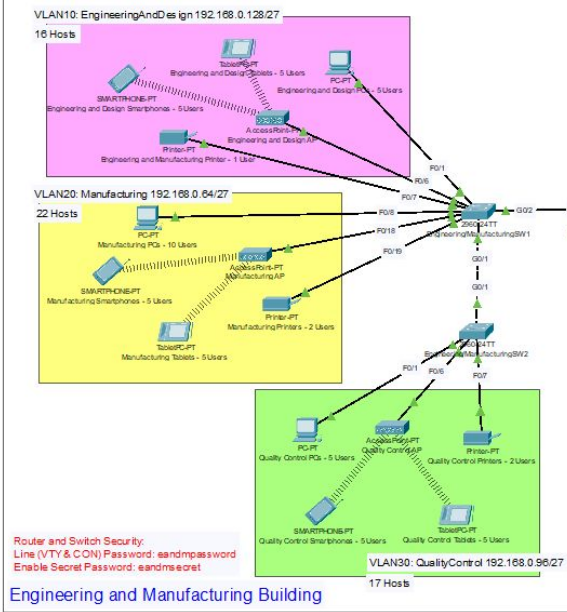
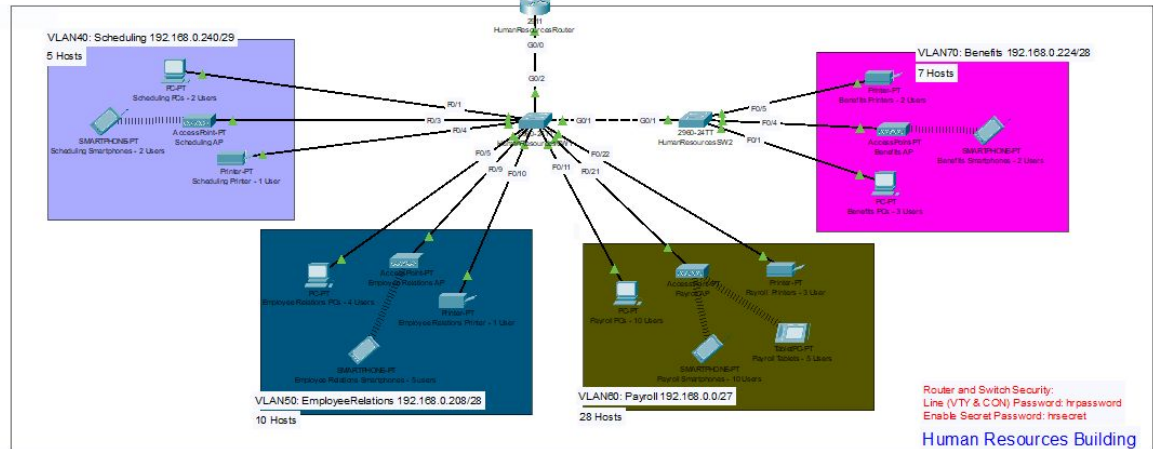
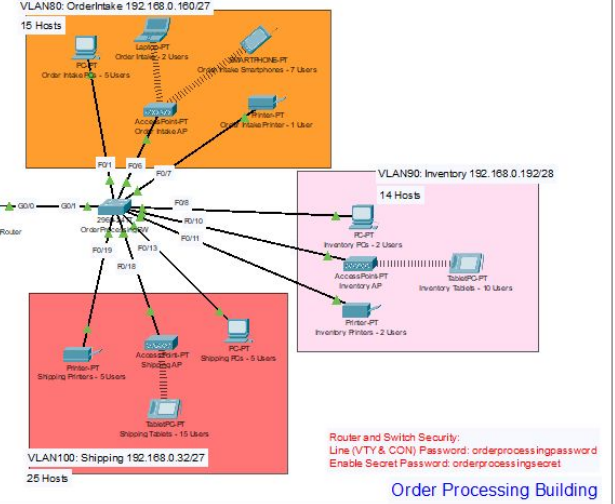
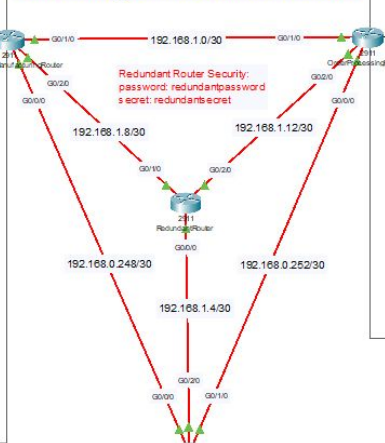


Manufacturing Plant Network

By. Max Gastelum

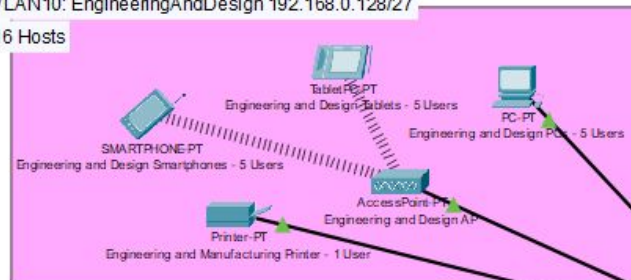


Manufacturing Plant Network 192.168.0.0/23



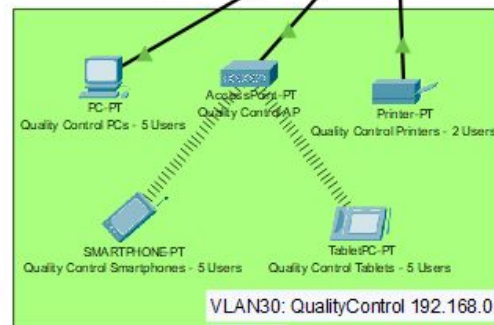
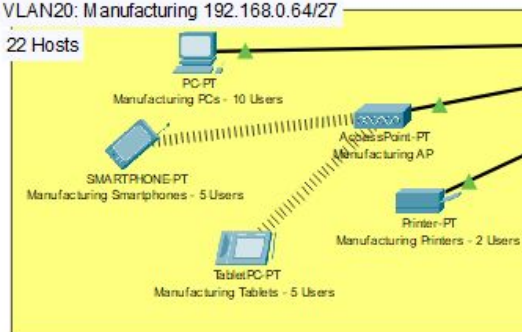
VLAN10: EngineeringAndDesign 192.168.0.128/27

16 Hosts



VLAN20: Manufacturing 192.168.0.64/27

22 Hosts



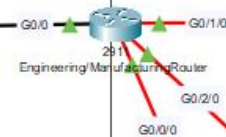
VLAN30: QualityControl 192.168.0.96/27

17 Hosts

Router and Switch Security:
Line (VTY & CON) Password: eandmnpassword
Enable Secret Password: eandmsecret

Engineering and Manufacturing Building

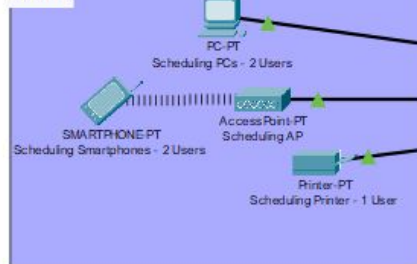
Manufa



1

VLAN40: Scheduling 192.168.0.240/29

5 Hosts



Human Resources Router

G0/0

G0/2

G0/1

G0/1

G0/1

G0/1

G0/1

G0/1

G0/1

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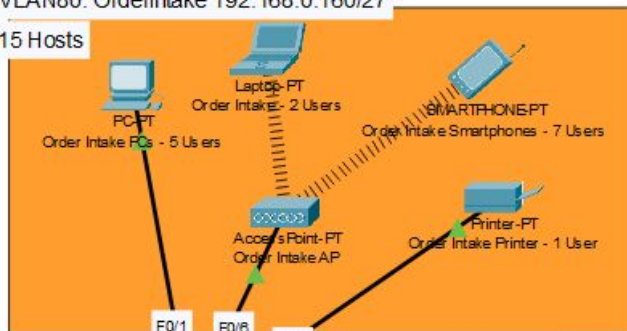
G0/1

