DigiJED - 2

Report

from laboratory work No. 1

of the course "ICT Security"

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Topic: "Building virtual local area networks"

Objective: Acquiring practical skills in building and securing virtual local area networks.

Initial data:

First net:

2 switches are connected to each other (Switch 0, Switch 1), a server is connected to Switch 0 (Server 0), 2 computers are connected to Switch 1 (PC 0,PC 1), 2 access points (Access Point 1, Access Point 2) are connected to Switch 0, 4 laptops are connected to Access Point 1 (Laptop 0, Laptop 1, Laptop 2, Laptop 3), 2 laptops are connected to Access Point 2 (Laptop 4, Laptop 5), the router is connected to Switch 0 (Router 1).

Second net:

switch (Switch 2), 3 computers are connected to Switch 2 (PC 2, PC 3, PC 4), the server is connected to Switch 2 (Server 1), the router is connected to Switch 2 (Router 2).

Third net:

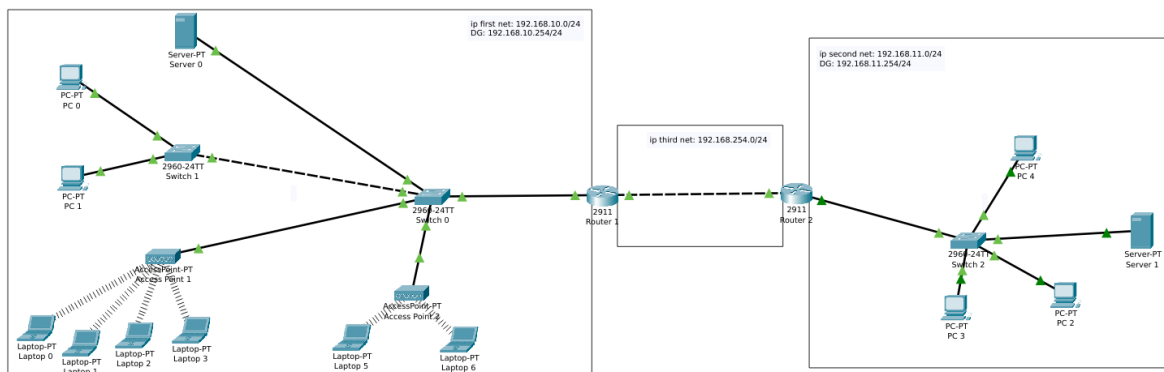2 routers are connected to each other (Router 1, Router 2).

Fig. 1. The initial data of the network

Work in progress

1) Divide the first network into two virtual networks: the first named VLAN X and numbered 100, and the second named VLAN Y and numbered 200. VLAN X includes PC 0, PC 1, Laptop 4, and Laptop 5. VLAN Y includes Laptop 0, Laptop 1, Laptop 2, Laptop 3, and Server 0.

To do this, run the following commands on Switch 0 andSwitch 1:

Switch#enable

Switch#configure terminal

Switch(config)#vlan 100

Switch(config-vlan)#name VLAN_X

Switch(config-vlan)#exit

Switch(config)#vlan 200

Switch(config-vlan)#name VLAN_Y

Switch(config-vlan)#exit

2) The access ports on the switches are distributed: in Switch 0, these areFastEthernet 0/1 and FastEthernet 0/3 for VLAN Y and FastEthernet 0/4 for VLAN X, in Switch 1, these are FastEthernet 0/1 and FastEthernet 0/2 for VLAN X.

To do this, run the following commands:

on Switch 0:

Switch#enable

Switch#configure terminal

Switch(config)#interface range fastEthernet 0/1, fastEthernet 0/3

Switch(config-if-range)#switchport mode access

Switch(config-if-range)#switchport access vlan 200

Switch(config-if-range)#exit

Switch(config)#interface fastEthernet 0/4

Switch(config-if)#switchport mode access

Switch(config-if)#switchport access vlan 100

Switch(config-if)#exit

on Switch 1:

Switch#enable

Switch#configure terminal

Switch(config)#interface range fastEthernet 0/1, fastEthernet 0/2

Switch(config-if-range)#switchport mode access

Switch(config-if-range)#switchport access vlan 100

Switch(config-if-range)#exit

3) Trunk communication channels have been created: between Switch 0 (FastEthernet 0/5) and Router 0 (GigabitEthernet 0/0) without using the DTP protocol, between Switch 0 (FastEthernet 0/2) and Switch 1 (FastEthernet 0/3) using the DTP protocol.

