

# Packet Tracer tutorial 2- IP telephony configuration on two branches of a company

## Tutorial description and scenario

This case study is designed to provide you with an insight into IP Telephony features, where you will be configuring Call Manager Express, setting up dial peers and connecting IP phones as well as analogue phones.

This activity is designed to provide you with an insight into what is now possible within Packet Tracer, how to use the various telephony devices, and finally how to apply the configuration.

For the purposes of this activity, we will assume that Company ABC has two remote buildings. Each building contains a router configured with DHCP, CME, & other telephony features. It also contains a Multilayer Switch configured to handle voice packets, and finally there are several telephone devices. The telephone devices vary, in some cases; the phones located within the buildings are IP Phones, or IP Communicators, or Analogue Phones. All phone devices must be able to call one another internally within a building as well as being able to call phones located within other buildings.

You will need to work through the steps provided within this document, completing the configuration, and inserting the various devices where needed.

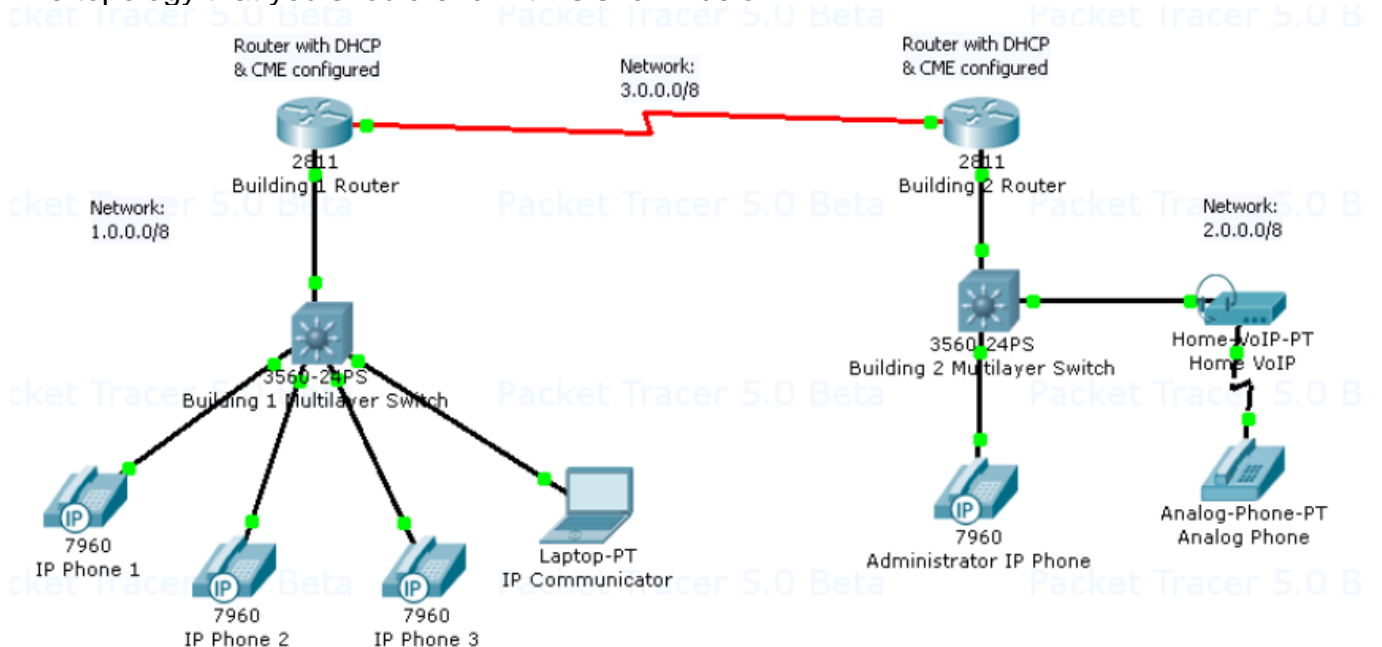
## Learning Objectives

To explore the new features of Packet Tracer v5.3

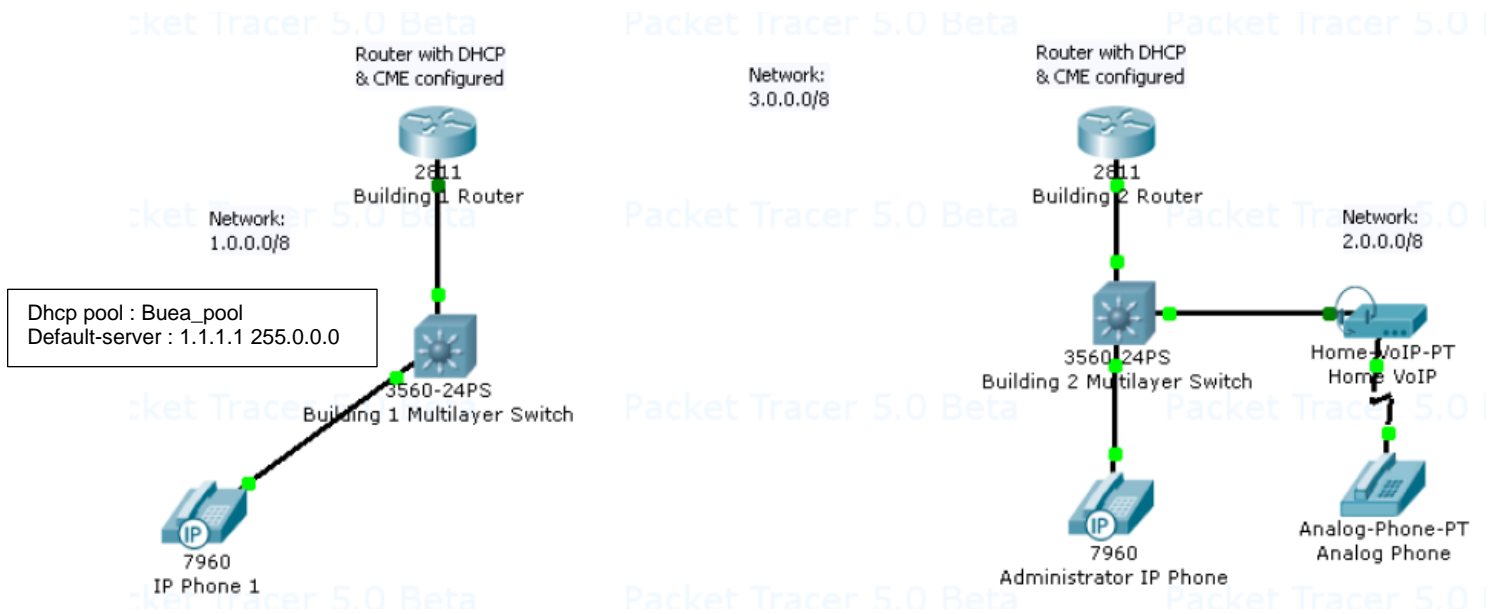
- Configure basic router & switch functions.
- Configure DHCP, Call Manager Express, Dial Peers, & Telephony Features

## Topology Diagrams

The topology that you should end with is shown below:



The topology that you start with is shown below:



## Tasks

### Step 1: DHCP config and TFTP server discovery

'**Building\_One\_Router**' needs to be configured for DHCP to provide addressing for each IP Phone to be connected. Once DHCP is configured, you will need to configure the FastEthernet0/0 interface and ensure that the IP Phone connected to the multilayer switch receives an IP Address (option 150).

Verify that 'IP Phone 1' has received an IP address (How do you verify that?).

### Step 2: Call Manager Express configuration

You must now configure the Call Manager Express telephony service on '**Building\_one\_Router**' (Why?). You will also need to specify the maximum number of phones (05) that the router will support and dial numbers (05). For this Configuration, take the default router ip address as the source address and 2000 as the port (PS: Ip source address are used by phones to register in the CME). Don't forget to automatically assign tags to phones as they register in the system.

### Step 3: switch configuration (QoS management):

On '**Building\_One\_Switch**', set Switchport's Fa0/1 – 5 to '**voice**' to handle voice packets belonging to VLAN 1.

### Step 4: dn and dial numbers configuration

Configure 'IP Phone 1' Phone on the first directory entry with dial number 1101:

Ensure that this IP Phone receives an 'IP Address' from the DHCP server configured on '**Building\_One\_Router**' and a 'Line Number'.

You are now at the stage where you can add additional IP Phones to Packet Tracer. You will also need to apply the configuration to each router stating that a phone has been connected and the dial number that should be assigned to the particular phone.