0/23

2911
OrderProcessingRouter
G0/0/0

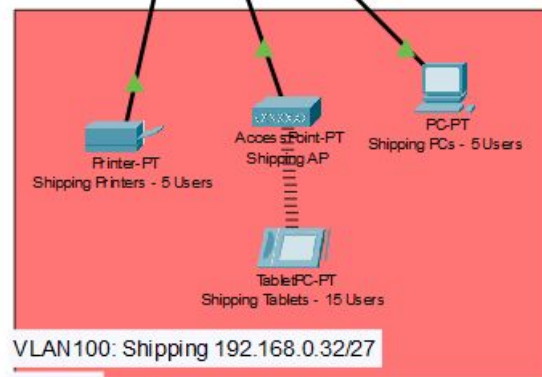
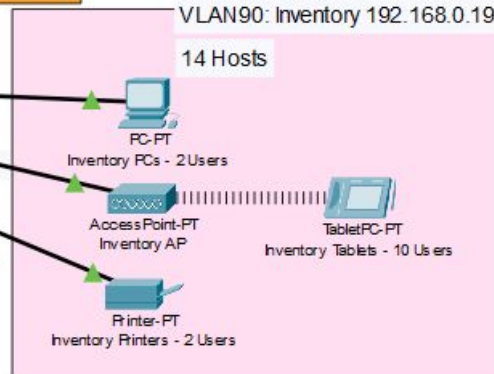
VLAN80: OrderIntake 192.168.0.160/27

15 Hosts



VLAN90: Inventory 192.168.0.192/28

14 Hosts



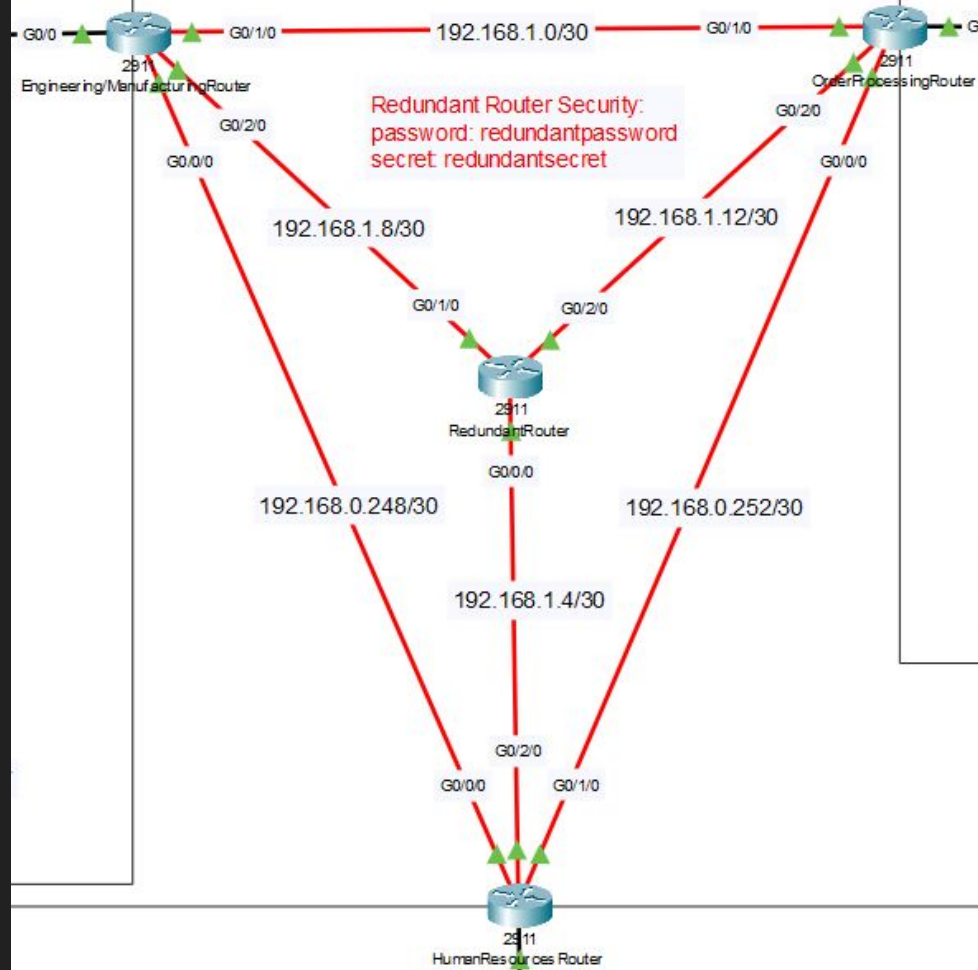
VLAN100: Shipping 192.168.0.32/27

25 Hosts

Router and Switch Security:
Line (VTY & CON) Password: orderprocessingpassword
Enable Secret Password: orderprocessingsecret

Order Processing Building

Manufacturing Plant Network 192.168.0.0/23



VLSM - 192.168.0.0/23

Engineering and Manufacturing Building:

Engineering and Design: 16 Hosts

Network Address: 192.168.0.128/27

Broadcast Address: 192.168.0.159/27

First Usable Address: 192.168.0.129/27

Last Usable Address: 192.168.0.158/27

Total Number of Usable Host Addresses: 30

Manufacturing: 22 Hosts

Network Address: 192.168.0.64/27

Broadcast Address: 192.168.0.95/27

First Usable Address: 192.168.0.65/27

Last Usable Address: 192.168.0.94/27

Total Number of Usable Host Addresses: 30

Quality Control: 17 Hosts

Network Address: 192.168.0.96/27

Broadcast Address: 192.168.0.127/27

First Usable Address: 192.168.0.97/27

Last Usable Address: 192.168.0.126/27

Total Number of Usable Host Addresses: 30

Human Resources Building:

Scheduling: 5 Hosts

Network Address: 192.168.0.240/29

Broadcast Address: 192.168.0.247/29

First Usable Address: 192.168.0.241/29

Last Usable Address: 192.168.0.246/29

Total Number of Usable Host Addresses: 6

Employee Relations: 10 Hosts

Network Address: 192.168.0.208/28

Broadcast Address: 192.168.0.223/28

First Usable Address: 192.168.0.209/28

Last Usable Address: 192.168.0.222/28

Total Number of Usable Host Addresses: 16

Payroll: 28 Hosts

Network Address: 192.168.0.0/27

Broadcast Address: 192.168.0.31/27

First Usable Address: 192.168.0.1/27

Last Usable Address: 192.168.0.30/27

Total Number of Usable Host Addresses: 30

Benefits: 7 Hosts

Network Address: 192.168.0.224/28

Broadcast Address: 192.168.0.239/28

First Usable Address: 192.168.0.225/28

Last Usable Address: 192.168.0.238/28

Total Number of Usable Host Addresses: 16

VLSM - 192.168.0.0/23

Order Processing Building:

Point-To-Point:

6

Order Intake: 15 Hosts
Network Address: 192.168.0.160/27
Broadcast Address: 192.168.0.191/27
First Usable Address: 192.168.0.161/27
Last Usable Address: 192.168.0.190/27
Total Number of Usable Host Addresses: 30

11

HR to Engineering/Manufacturing
Network Address: 192.168.0.248/30
Broadcast Address: 192.168.0.251/30
First Usable Address: 192.168.0.249/30
Last Usable Address: 192.168.0.250/30
Total Number of Usable Host Addresses: 2

14

HR to Redundant Router
Network Address: 192.168.1.4/30
Broadcast Address: 192.168.1.7/30
First Usable Address: 192.168.1.5/30
Last Usable Address: 192.168.1.6/30
Total Number of Usable Host Addresses: 2

7

Inventory: 14 Hosts
Network Address: 192.168.0.192/28
Broadcast Address: 192.168.0.207/28
First Usable Address: 192.168.0.191/28
Last Usable Address: 192.168.0.206/28
Total Number of Usable Host Addresses: 14

