Memòria Taller #4 Core Network MPLS

TXC

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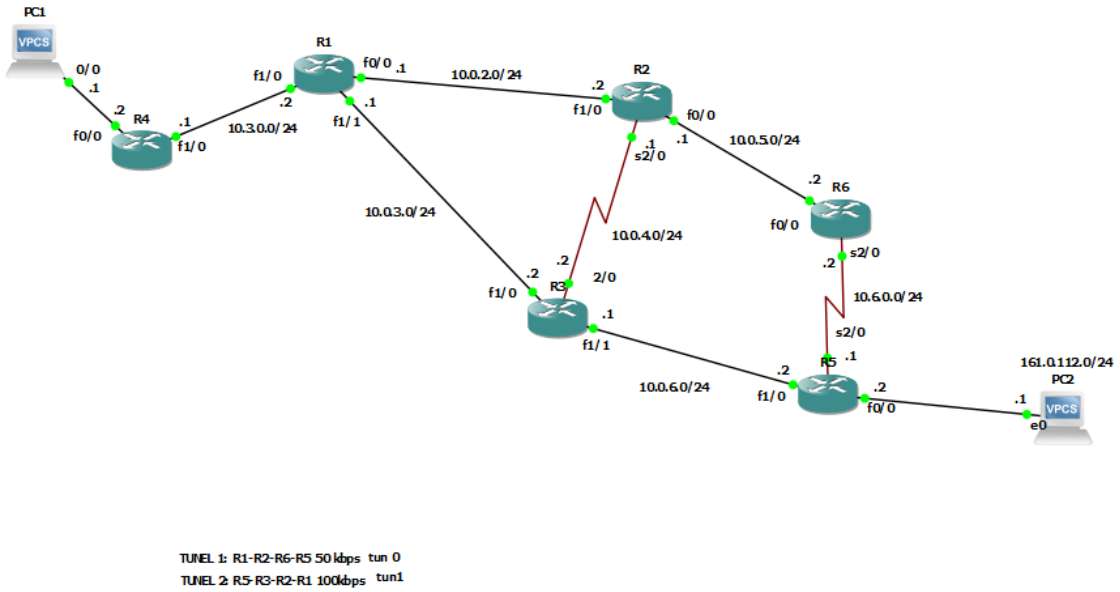
1. Esquema de la xarxa desenvolupada



Les adreses son les mateixes que les del exemple donat pero li he sumat un digit en algun numero de la seva direcció. Les direccions de loopback corresponen al número de router: RX.RX.RX.RX tal que amb el R4 te @loo = 4.4.4.4

El tunel0 corre per les IP: 10.0.2.1, 10.0.5.1, 10.6.0.2, 5.5.5.5

El tunel1 corre per les IP: 10.0.6.2, 10.0.4.2, 10.0.2.2, 1.1.1.1

Direccions de PC1 i PC2 corresponents: 146.0.104.1, 161.0.112.1

2. Relació de les línies de programació

R1:

```
interface Loopback0
 ip address 1.1.1.1 255.255.255.0
!
interface Tunnel0
 ip unnumbered Loopback0
 tunnel mode mpls traffic-eng
 tunnel destination 5.5.5.5
 tunnel mpls traffic-eng autoroute announce
 tunnel mpls traffic-eng priority 7 7
 tunnel mpls traffic-eng bandwidth 50
 tunnel mpls traffic-eng path-option 1 explicit name LP1
 no routing dynamic
!
interface FastEthernet0/0
 ip address 10.0.2.1 255.255.255.0
 duplex half
 mpls traffic-eng tunnels
 mpls ip
 ip rsvp bandwidth 150
!
interface FastEthernet1/0
 ip address 10.3.0.2 255.255.255.0
 duplex auto
 speed auto
 mpls ip
!
interface FastEthernet1/1
 ip address 10.0.3.1 255.255.255.0
 duplex auto
 speed auto
 mpls ip
!
router ospf 1
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 0
 network 1.1.1.0 0.0.0.255 area 0
 network 10.0.2.0 0.0.0.255 area 0
 network 10.0.3.0 0.0.0.255 area 0
 network 10.3.0.0 0.0.0.255 area 0
!
ip forward-protocol nd
no ip http server
no ip http secure-server
!
!
!
ip explicit-path name LP1 enable
 next-address 10.0.2.1
 next-address 10.0.5.1
 next-address 10.6.0.2
 next-address 5.5.5.5
```

