. This speeds up work and reduces network congestion.

Virtual LANS in Switches

VLAN is a feature with which you can create multiple networks on the same network device. It stands for Virtual Local Area Network. Vlan application:

- Reducing the load on the network due to its fragmentation into small segments (reducing the area of broadcast domains).
- Improving security by isolating one group of devices from another.
- Creation of several networks of the 3rd level using one network device.
- Reducing the amount of equipment needed for building networks.
- Simplification of network management - the independence of the logical structure from the physical.

Multilayer Switch

Multilayer switches are actually routers that implement routing mechanisms using routing protocols (RIPv2, OSPF, etc.) not in the device software, but using chips. Because of this, we used a multilayer switch in our topology.

2.6 VoIP (Voice over Internet Protocol)

Voice over Internet Protocol(VoIP) also touches on as IP Telephony, Internet Telephony, and Internet Calling. There are several advantages of usage VoIP:

- Free calls
- communicate without a telephone apparate
- Way to reduce a communication cost for organizations
- add more functions to communication and intercommunion between coworkers and with customers so that to extend the system more effectively and of high quality.

Why don't we use DHCP and VTP protocols?

DHCP

Each device connected to the network needs a unique IP address. Network administrators assign static IP addresses to routers, servers, printers, and other network devices whose locations (physical and logical) are unlikely to change. Usually these are devices that provide services to users and devices on the network, so the addresses assigned to them should remain constant. In addition, static addresses allow administrators to remotely manage these devices - it’s easier for them to access the device when they can easily determine its IP address.Because of this, we did not use a DHCP server.

VTP

We do not use the VTP protocol because of its insecurity. This is due to the fact that when connecting an attacker’s Switch, we will change information about vlan.

Part 3

Network Design and Configuration

EtherChannel

EtherChannel - is a group of port links which is used in Switches of Cisco. Etherchannel primarily used to provide high speed links and reduce the overflow of data transmission. To enable etherchannel protocol there must be following criteria:

- Same VLAN configuration
- Same duplex
- Same speed
- Switch port modes should be same (access or trunk mode)

There may be aggregated maximum 8 links to form a single logical link.
In our topology, we used LACP as it is an open protocol unlike PAgP.

EtherChannel configuration:

```
Switch(config)# int range f0/3-4;
Switch(config-if-range)# channel-group 1 mode active;
Switch(config-if-range)# int port-channel 1;
Switch(config-if)# switchport mode trunk;
```

SPT

STP stands for Spanning tree protocol. Protocol which used to stop the loop that appeared between circle formed connected switches, also shut down the least excess ones. The main advantages a of this protocol are

- it requires less memory
- achieved the prime load balancing
- optimization on the performance of a network

STP configuration:

```
Switch(config)#spanning-tree mode rapid-pvst;
Switch(config)#spanning-tree vlan 10 root primary;
Switch(config)#spanning-tree vlan 20 root secondary;
```

Switch(config-if)#spanning-tree portfast;

HSRP

HSRP (Hot Standby Protocol) - a protocol developed by Cisco to reserve Default Gateway without additional configuration on end devices. Routers with HSRP enabled present endpoint devices as one virtual Default Gateway.

HSRP configuration:

Router0(config-if)#standby version 2;
Router0(config-if)#standby 1 ip 192.168.10.254;
Router0(config-if)#standby 1 priority 200;
Router0(config-if)#standby 1 preempt

Router11(config-if)#standby version 2;
Router11(config-if)#standby 1 ip 192.168.10.254;
Router11(config-if)#standby 1 priority 150;
Router11(config-if)#standby 1 preempt

BGP

BGP is pertinent to arrange admins of big organizations which interface with at least two ISPs, who associate with other branches which are located in other locations with other connected network providers. It is useful for big corporations and only as it requires connecting two or more different network providers.

BGP configuration:

Router1(config)# router bgp 65001;
Router1(config-router)# neighbor 2.2.2.20 remote-as 65002;
Router1(config-router)# network 192.168.0.0 mask 255.255.255.0;

Router4(config)# router bgp 65003;
Router4(config-router)# neighbor 1.1.1.10 remote-as 65002;
Router4(config-router)# network 64.0.0.0 mask 255.0.0.0;

Router12(config)#router bgp 65002;

Router12(config-router)# neighbor 1.1.1.1 remote-as 65003;
Router12(config-router)# network 192.168.0.0 mask 255.255.255.0;

Router12(config)#router bgp 65002;
Router12(config-router)# neighbor 2.2.2.2 remote-as 65001;
Router12(config-router)# network 64.0.0.0 mask 255.0.0.0;

OSPF

OSPF (Open Short Path First) - it's a link-state dynamic routing protocol. To increase efficiency and scalability, we used OSPF, because OSPF supports hierarchical routing using areas.