12

HR to Order Processing
Network Address: 192.168.0.252/30
Broadcast Address: 192.168.0.255/30
First Usable Address: 192.168.0.253/30
Last Usable Address: 192.168.0.254/30
Total Number of Usable Host Addresses: 2

15

Engineering/Manufacturing to Redundant Router
Network Address: 192.168.1.8/30
Broadcast Address: 192.168.1.11/30
First Usable Address: 192.168.1.9/30
Last Usable Address: 192.168.1.10/30
Total Number of Usable Host Addresses: 2

2

Shipping: 25 Hosts
Network Address: 192.168.0.32/27
Broadcast Address: 192.168.0.63/27
First Usable Address: 192.168.0.33/27
Last Usable Address: 192.168.0.62/27
Total Number of Usable Host Addresses: 30

13

Engineering/Manufacturing to Order Processing
Network Address: 192.168.1.0/30
Broadcast Address: 192.168.1.3/30
First Usable Address: 192.168.1.1/30
Last Usable Address: 192.168.1.2/30
Total Number of Usable Host Addresses: 2

16

Order Processing to Redundant Router
Network Address: 192.168.1.12/30
Broadcast Address: 192.168.1.15/30
First Usable Address: 192.168.1.13/30
Last Usable Address: 192.168.1.14/30
Total Number of Usable Host Addresses: 2

Connections

- In general, copper straight-through cables were used to connect devices of different types and copper crossover-cables were used to connect devices of the same type.
- Routers were connected to routers using fiber-optic cable, as the routers were upgraded with HWIC-1GE-SFP and GLC-LH-SMD ports.

Connections

- Wireless connections for the APs...

Engineering and Design AP

Physical **Config** Attributes

GLOBAL
Settings
INTERFACE
Port 0
Port 1

Port 1

Port Status ☒ On

SSID Engineering and Design AP

2.4 GHz Channel 6

Coverage Range (meters) 140.00

Authentication
☐ Disabled ☐ WEP ☐ WPA-PSK ☒ WPA2-PSK

WEP Key

PSK Pass Phrase engineeranddesignpassword

User ID

Password

Encryption Type AES

☐ Top

Engineering and Design Smartphones - 5 Users

Physical **Config** Desktop Programming Attributes

GLOBAL
Settings
Algorithm Settings
INTERFACE
Wireless0
3G/4G Cell1
Bluetooth

Wireless0

Port Status ☒ On

Bandwidth 18 Mbps

MAC Address 0001.43EC.9146

SSID Engineering and Design AP

Authentication
☐ Disabled ☐ WEP ☒ WPA-PSK ☐ WPA2-PSK ☐ WPA ☐ 802.1X

WEP Key

PSK Pass Phrase engineeranddesignpassword

User ID

Password

Method: MD5

User Name

Password

Encryption Type AES

IP Configuration
☒ DHCP ☐ Static

IPv4 Address 192.168.0.131

Subnet Mask 255.255.255.224

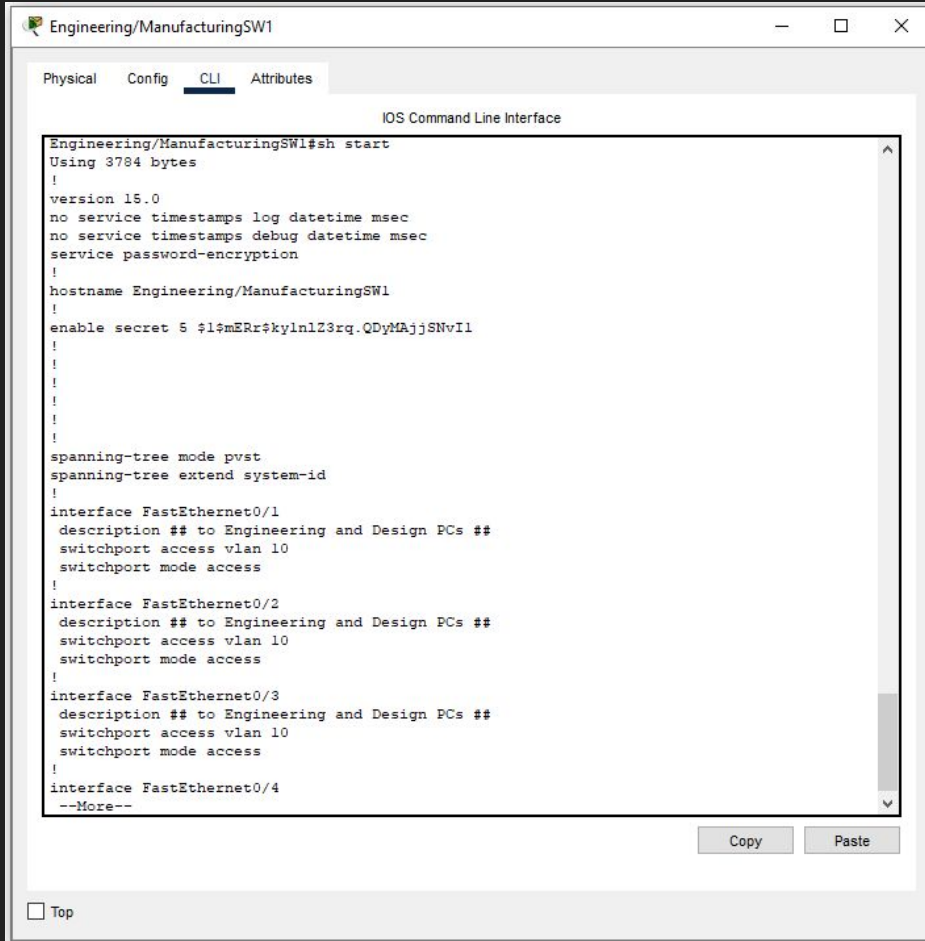
IPv6 Configuration
☒ Automatic ☐ Static

IPv6 Address

Link Local Address FE80::201:43FF:FEEC:9146

☐ Top

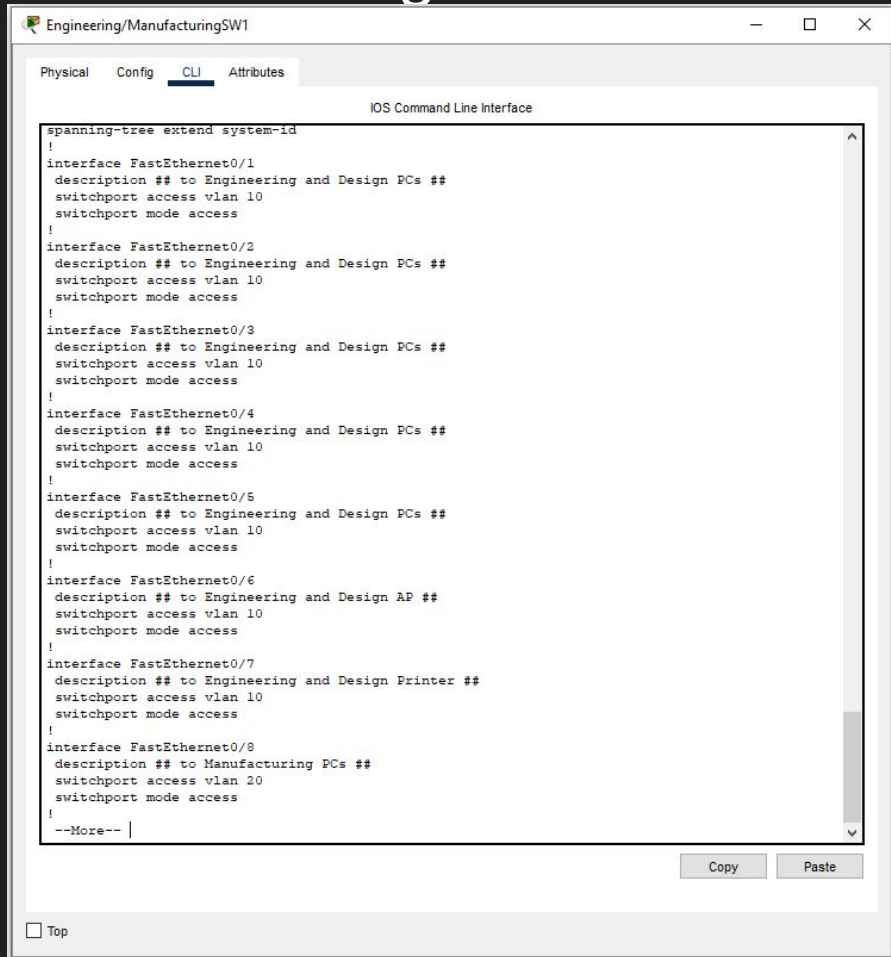
Switch Configuration



```
Engineering/ManufacturingSW1#sh start
Using 3784 bytes
!
version 15.0
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname Engineering/ManufacturingSW1
!
enable secret 5 $l$mERr$kylnlZ3rq.QDyMAjjSNvIl
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 description ## to Engineering and Design PCs ##
 switchport access vlan 10
 switchport mode access
!
interface FastEthernet0/2
 description ## to Engineering and Design PCs ##
 switchport access vlan 10
 switchport mode access
!
interface FastEthernet0/3
 description ## to Engineering and Design PCs ##
 switchport access vlan 10
 switchport mode access
!
interface FastEthernet0/4
--More--
```