R2:

```
interface Loopback0
 ip address 2.2.2.2 255.255.255.0
!
interface FastEthernet0/0
 ip address 10.0.5.1 255.255.255.0
 duplex auto
 speed auto
 mpls traffic-eng tunnels
 mpls ip
 ip rsvp bandwidth 150
!
interface FastEthernet0/1
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface FastEthernet1/0
 ip address 10.0.2.2 255.255.255.0
 duplex auto
 speed auto
 mpls traffic-eng tunnels
 mpls ip
 ip rsvp bandwidth 150
!
interface FastEthernet1/1
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface Serial2/0
 ip address 10.0.4.1 255.255.255.0
 mpls traffic-eng tunnels
 mpls ip
 serial restart-delay 0
 ip rsvp bandwidth 150
!
```

```
!
router ospf 1
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 0
 network 2.2.2.0 0.0.0.255 area 0
 network 10.0.2.0 0.0.0.255 area 0
 network 10.0.4.0 0.0.0.255 area 0
 network 10.0.5.0 0.0.0.255 area 0
!
```

R3:

```
interface Loopback0
 ip address 3.3.3.3 255.255.255.0
!
interface FastEthernet0/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface FastEthernet0/1
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface FastEthernet1/0
 ip address 10.0.3.2 255.255.255.0
 duplex auto
 speed auto
 mpls ip
!
interface FastEthernet1/1
 ip address 10.0.6.1 255.255.255.0
 duplex auto
 speed auto
 mpls traffic-eng tunnels
 mpls ip
 ip rsvp bandwidth 150
!
interface Serial2/0
 ip address 10.0.4.2 255.255.255.0
 mpls traffic-eng tunnels
 mpls ip
 serial restart-delay 0
 ip rsvp bandwidth 150
!
```

```
!
router ospf 1
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 0
 network 3.3.3.0 0.0.0.255 area 0
 network 10.0.3.0 0.0.0.255 area 0
 network 10.0.4.0 0.0.0.255 area 0
 network 10.0.6.0 0.0.0.255 area 0
!
```

R4:

```
!
interface Loopback0
 ip address 4.4.4.4 255.255.255.0
!
interface FastEthernet0/0
 ip address 146.0.104.2 255.255.255.0
 duplex half
!
interface FastEthernet1/0
 ip address 10.3.0.1 255.255.255.0
 duplex auto
 speed auto
 mpls ip
!
interface FastEthernet1/1
 no ip address
 shutdown
 duplex auto
 speed auto
!
router ospf 1
 network 4.4.4.0 0.0.0.255 area 0
 network 10.0.2.0 0.0.0.255 area 0
 network 10.0.5.0 0.0.0.255 area 0
 network 10.3.0.0 0.0.0.255 area 0
 network 146.0.104.0 0.0.0.255 area 0
!
```

R5:

```
interface Loopback0
 ip address 5.5.5.5 255.255.255.0
!
interface Tunnel1
 ip unnumbered Loopback0
 tunnel mode mpls traffic-eng
 tunnel destination 1.1.1.1
 tunnel mpls traffic-eng autoroute announce
 tunnel mpls traffic-eng priority 7 7
 tunnel mpls traffic-eng bandwidth 100
 tunnel mpls traffic-eng path-option 1 explicit name LP2
 no routing dynamic
!
interface FastEthernet0/0
 ip address 161.0.112.2 255.255.255.0
 duplex auto
 speed auto
!
```

```
!
interface FastEthernet1/0
 ip address 10.0.6.2 255.255.255.0
 duplex auto
 speed auto
 mpls traffic-eng tunnels
 mpls ip
 ip rsvp bandwidth 150
!
```

```
!
interface Serial2/0
 ip address 10.6.0.1 255.255.255.0
 mpls traffic-eng tunnels
 mpls ip
 serial restart-delay 0
 ip rsvp bandwidth 150
!
```

```
!
router ospf 1
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 0
 network 5.5.5.0 0.0.0.255 area 0
 network 10.0.6.0 0.0.0.255 area 0
 network 10.6.0.0 0.0.0.255 area 0
 network 161.0.112.0 0.0.0.255 area 0
!
ip forward-protocol nd
no ip http server
no ip http secure-server
!
!
!
ip explicit-path name LP2 enable
 next-address 10.0.6.2
 next-address 10.0.4.2
 next-address 10.0.2.2
 next-address 1.1.1.1
!
```

