Seneca | SCHOOL OF INFORMATION TECHNOLOGY, ADMINISTRATION AND SECURITY

DCN704 – Collaborative Communications
Laboratory Report

Lab # 3

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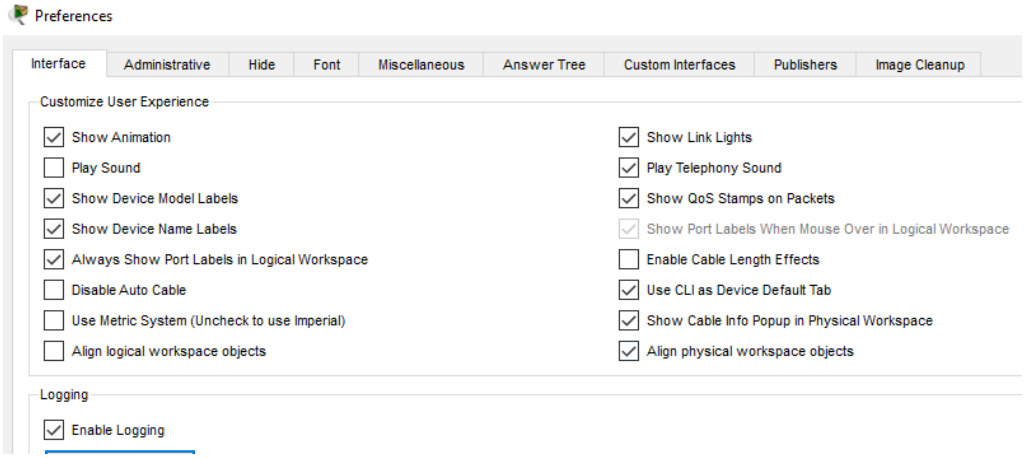
Learning objectives:

Use Packet Tracer to configure Cisco Unified Communications Manager Express (CUCME) in a basic two-site topology.

In developing one of the following topics, you must deliver a document requiring particular conditions. Students must demonstrate analytic skills to understand technical documentation, adapt technical instructions on specific cases, and generate technical documentation.

Go to Packet Tracer preferences menu and be sure that you set the Interface on the way shown below:

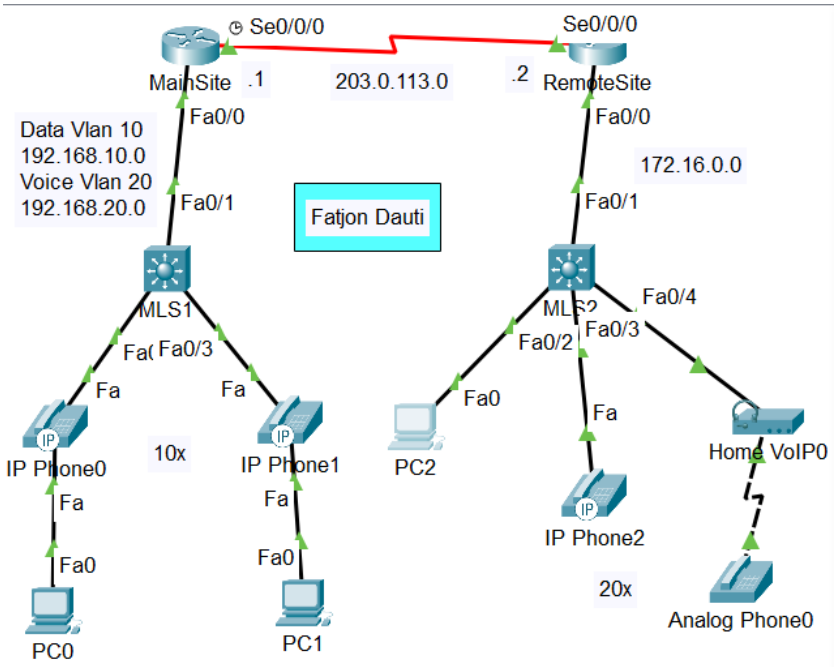


Background

In order to use a leased line WAN connection between the two sites, we need to place a WIC-2T (WAN Interface Card with 2 ports of T1 speed) module into the routers. This can be achieved on the Physical tab, but before we put the module in, we need to switch off the router. Make sure that each 2811 type router has a WIC-2T module in the lower right slot, so we can connect the Serial0/0/0 ports together. In the simulator one of them will be the DCE device, another one is the DTE. To connect them, use the Serial DCE cable from the “Connections” category: the first device we choose will be the DCE; the other will be the DTE automatically. In the Main site, we will have a multilayer switch with two VLANs, similar to the previous lab. In the remote site, they use a single-VLAN system but they have analog phones too.

The topology will look like this:

Replace this topology with the screenshot of your own topology from Packet Tracer (20%)



The IP addressing scheme is as follows:

- in the Main site the data VLAN uses the 192.168.10.0/24 subnet
- in the Main site the voice VLAN uses the 192.168.20.0/24 subnet
- in the Remote site the LAN uses the 172.16.0.0/24 subnet
- the WAN connection uses the 203.0.113.0/30 subnet

Part 1: Telephony Service Configuration

Start with the simpler configuration in the Remote site. On the switch, we just need to define the voice VLAN, in this example we will use VLAN 1:

```
MLS2(config)#interface range f0/1-4
MLS2(config-if-range)#switchport voice vlan 1
```

The basic configuration on the **Remote** router:

```
Remote(config)#interface s0/0/0
Remote(config-if)#ip address 203.0.113.2 255.255.255.252
Remote(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
Remote(config-if)#interface f0/0
Remote(config-if)#ip address 172.16.0.1 255.255.255.0
Remote(config-if)#no shut

Remote(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state t
o up

Remote(config-if)#ip dhcp pool remotelan
Remote(dhcp-config)#network 172.16.0.0 255.255.255.0
Remote(dhcp-config)#default-router 172.16.0.1
Remote(dhcp-config)#option 150 ip 172.16.0.1
```

Test it by looking at the IP addresses of the devices. On the VoIP device, set the *Server address* to 172.16.0.1. Continuing on the router, we set up the telephony service and the DNs (one for each device):

```
Remote(config)#telephony-service
Remote(config-telephony)#ip source-address 172.16.0.1 port 2000
Remote(config-telephony)#max-dn 3
Remote(config-telephony)#max-ephones 3
Remote(config-telephony)#auto assign 1 to 3
Remote(config-telephony)#create cnf-files
Creating CNF files
CNF-FILES: Clock is not set or synchronized, retaining old versionStamp

Remote(config-ephone-dn)#ephone-dn 1
Remote(config-ephone-dn)#number 201
Remote(config-ephone-dn)#ephone-dn 2
Remote(config-ephone-dn)#number 202
Remote(config-ephone-dn)#ephone-dn 3
Remote(config-ephone-dn)#number 203
```

Some things need to be mentioned here. First, we did not use the auto-reg-ephone command, as it is a default setting. Second, we suppressed the console error messages with the *no logging console* command, because while entering the telephony-service commands the devices are trying to register but there are no DNs for them yet. Lastly, we can observe the phone-numbering scheme.
Let us leave the Remote site and enter to Main. Here, we need to define the voice and data VLAN on **MLS1** in the very same way we did in the previous lab. On the **Main** router, the basic configuration is also the same except the slight modification of IP addressing and with an additional configuration of the serial interface:

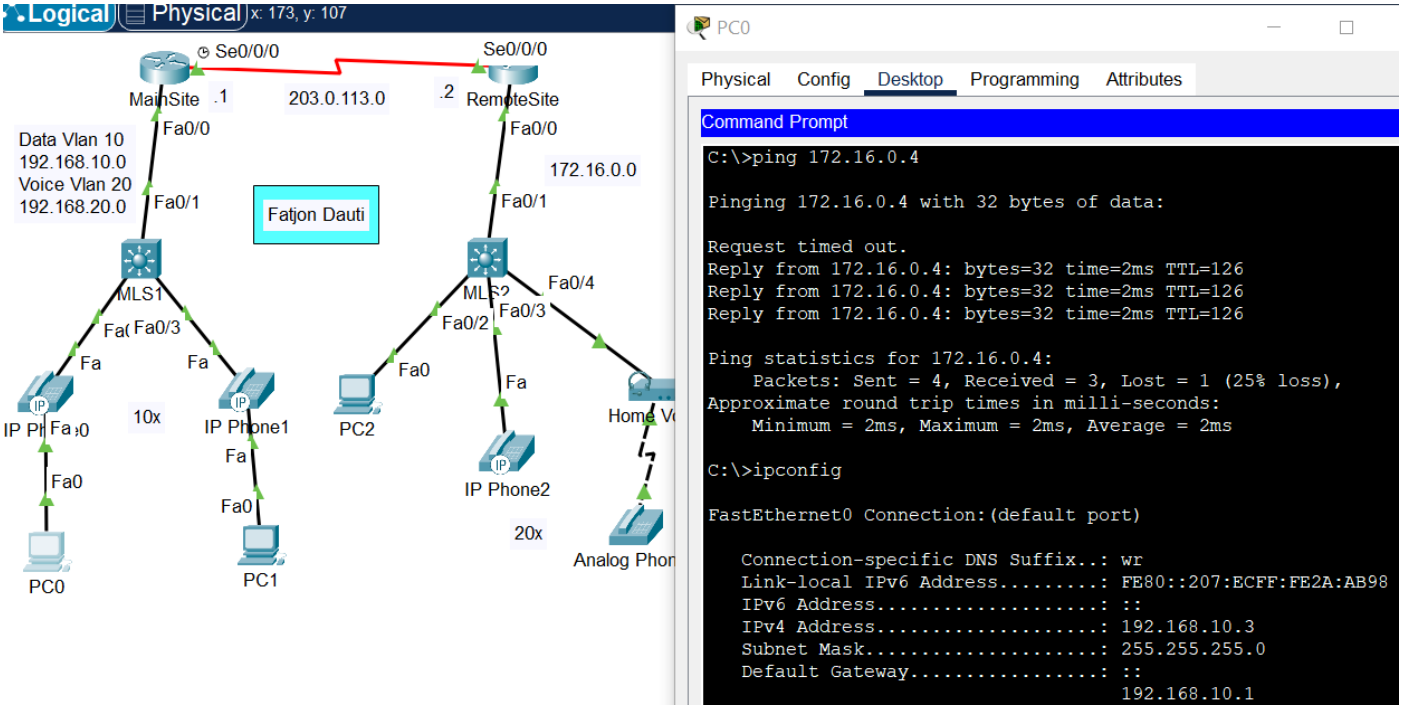
```
Main(config)#int s0/0/0
Main(config-if)#clock rate 128000
Main(config-if)#ip address 203.0.113.1 255.255.255.252
Main(config-if)#no shut

Main(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
```

The configuration of the CME is similar, except that we want to use the extension numbers 101 and 102 – set up the DNs according to this. If all is well, then at this stage the calls are working within the sites, but we want to dial any phones from the remote site in the Main and vice versa.

The first thing we need to configure is routing between the sites. Use EIGRP for example and check if the routing table contains all of the remote networks.

Insert here the screenshot of successful ping commands from end to end of the network. (20%)

Pinging from PC0 on the left, to PC2 on the right



Part 2: Dial Peer Configuration

A dial peer is a concept to describe a service either on a remote network, or on our own network but not in the scope of the basic VoIP system. If we want to handle an analog phone directly in the router's FXS port, then this device will be a dial peer also, although in PT we cannot use this. Here, we need to use dial peers to reach our remote VoIP devices. In the configuration of a dial peer, we need to define the remote router, which provides the VoIP service for specific extension numbers and these numbers too.

