# Company-A to Company-B with BGP

**Objective:** My goal for this virtual lab was to familiarize myself with the protocol BGP. As an aspiring network engineer that has completed the CCNA, I was only taught to use OSPF, so I went out my way to learn the basics for BGP. I implemented iBGP due to not being able to use eBGP with packet tracer, but I also added security features, SNMP server, DCHP server, NTP server and Inter-VLAN Routing. The reason why I implemented Inter-VLAN routing was to reduce network traffic from the routers. DHCP and NTP were to simulate the real-world protocols that are in use in every organization. Lastly SNMP and security features like username/passwords were added to add a touch of detail to the lab.

**Equipment:** (8) Cisco 2811, (4) Cisco 3560, (8) Cisco 2960 (12) Virtual PC's, packet tracer

**Key Steps:**

a. Company-A belongs to 10.0.0.0/8, use VLSM to make subnets that hold 8192, 1024, 512, 256, 64, and 16 host
b. Company-B belongs to 15.0.0.0/8, use VLSM to make subnets that hold 8192, 4096, 1024, 256, 64, and 16 host
c. Assign a VLAN to each subnet
d. Split the subnets into groups of 3 and use a layer 3 switch for inter-vlan routing
e. Create a channel-group between the layer 2 switches and a trunk link between the layer 3 switch, use LACP
f. Assign the last usable address of each subnet as the SVI for each subnet on the layer 3 switch
g. Implement an SVI VLAN 200 management network on all layer 3 switches to access them via ssh
h. Implement an ACL to only allow host 15.0.32.1 to access the layer 3 switches
i. Create a DHCP server to assign IP-addresses and exclude the last address of every network to use as the default gateway
j. Create an NTP server
k. Lastly, assign SNMP communities to every router so with the use of the MIB browser we can use OID to get information
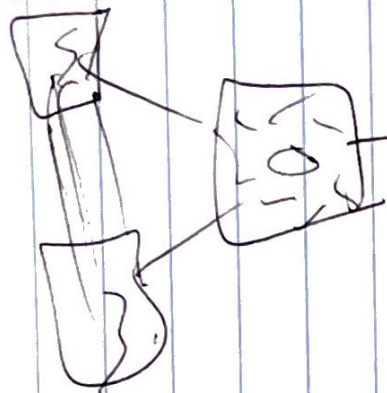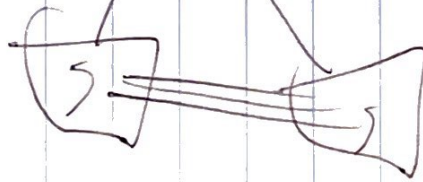