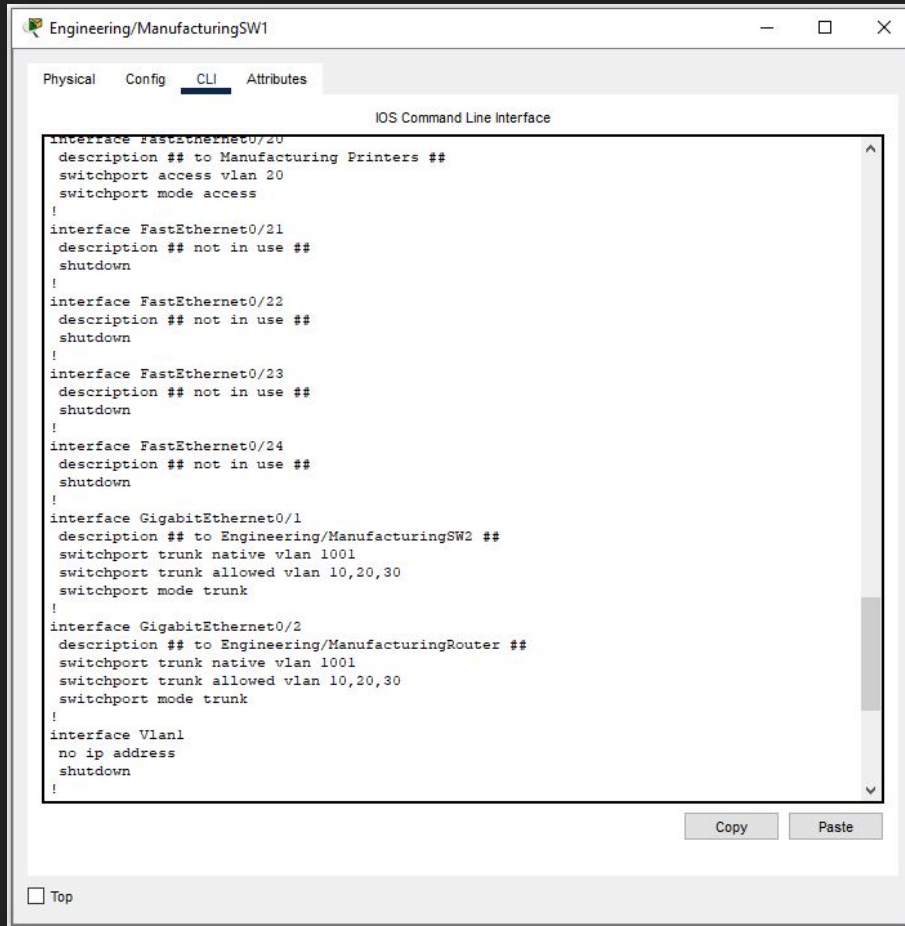
- Encrypted the passwords
- Set the minimum password length to 5
- Set a hostname
- Set an enable secret password

Switch Configuration - Interfaces



- Description indicating what it is connected to
- Assigned to a VLAN
- Designated as an access port
- In this case, because there are 5 Engineering and Design PCs in VLAN10, F0/1 - F0/5 are used and given the description "## to Engineering and Design PCs ##".

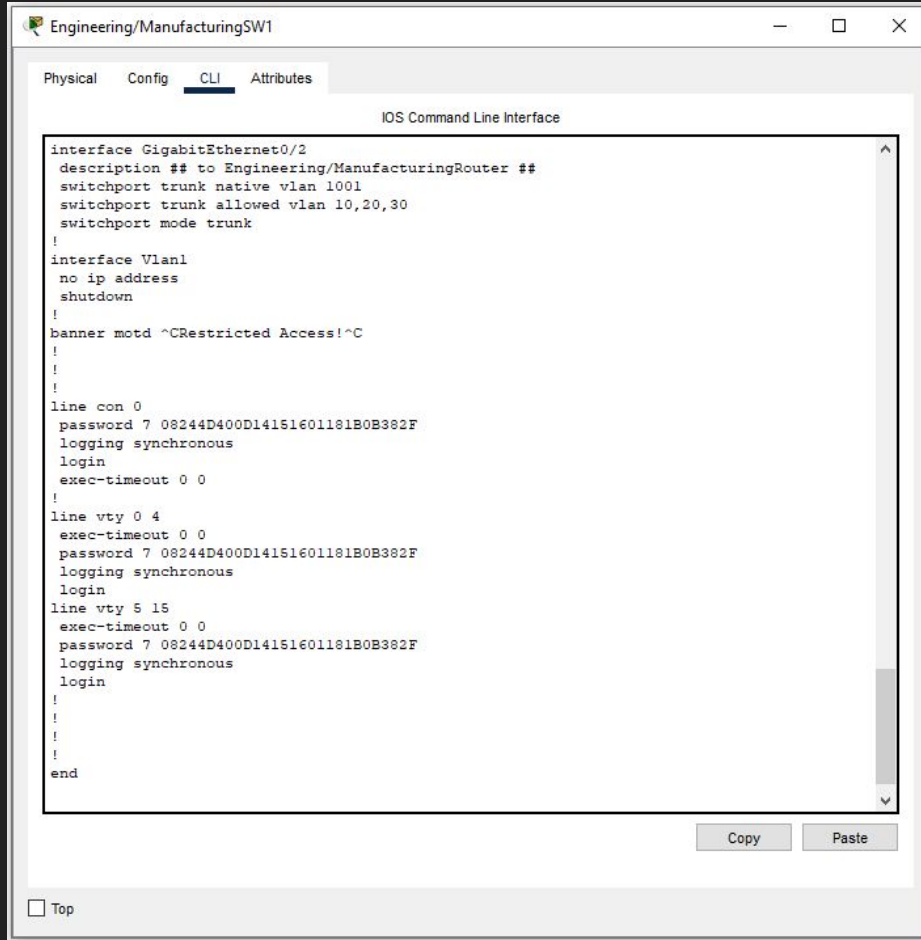
Switch Configuration - Interfaces Continued



```
interface FastEthernet0/20
description ## to Manufacturing Printers ##
switchport access vlan 20
switchport mode access
!
interface FastEthernet0/21
description ## not in use ##
shutdown
!
interface FastEthernet0/22
description ## not in use ##
shutdown
!
interface FastEthernet0/23
description ## not in use ##
shutdown
!
interface FastEthernet0/24
description ## not in use ##
shutdown
!
interface GigabitEthernet0/1
description ## to Engineering/ManufacturingSW2 ##
switchport trunk native vlan 1001
switchport trunk allowed vlan 10,20,30
switchport mode trunk
!
interface GigabitEthernet0/2
description ## to Engineering/ManufacturingRouter ##
switchport trunk native vlan 1001
switchport trunk allowed vlan 10,20,30
switchport mode trunk
!
interface Vlan1
no ip address
shutdown
!
```

