Router-on-a-Stick

```
Router(config)#interface fastethernet 0/0
Router(config-if)#no shutdown
Router(config-if)#interface fastethernet 0/0.10
Router(config-subif)#encapsulation dot1q 10          ----> VLAN 10
Router(config-subif)#ip address 192.168.10.1 255.255.255.0
Router(config-subif)#int fastethernet 0/0.20
Router(config-subif)#encapsulation dot1q 20          ----> VLAN 20

Router(config-subif)#ip address 192.168.20.1 255.255.255.0
Router(config-subif)#exit
```

Administrative Distance

Route Type	Administrative Distance
Connected	0
Static	1
EIGRP	90
IGRP	100
OSPF	110
RIP	120

Routing Protocol

Static Routing

- Static
- Default
- Floating

Dynamic Routing

- Distance Vector(RIP)
  - Auto-summary
  - Split-horizon
- Link state(OSPF)
  - Neighbor table
  - Topology table
  - Routing table
- Hybrid(EIGRP-Categorize in Distance Vector)
  - Auto-summary
  - Split-horizon
  - Neighbor table
  - Topology table
  - Routing table

Static/Default Route

Static Route

```
Router(config)#ip route 172.16.20.0 255.255.255.0 172.16.10.2
        172.16.20.0 = destination network 255.255.255.0 = subnet mask 172.16.10.2 =
next-hop address
```

Default Route

```
Router(config)#ip route 0.0.0.0 0.0.0.0 172.16.10.2
```

EIGRP

AD:90
Distance Vector
Composite Metric(Bandwidth + Delay)
Classless
224.0.0.10

```
Router(config)#router eigrp 1
Router(config-router)#no auto-summary
Router(config-router)#network 10.1.1.1 0.0.0.0
Router(config-router)#network 172.1.1.1 0.0.0.0
Router(config-router)#network 192.168.1.1 0.0.0.0
Router(config-router)#passive-interface fa0/0
Router(config-router)#passive-interface fa0/1
```

Or

```
Router(config)#router eigrp 1
Router(config-router)#no auto-summary
Router(config-router)#network 10.1.1.0 0.0.0.255
Router(config-router)#network 172.1.1.0 0.0.0.255
Router(config-router)#network 192.168.1.0 0.0.0.255
Router(config-router)#passive-interface default
Router(config-router)#no passive-interface serial 0/0
```

-Eigrp authentication-

```
Router(config)#key chain EIGRP-KEY
Router(config-keychain)#key 1
Router(config-keychain-key)#key-string PASSWORD

Router(config)#interface serial 0/0
Router(config-if)#ip address 192.168.1.5 255.255.255.0
Router(config-if)#ip authentication mode eigrp 1 md5
Router(config-if)#ip authentication key-chain eigrp 1 EIGRP-KEY
```

-Show commands-

```
Router#show ip eigrp neighbors
Router#show ip eigrp topology
Router#show ip route
```

OSPF

AD:110
Link State
Cost Metric(100,000,000/Link Speed)
Classless
224.0.0.5
224.0.0.6

```
Router(config)#router ospf 1

Router(config-router)#network 10.1.1.1 0.0.0.0 area 0
Router(config-router)#network 172.16.1.1 0.0.0.0 area 0
Router(config-router)#network 192.168.1.1 0.0.0.0 area 0
Router(config-router)#passive-interface fa0/0
Router(config-router)#passive-interface fa0/1
```

Or

```
Router(config)#router ospf 1

Router(config-router)#network 10.1.1.0 0.0.0.255 area 0
Router(config-router)#network 172.16.1.0 0.0.0.255 area 0
Router(config-router)#network 192.168.1.0 0.0.0.255 area 0
Router(config-router)#passive-interface default
Router(config-router)#no passive-interface serial 0/0
```

-OSPF authentication-

```
Router(config)#interface serial 0/0
Router(config-if)#ip address 192.168.1.5 255.255.255.0
Router(config-if)#ip ospf authentication message-digest
Router(config-if)#ip ospf message-digest-key 1 md5 PASSWORD
```

-Show commands-

```
Router#show ip ospf neighbor
Router#show ip ospf database
Router#show ip route
```

ACL

Funtions

Packet Filtering
Quality of Service(QoS)
Network Address Translation(NAT)
Route Filtering

--Standard ACL

```
Router(config)#access-list 1 permit 192.168.1.0 0.0.0.255
Router(config)#access-list 1 permit host 172.16.1.10
Router(config)#access-list 1 permit 172.16.1.11 0.0.0.0

Router(config)#interface f0/0
Router(config-if)#ip access-group 1 in
```