# Company A to Company B with BGP
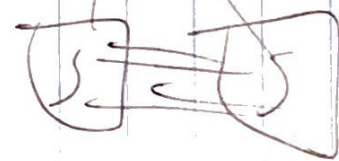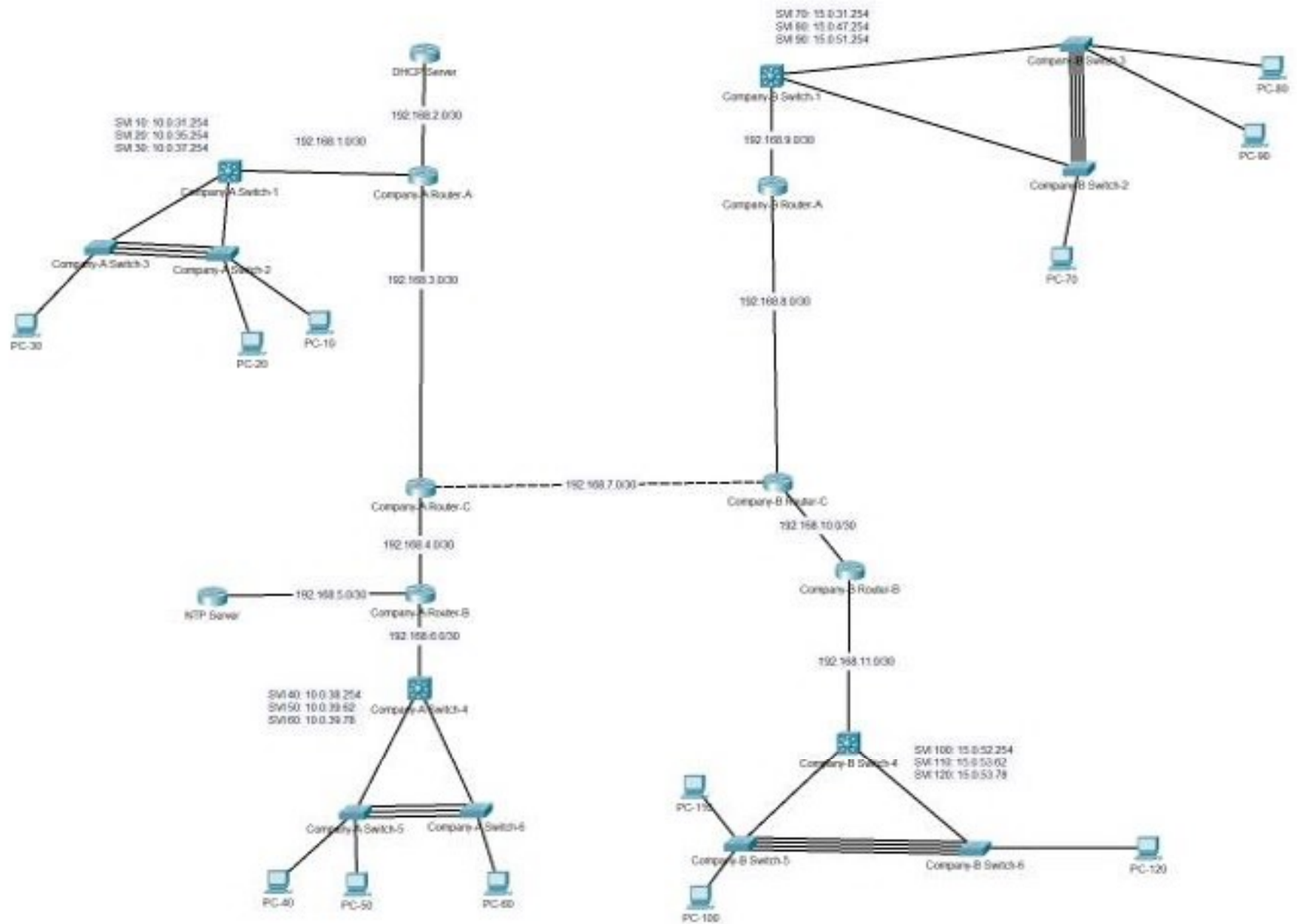
| | | | |
|---|---|---|---|
| Company-A Router-A | G0/2 | Company-A Router-C | G0/1 |
| Company-A Router-A | G0/1 | Company-A Switch-1 | G0/1 |
| Company-A Router-A | G0/0 | DHCP Server | G0/0 |
| Company-A Switch-1 | F0/1 | Company-A Switch-2 | F0/1 |
| Company-A Switch-1 | F0/13 | Company-A Switch-3 | F0/1 |
| Company-A Switch-2 | F0/1 | Company-A Switch-1 | F0/1 |
| Company-A Switch-2 | F0/2-4 | Company-A Switch-3 | F0/2-4 |
| Company-A Switch-2 | F0/5-14 | VLAN 10 | |
| Company-A Switch-2 | F0/15-24 | VLAN 20 | |
| Company-A Switch-3 | F0/1 | Company-A Switch-1 | F0/13 |
| Company-A Switch-3 | F0/2-4 | Company-A Switch-2 | F0/2-4 |
| Company-A Switch-3 | F0/5-14 | VLAN 10 | |
| Company-A Switch-3 | F0/15-24 | VLAN 30 | |
| Company-A Router-C | G0/0 | Company-B Router-C | G0/0 |
| Company-A Router-C | G0/1 | Company-A Router-A | G0/2 |
| Company-A Router-C | G0/2 | Company-A Router-B | G0/0 |
| DHCP Server | G0/0 | Company-A Router-A | G0/0 |
| Company-A Router-B | G0/0 | Company-A Router-C | G0/2 |
| Company-A Router-B | G0/1 | Company-A Switch-4 | G0/1 |
| Company-A Router-B | G0/2 | NTP Server | G0/0 |
| NTP Server | G0/0 | Company-A Router-B | G0/2 |
| Company-A Switch-4 | G0/1 | Company-A Router-B | G0/1 |
| Company-A Switch-4 | F0/1 | Company-A Switch-5 | F0/1 |
| Company-A Switch-4 | F0/13 | Company-A Switch-6 | F0/1 |
| Company-A Switch-5 | F0/1 | Company-A Switch-4 | F0/1 |
| Company-A Switch-5 | F0/2-4 | Company-A Switch-6 | F0/2-4 |
| Company-A Switch-5 | F0/5-14 | VLAN 40 | |
| Company-A Switch-5 | F0/15-24 | VLAN 50 | |
| Company-A Switch-6 | F0/1 | Company-A Switch-4 | F0/13 |
| Company-A Switch-6 | F0/2-4 | Company-A Switch-5 | F0/2-4 |
| Company-A Switch-6 | F0/5-14 | VLAN 40 | |
| Company-A Switch-6 | F0/15-24 | VLAN 60 | |

