==========

Assign a Name to the Host Device

```
Switch# configure terminal
Switch(config)# hostname Sw-Floor-1
Sw-Floor-1(config)#
```

==========

Configure passwords

Securing user EXEC mode access:

```
Sw-Floor-1# configure terminal
Sw-Floor-1(config)# line console 0
Sw-Floor-1(config-line)# password cisco
Sw-Floor-1(config-line)# login
Sw-Floor-1(config-line)# end
Sw-Floor-1#
```

Securing privileged EXEC mode access:

```
Sw-Floor-1# configure terminal
Sw-Floor-1(config)# enable secret class
Sw-Floor-1(config)# exit
Sw-Floor-1#
```

Securing VTY line access:

PC0> **telnet** *Sw-Floor-1-ip*

```
Sw-Floor-1# configure terminal
Sw-Floor-1(config)# line vty 0 15
Sw-Floor-1(config-line)# password cisco
Sw-Floor-1(config-line)# login
Sw-Floor-1(config-line)# end
Sw-Floor-1#
```

==========

Save Configurations

Configuration Files:

To save changes made to the running configuration to the startup configuration file, use: **copy running-config startup-config**

```
Router#show startup-config
Using 624 bytes
!
version 15.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
```

```
Router#show running-config
Building configuration...

Current configuration : 624 bytes
!
version 15.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
```

==========

Switch Virtual Interface Configuration:

IP is assigned to switch as a whole object, not in a specific port.

VLAN is a virtual port. By default, all interfaces of a switch fall under the default VLAN 1.

```
Switch# configure terminal
Switch(config)# interface vlan 1
Switch(config-if)# ip address 192.168.1.20 255.255.255.0
Switch(config-if)# no shutdown
```

==========

Configure Initial Router Settings

Basic Router Configuration Example:

R1(config)# **hostname R1**

R1(config)# **enable secret class**

R1(config)# **line console 0**

R1(config-line)# **password cisco**

R1(config-line)# **login**

R1**(**config-line)# **line vty 0 4**

R1(config-line)# **password cisco**

R1(config-line)# **login**

R1(config-line)# **exit**

R1(config)# **service password encryption**

R1(config)# **banner motd** # *message* #
R1(config)# **exit**

R1# **copy running-config startup-config**

==========

Configure Interfaces

Configure Router Interfaces:

Router(config)# **interface** *type-a-number*
Router(config-if)# **description** *description-text*
Router(config-if)# **ip address** *ipv4-address subnet-mask*
Router(config-if)# **no shutdown**

For Serial port [ONLY in the router with the 'clock' sign]:

int Se0/0

ip address 100.1.1.1 255.255.252.0

clock rate 64000

no shutdown

Setting the default gateway

SW1(config)# **ip default-gateway 172.16.1.1**

Verify Interface Configuration:

```
R1#  show ip interface brief
Interface              IP-Address      OK? Method Status
Protocol
GigabitEthernet0/0/0   192.168.10.1    YES manual up
```

Configure Verification Commands:

show interfaces Displays statistics for all interfaces on the device. Only displays the IPv4 addressing information.

show ip interfaces Displays the IPv4 statistics for all interfaces on a router.

==========

VLAN Config

Overview of VLANs:

```
Switch# show vlan brief

VLAN Name              Status    Ports
---- ----------------- --------  -------------------
1    default           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                 Fa0/5, 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
                                 Gi0/1, Gi0/2
1002 fddi-default                      act/unsup
1003 token-ring-default                act/unsup
1004 fddinet-default                   act/unsup
1005 trnet-default                     act/unsup
```

VLAN Creation [in all switches/routers]:

Switch# **conf t**

Switch(config)# **VLAN 10**

Switch(config-vlan)# **name CSE**

Switch(config)# **VLAN 20**

Switch(config-vlan)# **name ME**

VLAN Port Assignment Commands [in all switches/routers]:

Switch# **conf t**

Switch(config)# **int fa0/1**

Switch(config-if)# **switchport mode access**

Switch(config-if)# **switchport access vlan 10**

Switch(config)# **int fa1/1**

Switch(config-if)# **switchport mode access**

Switch(config-if)# **switchport access vlan 20**

Verify VLAN info:

```
S1# show interface vlan 20
Vlan20 is up, line protocol is up
  Hardware is EtherSVI, address is 001f.6ddb.3ec1 (bia 001f.6ddb.3ec1)
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set

(Output omitted)
```

Lists information about the VLANs:

SW1# **show vlan** {**brief** | *id* | *name* | **summary**}

Place interface back in VLAN 1:

```
S1(config)# interface fa0/18
S1(config-if)# no switchport access vlan
S1(config-if)# end
S1#
S1# show vlan brief
VLAN Name                    Status    Ports
---- ------------------- --------- -------------------------------
1    default             active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                   Fa0/5, 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
                                   Gi0/1, Gi0/2
20   student             active
1002 fddi-default        act/unsup
1003 token-ring-default  act/unsup
1004 fddinet-default     act/unsup
1005 trnet-default       act/unsup
```

Delete VLANs:

Delete VLANs with the **no vlan** *vlan-id*

Caution: Before deleting a VLAN, reassign all member ports to a different VLAN.

