



ENTERPRISE NETWORK SOLO PAPER



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IS 460

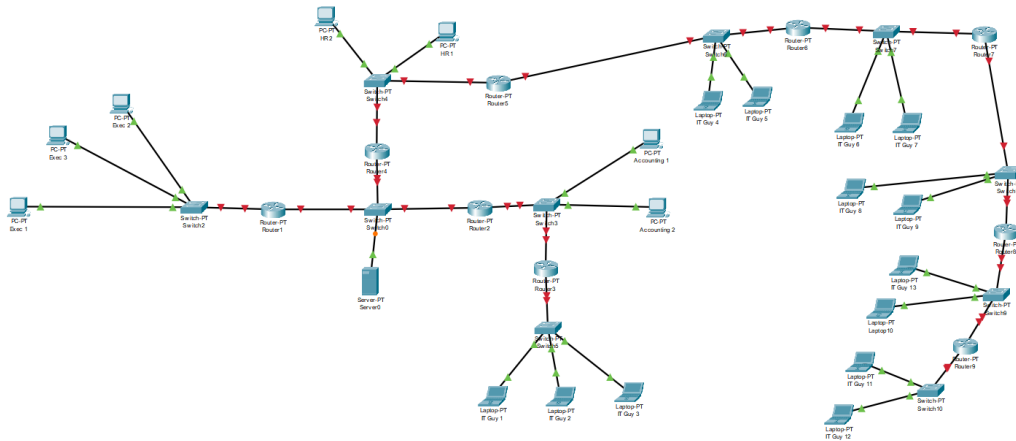
Date	Time	Accomplished
October 8, 2022	1 hour and 2 minutes	Initial rough draft with missing components.
October 12, 2022	42 minutes	Started the initial setup of the second draft with additional components.
October 15, 2022	36 minutes	Divided out smartphones and tablets and started on Vlan configuration for each Router. Additionally got IP squared away.
October 19, 2022	3 hours	Configured IP addresses and set up the Physical topology some. Started Vlan configuration
October 23, 2022	1 hour and 5 minutes	Configured 3 of 4 Vlans. Reconfigured routers
October 26, 2022	1 hour	Configured the IT vlan. Researched how to connect phones/tablets to computer
November 2, 2022	1 hour and 50 minutes	Set up trunking on the vlans. Started on configuring allowed vlans for each one
November 3, 2022	1 hour and 7 minutes	Set up allowed trunk ports on the vlans.
November 7, 2022	1 hour and 38 minutes	Changed Routers to 2811. Started work on VoIP
November 9, 2022	4 hours	Configured VoIP for Executive and researched
November 15, 2022	3 hours and 5 minutes	Designed a third design
November 16, 2022	2 hours and 20 minutes	Set up configurations from second design into new design. Set back up vlans for switches while adding the Data and Voice vlans. Added server and workstation vlans.
November 17, 2022	2 hours and 30 minutes	Configured trunking, configured serials on the routers, configured DHCP, DNS and Web Servers
November 18, 2022	1 hour and 30 minutes	Configured server pools, dhcp on routers, started on encapsulation
November 21, 2022	3 hours and 25 minutes	Configured encapsulation, configured ospf on routers
November 22, 2022	6 hours	Reconfigured routers and switches for a better VoIP, set

		up VoIP on each vlan segment except for workstation vlan
November 23, 2022	2 hours and 45 minutes	Reconfigured VoIP on Workstation, reconfigured serials
November 25, 2022	4 hours	Researched how to do Inter vlan routing
November 26, 2022	8 hours and 30 minutes	Reconfigured routers after forgetting to include dhcp excluded-address and helper address, continued to test inter vlan, configured physical, started process of configuring wifi networks
November 27, 2022	4 hours	Configured company and guest networks
November 28, 2022	Round 1: 2 hours Round 2: 1 hour and 20 minutes Total: 3 hours and 20 minutes	Made a wifi network for executives only, configured more of physical, set up email servers
November 30, 2022	3 hours	Fully reconfigured email from dhcp to static, researched intervlan through router rip, will use since successful
December 1, 2022	2 hours and 30 minutes	Set back up Server vlan, did router rip on all routers for inter vlan then ospf
Total time	67 hours	

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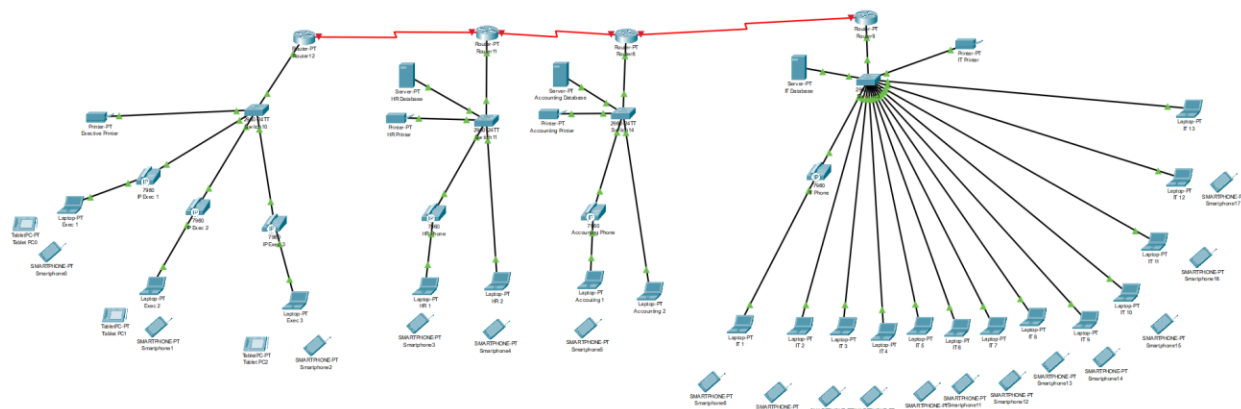
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Network Design Rough Draft



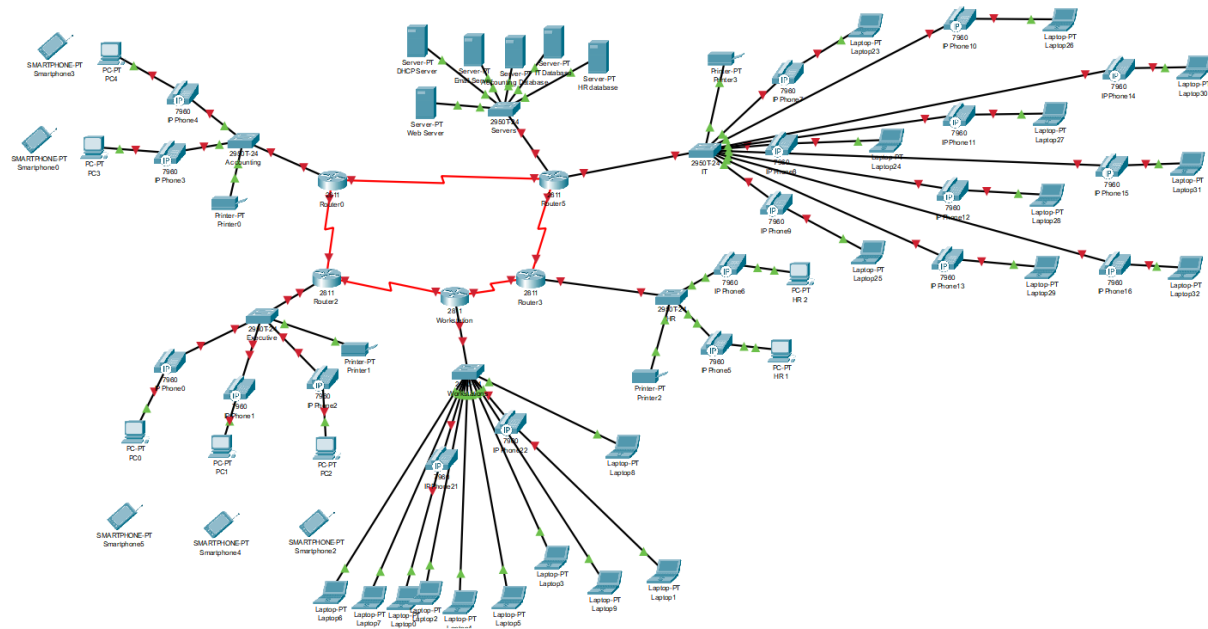
From the initial draft of the network, I had set up a basic setup of a network but missing a few key components like phones and a few other things and made one side have the bulk of the IT computers. It became apparent that I had used a switch that only allowed three ports to each computer and router which lead to it becomes large but missing the servers, the phones, and for the initial draft. However, it served as a lesson for how to design a network that would look better to look at and be better organized in the final draft of the network. The first draft of this network project can serve as a learning point and as a lesson in better designing a beforehand.

Second Setup of the Network Design



The second design of the enterprise network is composed of four separate routers but now featuring printers for each section, IP phones, server/databases, and smartphones and tablets for executive and just smartphones for the others as well. With this design, each part of the office is composed of each respective segment that will be assigned their respective rooms in the physical topology of the map. Using this new setup helps show a better design than the first one is that configuring the vlans and IP addresses are easier to do and makes for a far more logical design and network.

Third Set up of the Network



The third design of the project is a more fleshed out network that now includes a workstations portion and a vlan for the servers to make it more secure to access than being able to accessed in each vlan. This prevents an easier intrusion from getting access to the database and servers more quickly. This design looks and has the feel of a more fleshed out business network than the other two designs.

IP Addresses

Executive Side

```
int fa0/0.10
encapsulation dot1Q 10
ip address 192.168.100.1 255.255.255.224
ip helper-address 192.168.100.130
int fa0/0.100
encapsulation dot1Q 100
ip address 172.16.100.1 255.255.255.224
int fa0/0.10
ip helper-address 192.168.100.130
do wr
```

Fast Ethernet 0/0.10 has been assigned the address of 192.168.100.1 for Data and Fast Ethernet 0/0.100 has been assigned 172.16.100.1 for VoIP.

HR Side

```
int fa0/0.25
encapsulation dot1Q 25
ip add 192.168.100.65 255.255.255.224
ip helper-address 192.168.100.130
exit
int fa0/0.100
encapsulation dot1Q 100
ip add 172.16.100.65 255.255.255.224
exit
```

Fast Ethernet 0/0.25 has been assigned the address of 192.168.100.65 for Data and Fast Ethernet 0/0.100 has been assigned 172.16.100.65 for VoIP.

Accounting Side

```
int fa0/0.15
encapsulation dot1Q 15
ip add 192.168.100.33 255.255.255.224
ip helper-address 192.168.100.130
exit
int fa0/0.100
encapsulation dot1Q 100
ip add 172.16.100.33 255.255.255.224
exit
```

Fast Ethernet 0/0.15 has been assigned the address of 192.168.100.33 for Data and Fast Ethernet 0/0.100 has been assigned 172.16.100.33 for VoIP.

IT Side


```

int fa0/0.35
encapsulation dot1Q 35
ip add 192.168.100.97 255.255.255.224
ip helper-address 192.168.100.130
exit
int fa0/0.100
encapsulation dot1Q 100
ip add 172.16.100.97 255.255.255.224
exit
do wr

```

Fast Ethernet 0/0.35 has been assigned the address of 192.168.100.97 for Data and Fast Ethernet 0/0.100 has been assigned 172.16.100.97 for VoIP.

Workstation Side

```

int fa0/0.45
encapsulation dot1Q 45
ip add 192.168.100.51 255.255.255.224
ip helper-address 192.168.100.130
exit
int fa0/0.100
encapsulation dot1Q 100
ip add 172.16.100.51 255.255.255.224
exit
do wr

```

Fast Ethernet 0/0.45 has been assigned the address of 192.168.100.51 for Data and Fast Ethernet 0/0.100 has been assigned 172.16.100.51 for VoIP

Server side

```

int fa0/0.40
ip add 192.168.100.129 255.255.255.248
exit

```

Setting up the Vlan

```

ena
conf t
vlan 2
name Executive
vlan 10
name DATA
vlan 100
name VOICE
end
conf t
int range fa0/2-6
switchport mode access
switchport access vlan 2,10
end
conf t
int range fa0/2-4
switchport mode access
switchport voice vlan 100
end

```

The above picture is the vlan set up of the Executive vlan, use it as a guide when configuring vlans on the switches and setting the used ports on the routers.

Executive Vlan

```

Switch>show vlan brief

```

VLAN	Name	Status	Ports
1	default	active	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
2	Executive	active	
10	DATA	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5 Fa0/6
100	VOICE	active	Fa0/2, Fa0/3, Fa0/4

Executive Vlan has been set up with Fa0/1-4 and Fa0/6 taken up with the Executive Vlan and assigned 2, 10 for Data, and 100 for Voice.