| Company-B Router-C | G0/0 | Company-A Router-C | G0/0 |
|---|---|---|---|
| Company-B Router-C | G0/1 | Company-B Router-A | G0/1 |
| Company-B Router-C | G0/2 | Company-B Router-B | G0/1 |
| Company-B Router-A | G0/1 | Company-B Router-C | G0/1 |
| Company-B Router-A | G0/2 | Company-B Switch-1 | G0/1 |
| Company-B Switch-1 | G0/1 | Company-B Router-A | G0/2 |
| Company-B Switch-1 | F0/1 | Company-B Switch-2 | F0/1 |
| Company-B Switch-1 | F0/13 | Company-B Switch-3 | F0/1 |
| Company-B Switch-2 | F0/1 | Company-B Switch-1 | F0/1 |
| Company-B Switch-2 | F0/2-5 | Company-B Switch-3 | F0/2-5 |
| Company-B Switch-2 | F0/6-24 | VLAN 70 | |
| Company-B Switch-3 | F0/1 | Company-B Switch-1 | F0/13 |
| Company-B Switch-3 | F0/2-5 | Company-B Switch-2 | F0/2-5 |
| Company-B Switch-3 | F0/6-14 | VLAN 80 | |
| Company-B Switch-3 | F0/15-23 | VLAN 90 | |
| Company-B Router-B | G0/1 | Company-B Router-C | G0/2 |
| Company-B Router-B | G0/2 | Company-B Switch-4 | G0/1 |
| Company-B Switch-4 | G0/1 | Company-B Router-B | G0/2 |
| Company-B Switch-4 | F0/1 | Company-B Switch-5 | F0/1 |
| Company-B Switch-4 | F0/13 | Company-B Switch-6 | F0/1 |
| Company-B Switch-5 | F0/1 | Company-B Switch-4 | F0/1 |
| Company-B Switch-5 | F0/2-5 | Company-B Switch-6 | F0/2-5 |
| Company-B Switch-5 | F0/6-14 | VLAN 100 | |
| Company-B Switch-5 | F0/15-23 | VLAN 110 | |
| Company-B Switch-6 | F0/1 | Company-B Switch-4 | F0/13 |
| Company-B Switch-6 | F0/2-5 | Company-B Switch-5 | F0/2-5 |
| Company-B Switch-6 | F0/6-14 | VLAN 100 | |
| Company-B Switch-6 | F0/15-23 | VLAN 120 | |