R6:

```
!
interface Loopback0
 ip address 6.6.6.6 255.255.255.0
!
interface FastEthernet0/0
 ip address 10.0.5.2 255.255.255.0
 duplex half
 mpls traffic-eng tunnels
 mpls ip
 ip rsvp bandwidth 150
!
```

```
!
interface Serial2/0
 ip address 10.6.0.2 255.255.255.0
 mpls traffic-eng tunnels
 mpls ip
 serial restart-delay 0
 ip rsvp bandwidth 150
!
```

```
!
router ospf 1
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 0
 network 6.6.6.0 0.0.0.255 area 0
 network 10.0.5.0 0.0.0.255 area 0
 network 10.6.0.0 0.0.0.255 area 0
!
```

3. Comentaris

He tingut un parell de problemes amb la resolució de la xarxa en gns3.

La primera es que no m'anava la configuracio inicial del ospf perquè no havia inclòs les xarxes de loopback al área 0 llavors al no saber el router-id aquest no podía construir una topología.

La segona que a la hora de crear les direccions estàtiques del tunel he en mes de ficar la direcció origen del router havia posat les de la mateixa xarxa pero de la interfície del següent router llavors no sabia com anar pel túnel.

La ultima es que inicialment no he posat routers on PC1 i PC2 llavors son ordinadors virtuals i aquests no admeten la comanda traceroute els pings si. Llavors els traceroute els he hagut de fer desde el router mes proper al ordinador he aquí una prova del que dic i els pings entre PCS perquè es pugui veure que funcioni la xarxa:

```
PC1> ping 161.0.112.1
84 bytes from 161.0.112.1 icmp_seq=1 ttl=59 time=153.063 ms
84 bytes from 161.0.112.1 icmp_seq=2 ttl=59 time=151.924 ms
84 bytes from 161.0.112.1 icmp_seq=3 ttl=59 time=152.305 ms
84 bytes from 161.0.112.1 icmp_seq=4 ttl=59 time=152.420 ms
84 bytes from 161.0.112.1 icmp_seq=5 ttl=59 time=151.061 ms

PC1> traceroute 161.0.112.1
Bad command: "traceroute 161.0.112.1". Use ? for help.
```

Ping de PC1 a PC2 i prova que el traceroute no el puc usar i l'haure de fer servir en el router de davant de cada pc.

```
PC2> ping 146.0.104.1
84 bytes from 146.0.104.1 icmp_seq=1 ttl=59 time=151.681 ms
84 bytes from 146.0.104.1 icmp_seq=2 ttl=59 time=153.103 ms
84 bytes from 146.0.104.1 icmp_seq=3 ttl=59 time=151.785 ms
84 bytes from 146.0.104.1 icmp_seq=4 ttl=59 time=152.036 ms
84 bytes from 146.0.104.1 icmp_seq=5 ttl=59 time=152.343 ms
```

He fet servir tres pàgines més perque sino quedaven les configuracions del router molt petites i no es veia res de res.

4. Resultats

Traceroutes desde davant de cada pc per PC1->R4 , PC2->R5:

```
R5#traceroute 146.0.104.1
Type escape sequence to abort.
Tracing the route to 146.0.104.1
VRF info: (vrf in name/id, vrf out name/id)
  1 10.0.6.1 [MPLS: Label 18 Exp 0] 116 msec 92 msec 88 msec
  2 10.0.4.1 [MPLS: Label 17 Exp 0] 92 msec 84 msec 88 msec
  3 10.0.2.1 88 msec 80 msec 92 msec
  4 10.3.0.1 124 msec 116 msec 124 msec
  5 146.0.104.1 132 msec 132 msec 140 msec
```

```
R4#traceroute 161.0.112.1
Type escape sequence to abort.
Tracing the route to 161.0.112.1
VRF info: (vrf in name/id, vrf out name/id)
  1 10.3.0.2 [MPLS: Label 28 Exp 0] 24 msec 32 msec 28 msec
  2 10.0.2.2 [MPLS: Label 18 Exp 0] 124 msec 124 msec 116 msec
  3 10.0.5.2 [MPLS: Label 17 Exp 0] 112 msec 120 msec 116 msec
  4 10.6.0.1 116 msec 128 msec 108 msec
  5 161.0.112.1 148 msec 128 msec 140 msec
```