HR Vlan

```

ena
conf t
vlan 8
name HR
vlan 25
name DATA
vlan 100
name VOICE
end
conf t
int range fa0/2-5
switchport mode access
switchport access vlan 8,25
end
conf t
int range fa0/2-3
switchport mode access
switchport voice vlan 100
end

```

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
8	HR	active	
25	DATA	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5
100	VOICE	active	Fa0/2, Fa0/3

HR Vlan has been set up with Fa0/1-5 set as part of the HR vlan assigned at 8, 25 for Data, and 100 for Voice.

Accounting Vlan

```

ena
conf t
vlan 4
name Accounting
vlan 15
name DATA
vlan 100
name VOICE
end
conf t
int range fa0/2-5
switchport mode access
switchport access vlan 4,15
end
conf t
int range fa0/2-3
switchport mode access
switchport voice vlan 100
end

```

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
4	Accounting	active	
15	DATA	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5
100	VOICE	active	Fa0/2, Fa0/3

Accounting Vlan has been set up with Fa0/1-5 as part HR vlan assigned at 4, 15 for Data, and 100 for Voice.

IT Vlan

```

ena
conf t
vlan 6
name IT
vlan 35
name DATA
vlan 100
name VOICE
end
conf t
int range fa0/2-13
switchport mode access
switchport access vlan 6,35
end
conf t
int range fa0/2-11
switchport mode access
switchport voice vlan 100
end

Switch>show vlan brief

```

VLAN	Name	Status	Ports
1	default	active	Fa0/14, Fa0/15, Fa0/16, Fa0/17 Fa0/18, Fa0/19, Fa0/20, Fa0/21 Fa0/22, Fa0/23, Fa0/24
6	IT	active	
35	DATA	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5 Fa0/6, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Fa0/11, Fa0/12, Fa0/13
100	VOICE	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5 Fa0/6, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Fa0/11

IT vlan has been set up with Fa0/1-15 and 17 as part of IT vlan assigned at 6, 35 for Data, and 100 for Voice.

Workstation vlan

```

ena
conf t
vlan 32
name Workstation
vlan 45
name DATA
vlan 100
name VOICE
end
conf t
int range fa0/2-13
switchport mode access
switchport access vlan 32,45
end
conf t
int range fa0/2-11
switchport mode access
switchport voice vlan 100
end

```

Switch>show vlan brief

VLAN	Name	Status	Ports
1	default	active	Fa0/14, Fa0/15, Fa0/16, Fa0/17 Fa0/18, Fa0/19, Fa0/20, Fa0/21 Fa0/22, Fa0/23, Fa0/24
12	VLAN0012	active	
32	Workstation	active	
45	DATA	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5 Fa0/6, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Fa0/11, Fa0/12, Fa0/13
100	VOICE	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5 Fa0/6, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Fa0/11

Workstation vlan has been set up with number of 32 assigned to it, Data vlan of 45, and Voice vlan of 100.

VOICE Vlan has been assigned as number 100 and will be used for calls and such.

Server

```

ena
conf t
vlan 40
name DATA
vlan 70
name Servers
exit
int range fa0/2-5
switchport mode access
switchport access vlan 40,70
end

```

```
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
40	DATA	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5
70	Servers	active	
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

Trunk or allowed Vlan assess ability

Since this is the network being set up and designed for the company, certain parts of the network on their Vlans can only have access to the other Vlans based on their role in the company. For instance, the IT vlan has to be able to access the other Vlans to make sure everything is set and secure while the Accounting and HR departments are not allowed to have access to any other vlan.

```
ena
conf t
int fa0/1
switchport mode trunk
switchport trunk allowed vlan add vlan numbers
```

Accounting

```
Switch#show int fa0/1 switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: trunk
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk private VLANs: none
Operational private-vlan: none
Trunking VLANs Enabled: 1,4,10,15,35,100
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Protected: false
Appliance trust: none
```

For the accounting vlan, the vlans of Executive (10) and IT (35) are allowed to access the Accounting vlan.

Executive

```
Switch#show int fa0/1 switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: trunk
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: Off
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk private VLANs: none
Operational private-vlan: none
Trunking VLANs Enabled: 1-2,10,35,100
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Protected: false
Appliance trust: none
```

For the executive vlan, IT (35) is the only Vlan that has access to the Executive Vlan.

HR

```
Switch#show int fa0/1 switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: trunk
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk private VLANs: none
Operational private-vlan: none
Trunking VLANs Enabled: 1,8,10,25,35,100
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Protected: false
Appliance trust: none
```

For the HR vlan, only IT (35) has access to the HR vlan through the trunked ports.

IT

```
Switch>show int fa0/1 switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: trunk
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk private VLANs: none
Operational private-vlan: none
Trunking VLANs Enabled: 1,6,35,100
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Protected: false
Appliance trust: none
```

For the IT vlan, no one has access to it.

Workstations

```

Switch#show int fa0/1 switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: trunk
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk private VLANs: none
Operational private-vlan: none
Trunking VLANs Enabled: 1,32,35,45,100
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Protected: false
Appliance trust: none

```

For the Workstation vlan, only IT (35) has access to the vlan.

Server

```

Switch#show int fa0/1 switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: trunk
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk private VLANs: none
Operational private-vlan: none
Trunking VLANs Enabled: 35,40,70
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Protected: false
Appliance trust: none

```

For the Server vlan, only IT(35) has access to the vlan.

Router configuration

Executive

Serial0/3/0	
Port Status	<input checked="" type="checkbox"/> On
Duplex	<input type="radio"/> Full Duplex
Clock Rate	2000000
IP Configuration	
IPv4 Address	10.10.10.1
Subnet Mask	255.255.255.252
Tx Ring Limit	10

Serial0/3/1	
Port Status	<input checked="" type="checkbox"/> On
Duplex	<input type="radio"/> Full Duplex
Clock Rate	2000000
IP Configuration	
IPv4 Address	10.10.10.5
Subnet Mask	255.255.255.252
Tx Ring Limit	10

The Executive router addresses for Serial 3/0 and 3/1 have been configured on the router

HR

Serial0/3/0	
Port Status	<input checked="" type="checkbox"/> On
Duplex	<input type="radio"/> Full Duplex
Clock Rate	2000000
IP Configuration	
IPv4 Address	10.10.10.10
Subnet Mask	255.255.255.252
Tx Ring Limit	10

Serial0/3/1	
Port Status	<input checked="" type="checkbox"/> On
Duplex	<input type="radio"/> Full Duplex
Clock Rate	2000000
<div>IP Configuration</div> <div>IPv4 Address</div> <div>Subnet Mask</div>	
	10.10.10.13
	255.255.255.252
Tx Ring Limit	10

The HR router addresses have been configured for both Serials.

Accounting

Serial0/3/0	
Port Status	<input checked="" type="checkbox"/> On
Duplex	<input type="radio"/> Full Duplex
Clock Rate	2000000
<div>IP Configuration</div> <div>IPv4 Address</div> <div>Subnet Mask</div>	
	10.10.10.18
	255.255.255.252
Tx Ring Limit	10

Serial0/3/1	
Port Status	<input checked="" type="checkbox"/> On
Duplex	<input type="radio"/> Full Duplex
Clock Rate	2000000
<div>IP Configuration</div> <div>IPv4 Address</div> <div>Subnet Mask</div>	
	10.10.10.5
	255.255.255.252
Tx Ring Limit	10

The Accounting router addresses have been configured for both Serials

Workstation

Serial0/3/0	
Port Status	<input checked="" type="checkbox"/> On
Duplex	<input type="radio"/> Full Duplex
Clock Rate	2000000
IP Configuration	
IPv4 Address	10.10.10.9
Subnet Mask	255.255.255.252
Tx Ring Limit	10

Serial0/3/1	
Port Status	<input checked="" type="checkbox"/> On
Duplex	<input type="radio"/> Full Duplex
Clock Rate	2000000
IP Configuration	
IPv4 Address	10.10.10.2
Subnet Mask	255.255.255.252
Tx Ring Limit	10

The Workstation router addresses have been configured for both Serials.

IT

Port Status	<input checked="" type="checkbox"/> On
Duplex	<input type="radio"/> Full Duplex
Clock Rate	2000000
IP Configuration	
IPv4 Address	10.10.10.6
Subnet Mask	255.255.255.252
Tx Ring Limit	10

Port Status	<input checked="" type="checkbox"/> On
Duplex	<input type="radio"/> Full Duplex
Clock Rate	2000000
<div>IP Configuration</div> <div>IPv4 Address: 10.10.10.14</div> <div>Subnet Mask: 255.255.255.252</div>	
Tx Ring Limit	10

The router for IT has been configured for both Serials.

Server

Physical **Config** CLI Attributes

GLOBAL Settings Algorithm Settings ROUTING Static RIP SWITCHING VLAN Database INTERFACE FastEthernet0/0 FastEthernet0/1 Serial0/3/0 Serial0/3/1	<div>Serial0/3/0</div> <table border="1"> <tr> <td>Port Status</td> <td><input checked="" type="checkbox"/> On</td> </tr> <tr> <td>Duplex</td> <td><input type="radio"/> Full Duplex</td> </tr> <tr> <td>Clock Rate</td> <td>2000000</td> </tr> <tr> <td colspan="2"> <div>IP Configuration</div> <div>IPv4 Address: 10.10.10.14</div> <div>Subnet Mask: 255.255.255.224</div> </td> </tr> <tr> <td>Tx Ring Limit</td> <td>10</td> </tr> </table>	Port Status	<input checked="" type="checkbox"/> On	Duplex	<input type="radio"/> Full Duplex	Clock Rate	2000000	<div>IP Configuration</div> <div>IPv4 Address: 10.10.10.14</div> <div>Subnet Mask: 255.255.255.224</div>		Tx Ring Limit	10
Port Status	<input checked="" type="checkbox"/> On										
Duplex	<input type="radio"/> Full Duplex										
Clock Rate	2000000										
<div>IP Configuration</div> <div>IPv4 Address: 10.10.10.14</div> <div>Subnet Mask: 255.255.255.224</div>											
Tx Ring Limit	10										
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Port Status	<input checked="" type="checkbox"/> On										
Duplex	<input type="radio"/> Full Duplex										
Clock Rate	2000000										
<div>IP Configuration</div> <div>IPv4 Address: 192.168.1.16</div> <div>Subnet Mask: 255.255.255.224</div>											
Tx Ring Limit	10										

VoIP configuration

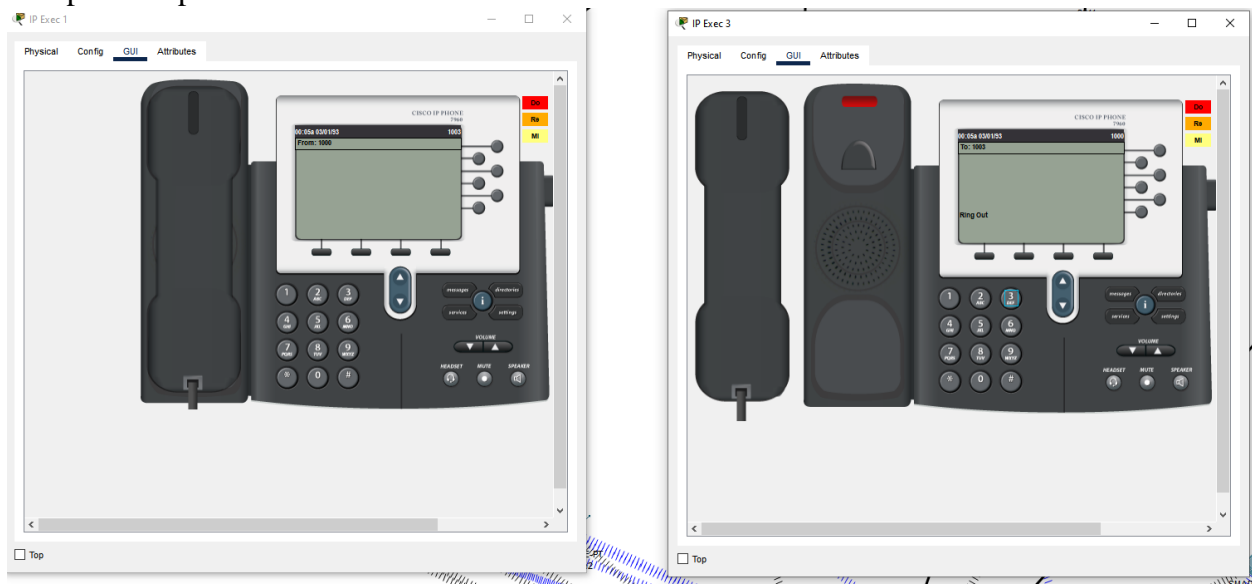
Since this is a office network, the IP phones need to be set up to allow calls to be occurring in the office between computers in each department of the network. The following picture is a good example how to go through the process of setting up VoIP on the Executive branch. For others with more phones change auto assign from 1 to the amount of phones on the Vlan, same with max-dn for the registry and max-ephones for how many on the vlan as well. Also change excluded address, the network info, default router, option 150, and source address for the configuration of each one.

Executive