# Building A to Building B with OSPF (IP Addresses)

| | | |
|---|---|---|
| Company-A Switch-1 | G0/1 | 192.168.1.1/30 |
| Company-A Switch-1 | SVI VLAN 10 | 10.0.31.254/19 |
| Company-A Switch-1 | SVI VLAN 20 | 10.0.35.254/22 |
| Company-A Switch-1 | SVI VLAN 30 | 10.0.37.254/23 |
| Company-A Switch-1 | SVI VLAN 200 | 192.168.20.2/24 |
| Company-A Router-A | G0/0 | 192.168.2.2/30 |
| Company-A Router-A | G0/1 | 192.168.1.2/30 |
| Company-A Router-A | G0/2 | 192.168.3.1/30 |
| DHCP Server | G0/0 | 192.168.2.1/30 |
| Company-A Router-C | G0/0 | 192.168.7.1/30 |
| Company-A Router-C | G0/1 | 192.168.3.2/30 |
| Company-A Router-C | G0/2 | 192.168.4.1/30 |
| Company-A Router-B | G0/0 | 192.168.4.2/30 |
| Company-A Router-B | G0/1 | 192.168.6.1/30 |
| Company-A Router-B | G0/2 | 192.168.5.2/30 |
| NTP-Server | G0/0 | 192.168.5.1/30 |
| Company-A Switch-4 | G0/1 | 192.168.6.2/30 |
| Company-A Switch-4 | SVI VLAN 40 | 10.0.38.254/24 |
| Company-A Switch-4 | SVI VLAN 50 | 10.0.39.62/26 |
| Company-A Switch-4 | SVI VLAN 60 | 10.0.39.78/28 |
| Company-A Switch-4 | SVI VLAN 200 | 192.168.20.1/24 |
| Company-B Router-C | G0/0 | 192.168.7.2/30 |
| Company-B Router-C | G0/1 | 192.168.8.2/30 |
| Company-B Router-C | G0/2 | 192.168.10.1/30 |
| Company-B Switch-1 | G0/1 | 192.168.9.1/30 |
| Company-B Switch-1 | SVI VLAN 70 | 15.0.31.254/19 |
| Company-B Switch-1 | SVI VLAN 80 | 15.0.47.254/20 |
| Company-B Switch-1 | SVI VLAN 90 | 15.0.51.254/22 |
| Company-B Switch-1 | VLAN 200 | 192.168.20.3/24 |
| Company-B Router-A | G0/1 | 192.168.8.1/30 |
| Company-B Router-A | G0/2 | 192.168.9.2/30 |
| Company-B Router-B | G0/1 | 192.168.10.2/30 |
| Company-B Router-B | G0/2 | 192.168.11.1/30 |
| Company-B Switch-4 | G0/1 | 192.168.11.2/30 |
| Company-B Switch-4 | SVI VLAN 100 | 15.0.52.254/24 |
| Company-B Switch-4 | SVI VLAN 110 | 15.0.53.62/26 |
| Company-B Switch-4 | SVI VLAN 120 | 15.0.53.78/28 |
| Company-B Switch-4 | SVI VLAN 200 | 192.168.20.4/24 |

| | | |
|---|---|---|
| PC-10 | DHCP | 10.0.0.1 |
| PC-20 | DHCP | 10.0.32.1 |
| PC-30 | DHCP | 10.0.36.1 |
| PC-40 | DHCP | 10.0.38.1 |
| PC-50 | DHCP | 10.0.39.1 |
| PC-60 | DHCP | 10.0.39.65 |
| PC-70 | DHCP | 15.0.0.1 |
| PC-80 | DHCP | 15.0.32.1 |
| PC-90 | DHCP | 15.0.48.1 |
| PC-100 | DHCP | 15.0.52.1 |
| PC-110 | DHCP | 15.0.53.1 |
| PC-120 | DHCP | 15.0.53.65 |
| BGP AS #1 | Company-A Switch-1 | |
| BGP AS #2 | Company-A Router-A | |
| BGP AS #3 | DHCP Server | |
| BGP AS #4 | Company-A Router-C | |
| BGP AS #5 | Company-A Router-B | |
| BGP AS #6 | NTP-Server | |
| BGP AS #7 | Company-A Switch-4 | |
| BGP AS #8 | Company-B Router-C | |
| BGP AS #9 | Company-B Router-A | |
| BGP AS #10 | Company-B Switch-1 | |
| BGP AS #11 | Company-B Router-B | |
| BGP AS #12 | Company-B Switch-4 | |