OSPF configuration:

Router(config)# router ospf 1
Router(config-router)# network 172.16.5.1 0.0.0.255 area 0;
Router(config-router)# network 172.16.3.1 0.0.0.255 area 0;
Router(config-router)# network 192.16.30.0 0.0.0.255 area 3;
Router(config-if)# ip ospf priority 100
Router(config)# ip route 0.0.0.0 0.0.0.0 Serial 0/2/0
Router(config-router)# default-information originate

Part 4

RESULTS AND DISCUSSIONS

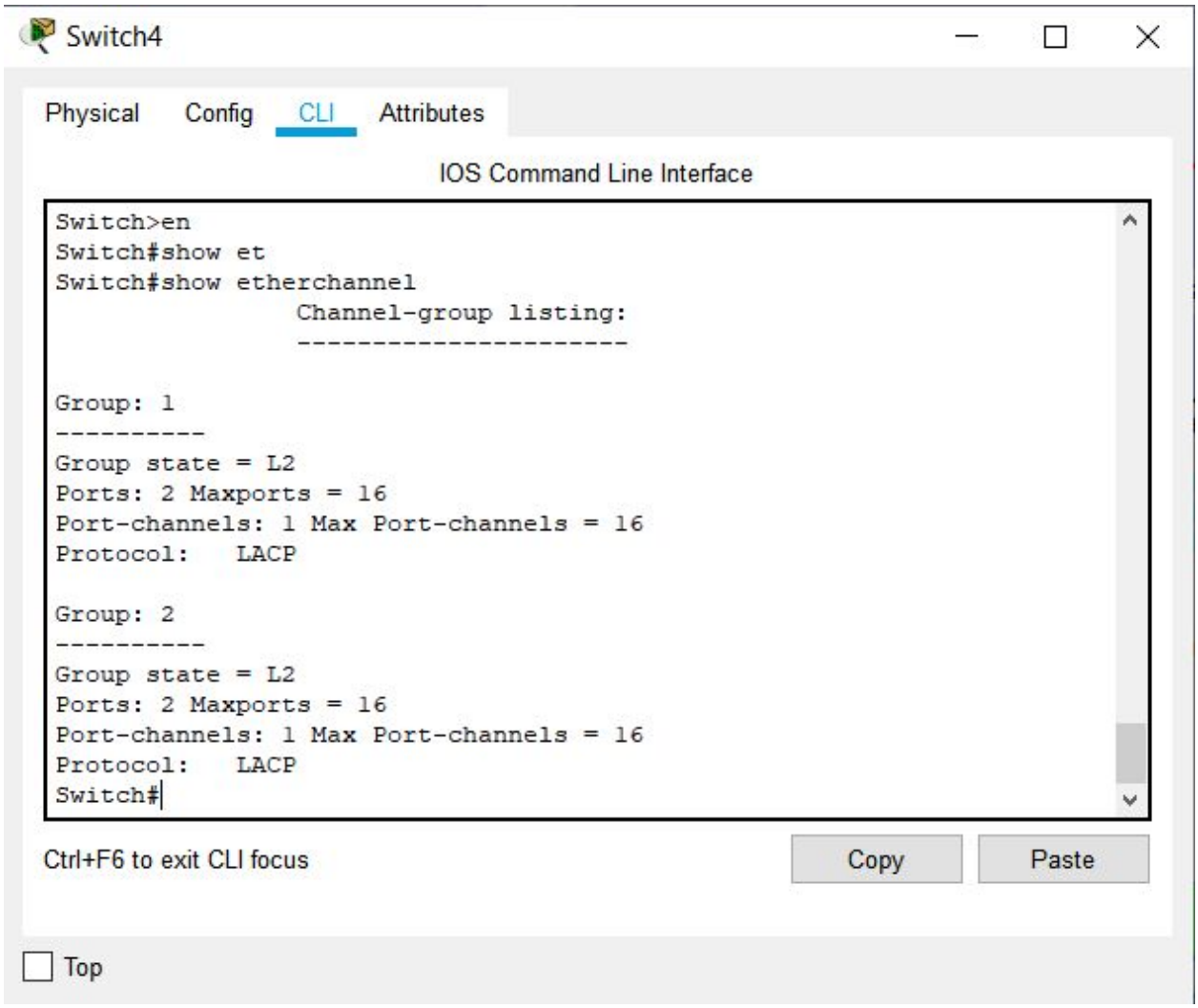


Figure 4.1

Result Etherchannel in Switch4

To look at the etherchannel configuration you need to run the **Switch#show etherchannel**

