SMALL OFFICE NETWORK DESIGN

(Cisco Packet Tracer – Step-by-Step Configuration with Explanations)

PHASE 1: PHYSICAL TOPOLOGY

Devices Used:

- Main Router (Customer Edge Router)
- Layer 2 Switch
- PCs (Departments: VLAN 10, 20, 30)
- ISP Router

Connections:

- PCs → Switch (Access ports)
- Switch → Main Router (Trunk link)
- Main Router → ISP Router (WAN link using crossover cable)

PHASE 2: SWITCH CONFIGURATION (VLANs & TRUNKING)

```
enable
configure terminal
(Enter privileged and global configuration mode)

vlan 10
name ADMIN
(Creates VLAN 10 for Admin department)

vlan 20
name IT
(Creates VLAN 20 for IT department)

vlan 30
name HR
(Creates VLAN 30 for HR department)
```

ASSIGN ACCESS PORTS TO VLANs

```
interface range fa0/2 - fa0/7
switchport mode access
switchport access vlan 10
(Assigns Admin PCs to VLAN 10)

interface range fa0/8 - fa0/15
switchport mode access
switchport access vlan 20
(Assigns IT PCs to VLAN 20)

interface range fa0/16 - fa0/21
switchport mode access
switchport access vlan 30
(Assigns HR PCs to VLAN 30)
```

CONFIGURE TRUNK TO ROUTER

```
interface fa0/1
switchport mode trunk
(All VLAN traffic can pass between switch and router)

exit
write memory
(Saves switch configuration)
```

PHASE 3: ROUTER-ON-A-STICK (INTER-VLAN ROUTING)

```
enable
configure terminal

interface fastEthernet1/0
no shutdown
(Enables the physical interface; router interfaces are shutdown
by default)
```

SUBINTERFACES (ONE PER VLAN)

```
interface fastEthernet1/0.10
encapsulation dot1Q 10
ip address 192.168.10.1 255.255.255.0
(Creates gateway for VLAN 10 using 802.1Q tagging)

interface fastEthernet1/0.20
encapsulation dot1Q 20
ip address 192.168.20.1 255.255.255.0
(Creates gateway for VLAN 20)

interface fastEthernet1/0.30
encapsulation dot1Q 30
ip address 192.168.30.1 255.255.255.0
(Creates gateway for VLAN 30)

exit
```

PHASE 4: DHCP CONFIGURATION (AUTOMATIC IP ASSIGNMENT)

```
ip dhcp excluded-address 192.168.10.1
ip dhcp excluded-address 192.168.20.1
ip dhcp excluded-address 192.168.30.1
(Prevents router gateway IPs from being assigned to clients)
```

DHCP POOLS

```
ip dhcp pool VLAN10
network 192.168.10.0 255.255.255.0
default-router 192.168.10.1
(Defines DHCP pool for VLAN 10)

ip dhcp pool VLAN20
network 192.168.20.0 255.255.255.0
default-router 192.168.20.1
(Defines DHCP pool for VLAN 20)

ip dhcp pool VLAN30
network 192.168.30.0 255.255.255.0
default-router 192.168.30.1
(Defines DHCP pool for VLAN 30)

exit
```

PHASE 5: PC TESTING

On each PC:

- Desktop
- IP Configuration
- Select DHCP
- Verify IP is received in correct subnet

PHASE 6: ISP ROUTER CONFIGURATION

```
enable
configure terminal

interface fastEthernet0/0
ip address 200.1.1.1 255.255.255.252
no shutdown
(Assigns WAN IP to ISP router)
```

SIMULATE INTERNET USING LOOPBACK

```
interface loopback0
ip address 8.8.8.8 255.255.255.255
(Simulates an internet destination like Google DNS)
```

ROUTE BACK TO CUSTOMER NETWORK

```
ip route 192.168.0.0 255.255.0.0 200.1.1.2
(Tells ISP how to reach internal LAN networks)

exit
write memory
```

PHASE 7: MAIN ROUTER WAN CONFIGURATION

```
interface fastEthernet0/0
ip address 200.1.1.2 255.255.255.252
no shutdown
(Assigns public-facing IP to main router)
```

DEFAULT ROUTE TO ISP

```
ip route 0.0.0.0 0.0.0.0 200.1.1.1
(Sends all unknown traffic to ISP router)
```

PHASE 8: NAT CONFIGURATION (PAT / OVERLOAD)

```
interface fastEthernet1/0.10
ip nat inside
(Marks VLAN 10 traffic as internal)

interface fastEthernet1/0.20
ip nat inside
(Marks VLAN 20 traffic as internal)

interface fastEthernet1/0.30
ip nat inside
(Marks VLAN 30 traffic as internal)

interface fastEthernet0/0
ip nat outside
(Marks WAN interface as external)
```

NAT RULE

```
access-list 1 permit 192.168.0.0 0.0.255.255
(Defines which private IPs are allowed to be translated)

ip nat inside source list 1 interface fastEthernet0/0 overload
(Allows many private IPs to share one public IP)
```

PHASE 9: FINAL VERIFICATION

```
ping 8.8.8.8
(Tests end-to-end internet connectivity)

show ip nat translations
(View active NAT sessions)

show ip nat statistics
(View NAT performance counters)
```

END OF CONFIGURATION