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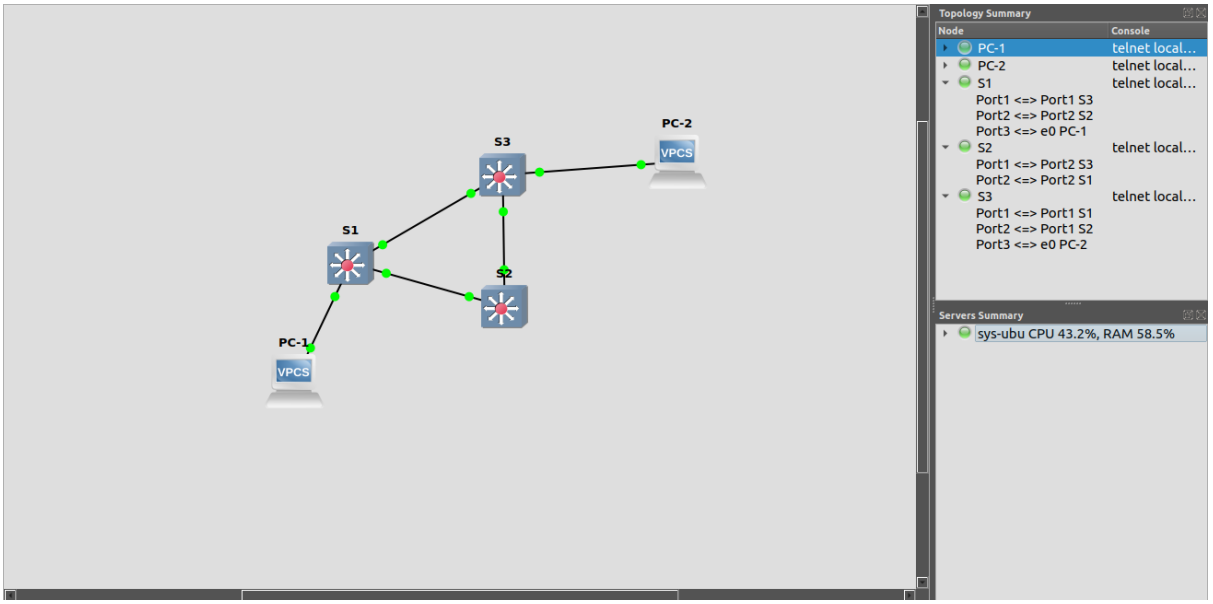
## 2.1. Configuración de VLAN

### 1. (0.5 puntos) Construya la siguiente Topología.

**PC-1#ip 192.168.10.2/24**
**PC-2#ip 192.168.10.3/24**

**EXOS-VM-1#config snmp sysname S1**
**EXOS-VM-2#config snmp sysname S2**
**EXOS-VM-3#config snmp sysname S3**




```
PC-1> ip 192.168.10.2/24
Checking for duplicate address...
PC-1 : 192.168.10.2 255.255.255.0

PC-1>
```

```
PC-2> ip 192.168.10.3/24
Checking for duplicate address...
PC-2 : 192.168.10.3 255.255.255.0

PC-2>
```

```
* EXOS-VM.1 #
* EXOS-VM.1 #
* EXOS-VM.1 #
* EXOS-VM.1 # config snmp sysname S1
* S1.2 #
```

```
* EXOS-VM.1 # config snmp sysname S2
* S2.2 #
```

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```
* EXOS-VM.1 # config snmp sysname S3
* S3.2 #
```

**2. (1 punto) Crea y configura la VLAN itx con vlan-id 10 en los swicthes S1, S2 y S3. Por ejemplo:**

**S1#create vlan itx tag 10**
**S1#configure vlan itx add port 1,2 tagged**
**S1#configure vlan itx add port 3**
**S1#sh vlan**
**S1#sh vlan itx**
**S1#sh vlan ports <port_list>**

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```
* S1.5 # sh vlan itx
VLAN Interface with name itx created by user
    Admin State:         Enabled     Tagging:   802.1Q Tag 10
    Description:         None
    Virtual router:      VR-Default
    IP Anycast:          Disabled
    IPv4 Forwarding:     Disabled
    IPv4 MC Forwarding:  Disabled
    IPv6 Forwarding:     Disabled
    IPv6 MC Forwarding:  Disabled
    IPv6:                None
    STPD:                None
    Protocol:            Match all unfiltered protocols
    Loopback:            Disabled
    NetLogin:            Disabled
    QosProfile:          None configured
    Egress Rate Limit Designated Port: None configured
    Flood Rate Limit QosProfile:       None configured
    Suppress ARP:        Disabled
    Suppress ND:         Disabled
    Proxy ARP:           Entry required
    Ports:   3.           (Number of active ports=3)
       Untag:      *3
       Tag:        *1,     *2
        Flags:    (*) Active, (!) Disabled, (g) Load Sharing port
                  (b) Port blocked on the vlan, (m) Mac-Based port
                  (i) Port inactivated on the vlan due to VXLAN configuration
                  (a) Egress traffic allowed for NetLogin
                  (u) Egress traffic unallowed for NetLogin
                  (t) Translate VLAN tag for Private-VLAN
                  (s) Private-VLAN System Port, (L) Loopback port
                  (x) VMAN Tag Translated port
                  (A) Dynamically added by Auto-peering
                  (F) Dynamically added by Fabric Attach
                  (G) Multi-switch LAG Group port
                  (H) Dynamically added by MVRP
                  (I) Dynamically added by IDM
                  (N) Dynamically added by Netlogin
                  (U) Dynamically added uplink port
                  (V) Dynamically added by VM Tracking

* S1.6 #
```