- Delete all VLANs with the **delete flash:vlan.dat** or **delete vlan.dat** commands.
- Reload the switch when deleting all VLANs.

==========

VLAN Trunks

Trunk Configuration Commands [in all switches/routers]:

Task	IOS Command
Enter global configuration mode.	Switch# **configure terminal**
Enter interface configuration mode.	Switch(config)# **interface** *interface-id*
Set the port to permanent trunking mode.	Switch(config-if)# **switchport mode trunk**
Sets the native VLAN to something other than VLAN 1.	Switch(config-if)# **switchport trunk native vlan** *vlan-id*
Specify the list of VLANs to be allowed on the trunk link.	Switch(config-if)# **switchport trunk allowed vlan** *vlan-list*
Return to the privileged EXEC mode.	Switch(config-if)# **end**

int g0/1

switchport mode trunk

switchport trunk native vlan 1

switchport trunk allowed vlan 10,20,1

Verify Trunk Configuration:

Switch# **show int fa0/1 switchport**

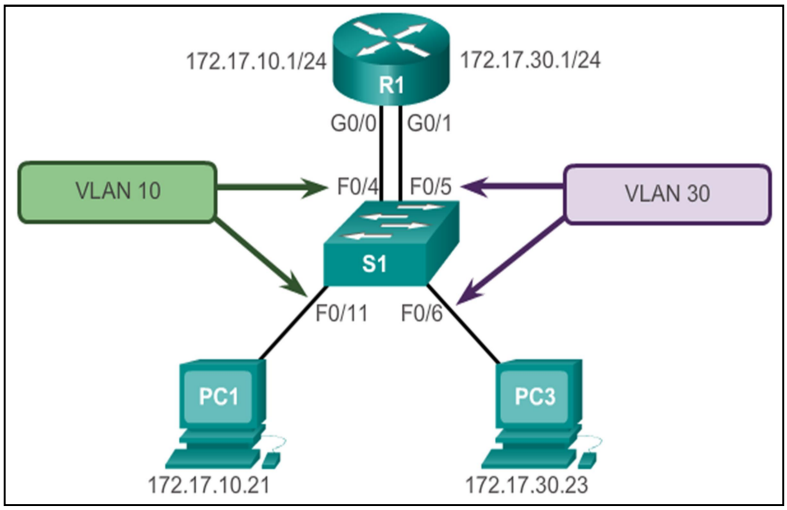
Lists all the trunk ports on a switch including the trunk allowed VLANs:

SW1# **show interfaces trunk**

==========

Inter-VLAN Routing

Configure Legacy Inter-VLAN Routing::



Switch configuration:

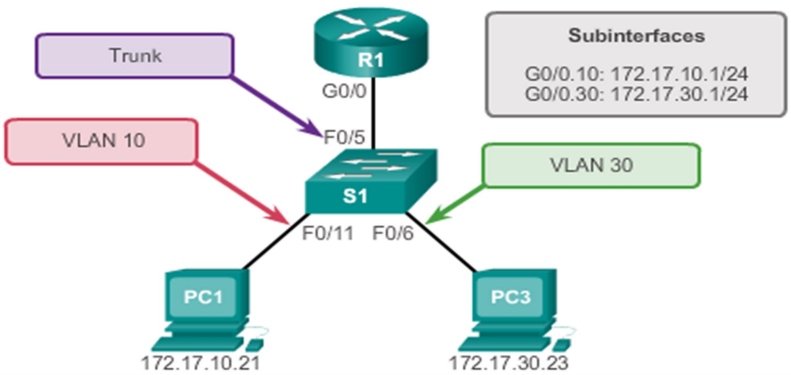
```
S1(config)# vlan 10
S1(config-vlan)# vlan 30
S1(config-vlan)# interface f0/11
S1(config-if)# switchport access vlan 10
S1(config-if)# interface f0/4
S1(config-if)# switchport access vlan 10
S1(config-if)# interface f0/6
S1(config-if)# switchport access vlan 30
S1(config-if)# interface f0/5
S1(config-if)# switchport access vlan 30
S1(config-if)# end
*Mar 20 01:22:56.751: %SYS-5-CONFIG_I: Configured from console by
console
S1# copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

Router Interface Configuration:

```
R1(config)# interface g0/0
R1(config-if)# ip address 172.17.10.1 255.255.255.0
R1(config-if)# no shutdown
*Mar 20 01:42:12.951: %LINK-3-UPDOWN: Interface GigabitEthernet0/0,
changed state to up
*Mar 20 01:42:13.951: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/0, changed state to up
R1(config-if)# interface g0/1
R1(config-if)# ip address 172.17.30.1 255.255.255.0
R1(config-if)# no shutdown
*Mar 20 01:42:54.951: %LINK-3-UPDOWN: Interface GigabitEthernet0/1,
changed state to up
*Mar 20 01:42:55.951: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/1, changed state to up
R1(config-if)# end
R1# copy running-config startup-config
```

Configure Router-on-a-Stick::

Switch:




```
S1(config)# vlan 10
S1(config-vlan)# vlan 30
S1(config-vlan)# interface f0/5
S1(config-if)# switchport mode trunk
S1(config-if)# end
S1#
```

Router:

```
R1(config)# interface g0/0.10
R1(config-subif)# encapsulation dot1q 10
R1(config-subif)# ip address 172.17.10.1 255.255.255.0
R1(config-subif)# interface g0/0.30
R1(config-subif)# encapsulation dot1q 30
R1(config-subif)# ip address 172.17.30.1 255.255.255.0
R1(config)# interface g0/0
R1(config-if)# no shutdown
*Mar 20 00:20:59.299: %LINK-3-UPDOWN: Interface GigabitEthernet0/0,
 changed state to down
*Mar 20 00:21:02.919: %LINK-3-UPDOWN: Interface GigabitEthernet0/0,
 changed state to up
*Mar 20 00:21:03.919: %LINEPROTO-5-UPDOWN: Line protocol on
 changed state to down
*Mar 20 00:21:02.919: %LINK-3-UPDOWN: Interface GigabitEthernet0/0,
 changed state to up
*Mar 20 00:21:03.919: %LINEPROTO-5-UPDOWN: Line protocol on
 Interface GigabitEthernet0/0, changed state to up
```

==========

Routing

Static Default Routing [In BOTH NAT router and external router]:

ip route 0.0.0.0 0.0.0.0 Se0/0

[If this router doesn't recognize any destination address, it directs the traffic to Se0/0 interface]

Static Routing:

ip route *network-address-that-is-not-neighbor-of-this-router subnet-mask interface-to-reach-that-network-from-this-router*

R1# **show ip route static** Shows routes learned via static routing only

Dynamic Routing:

router rip

network *network-address-that-is-neighbor-of-this-router*

show ip route Displays the contents of the IP routing tables stored in RAM.

R1# **show ip route rip** Shows routes learned via RIP only

==========

ACL [ACL rules per interface => inbound, outbound (From Router's perspective); An ACL must have at least one permit statement otherwise all traffic will be denied due to the implicit deny ACE statement.]

Standard ACL [Closest to destination; Source IP, Wildcard-mask]::

Configure Numbered Standard IPv4 ACL [In config mode]:

ip access-list 10 permit 192.168.10.64 0.0.0.15 [192.168.10.64 to 192.168.10.79]

ip access-list 10 deny any (default)

ip access-list 10 permit host 192.168.10.10 [host means '0.0.0.0'; so this list permits ONLY the device with ip 192.168.10.10]

ip access-list 10 deny 192.168.10.0 0.0.0.255

[and denies all other ips]

int g0/0

ip access-group 10 in

Configure Named Standard IPv4 ACL[In config mode]:

ip access-list standard PERMIT-ACCESS

permit host 192.168.10.10

deny 192.168.10.0 0.0.0.255

int s0/0

ip access-group PERMIT-ACCESS out

Permit / Deny All IP:

R1(config-ext-nacl)# **permit any** [permit all except the ones denied with 'deny' command]

Extended ACL[Closest to source; Protocol, Src IP, Wildcard-mask, Dest IP, Wildcard-mask, Port]:

Configure Extended ACLs [Named]:

R1(config)# **ip access-list extended FTP-FILTER**

R1(config-ext-nacl)# **permit tcp 192.168.10.0 0.0.0.255 any eq ftp**

R1(config-ext-nacl)# **permit tcp 192.168.10.0 0.0.0.255 any eq ftp-data**

R1(config-ext-nacl)# **permit tcp 192.168.10.0 0.0.0.255 any eq www**

[permit any device from network 192.168.10.0 to connect to any destination IP with ports ftp,ftp-data,www]

R1(config-ext-nacl)# **permit tcp 192.168.10.0 0.0.0.255 host 100.100.100.3 eq ftp**

[permit any device from network 192.168.10.0 to connect to the device 100.100.100.3 with port ftp]

int s0/1

ip access-group FTP-FILTER out

Permit / Deny All IP:

R1(config-ext-nacl)# **permit ip any any** [permit all except the ones denied with 'deny' command]

R1(config-ext-nacl)# **deny ip any any** [default]

Configure Extended ACLs [Numbered]:

```
R1(config)# access-list 110 permit tcp 192.168.10.0 0.0.0.255 any eq www
R1(config)# access-list 110 permit tcp 192.168.10.0 0.0.0.255 any eq 443
R1(config)# interface g0/0/0
R1(config-if)# ip access-group 110 in
R1(config-if)# exit
R1(config)#
```

Delete an ACL::

In Config Mode:

no ip access-list extended FTP-FILTER Extended ACL

no ip access-list standard PERMIT-ACCESS Standard ACL

no access-list 10 Both

In Interface Mode [Both extended and standard]:

int s0/0

no ip access-group FILTER out

Verify ACL:

R1# **show access-lists**
R1# **show ip access-list** Shows all ACLs configured on a router with counters at the end of each statement

R1# **show ip access-list 101** Shows only the specified ACL

R1# **show ip interface g0/0** verify the ACL on the interface and the direction in which it was applied.

==========

Static NAT

Configure Static NAT [In NAT router]:

```
R2(config)# ip nat inside source static 192.168.10.254 209.165.201.5
R2(config)#
R2(config)# interface serial 0/1/0
R2(config-if)# ip address 192.168.1.2 255.255.255.252
R2(config-if)# ip nat inside
R2(config-if)# exit
R2(config)# interface serial 0/1/1
R2(config-if)# ip address 209.165.200.1 255.255.255.252
R2(config-if)# ip nat outside
```

R2# **show ip nat translations**

```
R2# show ip nat translations
Pro  Inside global       Inside local       Outside local      Outside global
---  209.165.201.5       192.168.10.254     ---                ---
Total number of translations: 1
```

```
R2# show ip nat statistics
Total active translations: 1 (1 static, 0 dynamic; 0
extended)
Outside interfaces:
  Serial0/1/1
Inside interfaces:
  Serial0/1/0
Hits: 4  Misses: 1
(output omitted)
```

==========

Dynamic NAT

Configure Dynamic NAT [In NAT router]:

```
R2(config)# ip nat pool NAT-POOL1 209.165.200.226 209.165.200.240 netmask 255.255.255.224
R2(config)# access-list 1 permit 192.168.0.0 0.0.255.255
R2(config)# ip nat inside source list 1 pool NAT-POOL1
R2(config)# interface serial 0/1/0
R2(config-if)# ip nat inside
R2(config-if)# interface serial 0/1/1
R2(config-if)# ip nat outside
```

Clear Dynamic Translation Entry:

Command	Description
clear ip nat translation *	Clears all dynamic address translation entries from the NAT translation table.
clear ip nat translation inside *global-ip local-ip* [**outside** *local-ip global-ip*]	Clears a simple dynamic translation entry containing an inside translation or both inside and outside translation.
clear ip nat translation *protocol* **inside** *global-ip global-port local-ip local-port* [**outside** *local-ip local-port global-ip global-port*]	Clears an extended dynamic translation entry.

==========

PAT

Configure PAT to Use a Single IPv4 Address [previous ACL 1 is used]:

```
R2(config)# ip nat inside source list 1 209.165.200.225 overload
R2(config)# access-list 1 permit 192.168.0.0 0.0.255.255
R2(config)# interface serial0/1/0
R2(config-if)# ip nat inside
R2(config-if)# exit
R2(config)# interface Serial0/1/1
R2(config)# ip nat pool NAT-POOL2 209.165.200.226 209.165.200.240 netmask
255.255.255.224
R2(config)# access-list 1 permit 192.168.0.0 0.0.255.255
R2(config)# ip nat inside source list 1 pool NAT-POOL2 overload
R2(config)# interface serial0/1/0
R2(config-if)# ip nat inside
R2(config-if)# interface serial0/1/0
R2(config-if)# ip nat outside
```

Verify PAT:

R2# **show ip nat translations**