- Interfaces not in use are manually shut down and given a description to indicate that it is not being used
- The interfaces connected to Engineering/ManufacturingSW2 and the Engineering/ManufacturingRouter (configured for ROAS) are in trunking mode.
 - Native VLAN is set to 1001
 - The ports can carry traffic for VLANs 10,20,30
 - Only necessary VLANs are allowed on the trunk

Switch Configuration - Security



- Included a banner that says "Restricted Access!"
- Console and VTU
 - Set no connection time out
 - Set an encrypted password
 - Logging Synchronous, to keep command entry more organized
 - Login, to ask users for a password

Switch Configuration - VLANs

Engineering/ManufacturingSW1

Physical Config CLI Attributes

IOS Command Line Interface

```
Engineering/ManufacturingSW1#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Fa0/21, Fa0/22, Fa0/23, Fa0/24
10	EngineeringAndDesign	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7
20	Manufacturing	active	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
30	QualityControl	active	
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Transl	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
10	enet	100010	1500	-	-	-	-	-	0	0
20	enet	100020	1500	-	-	-	-	-	0	0
30	enet	100030	1500	-	-	-	-	-	0	0
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Transl	Trans2
------	------	------	-----	--------	--------	----------	-----	----------	--------	--------

Remote SPAN VLANs

Primary	Secondary	Type	Ports
---------	-----------	------	-------

Engineering/ManufacturingSW1#

Copy Paste

Top

- VLANs with their respective ports
- Although no interfaces from this switch are a part of VLAN30, it is created so that VLAN30 from the connected switch, Engineering/ManufacturingSW2, can use the trunk.

The screenshot shows a Cisco Packet Tracer interface with a console window open for the device "Engineering/ManufacturingSW1". The tabs at the top are Physical, Config, CLI (selected), and Attributes. The console title is "IOS Command Line Interface".

```

Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
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Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#
Engineering/ManufacturingSW1#show int trunk
Port      Mode       Encapsulation  Status        Native vlan
Gig0/1    on         802.1q          trunking      1001
Gig0/2    on         802.1q          trunking      1001

Port      Vlans allowed on trunk
Gig0/1    10,20,30
Gig0/2    10,20,30

Port      Vlans allowed and active in management domain
Gig0/1    10,20,30
Gig0/2    10,20,30

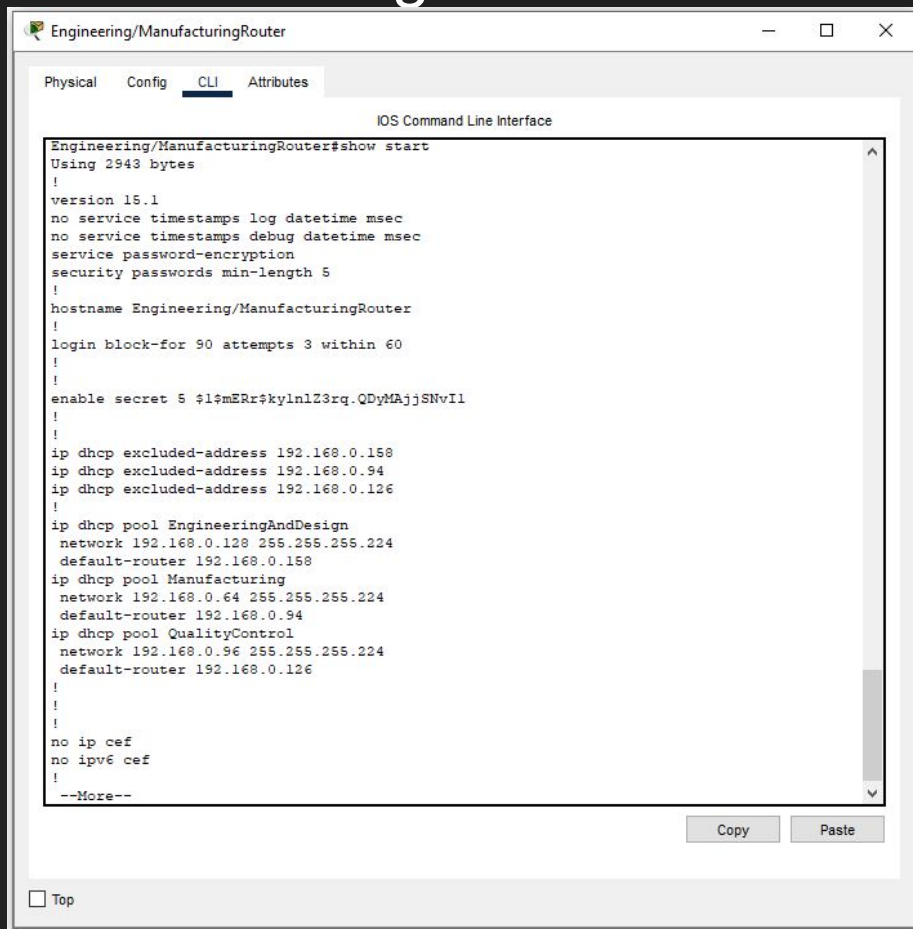
Port      Vlans in spanning tree forwarding state and not pruned
Gig0/1    10,20,30
Gig0/2    10,20,30

Engineering/ManufacturingSW1#
  
```

At the bottom right of the console window, there are two buttons: "Copy" and "Paste". At the very bottom left of the Packet Tracer window, there is a checkbox labeled "Top".

- Using 802.1q encapsulation
- Although no interfaces from this switch are a part of VLAN 30, it is allowed on both trunks, to be able to communicate with the ROAS configured router

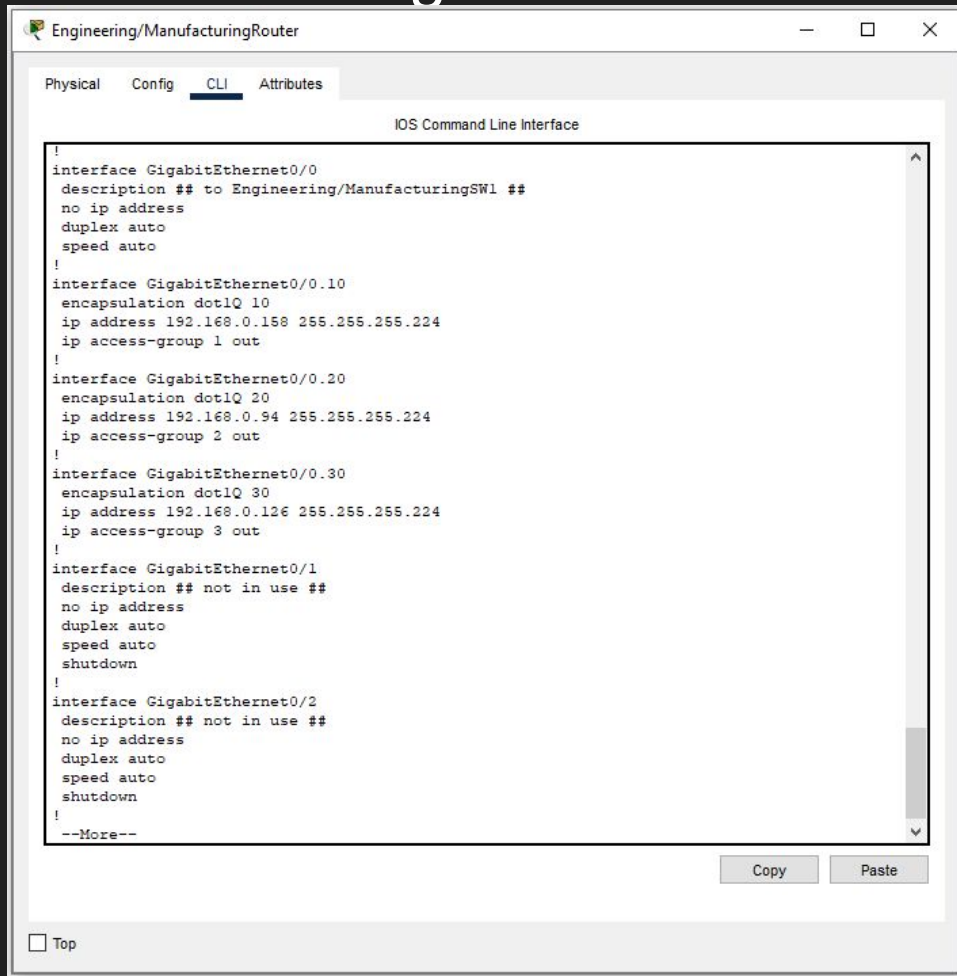
Router Configuration