To do this, run the following commands:

on Switch 0:

Switch#enable

Switch#configure terminal

Switch(config)#interface fastEthernet 0/5

Switch(config-if)#switchport mode trunk

Switch(config-if)#exit

Switch(config)#interface fastEthernet 0/2

Switch(config-if)#switchport mode dynamic desirable

Switch(config-if)#exit

on Switch 1:

Switch#enable

Switch#configure terminal

Switch(config)#interface fastEthernet 0/3

Switch(config-if)#switchport mode dynamic auto

Switch(config-if)#exit

4) The first network is divided into two logical networks: the first for VLAN X has the network IP address 192.168.10.0/29 and the default gateway in this network is 192.168.10.6/29, the second for VLAN Y has the network IP address 192.168.10.128/29 and the default gateway in this network is 192.168.10.134/29.

5) Statically assign IP addresses to all devices within the networks created in step 4, namely:

VLAN X:

PC 0 - 192.168.10.1/29,

PC 1 - 192.168.10.2/29,

Laptop 4 - 192.168.10.3/29,

Laptop 5 - 192.168.10.4/29.

VLAN Y:

Server 0 - 192.168.10.129/29,

Laptop 0 - 192.168.10.130/29,

Laptop 1 - 192.168.10.131/29,

Laptop 2 - 192.168.10.132/29,

Laptop 3 - 192.168.10.133/29.

6) Router 1 has routing configured between VLAN X and VLAN Y.

To do this, run the following commands on Router 1:

Router>enable

Router#configure terminal

Router(config)#interface gigabitEthernet 0/0

Router(config-if)#no ip address

Router(config-if)#exit

Router(config)#interface gigabitEthernet 0/0.100

Router(config-subif)#encapsulation dot1Q 100

Router(config-subif)#ip address 192.168.10.6 255.255.255.248

Router(config-if)#exit

Router(config)#interface gigabitEthernet 0/0.200

Router(config-subif)#encapsulation dot1Q 200

Router(config-subif)#ip address 192.168.10.134 255.255.255.248

Router(config-if)#exit

7) Have configured static IP addresses on the routers Router 1 and Router 2.

To do this, run the following commands:

on Router 1:

Router>enable

Router#configure terminal

Router(config)#ip route 192.168.11.0 255.255.255.0 192.168.254.2

on Router 2:

Router>enable

Router#configure terminal

Router(config)#ip route 192.168.10.0 255.255.255.248 192.168.254.1

Router(config)#ip route 192.168.10.128 255.255.255.248 192.168.254.1

8) The connection in the virtual local area network (Laptop 2 and Server 0) is checked:

C:\>ping 192.168.10.129

Pinging 192.168.10.129 with 32 bytes of data:

Reply from 192.168.10.129: bytes=32 time=63ms TTL=128

Reply from 192.168.10.129: bytes=32 time=24ms TTL=128

Reply from 192.168.10.129: bytes=32 time=37ms TTL=128

Reply from 192.168.10.129: bytes=32 time=12ms TTL=128

Ping statistics for 192.168.10.129:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 12ms, Maximum = 63ms, Average = 34ms

C:\>tracert 192.168.10.129

Tracing route to 192.168.10.129 over a maximum of 30 hops:

1 28 ms 27 ms 6 ms 192.168.10.129

Trace complete.

The connection between the virtual local area networks (Laptop 0 and PC 0) is checked:

C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Request timed out.