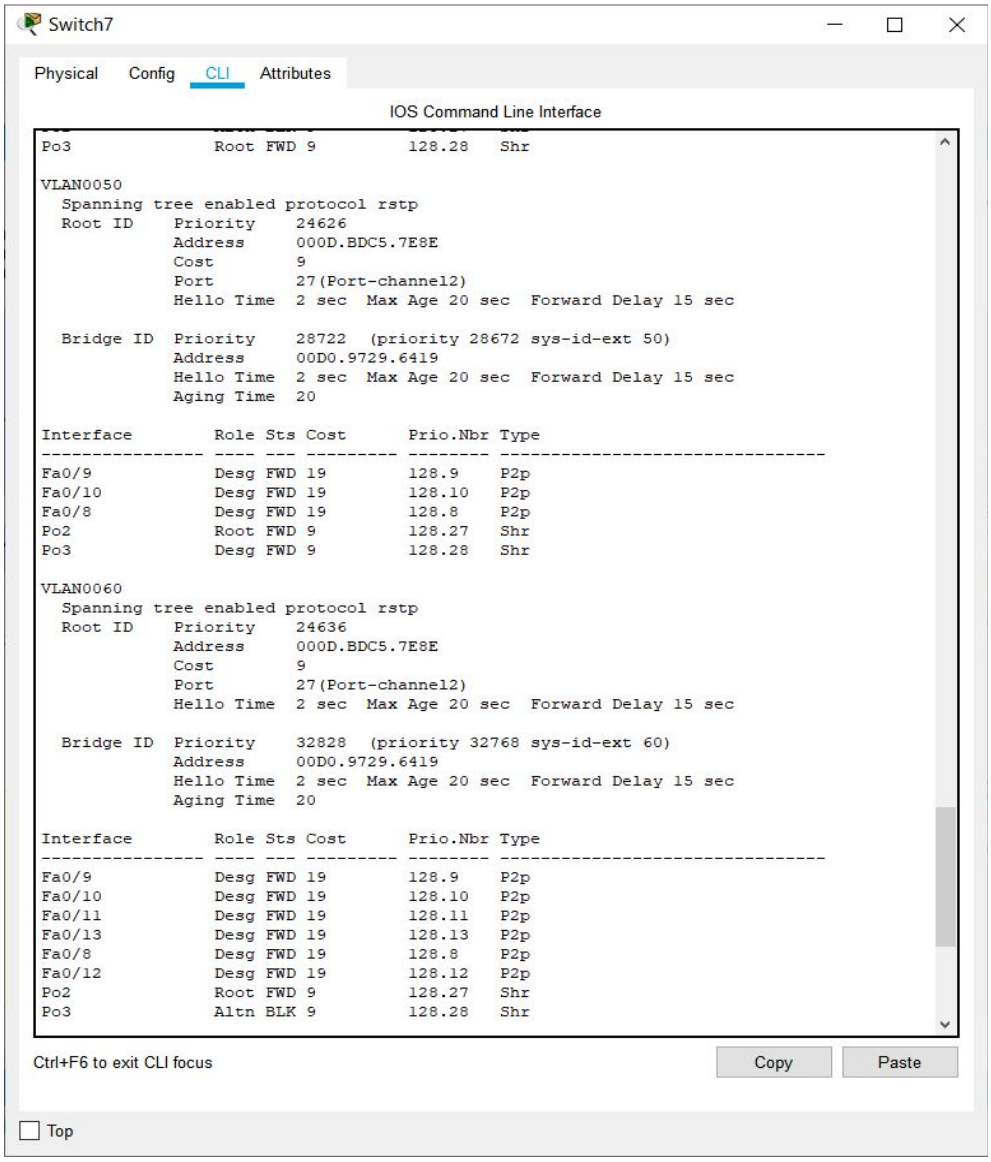


Figure 4.2

Result of configuring Spanning-tree protocol on Switch7

To look at the STP configuration you need to run the **Switch#show spanning-tree**