If we take the **Main** router first, it knows how to handle extension numbers 101-102, as it is the registrar of these numbers. However, if we dial a number on **IP Phone0** , which is not in this range, the router cannot handle that call as the number is unknown to it. Therefore, we need to define a dial peer, which describes the missing information. Namely, how the router can reach these numbers.

Let us begin our work on router **Main**. The command to define dial peers is dial-peer voice, which has an ID as first parameter and *voip* as second parameter (on a real router this can be *vofr* for example, for Voice over Frame Relay). Then we enter the dial-peer configuration submode. Here, we need to define the remote router first which will be our dial peer with the IP address of it visible to us. Then, we need to tell our router which extension numbers can be reached with the help of this dial peer. The whole configuration is this:

```
Main(config)#dial-peer voice ?
  <1-2147483647>  Voice dial-peer tag
Main(config)#dial-peer voice 1 voip
Main(config-dial-peer)#session target ipv4:203.0.113.0
Main(config-dial-peer)#destination-pattern 20.
```

As can be seen, the session target command needs an IP address as parameter, but we need to prefix it by the *ipv4* tag. The purpose of the destination-pattern command is to describe the extension numbers and it can use special characters for this purpose. In the example above, the "20." pattern means that this dial peer handles every number, which begins with 20 and the third digit is anything between 0 and 9. Therefore, the period behaves like a wildcard. In the real world, we can use other methods if we want to be more specific. The next example describes all the extension numbers that are beginning with 20 and then contain 1, 2 or 3 as the value of the third digit:
destination-pattern 20[1-3]

Note: this form is accepted by PT, but does not work!

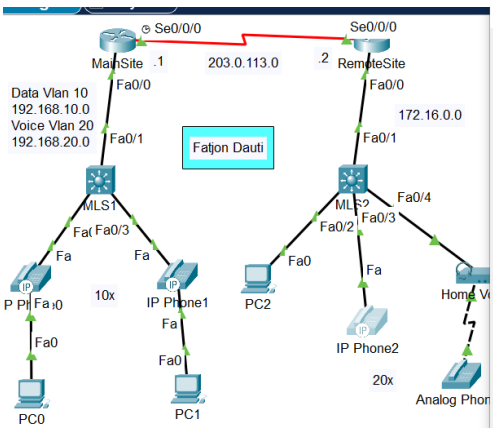
Now go to the **Remote** router, and define its dial peer:

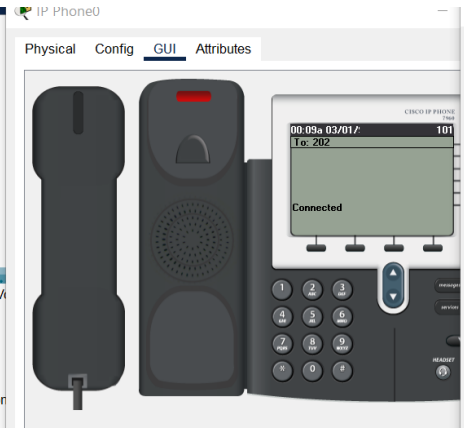
```
Remote(config)#dial voice 1 voip
Remote(config-dial-peer)#session target ipv4:203.0.113.1
Remote(config-dial-peer)#destination-pattern 10.
```

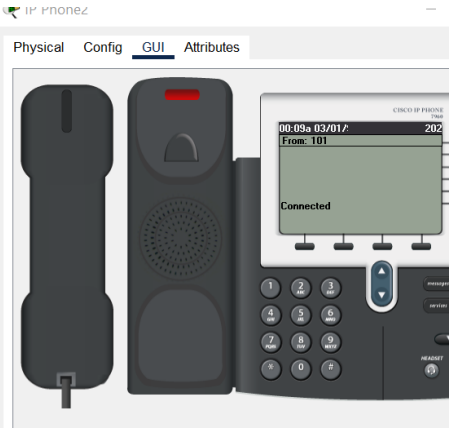
Finally, go to **IP Phone0** and dial the number of **IP Phone2** on the remote network. The call should be successful. Try some calls from each site to the other.