Reply from 192.168.10.1: bytes=32 time=8ms TTL=127

Reply from 192.168.10.1: bytes=32 time=39ms TTL=127

Reply from 192.168.10.1: bytes=32 time=18ms TTL=127

Ping statistics for 192.168.10.1:

Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),

Approximate round trip times in milli-seconds:

Minimum = 8ms, Maximum = 39ms, Average = 21ms

C:\>tracert 192.168.10.1

Tracing route to 192.168.10.1 over a maximum of 30 hops:

1 27 ms 6 ms 6 ms 192.168.10.134

2 21 ms 22 ms 28 ms 192.168.10.1

Trace complete.

The connection between the first and second networks (Laptop 4 and PC 4):

C:\>ping 192.168.11.12

Pinging 192.168.11.12 with 32 bytes of data:

Request timed out.

Request timed out.

Reply from 192.168.11.12: bytes=32 time=42ms TTL=126

Reply from 192.168.11.12: bytes=32 time=24ms TTL=126

Ping statistics for 192.168.11.12:

Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),

Approximate round trip times in milli-seconds:

Minimum = 24ms, Maximum = 42ms, Average = 33ms

C:\>tracert 192.168.11.12

Tracing route to 192.168.11.12 over a maximum of 30 hops:

1 34 ms 6 ms 34 ms 192.168.10.6

2 30 ms 9 ms 22 ms 192.168.254.2

3 26 ms 29 ms 7 ms 192.168.11.12

Trace complete.

The configuration of Switch 1 is checked:

Switch#enable

Switch#show ip interface brief

Interface IP-Address OK? Method Status Protocol

FastEthernet0/1 unassigned YES manual up up

FastEthernet0/2 unassigned YES manual up up

FastEthernet0/3 unassigned YES manual up up

FastEthernet0/4 unassigned YES manual administratively down down

FastEthernet0/5 unassigned YES manual administratively down down

FastEthernet0/6 unassigned YES manual administratively down down

FastEthernet0/7 unassigned YES manual administratively down down

FastEthernet0/8 unassigned YES manual administratively down down

FastEthernet0/9 unassigned YES manual administratively down down

FastEthernet0/10 unassigned YES manual administratively down down

FastEthernet0/11 unassigned YES manual administratively down down

FastEthernet0/12 unassigned YES manual administratively down down

FastEthernet0/13 unassigned YES manual administratively down down

FastEthernet0/14 unassigned YES manual administratively down down

FastEthernet0/15 unassigned YES manual administratively down down

FastEthernet0/16 unassigned YES manual administratively down down

FastEthernet0/17 unassigned YES manual administratively down down

FastEthernet0/18 unassigned YES manual administratively down down

FastEthernet0/19 unassigned YES manual administratively down down

FastEthernet0/20 unassigned YES manual administratively down down

FastEthernet0/21 unassigned YES manual administratively down down

FastEthernet0/22 unassigned YES manual administratively down down

FastEthernet0/23 unassigned YES manual administratively down down

FastEthernet0/24 unassigned YES manual administratively down down

GigabitEthernet0/1 unassigned YES manual administratively down down

GigabitEthernet0/2 unassigned YES manual administratively down down

Vlan1 unassigned YES manual administratively down down

Switch#show interface trunk

Port Mode Encapsulation Status Native vlan

Fa0/3 auto n-802.1q trunking 1

Port Vlans allowed on trunk

Fa0/3 1-1005

Port Vlans allowed and active in management domain

Fa0/3 1,100,200

Port Vlans in spanning tree forwarding state and not pruned

Fa0/3 1,100,200

Switch#show vlan brief

VLAN Name Status Ports

---- -------------------------------- --------- -------------------------------

1 default active Fa0/4, Fa0/5, Fa0/6, Fa0/7

Fa0/8, Fa0/9, Fa0/10, Fa0/11

Fa0/12, Fa0/13, Fa0/14, Fa0/15

Fa0/16, Fa0/17, Fa0/18, Fa0/19

Fa0/20, Fa0/21, Fa0/22, Fa0/23

Fa0/24, Gig0/1, Gig0/2

100 VLAN_X active Fa0/1, Fa0/2

200 VLAN_Y active

1002 fddi-default active

1003 token-ring-default active

1004 fddinet-default active

1005 trnet-default active

Switch#show vtp status

VTP Version capable : 1 to 2

VTP version running : 1

VTP Domain Name : first_net

VTP Pruning Mode : Disabled

VTP Traps Generation : Disabled

Device ID : 00D0.D379.C900

Configuration last modified by 0.0.0.0 at 3-1-93 00:40:10

Local updater ID is 0.0.0.0 (no valid interface found)