```
Executive
ip dhcp excluded-address 172.16.100.1
ip dhcp pool VOICE
network 172.16.100.0 255.255.255.224
default-router 172.16.100.1
option 150 ip 172.16.100.1
ip dhcp pool DATA
network 192.168.100.0 255.255.255.224
default-router 192.168.100.1
ip source-address 172.16.100.1
telephony-service
max-dn 3
max-ephones 3
ip source-address 172.16.100.1
auto assign 1 to 3
ephone-dn 1
number 1001
exit
ephone-dn 2
number 1002
exit
ephone-dn 3
number 1003
exit
end
```

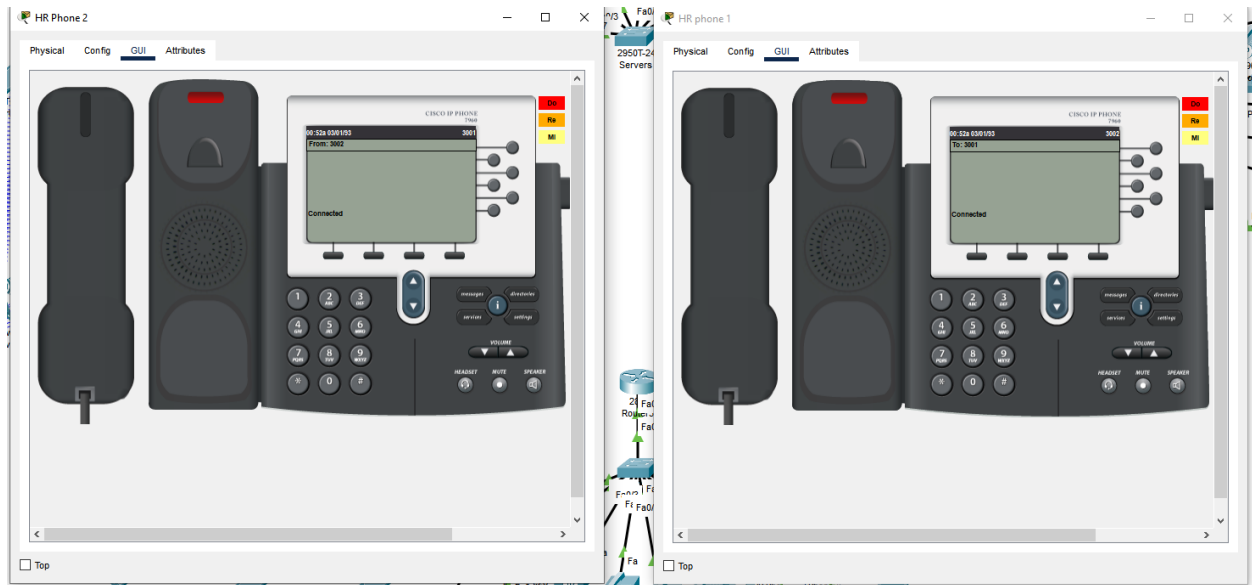
To configure VoIP you need to use telephony service, then configure the directory to the respective amount of phones on the vlan. The same IP address for the vlan will be the source address on port 2000 for VoIP. After going through the process of setting up the VoIP on Executive, the phones have been established on the three with 1000, 1001, and 1003 respectively

set up on the phones.



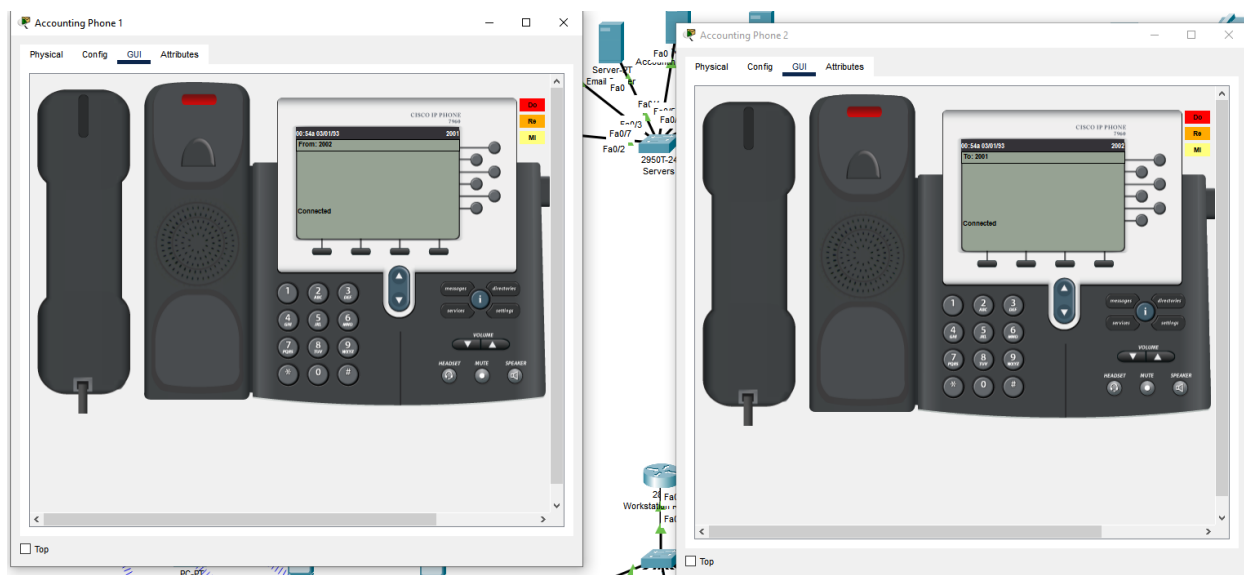
VoIP on Executive Phones

HR



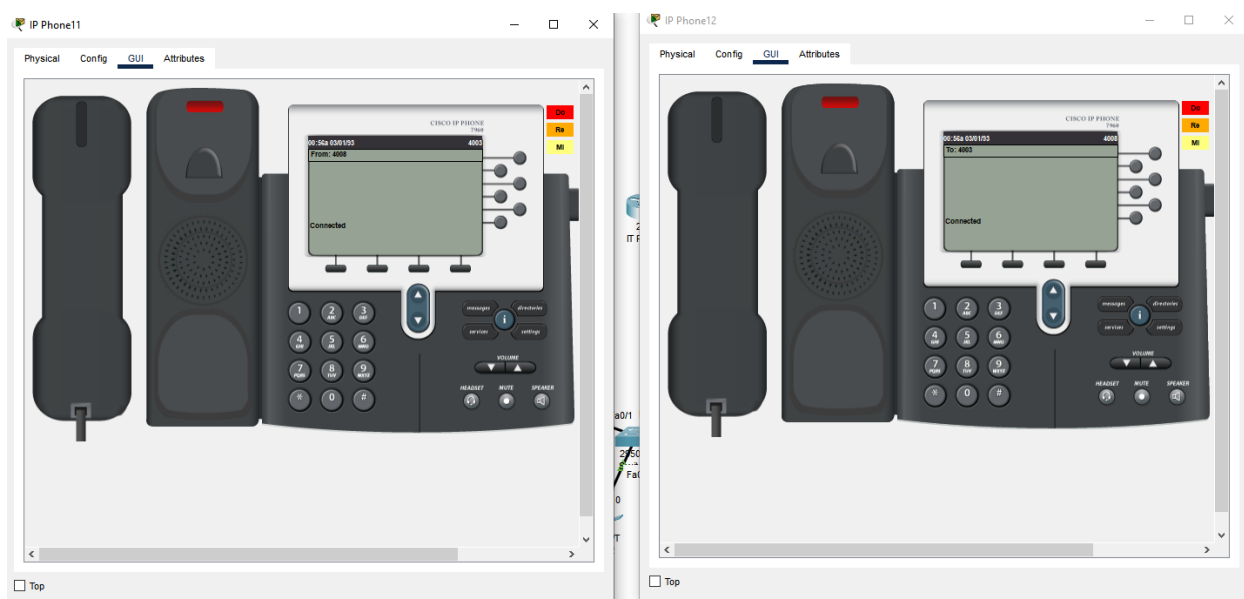
VoIP on HR phones

Accounting



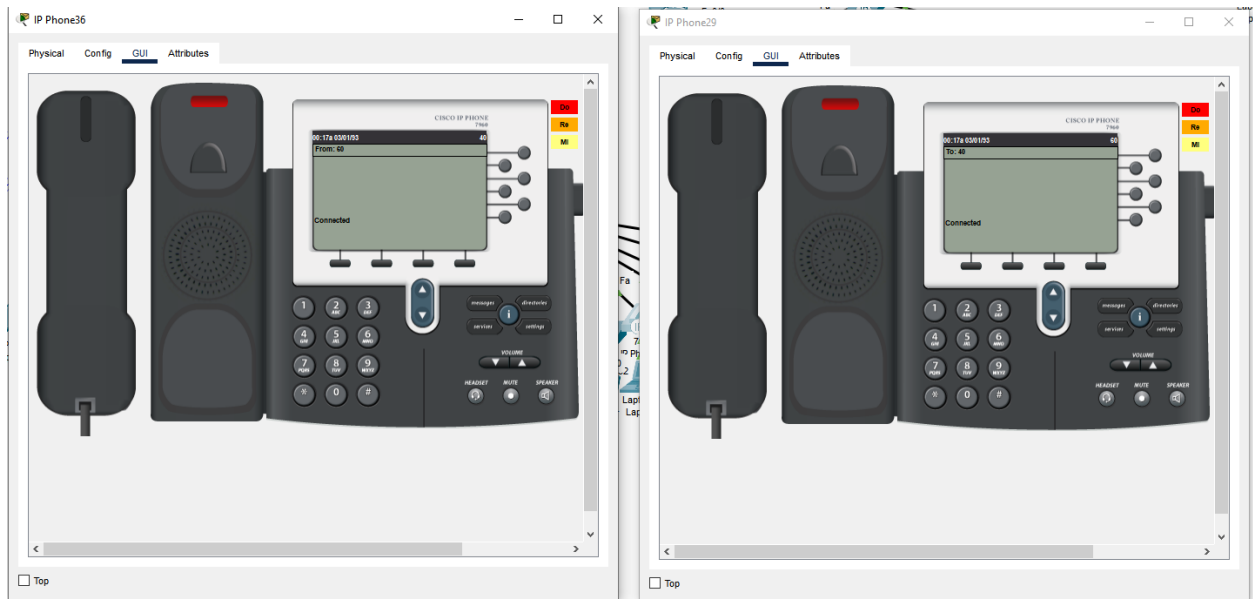
VoIP on Accounting

IT



VoIP on IT phones

Workstation



VoIP on Workstation phones.

Email Servers

Emails are important for a network since it helps with communication across the network to allow for ideas to be spread. For that, email servers must be set up to enable this.

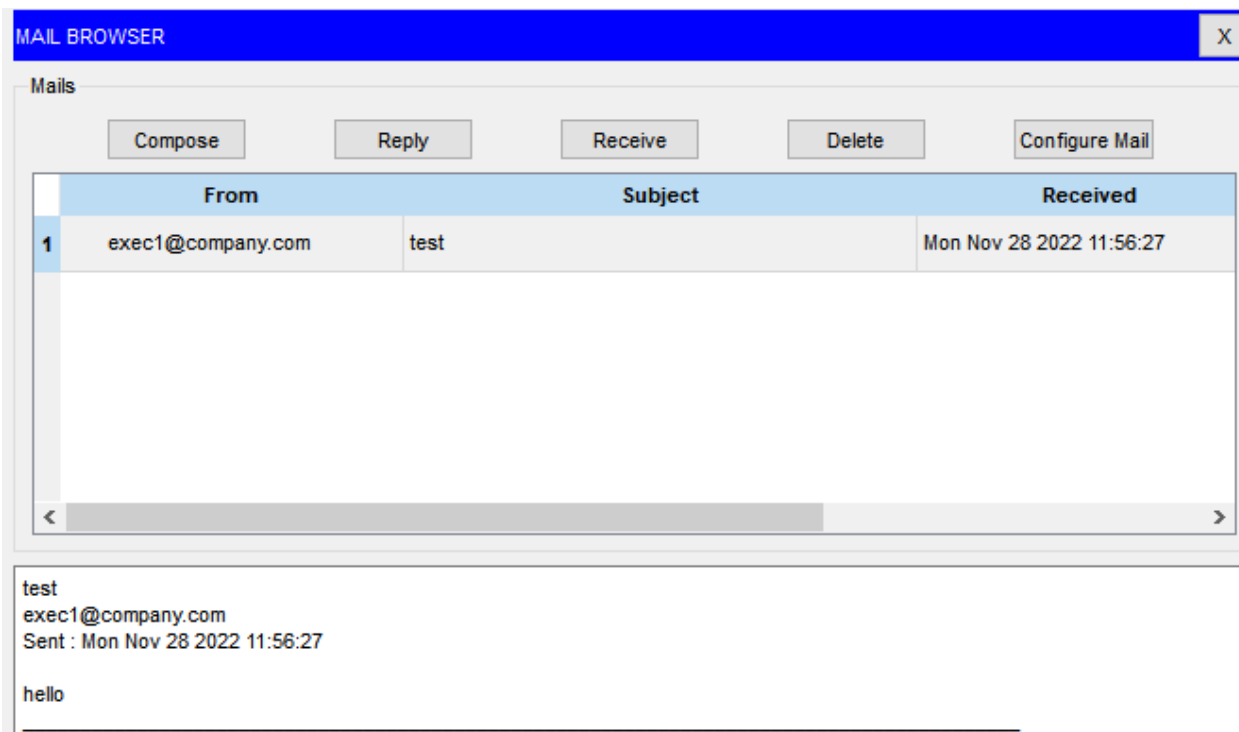
Executive

The screenshot shows the 'Services' configuration page. The left sidebar lists various services: HTTP, DHCP, DHCPv6, TFTP, DNS, SYSLOG, AAA, NTP, EMAIL (selected), FTP, and IoT. The main content area is titled 'EMAIL' and contains two sections: 'SMTP Service' and 'POP3 Service'. Both sections have radio buttons for 'ON' (selected) and 'OFF'. Below these, the 'Domain Name' is set to 'company.com'. Under the 'User Setup' section, there are three users listed: 'exec1', 'exec2', and 'exec3'. Each user has a corresponding 'User' and 'Password' field.

After setting up the domain name on the email server, you will want to go to the individual computers on the vlan with a similar setup on the Executive vlan, just change the mail server details, name, email address, username, and password.

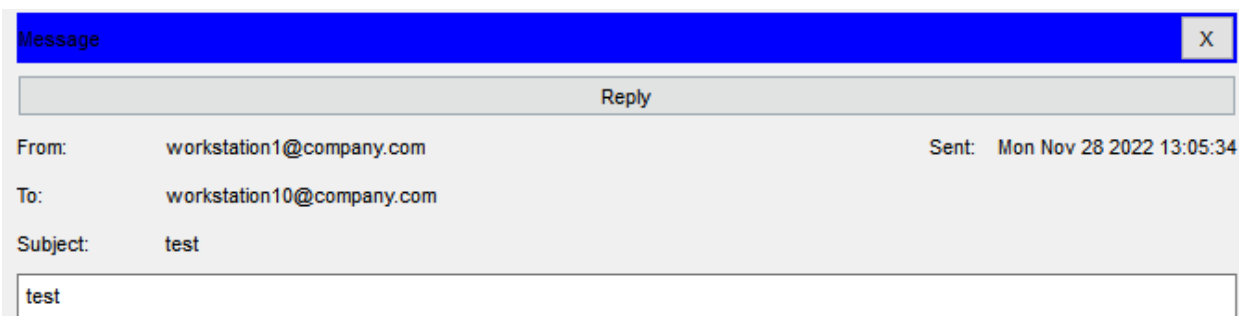
The 'Configure Mail' dialog box is shown. It has a title bar with a close button (X). The dialog is divided into three sections: 'User Information', 'Server Information', and 'Logon Information'. In the 'User Information' section, 'Your Name' is 'exec1' and 'Email Address' is 'exec1@company.com'. In the 'Server Information' section, both 'Incoming Mail Server' and 'Outgoing Mail Server' are '192.168.100.3'. In the 'Logon Information' section, 'User Name' is 'exec1' and 'Password' is a masked field. At the bottom, there are four buttons: 'Save', 'Remove', 'Clear', and 'Reset'.

