

Maximum Hosts Per Network

To calculate the maximum number of usable hosts in a network:

- Formula: $2^N - 2$, where N = number of host bits
(Subtracting 2 accounts for the **Network Address** and **Broadcast Address**, which are reserved.)

Class C Network

- Example: **192.168.1.0/24**
 - Host portion: 8 bits → $2^8 = 256$
 - Usable hosts: $256 - 2 = 254$

Class B Network

- Example: **172.16.0.0/16**
 - Host portion: 16 bits → $2^{16} = 65,536$
 - Usable hosts: $65,536 - 2 = 65,534$

Class A Network

- Example: **10.0.0.0/8**
 - Host portion: 24 bits → $2^{24} = 16,777,216$
 - Usable hosts: $16,777,216 - 2 = 16,777,214$
-

First and Last Usable Addresses

For any network:

- **First Usable Address:** Network Address + 1
- **Last Usable Address:** Broadcast Address - 1

Class C Network

- Network Address: **192.168.1.0/24**
 - First: **192.168.1.1**
 - Last: **192.168.1.254**

Class B Network

- Network Address: **172.16.0.0/16**
 - First: **172.16.0.1**
 - Last: **172.16.255.254**

Class A Network

- Network Address: 10.0.0.0/8
 - First: 10.0.0.1
 - Last: 10.255.255.254

Cisco CLI Device Configuration

Basic Commands

Enable Privileged EXEC Mode:

```
R1> enable
```

View Interface Summary:

```
R1# show ip interface brief
```

```
R1>en
R1#show ip interface brief
Interface                IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0       unassigned      YES unset  administratively down  down
GigabitEthernet0/1       unassigned      YES unset  administratively down  down
GigabitEthernet0/2       unassigned      YES unset  administratively down  down
GigabitEthernet0/3       unassigned      YES unset  administratively down  down
R1#
```

- administratively down: Interface has been disabled with the 'shutdown' command.

- This is the default Status of Cisco router interfaces.

- Cisco switch interfaces are NOT administratively down by default. 

Status -> Layer 1 status

Protocol -> Layer 2 status

Interface Configuration Mode

Enter Configuration Mode:

```
R1# conf t
```

Select Interface:

```
R1(config)# interface gigabitethernet 0/0
```

Shortcut: g0/0

Assign IP Address and Subnet Mask:

```
R1(config-if)# ip address 10.255.255.254 255.0.0.0
```

Enable the Interface:

```
R1(config-if)# no shutdown
```

- Confirmation: Look for messages indicating **Status: Up** and **Protocol: Up**.

Verify Configuration (Privileged EXEC Command):

```
R1(config-if)# do show ip interface brief
```

Descriptions for Interfaces

Add a description to an interface for clarity:

```
R1(config)# int g0/0
```

```
R1(config)# description ## to SW1 ##
```

Result in the interface table:

Interface	Description
Gi0/0	## to SW1 ##

Additional Useful Commands

View Detailed Interface Information:

```
R1# show interfaces <interface name>
```

- Displays Layer 1, Layer 2, and some Layer 3 details (e.g., MAC Address, IP Address).

Show Descriptions for All Interfaces:

```
R1# show interfaces description
```