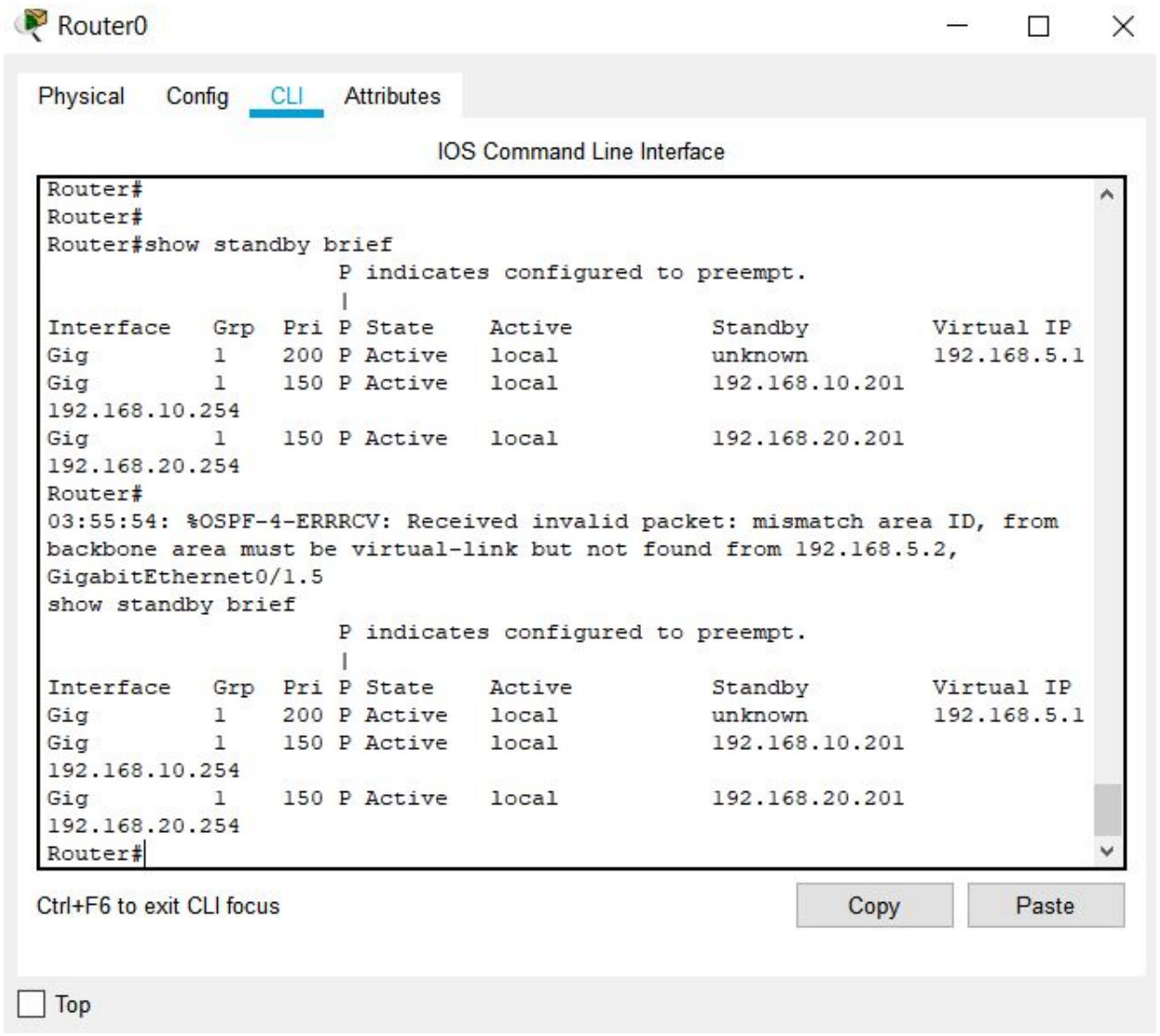


Figure 4.3

Result of configuring HSRP in Router0

To look at the etherchannel configuration you need to run the **Router#show standby brief**

