CSE 4215 (Network Security) – Lab
Dept of CSE, RUET
IPSec

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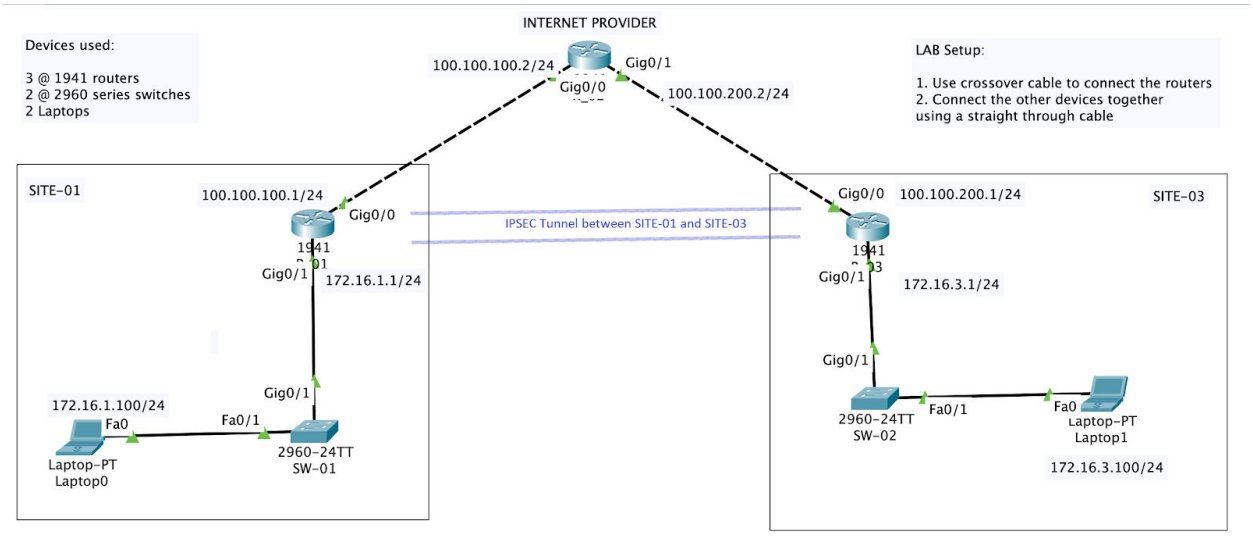
Construct the following Network using packet tracer




# Initial Setup

1/ Use a crossover cable to connect the routers together. We are using the 1941 Routers for this topology.

2/ Connect the other devices together using a straight through cable connection.

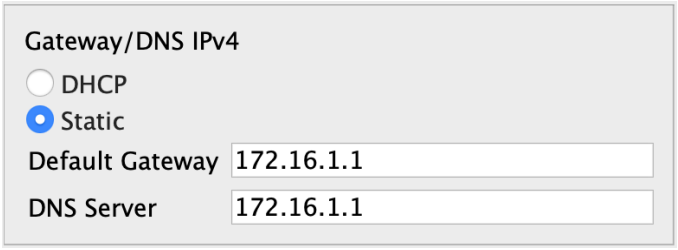
3/ Perform initial router configuration.

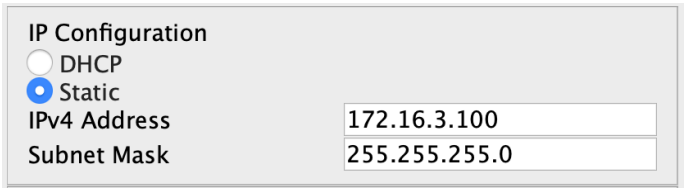
Configure the interface IP addresses on the routers and a default route on R_01 and R_03 pointing to the R_02 router. The R_02 router acts as an internet provider and has no knowledge of other networks except its directly connected network.

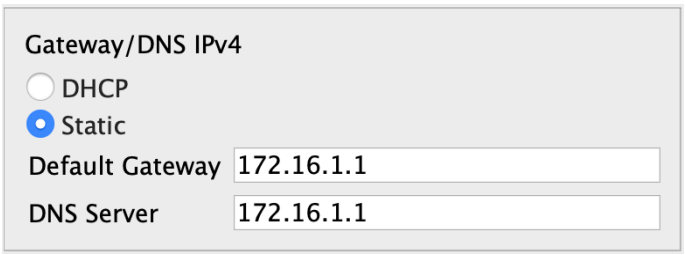
```
hostname R_01
interface g0/1
ip address 172.16.1.1 255.255.255.0
no shut
interface g0/0
ip address 100.100.100.1 255.255.255.0
no shut
exit
ip route 0.0.0.0 0.0.0.0 100.100.100.2
```

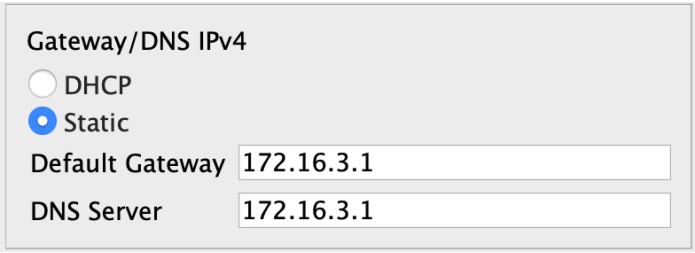
```
hostname R_02
interface g0/1
ip address 100.100.200.2 255.255.255.0
no shut
interface g0/0
ip address 100.100.100.2 255.255.255.0
no shut
exit

hostname R_03
interface g0/1
ip address 172.16.3.1 255.255.255.0
no shut
interface g0/0
ip address 100.100.200.1 255.255.255.0
no shut
exit
ip route 0.0.0.0 0.0.0.0 100.100.200.2
```