--Extended ACL

```
Router(config)#access-list 100 permit ip any 192.168.1.0 0.0.0.255
Router(config)#access-list 100 permit tcp any host 172.16.1.10 eq 23
Router(config)#access-list 100 permit udp any 192.168.1.0 0.0.0.255 eq snmp
Router(config)#access-list 100 permit icmp any any echo

Router(config)#interface f0/0
Router(config-if)#ip access-group 100 in
```

--Named ACL

```
Router(config)#ip access-list standard SACL
Router(config-std-nacl)#permit host 10.1.1.1
Router(config-std-nacl)#permit host 10.2.2.2
Router(config-std-nacl)#permit host 10.3.3.3

Router(config)#interface f0/0
Router(config-if)#ip access-group SACL in
```

--VTY Access

```
Router(config)#access-list 10 permit host 172.16.70.100

Router(config)#line vty 0 4
Router(config-line)#access-class 10 in
```

NAT

```
Router(config)#interface fastethernet0
Router(config-if)#ip nat inside

Router(config)#interface serial0
Router(config-if)#ip nat outside
```

--Static Nat

```
Router(config)#ip nat inside source static 192.168.1.50 172.16.100.1
```

--Nat Overload

```
Router(config)#ip access-list standard INTERNAL_ADDRESSES
Router(config-std-nacl)#permit 172.16.0.0 0.0.255.255

Router(config)#ip nat inside source list INTERNAL_ADDRESSES interface serial 0
overload
```

--Dynamic Nat

```
Router(config)#ip nat pool INTERNAL_NETWORK 192.168.1.100 192.168.1.199
prefix-length 24
```

```
Router(config)#ip access-list standard INTERNAL_ADDRESSES
Router(config-std-nacl)#permit 172.16.0.0 0.0.255.255

Router(config)#ip nat inside source list INTERNAL_ADDRESSES pool INTERNAL_NETWORK


----------------------------------------
HDLC
----------------------------------------

Router(config)#interface serial0/0
Router(config-if)#encapsulation hdlc


----------------------------------------
PPP
----------------------------------------

Router(config)#interface serial0/0
Router(config-if)#encapsulation ppp

CHAP authentication
Router(config)#username R2 password ABC
Router(config)#interface serial0/0
Router(config-if)#ppp authentication chap


----------------------------------------
Frame Relay
----------------------------------------

Multipoint

Router(config)#interface serial0/0
Router(config-if)#encapsulation frame-relay
Router(config-if)#no frame-relay inverse arp
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#frame-relay map ip 192.168.1.2 102 broadcast


Point-to-point

Router(config)#interface serial0/0
Router(config-if)#encapsulation frame-relay
Router(config-if)#no frame-relay inverse arp
Router(config)#interface serial0/0.1 point-to-point
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#frame-relay interface-dlci 102


----------------------------------------
EtherChannel (Port Aggregation)
----------------------------------------

On
PAgP (Port Aggregation Protocol)
 Cisco Proprietary
 At least one side to be Desirable
 Mode:
  Desirable
  Auto
```

```
LACP (Link Aggregation Control Protocol)
 Industry Standard
 At least one side to be Active
 Mode:
  Active
  Passive

interface range f0/1 - 4
 shutdown
 sw trunk encapsulation dot1q
 sw mode trunk
 channel-group 1 mode on
 no shutdown

interface range f0/5 - 8
 shutdown
 sw trunk encapsulation dot1q
 sw mode trunk
 channel-group 2 mode desirable
 no shutdown

interface range f0/9 - 12
 shutdown
 sw trunk encapsulation dot1q
 sw mode trunk
 channel-group 3 mode active
 no shutdown

interface port-channel 1
interface port-channel 2
interface port-channel 3


----------------------------------------
FHRP
----------------------------------------

 HSRP
 VRRP
 GLBP


----------------------------------------
HSRP
----------------------------------------

interface vlan 50
 ip address 192.168.1.10 255.255.255.0
 standby 1 priority 200
 standby 1 preempt
 standby 1 ip 192.168.1.1
 standby 2 priority 100
 standby 2 ip 192.168.1.2

sh standby br


----------------------------------------
VRRP
----------------------------------------

interface vlan 50
 ip address 192.168.1.10 255.255.255.0
```

```
 vrrp 1 priority 200
 vrrp 1 ip 192.168.1.1
 vrrp 2 priority 100
 vrrp 2 ip 192.168.1.2

sh vrrp br


----------------------------------------
GLBP
----------------------------------------
interface vlan 50
 ip address 192.168.1.10 255.255.255.0
 glbp 1 priority 200
 glbp 1 preempt
 glbp 1 ip 192.168.1.1

sh glbp br
```