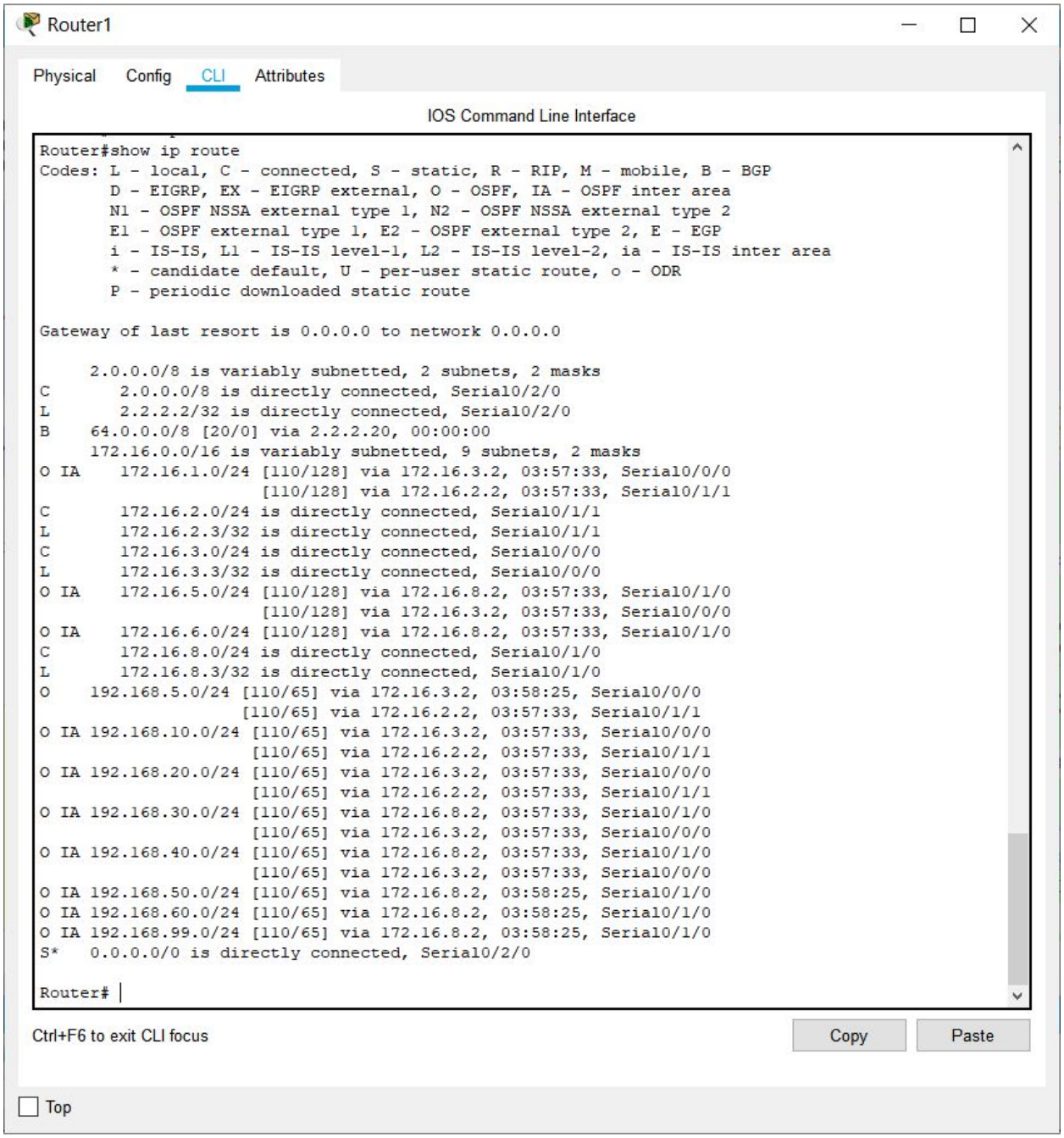


Figure 4.5

Result of configuring OSPF in Router1(ASBR)

To look at the etherchannel configuration you need to run the **Router#show ip route**