Feature VLAN :

VTP Operating Mode : Server

Maximum VLANs supported locally : 255

Number of existing VLANs : 7

Configuration Revision : 7

MD5 digest : 0x91 0x5D 0x5C 0x2B 0x5E 0x8A 0xAC 0x7F

0x26 0x8C 0xAD 0x56 0xC0 0xD0 0x9F 0x93

        The configuration of Switch 0 is checked:

Switch>enable

Switch#show ip interface brief

Interface IP-Address OK? Method Status Protocol

FastEthernet0/1 unassigned YES manual up up

FastEthernet0/2 unassigned YES manual up up

FastEthernet0/3 unassigned YES manual up up

FastEthernet0/4 unassigned YES manual up up

FastEthernet0/5 unassigned YES manual up up

FastEthernet0/6 unassigned YES manual administratively down down

FastEthernet0/7 unassigned YES manual administratively down down

FastEthernet0/8 unassigned YES manual administratively down down

FastEthernet0/9 unassigned YES manual administratively down down

FastEthernet0/10 unassigned YES manual administratively down down

FastEthernet0/11 unassigned YES manual administratively down down

FastEthernet0/12 unassigned YES manual administratively down down

FastEthernet0/13 unassigned YES manual administratively down down

FastEthernet0/14 unassigned YES manual administratively down down

FastEthernet0/15 unassigned YES manual administratively down down

FastEthernet0/16 unassigned YES manual administratively down down

FastEthernet0/17 unassigned YES manual administratively down down

FastEthernet0/18 unassigned YES manual administratively down down

FastEthernet0/19 unassigned YES manual administratively down down

FastEthernet0/20 unassigned YES manual administratively down down

FastEthernet0/21 unassigned YES manual administratively down down

FastEthernet0/22 unassigned YES manual administratively down down

FastEthernet0/23 unassigned YES manual administratively down down

FastEthernet0/24 unassigned YES manual administratively down down

GigabitEthernet0/1 unassigned YES manual administratively down down

GigabitEthernet0/2 unassigned YES manual administratively down down

Vlan1 unassigned YES manual administratively down down

Switch#show interface trunk

Port Mode Encapsulation Status Native vlan

Fa0/2 desirable n-802.1q trunking 1

Fa0/5 on 802.1q trunking 1

Port Vlans allowed on trunk

Fa0/2 1-1005

Fa0/5 1-1005

Port Vlans allowed and active in management domain

Fa0/2 1,100,200

Fa0/5 1,100,200

Port Vlans in spanning tree forwarding state and not pruned

Fa0/2 1,100,200

Fa0/5 1,100,200

Switch#show vlan brief

VLAN Name Status Ports

---- -------------------------------- --------- -------------------------------

1 default active Fa0/6, Fa0/7, Fa0/8, Fa0/9

Fa0/10, Fa0/11, Fa0/12, Fa0/13

Fa0/14, Fa0/15, Fa0/16, Fa0/17

Fa0/18, Fa0/19, Fa0/20, Fa0/21

Fa0/22, Fa0/23, Fa0/24, Gig0/1

Gig0/2

100 VLAN_X active Fa0/4

200 VLAN_Y active Fa0/1, Fa0/3

1002 fddi-default active

1003 token-ring-default active

1004 fddinet-default active

1005 trnet-default active

Switch#show vtp status

VTP Version capable : 1 to 2

VTP version running : 1

VTP Domain Name : first_net

VTP Pruning Mode : Disabled

VTP Traps Generation : Disabled

Device ID : 00E0.F954.6700

Configuration last modified by 0.0.0.0 at 3-1-93 00:40:10

Local updater ID is 0.0.0.0 (no valid interface found)