Cisco Packet Tracer - C:\Users\ddiaz\Desktop\At-Home Labs\Mega Lab BGP.pkt

File  Edit  Options  View  Tools  Extensions  Window  Help

Logical | Physical  x: 969, y: 581

Company-A Switch-1

Company-A Switch-3    Company-A Switch-2

PC-30

PC-20    PC-10
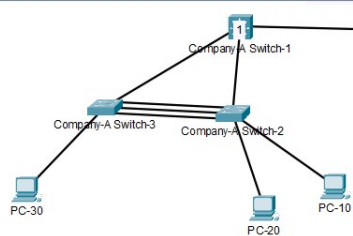
192.168.5.0/30

NTP Server

Company-A Swi

PC-40

**Company-B Router-B**

Physical    Config    CLI    Attributes

IOS Command Line Interface

```
Company-B-Router-B con0 is now available




Press RETURN to get started.




User Access Verification

Username: bryan
Password:

Company-B-Router-B>en
Password:
Company-B-Router-B#sh ntp ass

address          ref clock          st   when    poll    reach  delay
offset          disp
*~192.168.5.1    127.127.1.1        8    15      32      377    0.00          0.00
0.12
 * sys.peer, # selected, + candidate, - outlyer, x falseticker, ~ configured
Company-B-Router-B#sh clo
5:33:26.305 UTC Sun Feb 23 2025
Company-B-Router-B#
```

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Time: 00:34:31

Router-PT-Empty

4331  4321  1941  2901  2911  819IOX  819HGW  829  1240  PT-Router  PT-Empty  1841  2620XM  2621XM  2811

Realtime    Simulation
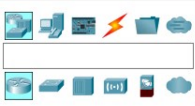
Scenario 0

New    Delete

Fire  Last Status  Source  Destination  Type  Color  Time(sec)  Periodic  Num  Edit  Delete

Toggle PDU List Window

## Company-A Router-C

Physical | Config | CLI | Attributes

IOS Command Line Interface

```
B        10.0.32.0/22 [20/0] via 192.168.3.1, 00:00:00
B        10.0.36.0/23 [20/0] via 192.168.3.1, 00:00:00
B        10.0.38.0/24 [20/0] via 192.168.4.2, 00:00:00
B        10.0.39.0/26 [20/0] via 192.168.4.2, 00:00:00
B        10.0.39.64/28 [20/0] via 192.168.4.2, 00:00:00
     15.0.0.0/8 is variably subnetted, 6 subnets, 6 masks
B        15.0.0.0/19 [20/0] via 192.168.7.2, 00:00:00
B        15.0.32.0/20 [20/0] via 192.168.7.2, 00:00:00
B        15.0.48.0/22 [20/0] via 192.168.7.2, 00:00:00
B        15.0.52.0/24 [20/0] via 192.168.7.2, 00:00:00
B        15.0.53.0/26 [20/0] via 192.168.7.2, 00:00:00
B        15.0.53.64/28 [20/0] via 192.168.7.2, 00:00:00
     192.168.1.0/30 is subnetted, 1 subnets
B        192.168.1.0/30 [20/0] via 192.168.3.1, 00:00:00
     192.168.2.0/30 is subnetted, 1 subnets
B        192.168.2.0/30 [20/0] via 192.168.3.1, 00:00:00
     192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.3.0/30 is directly connected, GigabitEthernet0/1
L        192.168.3.2/32 is directly connected, GigabitEthernet0/1
     192.168.4.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.4.0/30 is directly connected, GigabitEthernet0/2
L        192.168.4.1/32 is directly connected, GigabitEthernet0/2
     192.168.5.0/30 is subnetted, 1 subnets
B        192.168.5.0/30 [20/0] via 192.168.4.2, 00:00:00
     192.168.6.0/30 is subnetted, 1 subnets
B        192.168.6.0/30 [20/0] via 192.168.4.2, 00:00:00
     192.168.7.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.7.0/30 is directly connected, GigabitEthernet0/0
L        192.168.7.1/32 is directly connected, GigabitEthernet0/0
     192.168.8.0/30 is subnetted, 1 subnets
B        192.168.8.0/30 [20/0] via 192.168.7.2, 00:00:00
     192.168.9.0/30 is subnetted, 1 subnets
B        192.168.9.0/30 [20/0] via 192.168.7.2, 00:00:00
     192.168.10.0/30 is subnetted, 1 subnets
B        192.168.10.0/30 [20/0] via 192.168.7.2, 00:00:00
     192.168.11.0/30 is subnetted, 1 subnets
B        192.168.11.0/30 [20/0] via 192.168.7.2, 00:00:00
B    192.168.20.0/24 [20/0] via 192.168.4.2, 00:00:00
```