On the Executive vlan, the domain name has been assigned company.com with three users on the email server for it.



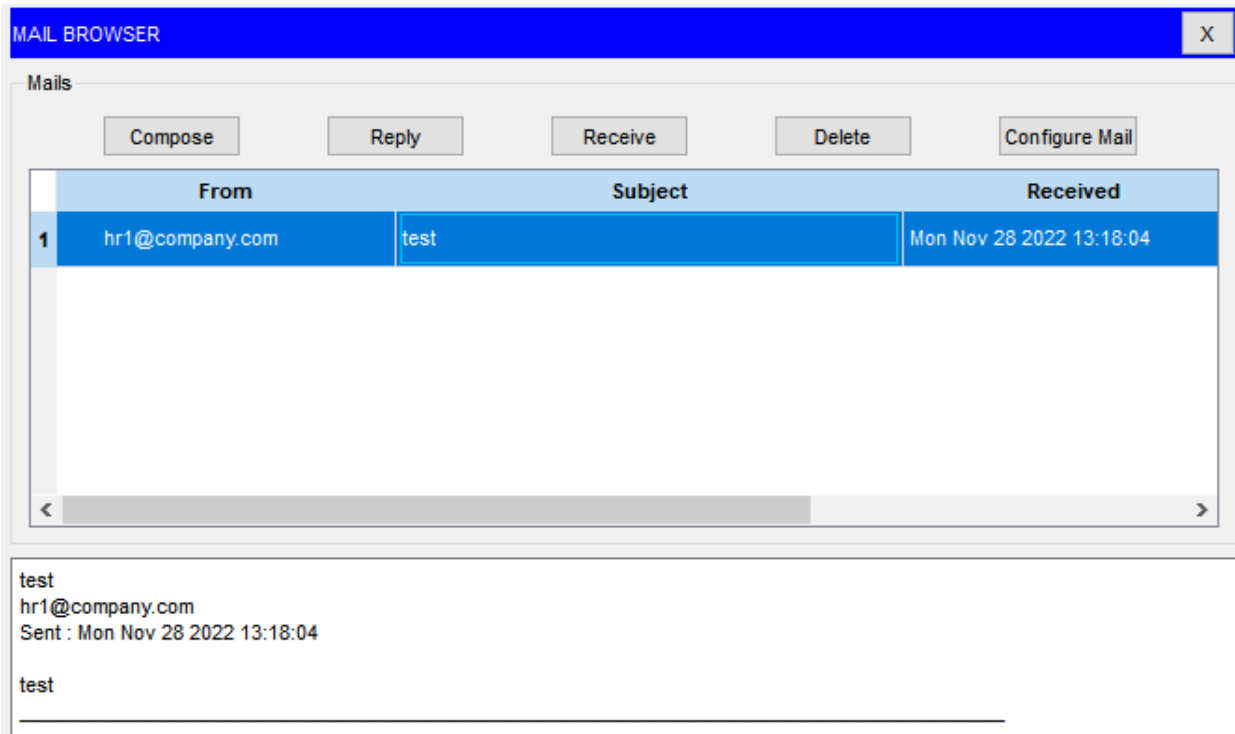
Test email between exec1 and exec2.

Workstation



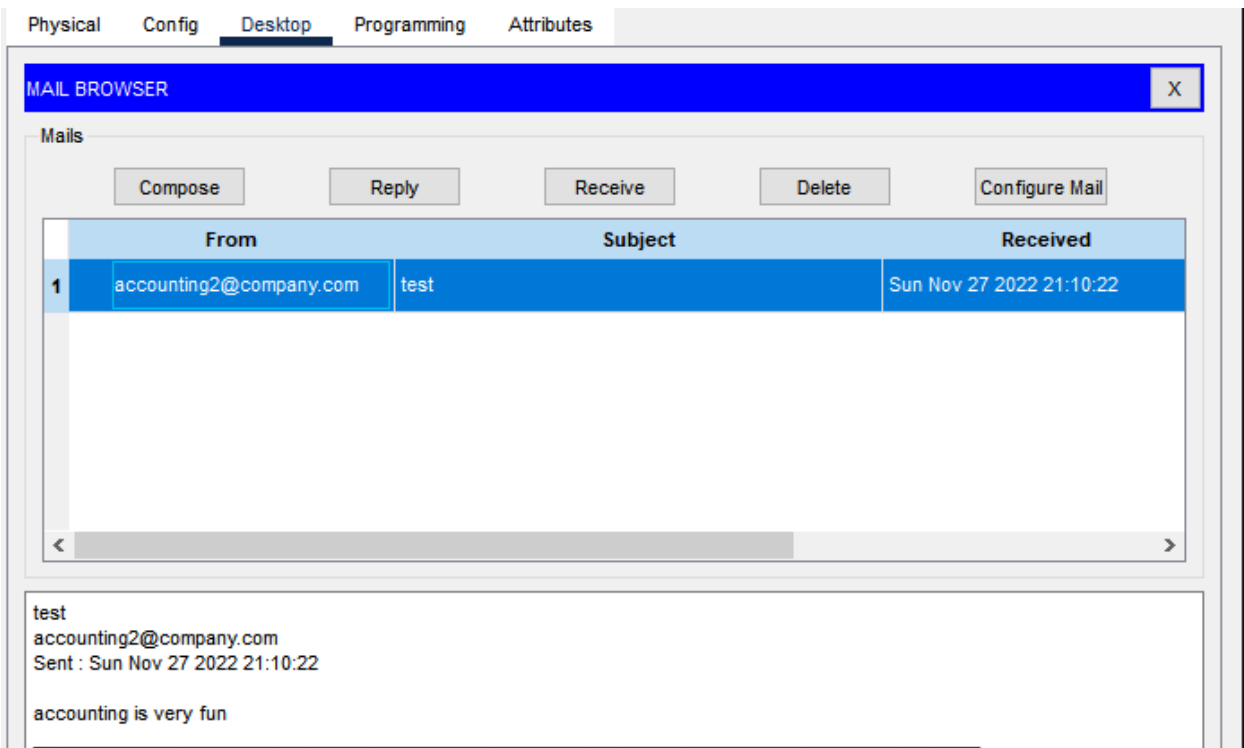
Email between 1 and 10 of the Workstation vlan

HR



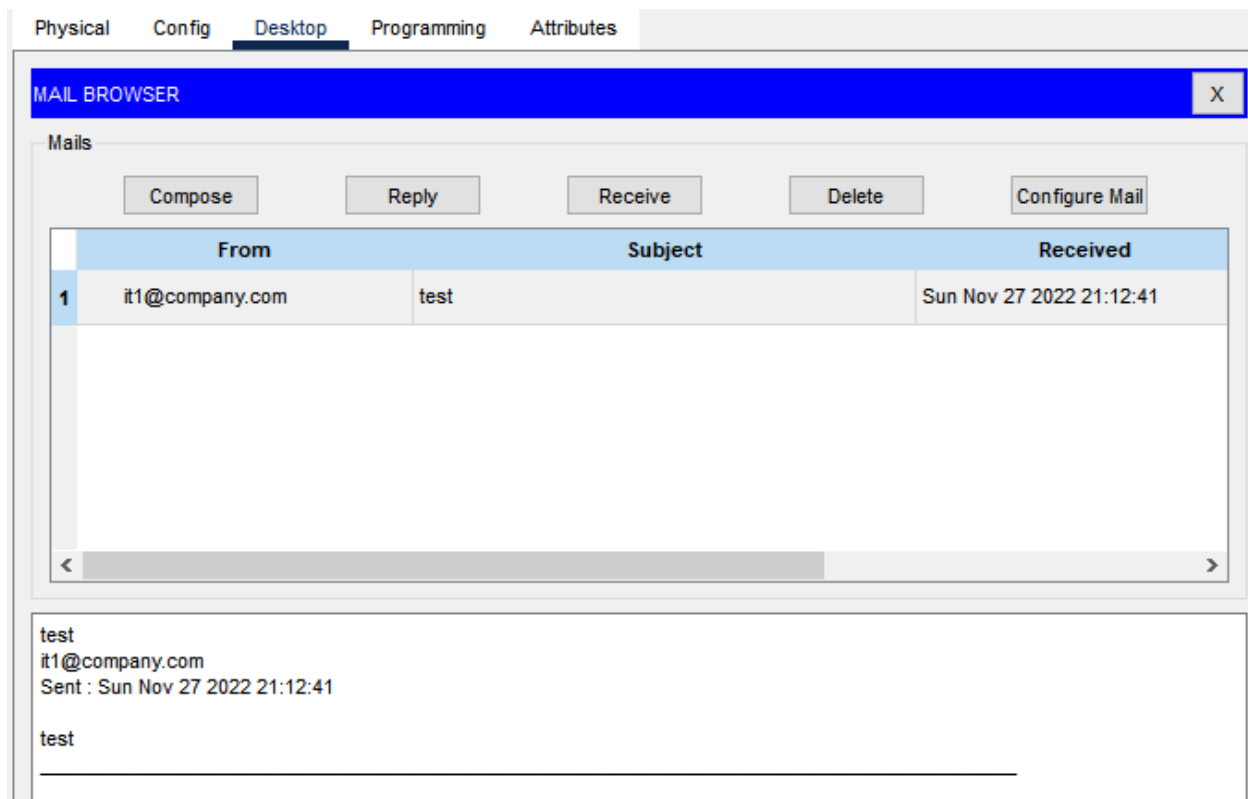
Email between the HR computers

Accounting



Email between the accounting computers.

IT



Email between two computers in IT.

Inter Vlan Routing / Router Rip

As part of the Inter Vlan process, one of the things that can be done is the router rip command. The command tells you what is directly connected with the selected router and allows you to configure from there.

Executive

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface Serial0/3/0
Router(config-if)#router rip
Router(config-router)#no auto-summary
Router(config-router)#version 2
Router(config-router)#do show ip route connected
C   10.10.10.0/30 is directly connected, Serial0/3/0
C   10.10.10.4/30 is directly connected, Serial0/3/1
C   172.16.100.0/27 is directly connected, FastEthernet0/0.100
C   192.168.100.0/27 is directly connected, FastEthernet0/0.10

Router(config-router)#network 10.10.10.0
Router(config-router)#network 10.10.10.4
Router(config-router)#network 192.168.100.0
Router(config-router)#exit
Router(config)#ip route 0.0.0.0 0.0.0.0 Serial0/3/0
Router(config)#router rip
Router(config-router)#default-information originate
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#copy run start
Destination filename [startup-config]?
Building configuration...

Router#sh 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 0.0.0.0 to network 0.0.0.0

    10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C       10.10.10.0/30 is directly connected, Serial0/3/0
L       10.10.10.1/32 is directly connected, Serial0/3/0
C       10.10.10.4/30 is directly connected, Serial0/3/1
L       10.10.10.5/32 is directly connected, Serial0/3/1
    172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.100.0/27 is directly connected, FastEthernet0/0.100
L       172.16.100.1/32 is directly connected, FastEthernet0/0.100
    192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.100.0/27 is directly connected, FastEthernet0/0.10
L       192.168.100.1/32 is directly connected, FastEthernet0/0.10
S*    0.0.0.0/0 is directly connected, Serial0/3/0
        is directly connected, Serial0/3/1
```