Insert printouts of these successful calls here (20%)

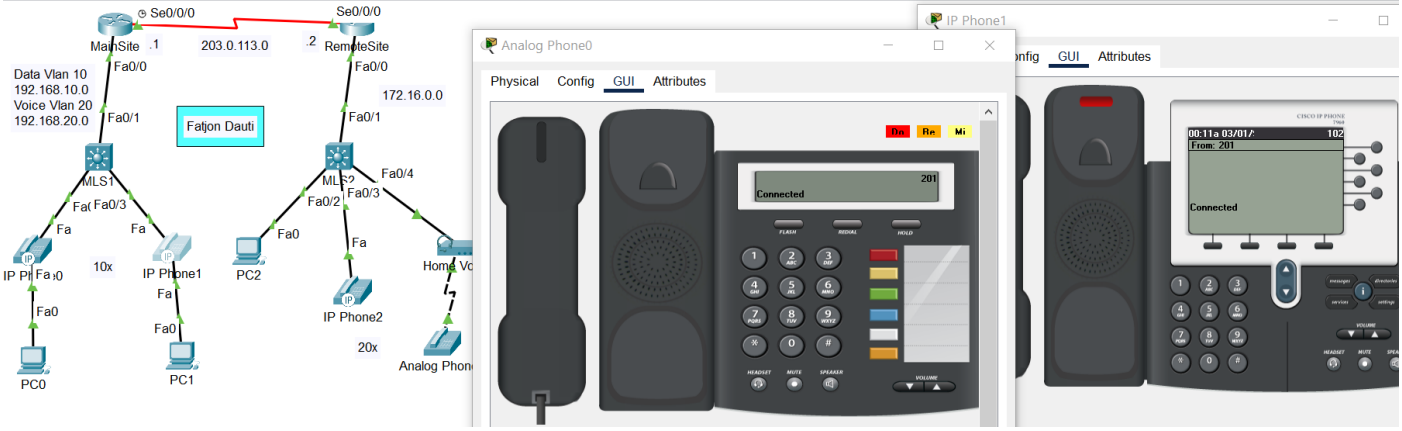
From IP Phone0 on Main site (101), dialing IP Phone2 on the Remote site (202)



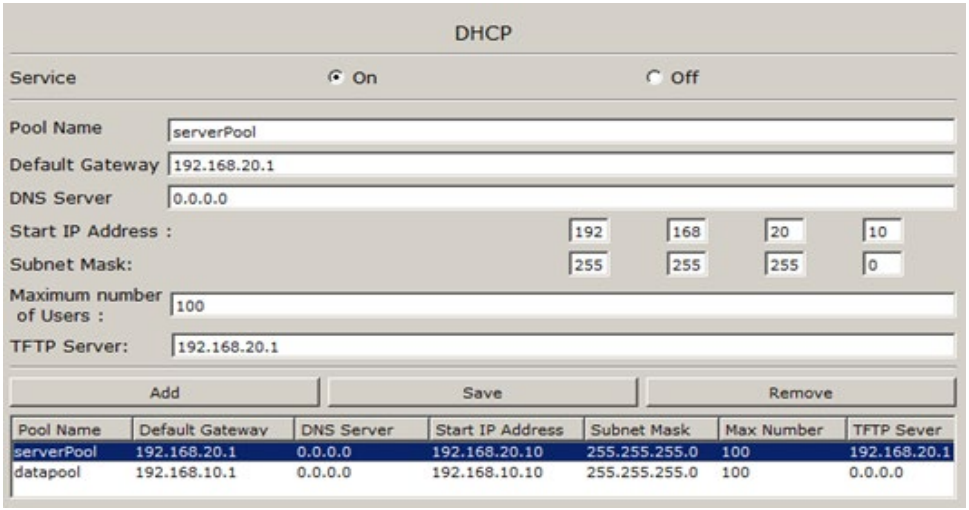




From Analog Phone (201), dialing IP Phone1 on the Main site (102)