```
Engineering/ManufacturingRouter
Physical Config CLI Attributes
IOS Command Line Interface
Engineering/ManufacturingRouter#show start
Using 2943 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
security passwords min-length 5
!
hostname Engineering/ManufacturingRouter
!
login block-for 90 attempts 3 within 60
!
!
enable secret 5 $1$mERr$kylnlZ3rq.QDyMAjjsNvIl
!
!
ip dhcp excluded-address 192.168.0.158
ip dhcp excluded-address 192.168.0.94
ip dhcp excluded-address 192.168.0.126
!
ip dhcp pool EngineeringAndDesign
network 192.168.0.128 255.255.255.224
default-router 192.168.0.158
ip dhcp pool Manufacturing
network 192.168.0.64 255.255.255.224
default-router 192.168.0.94
ip dhcp pool QualityControl
network 192.168.0.96 255.255.255.224
default-router 192.168.0.126
!
!
!
no ip cef
no ipv6 cef
!
--More--
```

- Encrypted the passwords
- Set the minimum password length to 5
- Set a hostname
- Set an enable secret password
- Blocks login for 90 seconds if 3 fails occur within 60 seconds
- DHCP Pools for each VLAN
 - Excluded the IP address that will be used for the default-router.
 - Default router IP address is the IP address of the subinterface connected to corresponding VLAN
 - Will automatically assign DHCP enabled hosts an IP within the specified pool.

Router Configuration - Interfaces and ROAS



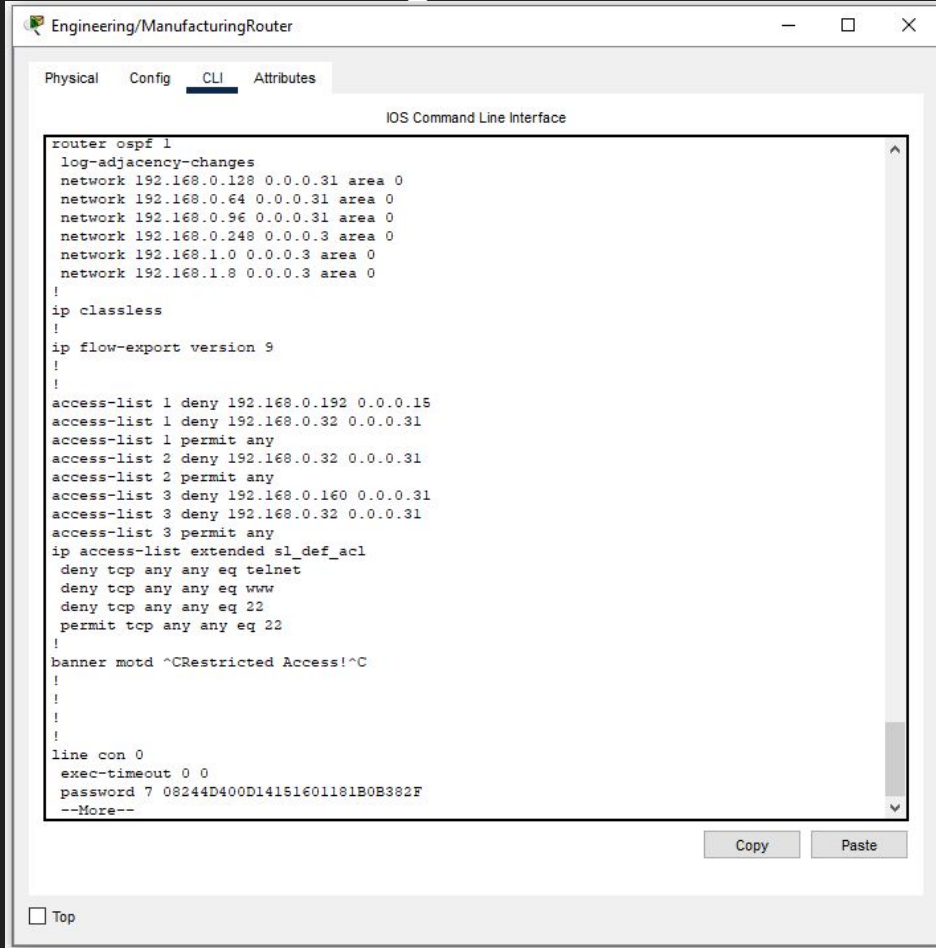
The screenshot shows a terminal window titled "Engineering/ManufacturingRouter" with tabs for "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the "IOS Command Line Interface". The configuration text is as follows:

```
!
interface GigabitEthernet0/0
description ## to Engineering/ManufacturingSW1 ##
no ip address
duplex auto
speed auto
!
interface GigabitEthernet0/0.10
encapsulation dot1Q 10
ip address 192.168.0.158 255.255.255.224
ip access-group 1 out
!
interface GigabitEthernet0/0.20
encapsulation dot1Q 20
ip address 192.168.0.94 255.255.255.224
ip access-group 2 out
!
interface GigabitEthernet0/0.30
encapsulation dot1Q 30
ip address 192.168.0.126 255.255.255.224
ip access-group 3 out
!
interface GigabitEthernet0/1
description ## not in use ##
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/2
description ## not in use ##
no ip address
duplex auto
speed auto
shutdown
!
--More--
```

At the bottom of the terminal window, there are "Copy" and "Paste" buttons. Below the terminal window, there is a checkbox labeled "Top".

- The physical interface used for the ROAS configuration is turned on
 - Description indicating what it is connected to
- Three sub interfaces are created, one for each VLAN.
 - For simplicity the extension is the same as the VLAN number.
 - Encapsulated using dot1Q
 - It is assigned the last usable host IP address
 - Assigned a standard ACL
- Interfaces not in use are manually shut down and given a description to indicate that it is not being used

Router Configuration - OSPF and ACL



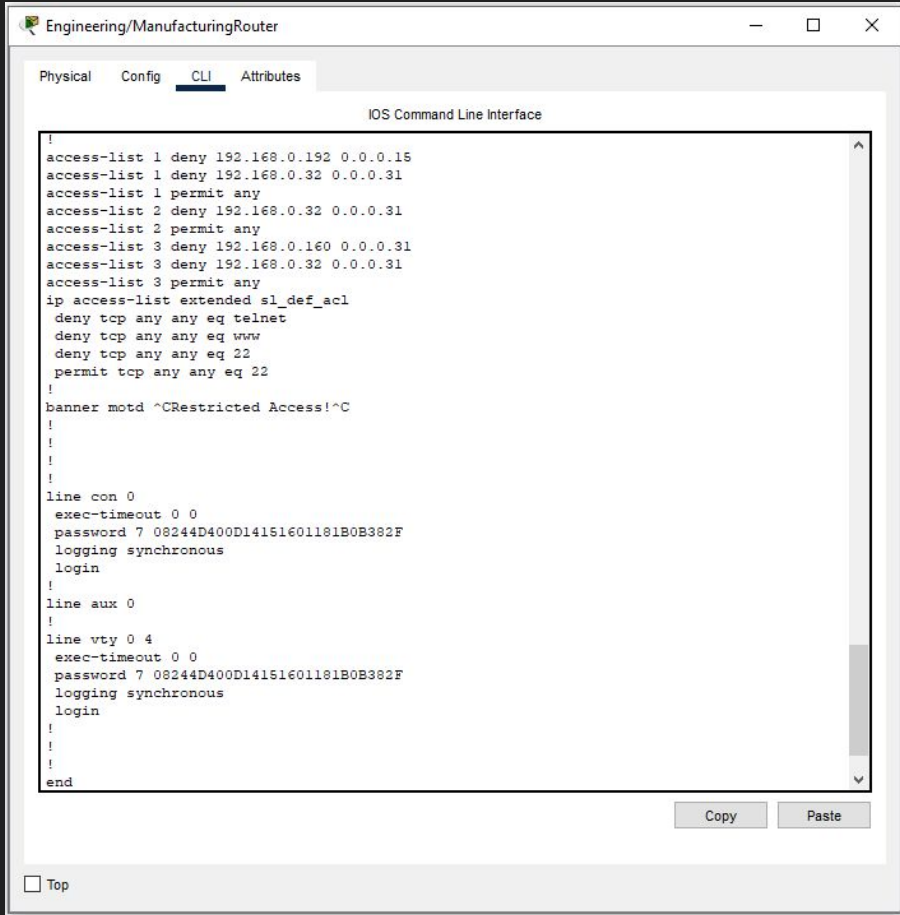
```
Engineering/ManufacturingRouter
Physical Config CLI Attributes
IOS Command Line Interface