Accounting

```

Router#sh 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 0.0.0.0 to network 0.0.0.0

    10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C       10.10.10.4/30 is directly connected, Serial0/3/1
L       10.10.10.5/32 is directly connected, Serial0/3/1
C       10.10.10.16/30 is directly connected, Serial0/3/0
L       10.10.10.18/32 is directly connected, Serial0/3/0
    172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.100.32/27 is directly connected, FastEthernet0/0.100
L       172.16.100.33/32 is directly connected, FastEthernet0/0.100
    192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.100.32/27 is directly connected, FastEthernet0/0.15
L       192.168.100.33/32 is directly connected, FastEthernet0/0.15
S*    0.0.0.0/0 is directly connected, Serial0/3/0
        is directly connected, Serial0/3/1

```

Server

```

Router#sh 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 0.0.0.0 to network 0.0.0.0

    10.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
C       10.10.10.0/27 is directly connected, Serial0/3/0
L       10.10.10.14/32 is directly connected, Serial0/3/0
R       10.10.10.16/30 [120/1] via 10.10.10.5, 00:00:29, Serial0/3/0
    172.16.0.0/27 is subnetted, 1 subnets
R       172.16.100.32/27 [120/1] via 10.10.10.5, 00:00:29, Serial0/3/0
    192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/27 is directly connected, Serial0/3/1
L       192.168.1.16/32 is directly connected, Serial0/3/1
    192.168.100.0/24 is variably subnetted, 3 subnets, 2 masks
R       192.168.100.32/27 [120/1] via 10.10.10.5, 00:00:29, Serial0/3/0
C       192.168.100.128/27 is directly connected, FastEthernet0/0.40
L       192.168.100.129/32 is directly connected, FastEthernet0/0.40
S*    0.0.0.0/0 is directly connected, Serial0/3/0
        is directly connected, Serial0/3/1

```

IT

```
Router#sh 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 0.0.0.0 to network 0.0.0.0
```

```

    10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C       10.10.10.4/30 is directly connected, Serial0/3/0
L       10.10.10.6/32 is directly connected, Serial0/3/0
C       10.10.10.12/30 is directly connected, Serial0/3/1
L       10.10.10.14/32 is directly connected, Serial0/3/1
    172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.100.96/27 is directly connected, FastEthernet0/0.100
L       172.16.100.97/32 is directly connected, FastEthernet0/0.100
    192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.100.96/27 is directly connected, FastEthernet0/0.35
L       192.168.100.97/32 is directly connected, FastEthernet0/0.35
S*    0.0.0.0/0 is directly connected, Serial0/3/0
        is directly connected, Serial0/3/1
```

```
Router#sh 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 0.0.0.0 to network 0.0.0.0
```

```

    10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C       10.10.10.8/30 is directly connected, Serial0/3/0
L       10.10.10.10/32 is directly connected, Serial0/3/0
C       10.10.10.12/30 is directly connected, Serial0/3/1
L       10.10.10.13/32 is directly connected, Serial0/3/1
    172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.100.64/27 is directly connected, FastEthernet0/0.100
L       172.16.100.65/32 is directly connected, FastEthernet0/0.100
    192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.100.64/27 is directly connected, FastEthernet0/0.25
L       192.168.100.65/32 is directly connected, FastEthernet0/0.25
S*    0.0.0.0/0 is directly connected, Serial0/3/0
        is directly connected, Serial0/3/1
```

Workstation

```
Router#sh 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 0.0.0.0 to network 0.0.0.0

    10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C       10.10.10.0/30 is directly connected, Serial0/3/1
L       10.10.10.2/32 is directly connected, Serial0/3/1
C       10.10.10.8/30 is directly connected, Serial0/3/0
L       10.10.10.9/32 is directly connected, Serial0/3/0
    172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.100.32/27 is directly connected, FastEthernet0/0.100
L       172.16.100.51/32 is directly connected, FastEthernet0/0.100
    192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.100.32/27 is directly connected, FastEthernet0/0.45
L       192.168.100.51/32 is directly connected, FastEthernet0/0.45
S*    0.0.0.0/0 is directly connected, Serial0/3/0
       is directly connected, Serial0/3/1
```

Inter Vlan / OSPF

OSPF is another component of Inter Vlan routing in which it helps connect different routers and vlans together to form the overall network.

Executive

```
Router(config)#router ospf 10
Router(config-router)#network 10.10.10.0 0.0.0.3 area 0
Router(config-router)#network 10.10.10.4 0.0.0.3 area 0
Router(config-router)#network 192.168.100.0 0.0.0.31 area 0
Router(config-router)#network 172.16.100.0 0.0.0.31 area 0
Router(config-router)#do wr
```

Workstation

```
Router(config)#router ospf 10
Router(config-router)#network 10.10.10.0 0.0.0.3 area 0
Router(config-router)#network 10.10.10.8 0.0.0.3 area 0
Router(config-router)#network 192.168.100.32 0.0.0.31 area 0
Router(config-router)#network 172.16.100.32 0.0.0.31 area 0
Router(config-router)#do wr
Building configuration...
```

HR

```
Router(config)#router ospf 10
Router(config-router)#network 10.10.10.8 0.0.0.3 area 0
Router(config-router)#network 10.10.10.12 0.0.0.3 area 0
Router(config-router)#network 192.168.100.64 0.0.0.31 area 0
Router(config-router)#network 172.16.100.64 0.0.0.31 area 0
Router(config-router)#do wr
```

IT

```
Router(config)#router ospf 10
Router(config-router)#network 10.10.10.4 0.0.0.3 area 0
Router(config-router)#network 10.10.10.12 0.0.0.3 area 0
Router(config-router)#network 192.168.100.96 0.0.0.31 area 0
Router(config-router)#network 172.16.100.96 0.0.0.31 area 0
Router(config-router)#do wr
Building configuration...
```

Server

```
Router(config)#router ospf 10
Router(config-router)#network 10.10.10.0
% Incomplete command.
Router(config-router)#network 192.168.1.0 0.0.0.3 area 0
Router(config-router)#network 192.168.100.128 0.0.0.31 area 0
Router(config-router)#network 10.10.10.0 0.0.0.3 area 0
Router(config-router)#do wr
```

Accounting

```
Router(config)#router ospf 10
Router(config-router)#network 10.10.10.4 0.0.0.3 area 0
Router(config-router)#network 10.10.10.16 0.0.0.3 area 0
Router(config-router)#network 192.168.100.32 0.0.0.31 area 0
Router(config-router)#network 172.16.100.32 0.0.0.31 area 0
Router(config-router)#do wr
```

VoIP peer calling

N/A

Secure Wifi Networks

With any big network, there must be a wireless router that has the configured networks for private (Executive), guest, and company portions of the network. Securing the networks is always a good idea after creating them to ensure that there won't be any intrusions into the network from people wanting to steal information about critical knowledge to the inner workings of the company.

Internet Setup	
Internet Connection type	Static IP
	Internet IP Address: 192 . 168 . 10 . 2 Subnet Mask: 255 . 255 . 255 . 0 Default Gateway: 192 . 168 . 10 . 1 DNS 1: 192 . 168 . 1 . 1 DNS 2 (Optional): 0 . 0 . 0 . 0 DNS 3 (Optional): 0 . 0 . 0 . 0
Optional Settings (required by some internet service providers)	Host Name:
	Domain Name:
	MTU: Size: 1500
Network Setup	
Router IP	IP Address: 192 . 168 . 2 . 1
	Subnet Mask: 255.255.255.0

For this network, the network IP address is 192.168.10.2, subnet mask is 255.255.255.0, default gateway is 192.168.10.1, and a DNS of 192.168.1.1. The IP of the Router is 192.168.2.1 which connects the devices of the network which will also serve as the LAN of the network.

Company Wifi

Physical	Config	GUI	Attributes
<div> <div> GLOBAL Settings Algorithm Settings INTERFACE Internet LAN Wireless 2.4G Wireless 5G(1) Wireless 5G(2) Wireless Guest 2.4G Wireless Guest 5G(1) Wireless Guest 5G(2) </div> <div> Wireless 5G(1) Settings SSID: Company Wifi 5 GHz Channel: Auto Coverage Range (meters): 250.00 Authentication: <input type="radio"/> Disabled <input type="radio"/> WEP WEP Key: <input type="text"/> <input type="radio"/> WPA-PSK <input checked="" type="radio"/> WPA2-PSK PSK Pass Phrase: businessboom! <input type="radio"/> WPA <input type="radio"/> WPA2 RADIUS Server Settings: IP Address: <input type="text"/> Shared Secret: <input type="text"/> Encryption Type: AES </div> </div>			

The main network for much of the connections, Company Network, is the main connection of the designed interface. For security purposes, it has been given WPA2-PSK with the pass phrase of businessnetwork.

