

**VOIP LAB**

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**Purpose:**

To set up voice over ip to call both within a network and out the network

**Background:**

VOIP stands for Voice Over Internet Protocol and is also commonly known as IP Telephony. IP Telephony is used as commands in the configuration on the cisco devices for VOIP. For our lab VOIP was more simplified as we did not have to configure any voice mail, so we didn’t need PSTN. We used an outdated system for VOIP called Call Manager Express in order to call outside the network. For calling inside the network we just had to configure two phones which was much simpler as there was a lot of preexisting sources of information for how to configure this. For CME or Call Manager Express was very difficult to find a solid site to use to configure this as the switch we were using was also very old and was end of life. The old CCNPs used Cisco Unity Express so they were not able to help very much, but we got very useful configuration from “someone” named Bob. For our VOIP we connected to an old landline so only certain 425 numbers were able to be called.

How VOIP works is by converting voice into digital signals. These digital signals are then sent through the internet. In our case we went through a landline to a center that then gets sent to its destination. VOIP has a bunch of function including, but not limited to, Network and Transport, Session Management, Signaling, etc.

VOIP sees a lot of practical use in corporations. Because of the broadband efficiency and low-cost businesses like to use VOIP over older copper wire systems. VOIP allows for voice and data to run through a single network, which is very efficient. VOIP can be done through Hosted VOIP Systems or Private. The difference being Hosted is typically done through service providers and for Private it is typically a corporation setting up its own VOIP.

VOIP can see some issues do to traveling through the internet. Some packets of voice can be lost and there can also be delay. A term was coined for this called Jitter which is a random variable about queuing delays in VOIP. When there is a lot of traffic or data being sent VOIP can suffer and so there is a system called QOS which tries to solve this problem.

**Lab Summary:**

We configured VOIP for two phones to be able to call each other on a single network and made it so a phone can call outside the network by going through the landline.

**Commands:**

**ip dhcp excluded-address [excluded-address-range-1] [excluded-address-range-2]** excludes which IP addresses to be leased to clients connecting to the DHCP server, this makes sure that there are no chances of duplicate IP addresses

**option 150 ip [router-ip-address]** is used to specify the IP address of the TFTP server specifically used for VOIP

**network [ip-address] [subnet-mask]** is used specify the range of addresses that can be leased by the DHCP server.

**default-router [default-gateway]** when using DHCP it enables the client device to receive the default gateway on its own.

**dial-peer voice 99 pots** enables the device to communicate to external or multiple other Cisco CME routers and create a connection between them.

**destination-pattern 91[2-9].........** specifies the numbers that the user may dial, adding a range will disable the user from picking numbers outside that range.

**forward-digits all** dictates how many digits the router will forward to the dial peer.

**telephony-service** enables the telephony service and allows for configuration of the service.

**ip source-address 192.168.20.1 port 2000** assigns the IP address and port number used for registering and configuring IP phones

**create cnf-files** is used to create the files that the phones will use to configure itself when connected.

**ephone-dn  1** creates a virtual port on the CME system that allows for multiple calls depending on how many ports are defined and allows for it to be configured.

**number 1921** assigns a number to the phone.

**ephone  1** represents the actual telephone device connected to the router and enables configuration of it.

**mac-address 0015.2B47.6685** specifies the mac address of the IP phone which is being configured.

**type 7960** defines the type of IP phone connected.

**button  1:1** correlates the ephone with a specific button number.

**Network Diagram:*Diagram

Description automatically generated***

**Configurations:**

**Switch 1:**

!

version 12.2

no service pad

service timestamps debug uptime

service timestamps log uptime

no service password-encryption

!

hostname S1

!

!

no aaa new-model

vtp domain CCNP

vtp mode transparent

ip subnet-zero

no ip domain-lookup

!

!

!

!

no file verify auto

spanning-tree mode pvst

spanning-tree extend system-id

!

vlan internal allocation policy ascending

!

vlan 10

name Data

!

vlan 20

name Voice

!

vlan 30

name Native

!

vlan 40

name MISC

!

vlan 50

name NATIVE

!

vlan 99

name MANAGEMENT

!

!

interface FastEthernet0/1

switchport trunk encapsulation dot1q

switchport trunk native vlan 30

switchport mode trunk

!

interface FastEthernet0/2

switchport access vlan 10

switchport mode access

switchport voice vlan 20

mls qos trust cos

spanning-tree portfast

!

interface FastEthernet0/3

switchport access vlan 10

switchport mode access

switchport voice vlan 20

mls qos trust cos

spanning-tree portfast

!

interface FastEthernet0/4

!

interface FastEthernet0/5

!

interface FastEthernet0/6

!

interface FastEthernet0/7

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interface FastEthernet0/8

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interface FastEthernet0/9

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interface FastEthernet0/10

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interface FastEthernet0/11

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interface FastEthernet0/12

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interface FastEthernet0/13

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interface FastEthernet0/14

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interface FastEthernet0/15

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interface FastEthernet0/16

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interface FastEthernet0/17

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interface FastEthernet0/18

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interface FastEthernet0/19

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interface FastEthernet0/20

!

interface FastEthernet0/21

!

interface FastEthernet0/22

!

interface FastEthernet0/23

!

interface FastEthernet0/24

!

interface GigabitEthernet0/1

!

interface GigabitEthernet0/2

!

interface Vlan1

no ip address

shutdown

!

ip classless

ip http server

!

!

!

control-plane

!

!

line con 0

line vty 0 4

no login

line vty 5 15

no login

!

!

end

**Pings:**Calendar

Description automatically generated with low confidence

**Problems:**

There was an issue with the initial set up of the internal VOIP as majority of the phones we were given to use didn’t work. The rest of the issues came when we tried to do external VOIP. We struggled to find working numbers to call to see if it was working. We figured out that only one of the racks had CME installed so we had to put that onto all the racks so every group could actually work to configure this. We forgot to add an additional number to our configuration which prevented us from calling out. The biggest problem however was finding configurations that worked and trying to find what ports to use. Even if the configuration was correct there was the chance that we weren’t in the right port. It took all the classes to find a configuration and a “mysterious person named Bob” to help us. The trial and error would’ve been endless without Bob.

**Conclusion:**

We successfully configured both internal and external VOIP on our racks using CME. We went through the network for internal and went to a provider for external and managed to call a specific 425 number.