In a big network, it is not a good practice to use the routers as DHCP servers. We should use a dedicated server instead. Let us modify our topology slightly: add a Server into the Main site to be the DHCP server. In order to do this, connect it to the **MLS1** switch on the Fa0/4 port. Because the interface in the server does not support trunking, we need to place it into an access VLAN. For example, into the voice VLAN with the command switchport access vlan 10 on **MLS1**. In the Server's Config tab, search for the DHCP service and turn it on then define the *serverPool,* such that, TFTP server will be 192.168.20.1. Save it and define another pool named *datapool* for the PCs. The final configuration is like this:

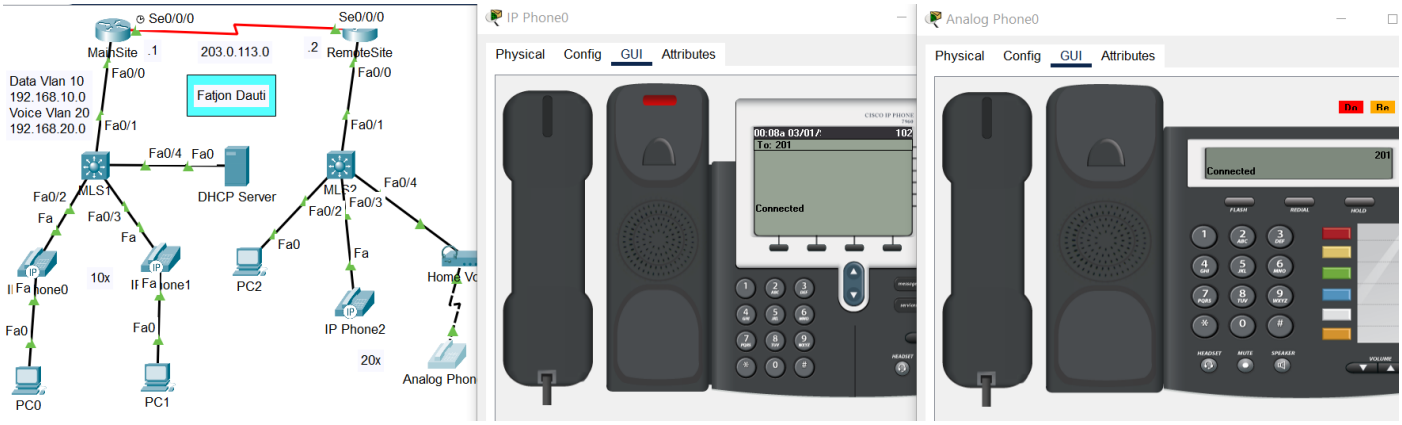