Private Wifi for Executives

Physical	Config	GUI	Attributes
<div> <div> GLOBAL Settings Algorithm Settings INTERFACE Internet LAN Wireless 2.4G Wireless 5G(1) Wireless 5G(2) Wireless Guest 2.4G Wireless Guest 5G(1) Wireless Guest 5G(2) </div> <div> Wireless 5G(2) Settings SSID: Private Wifi 5 GHz Channel: Auto Coverage Range (meters): 250.00 Authentication: <input type="radio"/> Disabled <input type="radio"/> WEP WEP Key: <input type="text"/> <input type="radio"/> WPA-PSK <input checked="" type="radio"/> WPA2-PSK PSK Pass Phrase: securenetwork <input type="radio"/> WPA <input type="radio"/> WPA2 RADIUS Server Settings: IP Address: <input type="text"/> Shared Secret: <input type="text"/> Encryption Type: AES </div> </div>			

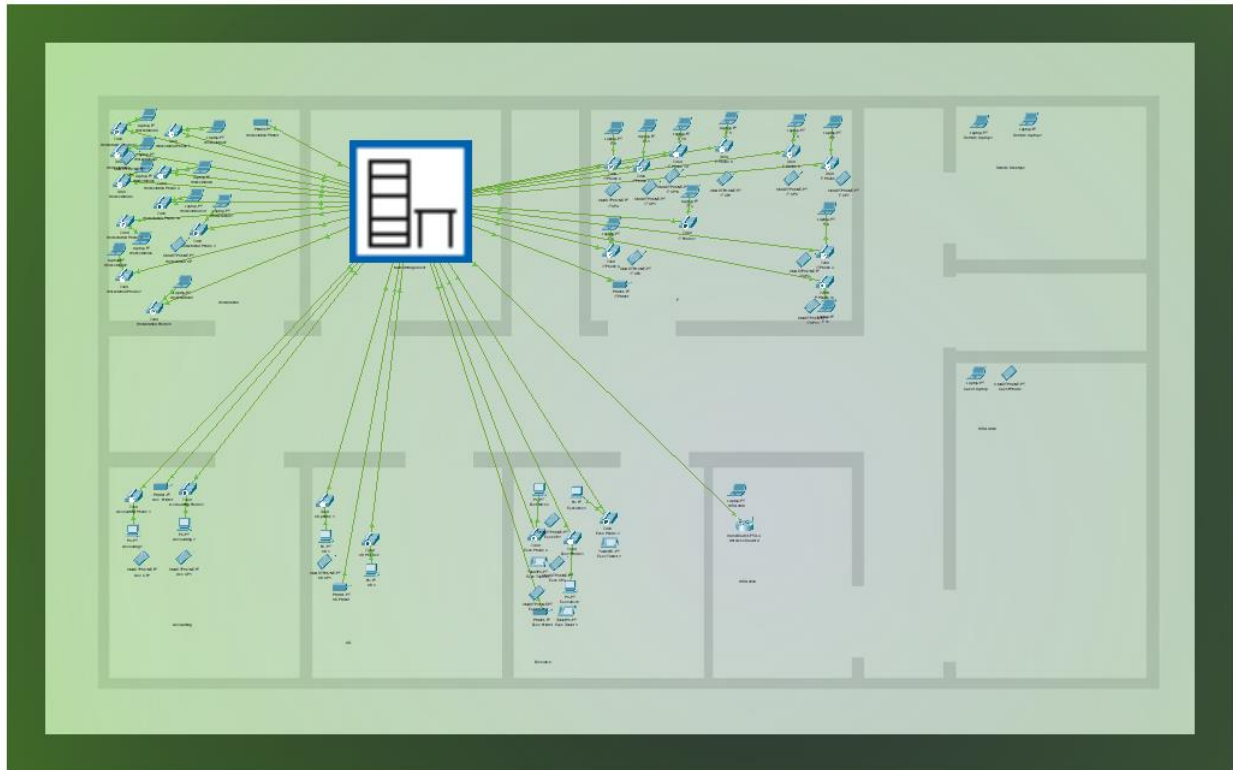
A special network just for the Executives has been assigned for the smartphones and tablets of the Executive vlan since the overall part of the Executive side is important for the day to day operations of the company. For security purposes, it has been given WPA2-PSK with the pass phrase of securenetwork.

Guest Network

Physical	Config	GUI	Attributes
<div> <div> GLOBAL Settings Algorithm Settings INTERFACE Internet LAN Wireless 2.4G Wireless 5G(1) Wireless 5G(2) Wireless Guest 2.4G Wireless Guest 5G(1) Wireless Guest 5G(2) </div> <div> Wireless Guest 5G(1) Settings SSID: Guest Network 5 GHz Channel: Auto Coverage Range (meters): 250.00 Authentication: <input type="radio"/> Disabled <input type="radio"/> WEP WEP Key: <input type="text"/> <input type="radio"/> WPA-PSK <input checked="" type="radio"/> WPA2-PSK PSK Pass Phrase: <input type="text" value="guestnetwork1"/> <input type="radio"/> WPA <input type="radio"/> WPA2 RADIUS Server Settings: IP Address: <input type="text"/> Shared Secret: <input type="text"/> Encryption Type: AES </div> </div>			

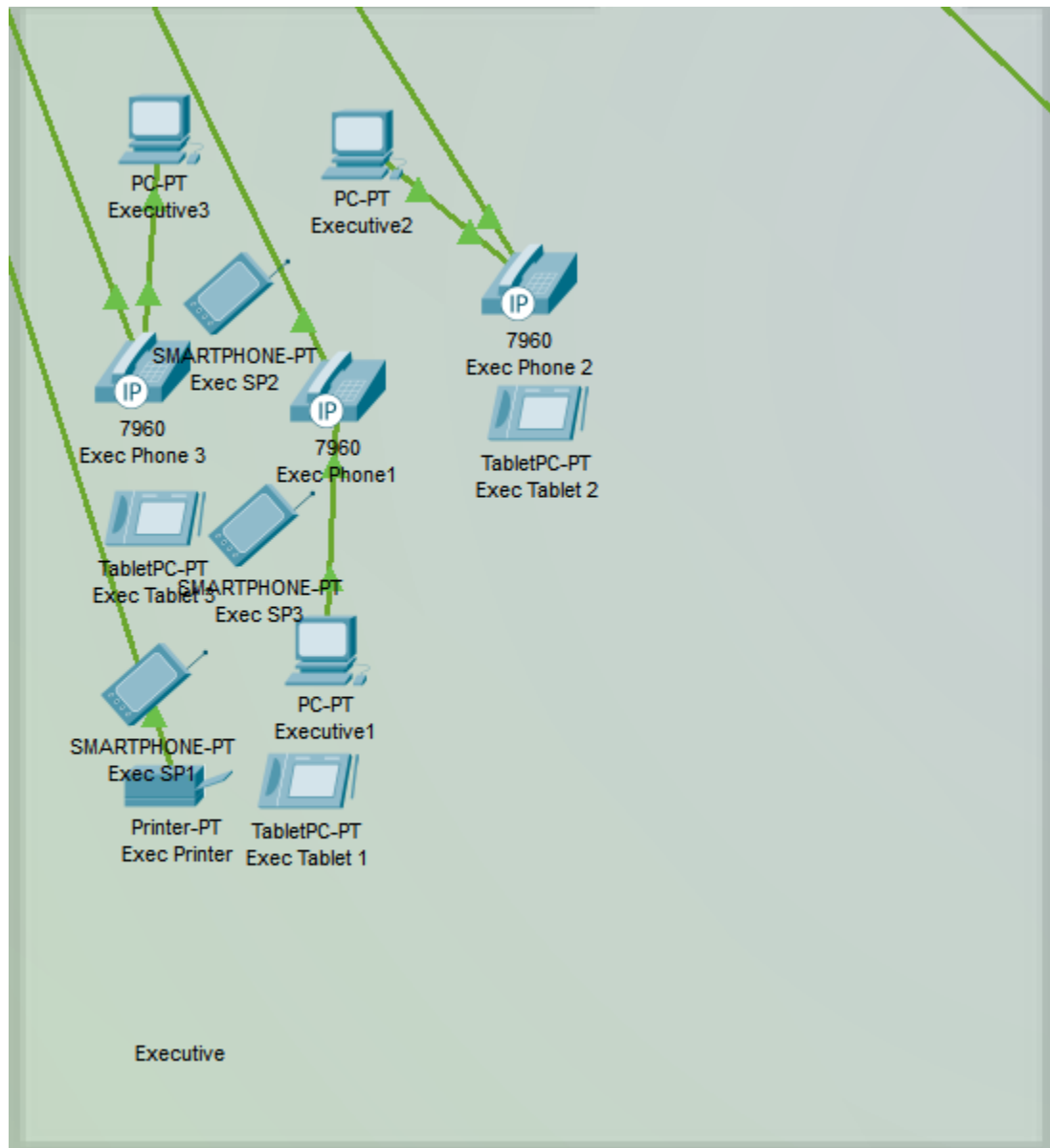
A network for guests like visitors and such must have a wifi connection for themselves to have so that don't have to use cellular data if they don't have unlimited plans for their phone if the company has terrible reception without wifi. For security purposes, it has been given WPA2-PSK with the passphrase of guestnetwork1.

Physical topology

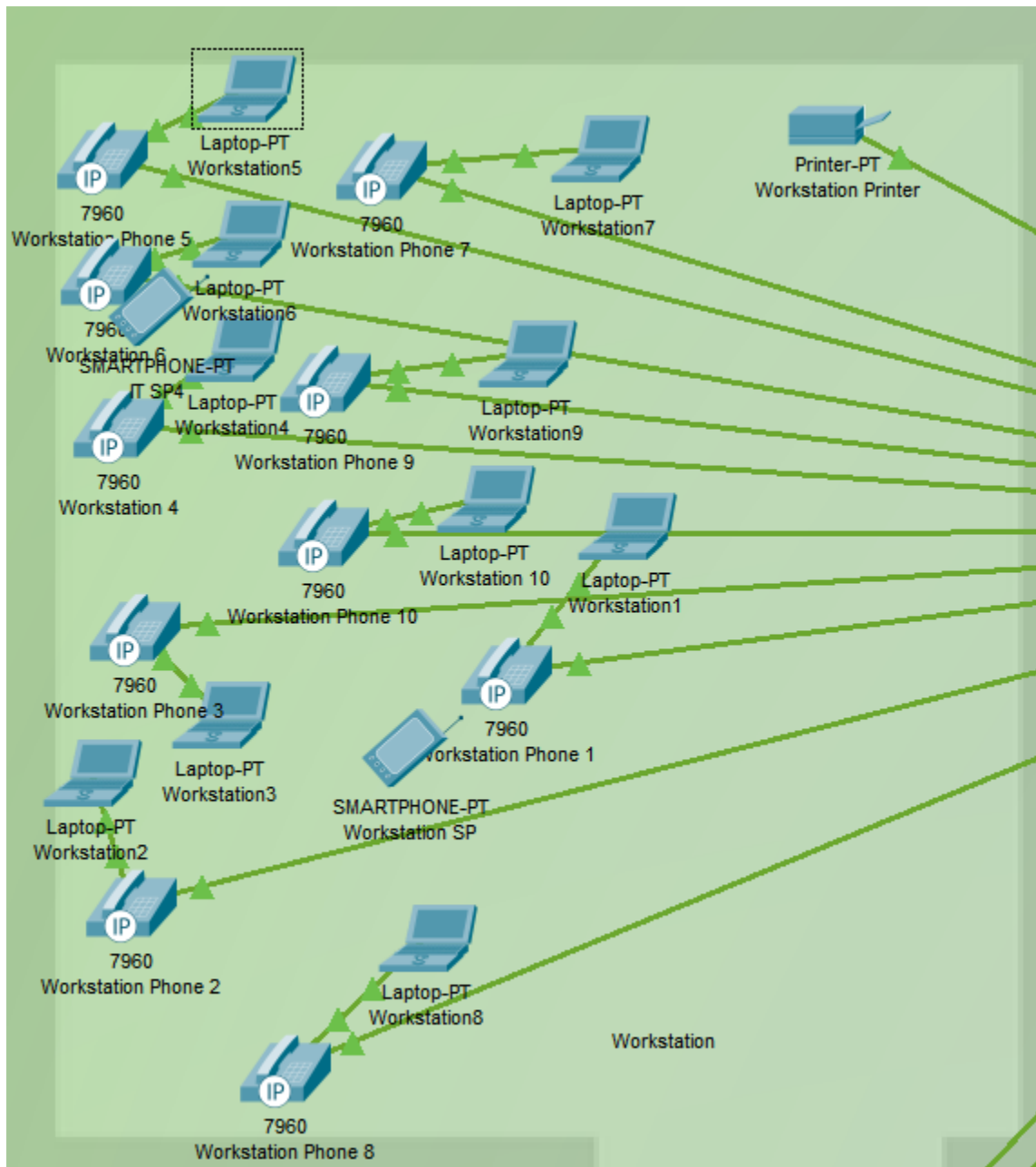


After setting everything up in the logical workspace, you also have to sort everything out in the physical workspace into respective rooms for each other. The picture above is everything sorted into their respective rooms instead of scattered in a straight line across the physical workspace. Sorting every device in the logical space helps show where each department is located in a more professional manner.