router ospf 1
 log-adjacency-changes
 network 192.168.0.128 0.0.0.31 area 0
 network 192.168.0.64 0.0.0.31 area 0
 network 192.168.0.96 0.0.0.31 area 0
 network 192.168.0.248 0.0.0.3 area 0
 network 192.168.1.0 0.0.0.3 area 0
 network 192.168.1.8 0.0.0.3 area 0
!
ip classless
!
ip flow-export version 9
!
!
access-list 1 deny 192.168.0.192 0.0.0.15
access-list 1 deny 192.168.0.32 0.0.0.31
access-list 1 permit any
access-list 2 deny 192.168.0.32 0.0.0.31
access-list 2 permit any
access-list 3 deny 192.168.0.160 0.0.0.31
access-list 3 deny 192.168.0.32 0.0.0.31
access-list 3 permit any
ip access-list extended s1_def_acl
 deny tcp any any eq telnet
 deny tcp any any eq www
 deny tcp any any eq 22
 permit tcp any any eq 22
!
banner motd ^CRestricted Access!^C
!
!
!
!
!
line con 0
 exec-timeout 0 0
 password 7 08244D400D14151601181B0B382F
--More--

Copy Paste
```

- Enabled OSPF on each router for dynamic routing.
 - Specified each network that the router is directly connected to, to incorporate it into the OSPF Backbone Area
- Configured an individual standard ACL for each subinterface.
 - It is best practice to place standard ACLs closest to the destination
 - These ACLs deny access to other VLANs

Router Configuration - Security



```
Engineering/ManufacturingRouter
Physical Config CLI Attributes
IOS Command Line Interface
!
access-list 1 deny 192.168.0.192 0.0.0.15
access-list 1 deny 192.168.0.32 0.0.0.31
access-list 1 permit any
access-list 2 deny 192.168.0.32 0.0.0.31
access-list 2 permit any
access-list 3 deny 192.168.0.160 0.0.0.31
access-list 3 deny 192.168.0.32 0.0.0.31
access-list 3 permit any
ip access-list extended sl_def_acl
deny tcp any any eq telnet
deny tcp any any eq www
deny tcp any any eq 22
permit tcp any any eq 22
!
banner motd ^CRestricted Access!^C
!
!
!
!
line con 0
exec-timeout 0 0
password 7 08244D400D14151601181B0B382F
logging synchronous
login
!
line aux 0
!
line vty 0 4
exec-timeout 0 0
password 7 08244D400D14151601181B0B382F
logging synchronous
login
!
!
!
end
```

Copy Paste

☐ Top

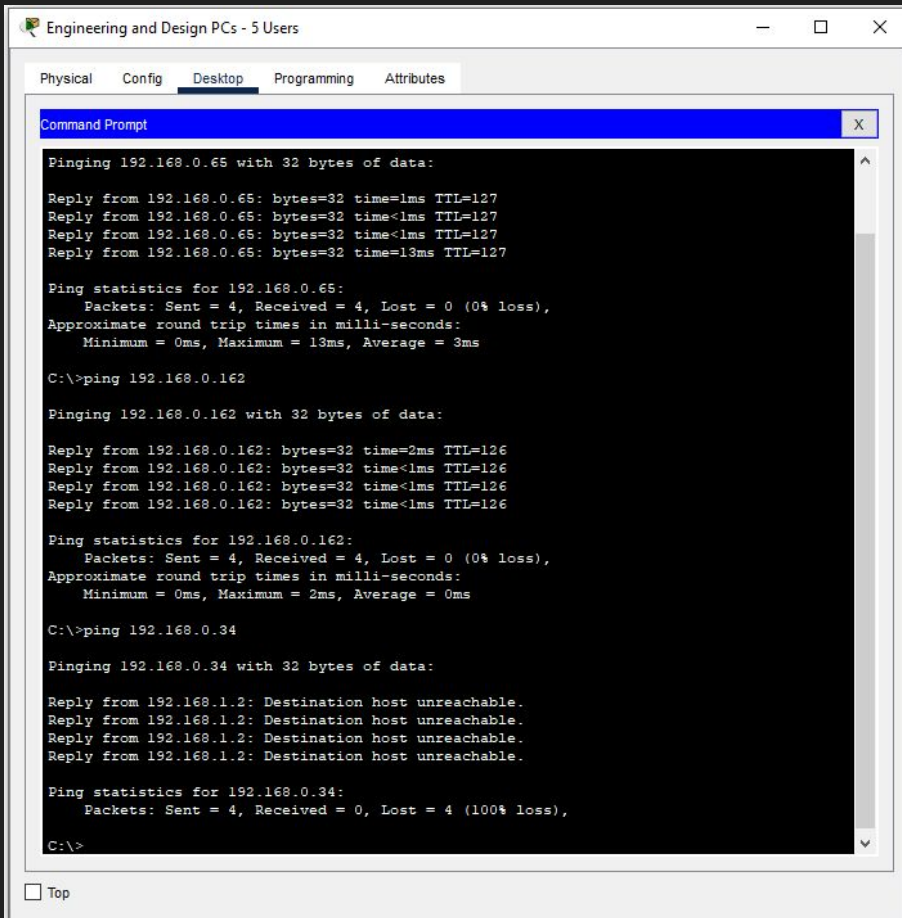
- Included a banner that says “Restricted Access!”
- Console and VTY
 - Set no connection time out
 - Set an encrypted password
 - Logging Synchronous, to keep command entry more organized
 - Login, to ask users for a password

Standard ACLs

- Standard ACLs were used to block certain networks from accessing other networks.
- They were placed closest to the destination.
- Lay out:
 - VLANs in Engineering and Manufacturing Building
 - ACL 1 - EngineeringAndDesign denies traffic from Inventory and Shipping
 - ACL 2 - Manufacturing denies traffic from Shipping
 - ACL 3 - QualityControl denies traffic from OrderIntake and Shipping
 - VLANs in Order Processing Building
 - ACL 1 - OrderIntake denies traffic from QualityControl
 - ACL 2 - Inventory denies traffic from EngineeringAndDesign
 - ACL 3 - Shipping Denies traffic from EngineeringAndDesign, Manufacturing, QualityControl
 - VLANs in Human Resources Building
 - ACL 1 - Scheduling, Payroll, and Benefits, deny traffic from all networks that are not within the human resources building
 - EmployeeRelations does not implement an ACL, it serves as a point of communication for all employees to reach human resources.
 - Note, all human resources VLANs are able to send traffic to all VLANs, but may not get a response back.

Testing The Standard ACLs

- Sending ping from EngineeringAndDesign to Manufacturing, then OrderIntake, then Shipping



```
Engineering and Design PCs - 5 Users
Physical Config Desktop Programming Attributes
Command Prompt X

Pinging 192.168.0.65 with 32 bytes of data:

Reply from 192.168.0.65: bytes=32 time<1ms TTL=127
Reply from 192.168.0.65: bytes=32 time<1ms TTL=127
Reply from 192.168.0.65: bytes=32 time<1ms TTL=127
Reply from 192.168.0.65: bytes=32 time=13ms TTL=127

Ping statistics for 192.168.0.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 13ms, Average = 3ms

C:\>ping 192.168.0.162

Pinging 192.168.0.162 with 32 bytes of data:

Reply from 192.168.0.162: bytes=32 time=2ms TTL=126
Reply from 192.168.0.162: bytes=32 time<1ms TTL=126
Reply from 192.168.0.162: bytes=32 time<1ms TTL=126
Reply from 192.168.0.162: bytes=32 time<1ms TTL=126

Ping statistics for 192.168.0.162:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>ping 192.168.0.34

Pinging 192.168.0.34 with 32 bytes of data:

Reply from 192.168.1.2: Destination host unreachable.
Reply from 192.168.1.2: Destination host unreachable.
Reply from 192.168.1.2: Destination host unreachable.
Reply from 192.168.1.2: Destination host unreachable.