## PC-40

Physical | Config | Desktop | Programming | Attributes

### MIB Browser

Address: 192.168.1.2          OID: .1.3.6.1.2.1.1.3.0

Advanced...          Operations: Get          GO

SNMP MIBs
- MIB Tree
  - router_std MIBs
    - .iso
      - .org
        - .dod
          - .internet
            - .mgmt
              - .mib-2
                - .system
                  - .sysDescr
                  - .sysObje...
                  - .sysUpTi...
                  - .sysCont...
                  - .sysName
                  - .sysLoca...

Result Table

| Name/OID | Value | Type |
|---|---|---|
| .1.3.6.1.2.1.1.3.0 (.iso.org.dod.int... | 3 hours 11 minutes 10 seconds | TimeTicks |

Name : .sysUpTime

OID : .1.3.6.1.2.1.1.3.0

## PC-30

Physical | Config | Desktop | Programming | Attributes

### Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ssh -l David 192.168.20.1

% Connection refused by remote host
C:\>
```

## PC-120

Physical | Config | Desktop | Programming | Attributes

### Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig /all

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..:
   Physical Address................: 000C.CFEB.028C
   Link-local IPv6 Address.........: FE80::20C:CFFF:FEEB:28C
   IPv6 Address....................: ::
   IPv4 Address....................: 15.0.53.65
   Subnet Mask.....................: 255.255.255.240
   Default Gateway.................: ::
                                     15.0.53.78
   DHCP Servers....................: 192.168.2.1
   DHCPv6 IAID.....................:
```

## PC-80

Physical | Config | Desktop | Programming | Attributes

### Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ssh -l David 192.168.20.1

Password:


Company-A-Switch-4>
```

Company-B Router-B

192.168.11.0/30

Company-B Switch-4

## DHCP Server

Physical | Config | CLI | Attributes

IOS Command Line Interface

```
User Access Verification

Username: David
Password:

DHCP-Server>en
Password:
DHCP-Server#
```

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DHCP Server

## Company-B Switch-1

Physical | Config | CLI | Attributes

IOS Command Line Interface

```
Press RETURN to get started!


User Access Verification

Username: Jacob
Password:

Company-B-Switch-1>en
Password:
Company-B-Switch-1#
```

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## Company-B Router-B

```
User Access Verification

Username: Bryan
Password:

Company-B-Router-B>en
Password:
Company-B-Router-B#
```

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/30

ter-A

30

30

## NTP Server

Physical | Config | CLI | Attributes

IOS Command Line Interface

```
Press RETURN to get started!


User Access Verification

Username: Daniel
Password:

NTP-Server>en
Password:
NTP-Server#
```

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Time: 00:22:31

4331 4321 1941 2901 2911 819IOX 819HGW 829 1240 PTRouter PTEmpty 1841 2620XM 2621XM 2811

(i) Scenario 0 ▽    Fire | Last Status

New | Delete

Toggle PDU List Window

(Select a Device to Drag and Drop to the Workspace)