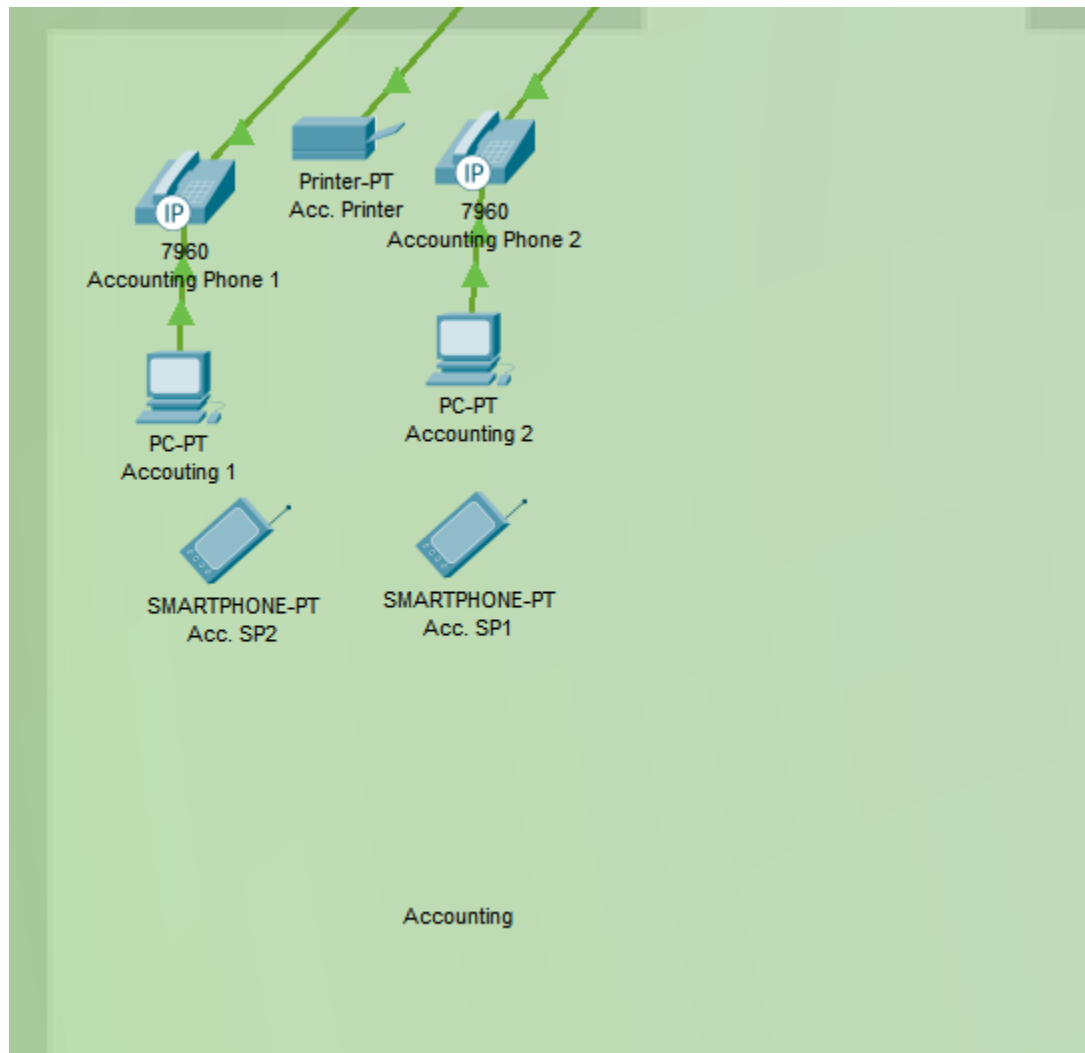
Executive room



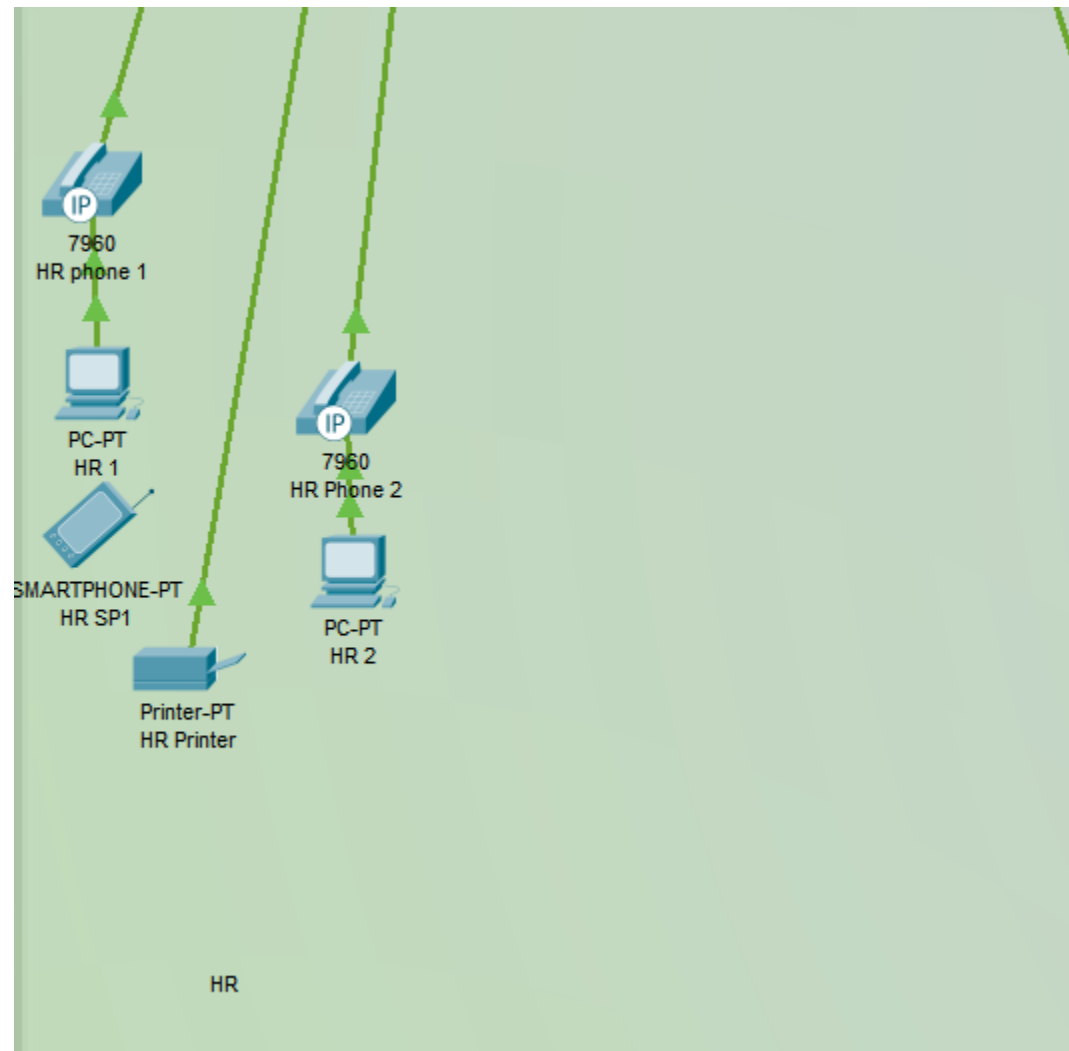
Workstation room



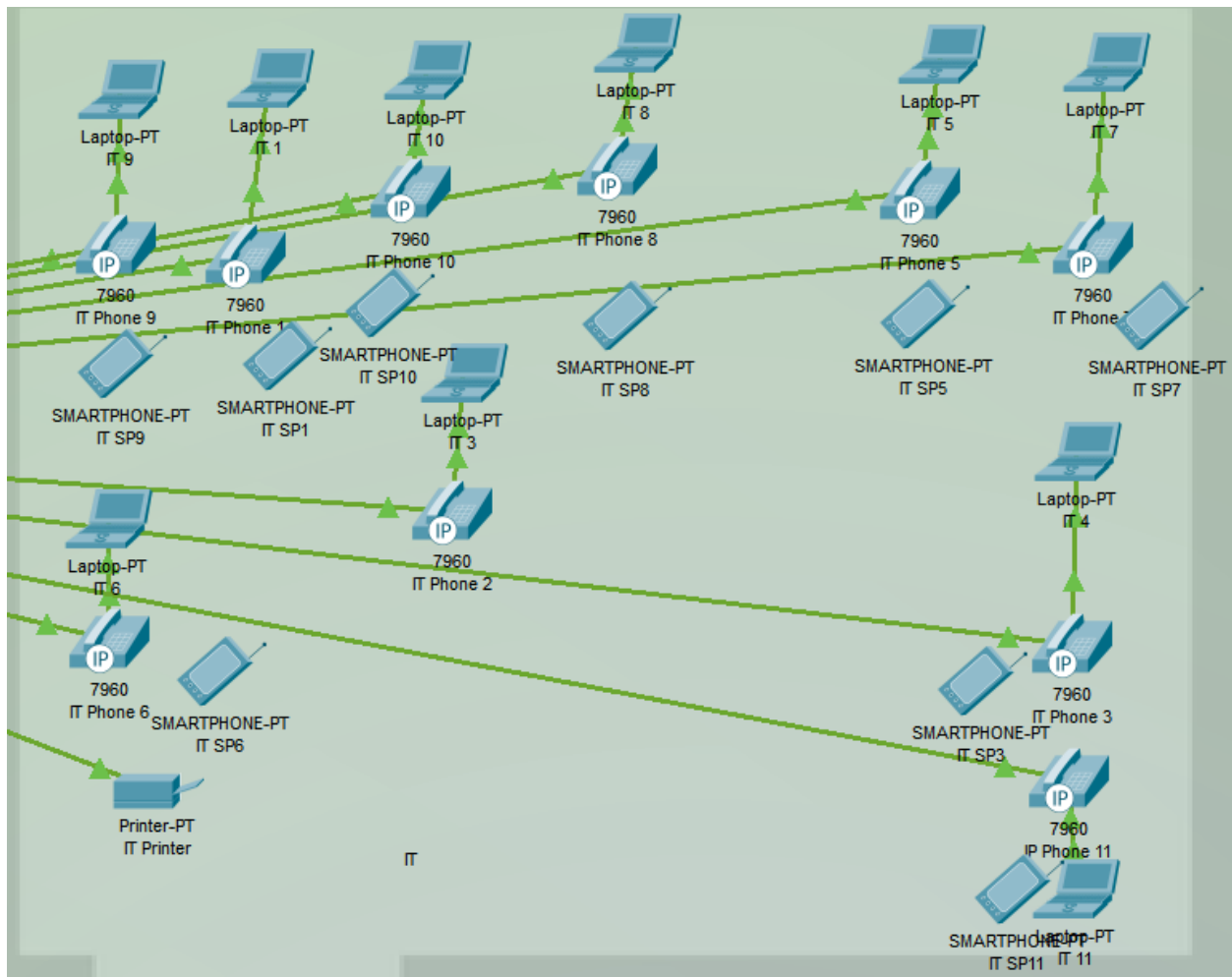
Accounting



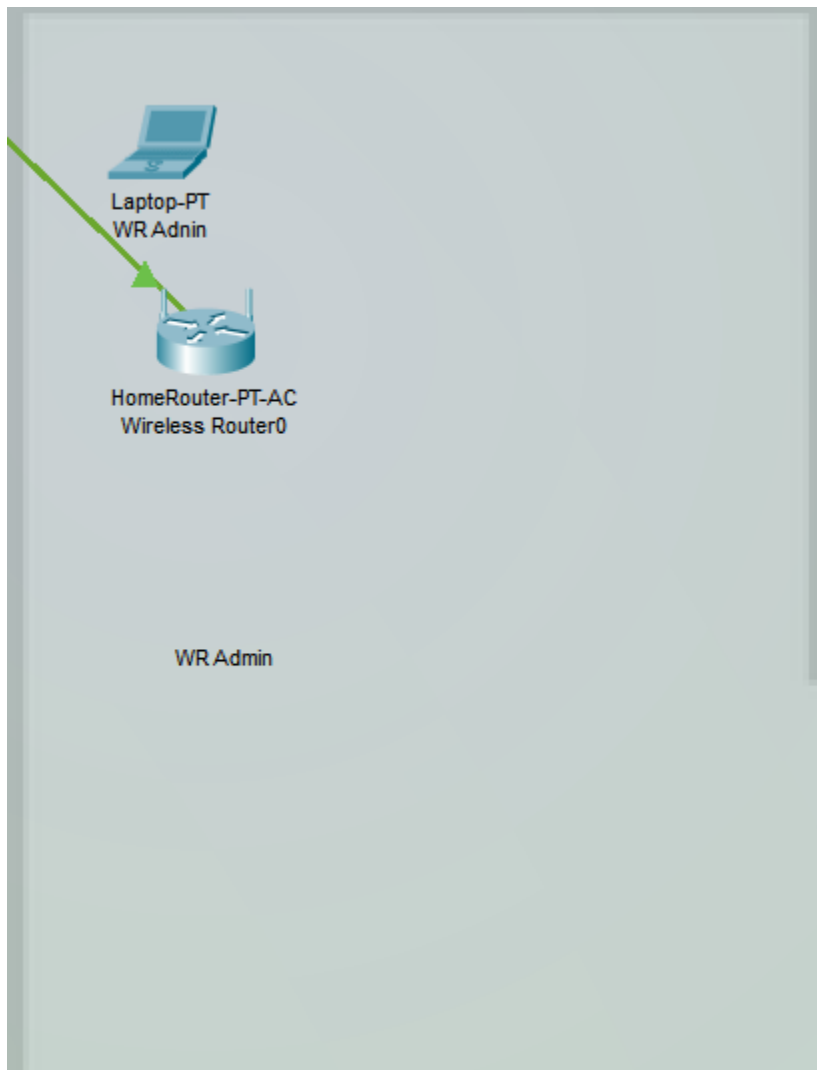
HR Room



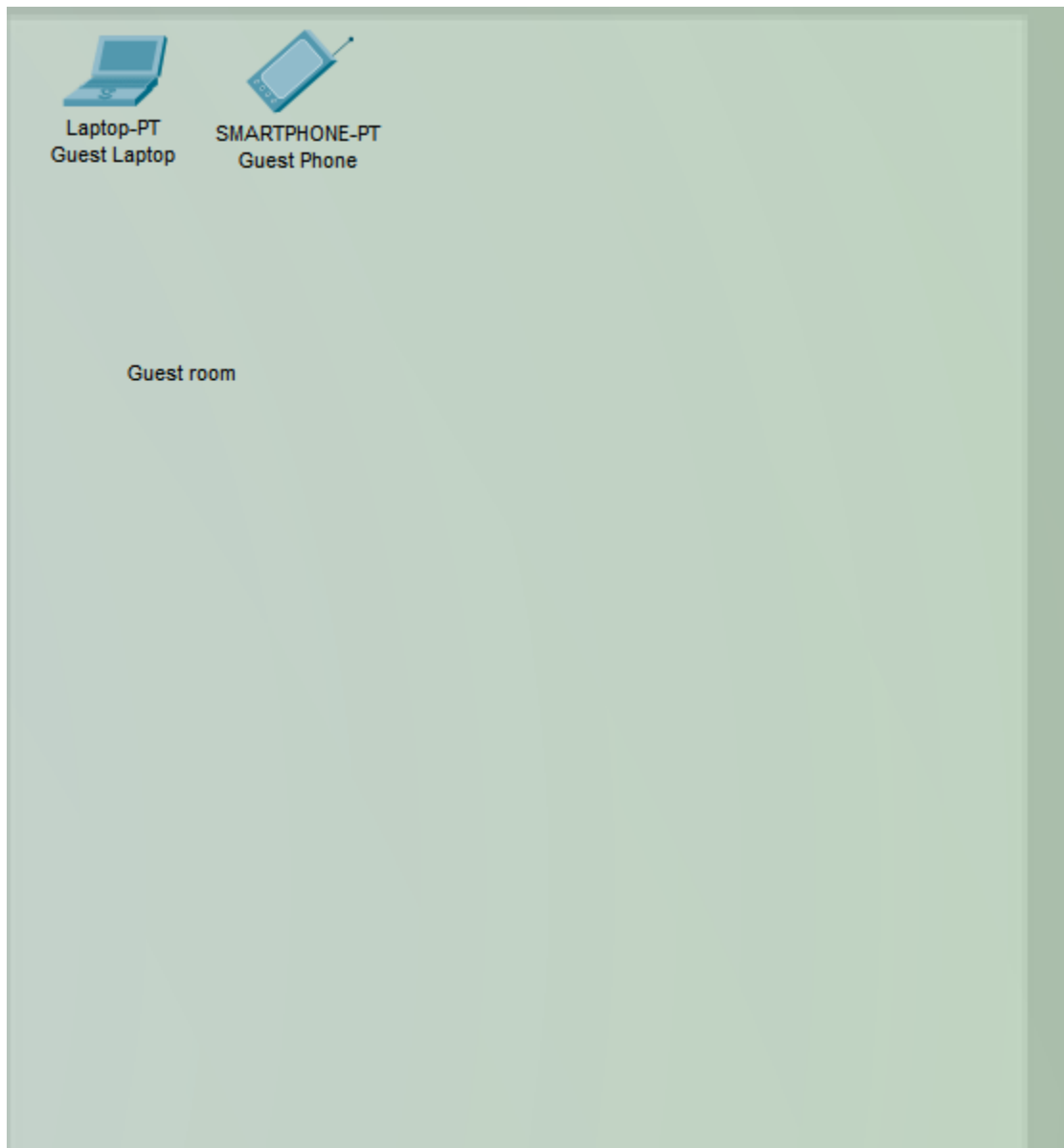
IT Room



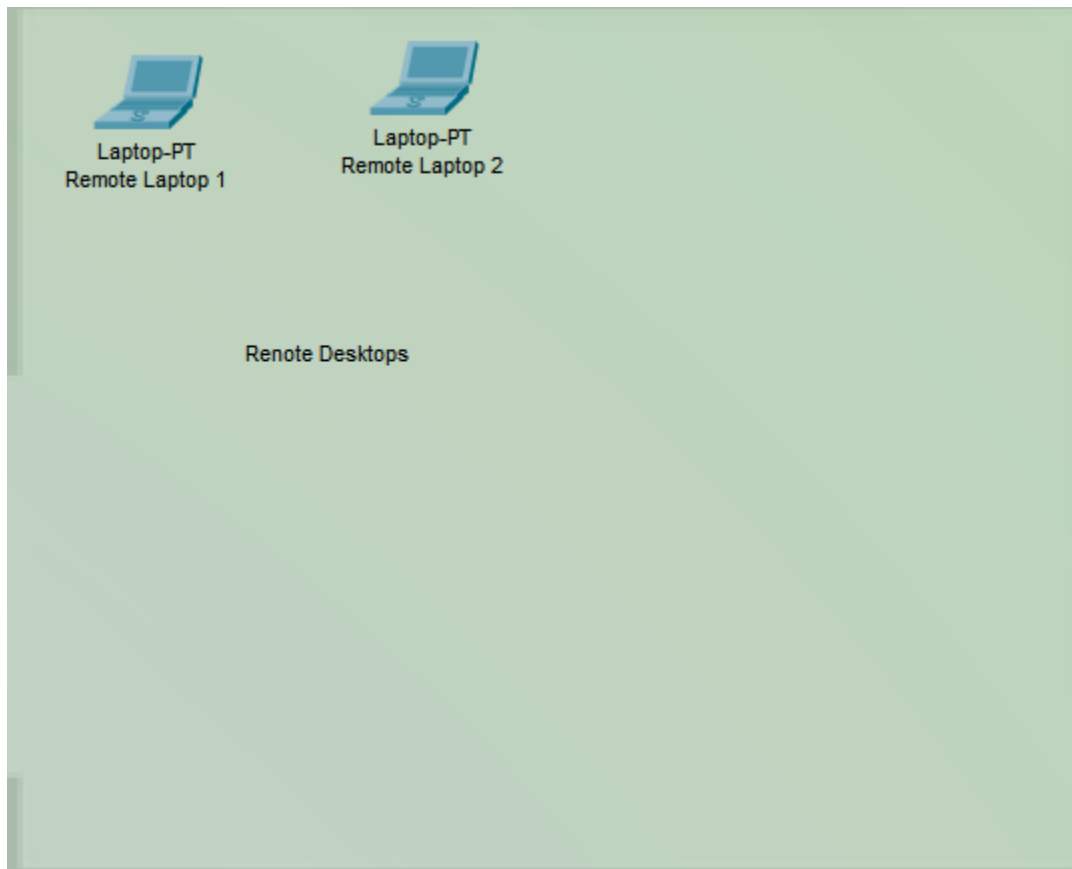
Wireless Router & Admin room



Guest room



Remote Desktop room



Wireless Admin

For the security of the wireless router, a wireless computer has been put down to act as the admin of the wireless router. With this in place, it shows that one computer must have access to the router to allow for change to be made for the networks that make up the router. The way to login is through the address of 192.168.2.1. Then you must type in the name (admin) and the router password of networkdesign460.

The screenshot shows a web browser window titled "WR Admin" with the address bar set to "http://192.168.2.1". The browser displays the "Wireless Tri-Band Home Router" configuration page. The page has a navigation bar with tabs: "Physical", "Config", "Desktop" (selected), "Programming", and "Attributes". Below the navigation bar, there are sub-tabs: "Setup", "Wireless", "Security", "Access Restrictions", "Applications & Gaming", and "Admin". The "Setup" tab is active, and the "Internet Setup" section is expanded. The "Internet Connection type" is set to "Static IP". The "Internet IP Address" is 192.168.10.2, the "Subnet Mask" is 255.255.255.0, and the "Default Gateway" is 192.168.10.1. The "DNS 1" is 192.168.1.1, and "DNS 2 (Optional)" and "DNS 3 (Optional)" are both 0.0.0.0. The "Host Name" and "Domain Name" fields are empty. The "MTU" is set to 1500. The "Optional Settings (required by some internet service providers)" section is also visible.

Web Browser

URL: http://192.168.2.1

Go Stop

Wireless Tri-Band Home Router

Setup Wireless Security Access Restrictions Applications & Gaming Admin

Basic Setup DDNS MAC Address Clone

Internet Setup

Internet Connection type

Static IP

Internet IP Address: 192 . 168 . 10 . 2

Subnet Mask: 255 . 255 . 255 . 0

Default Gateway: 192 . 168 . 10 . 1

DNS 1: 192 . 168 . 1 . 1

DNS 2 (Optional): 0 . 0 . 0 . 0

DNS 3 (Optional): 0 . 0 . 0 . 0

Host Name:

Domain Name:

MTU: Size: 1500

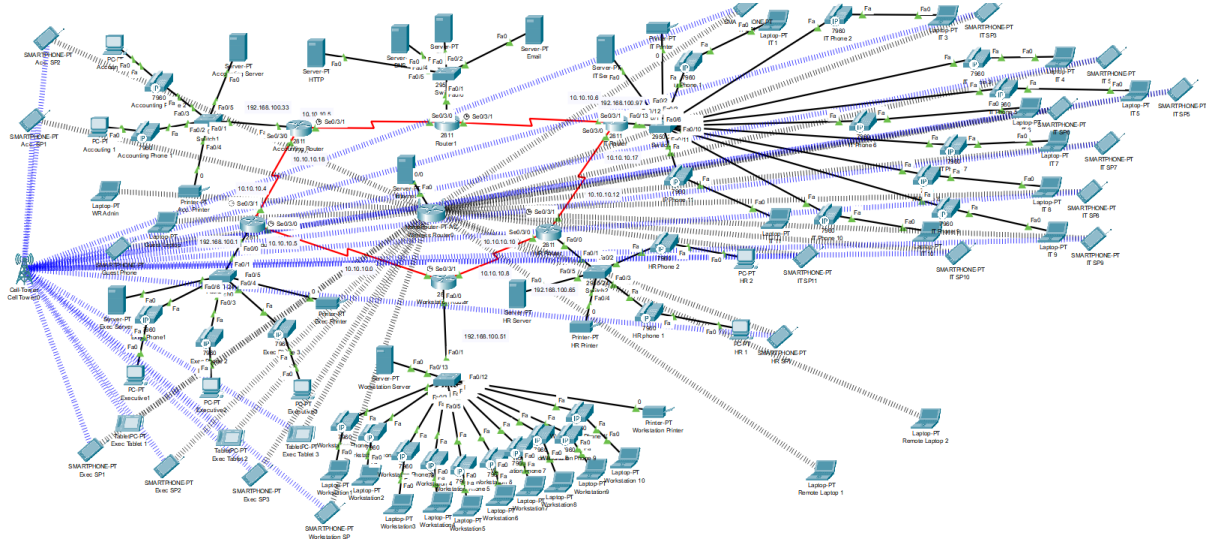
Optional Settings (required by some internet service providers)

Top

Internet

N/A

Finished/Final Design



The final design of the project has a lot of things going on everywhere in the network. Some stuff to point out includes a wireless desktop made for modifying the contents of the wireless router, a guest laptop accompanied by a guest phone, and two remote laptops for a couple employees who work remote.

I have learned a lot from working on this project. After spending 67 hours, more likely in the range of 85-100 hours due to use of a stopwatch, over a period of almost 2 months I learned so much from doing this project. Even though I have run out of time to work on this, I will continue on with this as a personal project to work on until it is finished.