### Adding IP Phone 2

Place an IP Phone into the physical workspace within Packet Tracer and name it 'IP Phone 2'. Connect the switchport of the IP Phone to port Fa0/3 of 'Building\_One\_Switch'.

Now on '**Building\_One\_Router**' configure IP Phone 2 on the second directory number with dial number **1201**:

After a short while, the IP Phone will be configured with an 'IP Address' and also a 'Line Number' should appear within its configuration. Verify that this has occurred.

### Adding IP Phone 3

Place an IP Phone into the physical workspace within Packet Tracer and name it 'IP Phone 3'. Connect the switchport of the IP Phone to port Fa0/4 of 'Building\_One\_Switch'.

Now on 'Building\_One\_Router' configure ip phone 3 on the 3<sup>rd</sup> directory number with dial number 1301:

After a short while, the IP Phone will be configured with an 'IP Address' and also a 'Line Number' should appear within its configuration. Verify that this has occurred.

### Adding the IP Communicator

Repeat the above process, however, this time add a 'Laptop' instead of an IP Phone to Packet Tracer. Here you will use the 'IP Communicator' in place of a physical IP Phone. Connect the Ethernet port of the laptop to port Fa0/5 of 'Building\_One\_Switch'. Ensure that the laptop has been set to receive an IP Address via DHCP!

Now on 'Building\_One\_Router', configure the PC on the 4<sup>th</sup> directory number, with dial number **1401**:

After a short while, the laptop will be configured with an 'IP Address' and a 'Line Number' should also appear within its IP Communicator configuration. Verify that this has occurred.

**Step 5: Testing & Verification.** The information shown in the below table should be similar to your IP Configuration & Line Numbers. Please verify that you have similar results:

Building	Phone	IP Address	Line Number
Building One	IP Phone 1	1.0.0.1	1101
	IP Phone 2	1.0.0.2	1201
	IP Phone 3	1.0.0.3	1301
	IP Communicator	1.0.0.4	1401
Building Two	Administrator IP Phone	2.0.0.1	2101
	Analogue Phone	-	2501

Within each building check to see if you can call between IP Phones, for example, select IP Phone 1 (take the receiver off the phone) and dial IP Phones 2, 3, or the IP Communicator.

### Step 6: Establishing WAN communication.

For the moment 'Building\_One\_Router' and 'Building\_Two\_Router' are not connected.

You will need to establish a WAN serial connection between the two routers by connecting both S0/3/0 interfaces. You will then need to define a static route on each of the two routers, notifying them of route information to each network.

First of all, place a serial connection between interfaces S0/3/0 of each router. Note that 'Building\_One\_Router' should be designated as the DCE.

### Step 7: Configuring routing protocol

Now that the interfaces have been configured, you will need to configure Static Routes on each router so that traffic can be routed from network 1.0.0.0/8 through to 2.0.0.0/8 via network 3.0.0.0/8.

### Step 8: Enabling WAN voice communication with Dial Peer Mapping

Finally, now that you have connectivity between all phone devices within each Local Area Network, and that you have established a WAN connection between both routers defining static routes; you are now ready to configure the '**Dial Peer Mapping**' so that an IP Phone belonging within one LAN can call across the WAN to another IP Phone.

In order to do this you will need to configure dial peer information on 'Building\_One\_Router':

```
Building_One_Router(config)#dial-peer voice 1 voip           #Assigning the dial-peer#
Building_One_Router(config-dial-peer)#destination-pattern 2... #Destination dial pattern
begins with n.o.2#
Building_One_Router(config-dial-peer)#session target ipv4:3.0.0.2 #Gateway to
Building_Two_Router#
```

Dial peer information for 'Building\_Two\_Router' has already been configured.

### Step 9: Testing & Verification.

Please complete the following tests to ensure that you have end-to-end connectivity between all telephone devices. Note, to make a call: first select a phone with your mouse cursor; looking at the GUI, click on the receiver to dismount it from the telephone; then finally dial the destination telephone number.

1. Test that you can call from 'IP Phone 1' through the WAN to the 'Administrators IP Phone'.
2. Test that you can call from the 'Analogue Phone' to the 'IP Communicator'.

Once a call is placed, you should see similar results to the below screen capture. Here we have the IP Phone 1 (right) calling the Administrators IP Phone (left). Notice the caption above the phone on the Administrators IP Phone stating that "The phone is ringing".