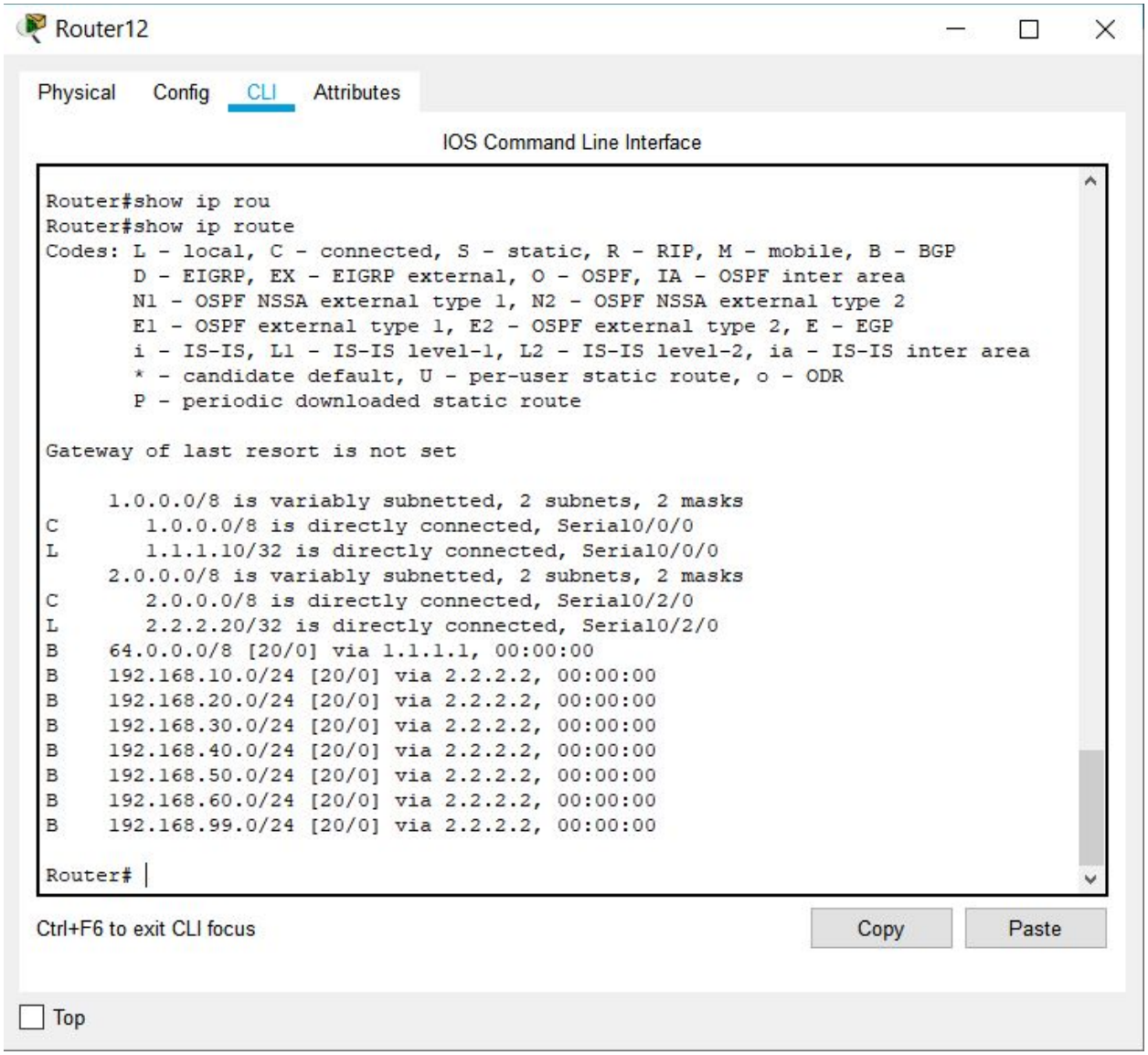


Figure 4.6

Result of configuring BGP in Router12(IST)

To look at the etherchannel configuration you need to run the **Router#show ip route**

Part 5

Conclusion and Recommendations

Conclusions

The main purpose of this course is to deepen our understanding of a computer network. It is how to secure it, make it reliable, uninterrupted and convenient for people. We had a chance work with complex routing methods and expand the understanding the Internet protocols like OSPF, BGP, HSRP, Etherchannel, STP, VTP etc; In the previous course we experienced how to configure basic protocols and use them, in the second course of Computer Networks we interacted with bigger and larger topics. We've figured out the difference between protocols and which one will be better to use, and in what cases we can be hacked or get damaged packets during the transmission. By using this knowledge team members had to create an enterprise network, where no device remains onto itself, and this topology secured, high speeded. With our teammates seeked to achieve all these aims, particularly we achieved, but there are some difficulties with protocols ACL, NAT, PAT so, we cannot configure these protocols.

Our project plan consists of several stages:

1) Find out why the company needs a computer network.
2) Present the design and architecture of the future network
3) Install all the necessary equipment.
4) Configure all equipment.
5) Check for safety, reliability and continuity.
6) Document all network settings.

The advantages of our network is that we have made it a reliable, flexible and uninterrupted enterprise network.

The disadvantages of our topology is that although it is reliable but not very safe, we hope that with further training we can deal with this problem.

Recommendations for Future Work

a) Additional access control lists (ACLs) should be implemented throughout the network to provide robust end-to-end security.
b) IPv6 addressing can be implemented to overcome any limitations in the number of hosts that

can be used due to the available address space.
c)Use wireless networks.
d)Make the network even larger so that two or more branches can communicate with each other