info. tun0:


```
R1#show mpls traffic-eng tunnels tunnel 0

Name: R1_t0                               (Tunnel0) Destination: 5.5.5.5
  Status:
    Admin: up         Oper: up     Path: valid       Signalling: connected
    path option 1, type explicit LP1 (Basis for Setup, path weight 66)

  Config Parameters:
    Bandwidth: 50       kbps (Global)  Priority: 7  7   Affinity: 0x0/0xFFFF
    Metric Type: TE (default)
    AutoRoute:  enabled   LockDown: disabled  Loadshare: 50       bw-based
    auto-bw: disabled
  Active Path Option Parameters:
    State: explicit path option 1 is active
    BandwidthOverride: disabled  LockDown: disabled  Verbatim: disabled


  InLabel  :  -
  OutLabel : FastEthernet0/0, 18
  RSVP Signalling Info:
       Src 1.1.1.1, Dst 5.5.5.5, Tun_Id 0, Tun_Instance 8
    RSVP Path Info:
      My Address: 10.0.2.1
      Explicit Route: 10.0.2.2 10.0.5.1 10.0.5.2 10.6.0.1
                      5.5.5.5
      Record   Route:   NONE
      Tspec: ave rate=50 kbits, burst=1000 bytes, peak rate=50 kbits
    RSVP Resv Info:
      Record   Route:   NONE
      Fspec: ave rate=50 kbits, burst=1000 bytes, peak rate=50 kbits
  Shortest Unconstrained Path Info:
    Path Weight: 66 (TE)
    Explicit Route: 10.0.2.1 10.0.2.2 10.0.5.1 10.0.5.2
                    10.6.0.1 5.5.5.5
  History:
    Tunnel:
      Time since created: 2 hours, 20 minutes
      Time since path change: 2 hours, 13 minutes
      Number of LSP IDs (Tun_Instances) used: 8
    Current LSP:
      Uptime: 2 hours, 13 minutes
      Selection: reoptimization
    Prior LSP:
      ID: path option 1 [7]
      Removal Trigger: configuration changed
```

info. tun1:

```
R5#show mpls traffic-eng tunnels tunnel 1

Name: R5_t1                               (Tunnel1) Destination: 1.1.1.1
  Status:
    Admin: up         Oper: up     Path: valid       Signalling: connected
    path option 1, type explicit LP2 (Basis for Setup, path weight 66)

  Config Parameters:
    Bandwidth: 100      kbps (Global)  Priority: 7  7   Affinity: 0x0/0xFFFF
    Metric Type: TE (default)
    AutoRoute:  enabled   LockDown: disabled  Loadshare: 100      bw-based
    auto-bw: disabled
  Active Path Option Parameters:
    State: explicit path option 1 is active
    BandwidthOverride: disabled  LockDown: disabled  Verbatim: disabled


  InLabel  :  -
  OutLabel : FastEthernet1/0, 18
  RSVP Signalling Info:
       Src 5.5.5.5, Dst 1.1.1.1, Tun_Id 1, Tun_Instance 7
    RSVP Path Info:
      My Address: 10.0.6.2
      Explicit Route: 10.0.6.1 10.0.4.1 10.0.2.2 10.0.2.1
                      1.1.1.1
      Record   Route:   NONE
      Tspec: ave rate=100 kbits, burst=1000 bytes, peak rate=100 kbits
    RSVP Resv Info:
      Record   Route:   NONE
      Fspec: ave rate=100 kbits, burst=1000 bytes, peak rate=100 kbits
  Shortest Unconstrained Path Info:
    Path Weight: 66 (TE)
    Explicit Route: 10.0.6.2 10.0.6.1 10.0.4.1 10.0.2.2
                    10.0.2.1 1.1.1.1
  History:
    Tunnel:
      Time since created: 2 hours, 7 minutes
      Time since path change: 2 hours, 5 minutes
      Number of LSP IDs (Tun_Instances) used: 7
    Current LSP:
      Uptime: 2 hours, 5 minutes
      Selection: reoptimization
    Prior LSP:
      ID: path option 1 [6]
      Removal Trigger: configuration changed
```

5. Referències

Per a configurar MPLS-TE :

https://www.youtube.com/watch?v=VZ0Vz62htmM

Per a configurar MPLS:

https://www.youtube.com/watch?v=1gZuEO6VsXA

Per a configurar OSPF

https://www.youtube.com/watch?v=moGLhgJIbVg&t=1263s

He consultat també les diapositives de la asignatura i la referencia que donava el taller.