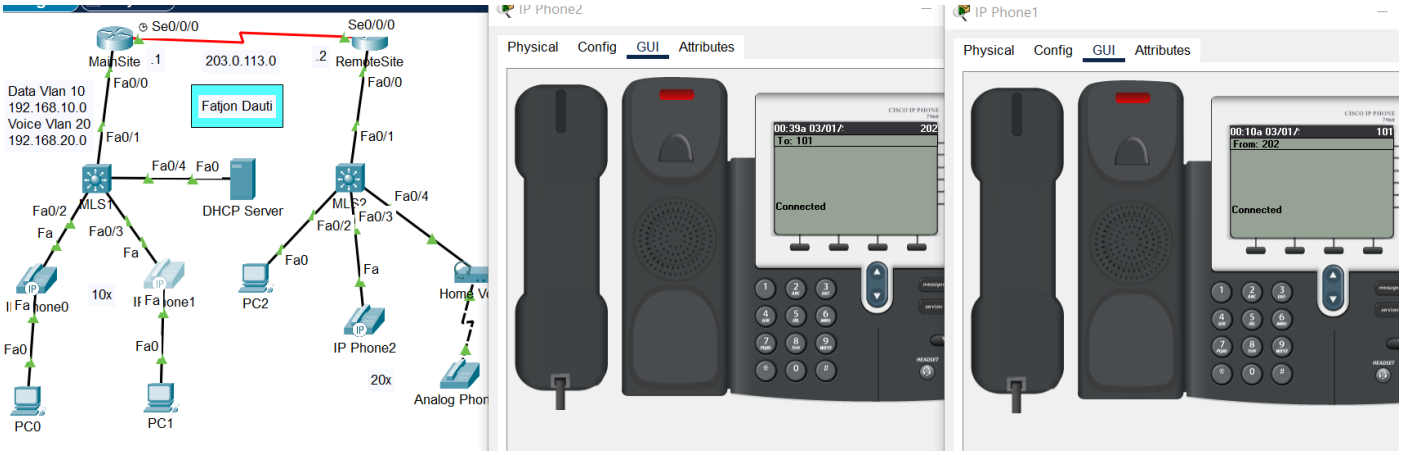
Add an IP address of 192.168.10.254/24 to the server then go to the **Main** router. First, disable the two DHCP pools there with the no ip dhcp pool *name* command. Now, IP phones in the Main site can use the server but the PCs cannot find the server on their subnet. Therefore, we need to issue the ip helper-address 192.168.10.254 command on the Fa0/0.20 subinterface to set up a DHCP relay towards the server. After this, everything should work as before.

Insert printouts of these successful calls here (20%)

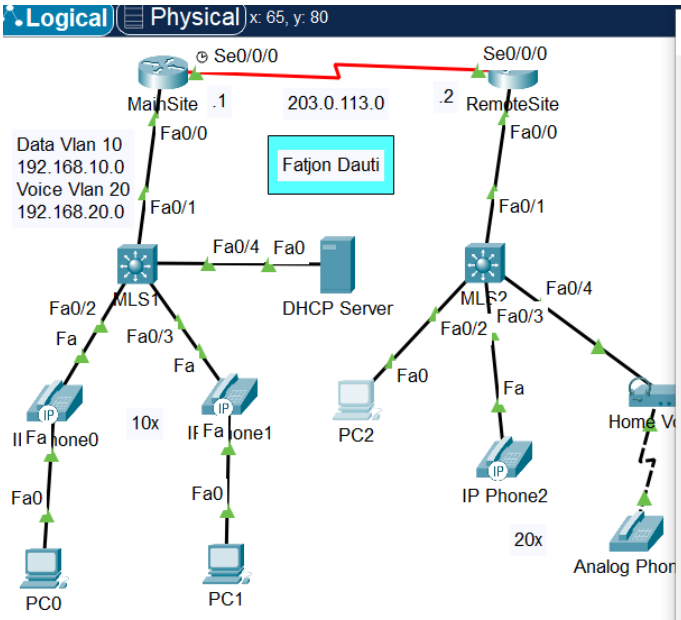
This part is related to my second pkt_b file

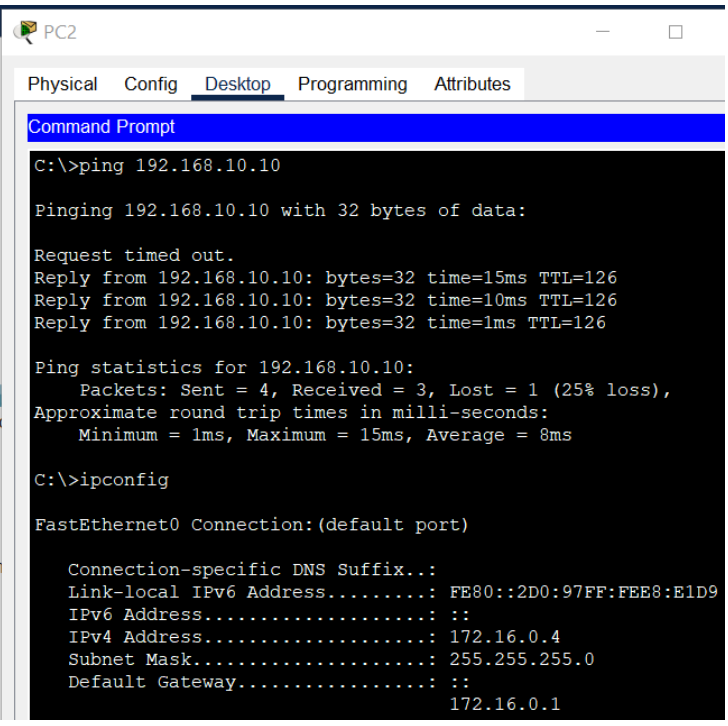
From 102 dialing 201 and from 202 dialing 101