4/ Ensure that the laptops have static IP addresses configured. Laptop0 should have IP 172.16.1.100/24. Laptop1 should have 172.16.3.100/24. Attempt pinging across from Laptop0 to Laptop1. This should fail as R_02 does not know how to route this traffic.






```
!Laptop0
ping 172.16.3.100

!Laptop1
ping 172.16.1.100
```

5/ Activate licensing on the edge routers. Ensure that you have the security license enabled on R_01 and R_03.

```
show version
license boot module c1900 technology-package securityk9
copy run start
reload
show version
```

# IPSec VPN Configuration

For the IPSec Tunnel to come up. The configuration on both ends need to be match for both Phase 1 and Phase 2 to be successful. The tunnel will be formed between R_01 and R_03.

1/ Setup an ACL that will specify which interesting traffic will be allowed to pass through the tunnel.

```
!R_01
access-list 100 permit ip 172.16.1.0 0.0.0.255 172.16.3.0 0.0.0.255

!R_03
access-list 100 permit ip 172.16.3.0 0.0.0.255 172.16.1.0 0.0.0.255
```

2/ Setup Phase 1 of the IPSec Tunnel. In this part, we define the ISAKMP policy and specify that we will use a preshared key. This is also defined in this case.

```
!R_01
crypto isakmp policy 10
    encryption aes 256
    authentication pre-share
    group 5
!
crypto isakmp key Secret-2020 address 100.100.200.1

!R_03
crypto isakmp policy 10
    encryption aes 256
    authentication pre-share
    group 5
!
crypto isakmp key Secret-2020 address 100.100.100.1
```

3/ Next, we setup phase 2 of the IPSec Tunnel (IPsec Transform-set). This is where the IKE negotiation takes place. We will be using 256 bit AES encryption with hash message authentication code providing confidentiality, integrity and authentication.

```
! R_01
crypto ipsec transform-set R_01-R_03 esp-aes 256 esp-sha-hmac

! R_03
crypto ipsec transform-set R_03-R_01 esp-aes 256 esp-sha-hmac
```

4/ All we need to do next is to tie Phase 1 and Phase 2 together by defining the crypto map

```
!R_01
crypto map IPSEC-CRYPTOMAP 100 ipsec-isakmp
 set peer 100.100.200.1
 set pfs group5
 set security-association lifetime seconds 86400
 set transform-set R_01-R_03
 match address 100

!R_03
crypto map IPSEC-CRYPTOMAP 100 ipsec-isakmp
 set peer 100.100.100.1
 set pfs group5
 set security-association lifetime seconds 86400
 set transform-set R_03-R_01
```

```
 match address 100
```

5/ We then activate IPSec on the outbound interface by applying the crypto map to the interface.

```
!R_01
interface GigabitEthernet0/0
 crypto map IPSEC-CRYPTOMAP


!R_03
interface GigabitEthernet0/0
 crypto map IPSEC-CRYPTOMAP
```

6/ For the tunnel to comeuppance, we need to start pings through the tunnel. Attempt pinging across from Laptop0 to Laptop1. The pings may initially fail, but if all configuration is accurate, the pings should succeed after a couple of tries.

```
!Laptop0
ping 172.16.3.100


!Laptop1
ping 172.16.1.100
```

7/ Finally, lets verify that the tunnel is up and running using the below commands:

```
R_01#show crypto ipsec sa


interface: GigabitEthernet0/0
    Crypto map tag: IPSEC-MAP, local addr 100.100.100.1


   protected vrf: (none)
   local  ident (addr/mask/prot/port): (172.16.1.0/255.255.255.0/0/0)
   remote  ident (addr/mask/prot/port): (172.16.3.0/255.255.255.0/0/0)
   current_peer 100.100.200.1 port 500
    PERMIT, flags={origin_is_acl,}
   #pkts encaps: 7, #pkts encrypt: 7, #pkts digest: 0
   #pkts decaps: 6, #pkts decrypt: 6, #pkts verify: 0
   #pkts compressed: 0, #pkts decompressed: 0
   #pkts not compressed: 0, #pkts compr. failed: 0
   #pkts not decompressed: 0, #pkts decompress failed: 0
   #send errors 1, #recv errors 0
```

```
     local crypto endpt.: 100.100.100.1, remote crypto
endpt.:100.100.200.1
     path mtu 1500, ip mtu 1500, ip mtu idb GigabitEthernet0/0
     current outbound spi: 0xD0212CD7(3491835095)

     inbound esp sas:
      spi: 0x90BB08EE(2428176622)
        transform: esp-aes 256 esp-sha-hmac ,
        in use settings ={Tunnel, }
        conn id: 2005, flow_id: FPGA:1, crypto map: IPSEC-MAP
        sa timing: remaining key lifetime (k/sec): (4525504/86381)
        IV size: 16 bytes
        replay detection support: N
        Status: ACTIVE

     inbound ah sas:

     inbound pcp sas:

     outbound esp sas:
      spi: 0xD0212CD7(3491835095)
        transform: esp-aes 256 esp-sha-hmac ,
        in use settings ={Tunnel, }
        conn id: 2006, flow_id: FPGA:1, crypto map: IPSEC-MAP
        sa timing: remaining key lifetime (k/sec): (4525504/86381)
        IV size: 16 bytes
        replay detection support: N
        Status: ACTIVE

     outbound ah sas:

     outbound pcp sas:
```

End