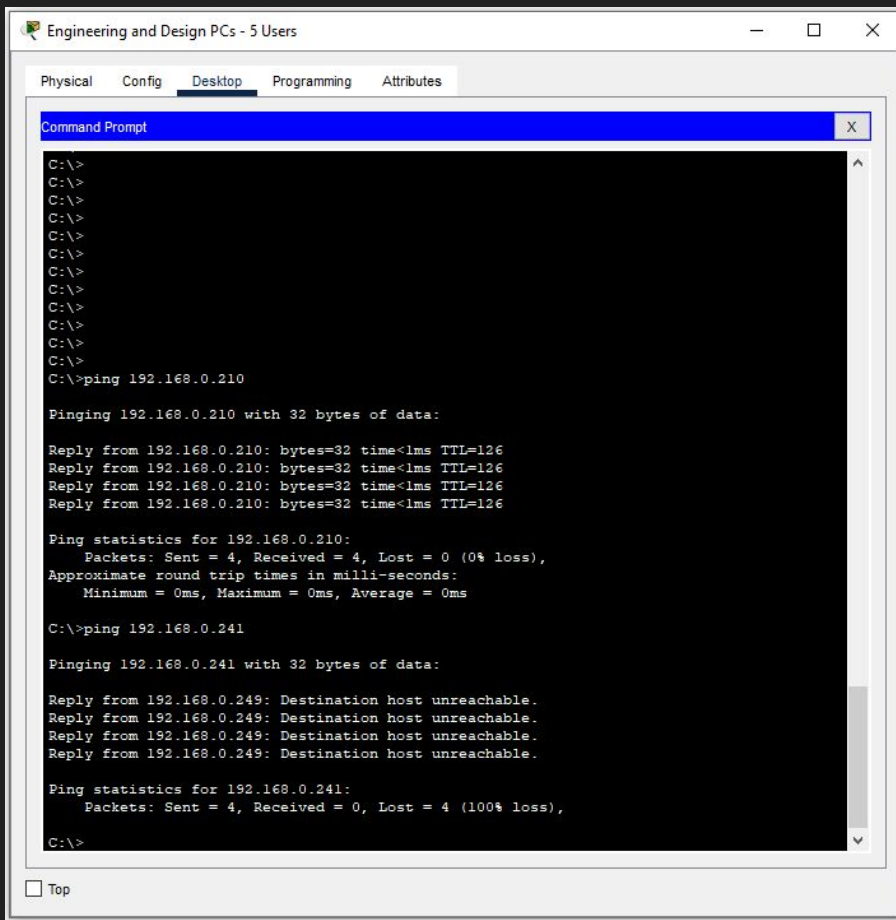
Ping statistics for 192.168.0.34:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

☐ Top

Testing The Standard ACLs

- Sending ping from EngineeringAndDesign to EmployeeRelations, then Scheduling



The screenshot shows a Windows desktop environment with a window titled "Engineering and Design PCs - 5 Users". The window has tabs for "Physical", "Config", "Desktop", "Programming", and "Attributes", with "Desktop" currently selected. Inside the window is a "Command Prompt" application. The command prompt shows a series of "C:\>" prompts, followed by the command "C:\>ping 192.168.0.210". The output shows four successful ping replies from 192.168.0.210, each with 32 bytes of data, a time less than 1ms, and a TTL of 126. The ping statistics for 192.168.0.210 show 4 packets sent, 4 received, 0 lost (0% loss), and approximate round trip times of 0ms. The command prompt then shows "C:\>ping 192.168.0.241". The output shows four failed ping replies from 192.168.0.241, each with the message "Destination host unreachable". The ping statistics for 192.168.0.241 show 4 packets sent, 0 received, 4 lost (100% loss). The command prompt ends with "C:\>".

```
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>ping 192.168.0.210

Pinging 192.168.0.210 with 32 bytes of data:

Reply from 192.168.0.210: bytes=32 time<1ms TTL=126
Reply from 192.168.0.210: bytes=32 time<1ms TTL=126
Reply from 192.168.0.210: bytes=32 time<1ms TTL=126
Reply from 192.168.0.210: bytes=32 time<1ms TTL=126

Ping statistics for 192.168.0.210:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.0.241

Pinging 192.168.0.241 with 32 bytes of data:

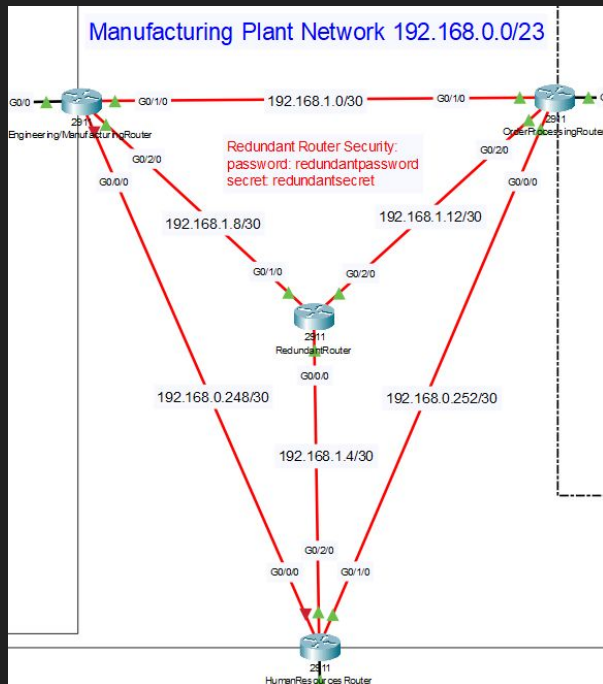
Reply from 192.168.0.249: Destination host unreachable.
Reply from 192.168.0.249: Destination host unreachable.
Reply from 192.168.0.249: Destination host unreachable.
Reply from 192.168.0.249: Destination host unreachable.

Ping statistics for 192.168.0.241:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

Routing Redundancy

- There are multiple routes to each building, in case the direct connections are unavailable.
- For example, EngineeringAndDesign can still ping EmployeeRelations when the point-to-point connection between the Engineering/ManufacturingRouter and HumanResourcesRouter is down.



Engineering and Design PCs - 5 Users

Physical Config Desktop Programming Attributes

Command Prompt

```
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>ping 192.168.0.210

Pinging 192.168.0.210 with 32 bytes of data:

Reply from 192.168.0.210: bytes=32 time<1ms TTL=125
Reply from 192.168.0.210: bytes=32 time<1ms TTL=125
Reply from 192.168.0.210: bytes=32 time<1ms TTL=125
Reply from 192.168.0.210: bytes=32 time<1ms TTL=125

Ping statistics for 192.168.0.210:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>tracert 192.168.0.210

Tracing route to 192.168.0.210 over a maximum of 30 hops:

  0  0 ms    0 ms    0 ms    192.168.0.168
  1  0 ms    0 ms    0 ms    192.168.1.2
  2  0 ms    0 ms    0 ms    192.168.1.5
  3  0 ms    0 ms    0 ms    192.168.0.210

Trace complete.

C:\>
```

Thank You!