From PC2 on Remote site pinging PC1 on the Main site





```
!MLS2
enable
config t
hostname MLS2
line con 0
logging synchronous
exec-timeout 0 0
!
int range f0/1-4
switchport voice vlan 1
!

!On the VoIP device, set the Server address to 172.16.0.1

!RemoteSite
enable
config t
hostname Remote
line con 0
logging synchronous
exec-timeout 0 0
!
int s0/0/0
ip addr 203.0.113.2 255.255.255.252
no shut
int f0/0
ip address 172.16.0.1 255.255.255.0
no shut
!
ip dhcp pool remotelan
net 172.16.0.0 255.255.255.0
default-router 172.16.0.1
option 150 ip 172.16.0.1
!
!configure phones
telephony-service
ip source-address 172.16.0.1 port 2000
max-dn 3
max-ephones 3
auto assign 1 to 3
create cnf-files
!
ephone-dn 1
number 201
ephone-dn 2
number 202
ephone-dn 3
number 203
!
!config EIGRP routing on routers
router eigrp 100
net 172.16.0.0 255.255.255.0
net 203.0.113.0 255.255.255.252
!
!config voip dial-peer
dial-peer voice 1 voip
session target ipv4:203.0.113.1
destination-pattern 10.
!
```

```
!MLS1
enable
config t
hostname MLS1
line con 0
logging synchronous
exec-timeout 0 0
!
vlan 10
name data
vlan 20
name voice
int range f0/2-3
switchport voice vlan 20
switchport access vlan 10
int f0/1
switchport trunk encapsulation dot1Q
switchport mode trunk
!

!MainSite Router
enable
config t
hostname Main
line con 0
logging synchronous
exec-timeout 0 0
!
int s0/0/0
clock rate 128000
ip addr 203.0.113.1 255.255.255.252
no shut
!
ip dhcp excluded-address 192.168.10.1
ip dhcp excluded-address 192.168.20.1
ip dhcp pool data
net 192.168.10.0 255.255.255.0
default-router 192.168.10.1
ip dhcp pool voice
net 192.168.20.0 255.255.255.0
default-router 192.168.20.1
option 150 ip 192.168.20.1
!
int f0/0
no shut
int f0/0.10
encapsulation dot1Q 10
ip add 192.168.10.1 255.255.255.0
int f0/0.20
encapsulation dot1Q 20
ip add 192.168.20.1 255.255.255.0
!
!configure phones
telephony-service
ip source-address 192.168.20.1 port 2000
max-dn 2
max-ephones 2
auto assign 1 to 2
create cnf-files
!
ephone-dn 1
```

```
number 101
ephone-dn 2
number 102
!
!config EIGRP routing on routers
router eigrp 100
net 192.168.10.0 255.255.255.0
net 192.168.20.0 255.255.255.0
net 203.0.113.0 255.255.255.252
!
!config voip dial-peer
dial-peer voice 1 voip
session target ipv4:203.0.113.2
destination-pattern 20.
!

!Part 2 DHCP Server separate

!Main
no ip dhcp pool data
no ip dhcp pool voice
!Main
int f0/0.20
ip helper-address 192.168.10.254
!
!MLS1
int f0/4
switchport access vlan 10
!

!DHCP server IP 192.168.10.254
!data pools on dhcp server
```