Feature VLAN :

VTP Operating Mode : Server

Maximum VLANs supported locally : 255

Number of existing VLANs : 7

Configuration Revision : 7

MD5 digest : 0x91 0x5D 0x5C 0x2B 0x5E 0x8A 0xAC 0x7F

0x26 0x8C 0xAD 0x56 0xC0 0xD0 0x9F 0x93

The configuration of Router 1 is checked:

Router>enable

Router#show ip interface brief

Interface IP-Address OK? Method Status Protocol

GigabitEthernet0/0 unassigned YES manual up up

GigabitEthernet0/0.100 192.168.10.6 YES manual up up

GigabitEthernet0/0.200 192.168.10.134 YES manual up up

GigabitEthernet0/1 192.168.254.1 YES manual up up

GigabitEthernet0/2 unassigned YES unset administratively down down

Vlan1 unassigned YES unset administratively down down

Router#show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is not set

192.168.10.0/24 is variably subnetted, 4 subnets, 2 masks

C 192.168.10.0/29 is directly connected, GigabitEthernet0/0.100

L 192.168.10.6/32 is directly connected, GigabitEthernet0/0.100

C 192.168.10.128/29 is directly connected, GigabitEthernet0/0.200

L 192.168.10.134/32 is directly connected, GigabitEthernet0/0.200

S 192.168.11.0/24 [1/0] via 192.168.254.2

192.168.254.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.254.0/24 is directly connected, GigabitEthernet0/1

L 192.168.254.1/32 is directly connected, GigabitEthernet0/1

The configuration of Router 2 is checked:

Router>enable

Router#show ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is not set

192.168.10.0/29 is subnetted, 2 subnets

S 192.168.10.0/29 [1/0] via 192.168.254.1

S 192.168.10.128/29 [1/0] via 192.168.254.1

192.168.11.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.11.0/24 is directly connected, GigabitEthernet0/0

L 192.168.11.254/32 is directly connected, GigabitEthernet0/0

192.168.254.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.254.0/24 is directly connected, GigabitEthernet0/1

L 192.168.254.2/32 is directly connected, GigabitEthernet0/1

9) A switch (Switch Enemy) has been added to the network before Switch 0, and the DTP protocol has been enabled on this device to create a trunk connection between Switch Enemy and Switch 0. To do this, run the following commands on Switch Enemy:

Switch#enable

Switch#configure terminal

Switch(config)#interface fastEthernet 0/1

Switch(config-if)#switchport mode dynamic desirable

To prevent this switch from being affected by the VTP protocol, you set the domain name first_net and password for VTP.

To do this, run the following commands on Switch 0 and Switch 1:

Switch>enable

Switch#configure terminal

Switch(config)#vtp domain first_net

Switch(config)#vtp password eXgCwqsqY5jC

Also on routers were disabled ports that are not are not being used.

To do this, run the following

on Switch 0:

Router>enable

Router#configure terminal

Switch(config)#interface range fastEthernet 0/6 - 24

Switch(config-if-range)#shutdown

Switch(config-if-range)#exit

Switch(config)#interface range gigabitEthernet 0/1 - 2

Switch(config-if-range)#shutdown

on Switch 1:

Router>enable

Router#configure terminal

Switch(config)#interface range fastEthernet 0/4 - 24

Switch(config-if-range)#shutdown

Switch(config-if-range)#exit

Switch(config)#interface range gigabitEthernet 0/1 - 2

Switch(config-if-range)#shutdown

Conclusion:

During this laboratory work, the skills of creating and protecting virtual local area networks were acquired: we learned how to create access ports and trunk ports, configure a router for routing between virtual local area networks. The DTP and VTP protocols, their disadvantages and advantages were studied (automation is very convenient and facilitates work, but there is a risk that attackers can find and exploit the shortcomings of these protocols).