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```
* S2.4 # sh vlan itx
VLAN Interface with name itx created by user
    Admin State:         Enabled     Tagging:   802.1Q Tag 10
    Description:         None
    Virtual router:      VR-Default
    IP Anycast:          Disabled
    IPv4 Forwarding:     Disabled
    IPv4 MC Forwarding:  Disabled
    IPv6 Forwarding:     Disabled
    IPv6 MC Forwarding:  Disabled
    IPv6:                None
    STPD:                None
    Protocol:            Match all unfiltered protocols
    Loopback:            Disabled
    NetLogin:            Disabled
    QosProfile:          None configured
    Egress Rate Limit Designated Port: None configured
    Flood Rate Limit QosProfile:       None configured
    Suppress ARP:        Disabled
    Suppress ND:         Disabled
    Proxy ARP:           Entry required
    Ports:   2.           (Number of active ports=2)
       Tag:        *1,     *2
        Flags:    (*) Active, (!) Disabled, (g) Load Sharing port
                  (b) Port blocked on the vlan, (m) Mac-Based port
                  (i) Port inactivated on the vlan due to VXLAN configuration
                  (a) Egress traffic allowed for NetLogin
                  (u) Egress traffic unallowed for NetLogin
                  (t) Translate VLAN tag for Private-VLAN
                  (s) Private-VLAN System Port, (L) Loopback port
                  (x) VMAN Tag Translated port
                  (A) Dynamically added by Auto-peering
                  (F) Dynamically added by Fabric Attach
                  (G) Multi-switch LAG Group port
                  (H) Dynamically added by MVRP
                  (I) Dynamically added by IDM
                  (N) Dynamically added by Netlogin
                  (U) Dynamically added uplink port
                  (V) Dynamically added by VM Tracking

* S2.5 #
```

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```
* S3.5 # sh vlan itx
VLAN Interface with name itx created by user
    Admin State:         Enabled     Tagging:   802.1Q Tag 10
    Description:         None
    Virtual router:      VR-Default
    IP Anycast:          Disabled
    IPv4 Forwarding:     Disabled
    IPv4 MC Forwarding:  Disabled
    IPv6 Forwarding:     Disabled
    IPv6 MC Forwarding:  Disabled
    IPv6:                None
    STPD:                None
    Protocol:            Match all unfiltered protocols
    Loopback:            Disabled
    NetLogin:            Disabled
    QosProfile:          None configured
    Egress Rate Limit Designated Port: None configured
    Flood Rate Limit QosProfile:       None configured
    Suppress ARP:        Disabled
    Suppress ND:         Disabled
    Proxy ARP:           Entry required
    Ports:   3.           (Number of active ports=3)
       Untag:      *3
       Tag:        *1,     *2
        Flags:    (*) Active, (!) Disabled, (g) Load Sharing port
                  (b) Port blocked on the vlan, (m) Mac-Based port
                  (i) Port inactivated on the vlan due to VXLAN configuration
                  (a) Egress traffic allowed for NetLogin
                  (u) Egress traffic unallowed for NetLogin
                  (t) Translate VLAN tag for Private-VLAN
                  (s) Private-VLAN System Port, (L) Loopback port
                  (x) VMAN Tag Translated port
                  (A) Dynamically added by Auto-peering
                  (F) Dynamically added by Fabric Attach
                  (G) Multi-switch LAG Group port
                  (H) Dynamically added by MVRP
                  (I) Dynamically added by IDM
                  (N) Dynamically added by Netlogin
                  (U) Dynamically added uplink port
                  (V) Dynamically added by VM Tracking

* S3.6 #
```

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**3. (1 punto) Identifica la vlan-id por defecto y luego cambiala a 99 en todos los switches.**

**S1#configure vlan default tag 99**
**S1#sh vlan**
**S1#show stpd detail**

```
* S1.8 # show vlan
Untagged ports auto-move: Inform
-------------------------------------------------------------------------------------------------
Name            VID  Protocol Addr       Flags                        Proto  Ports  Virtual
                                                                             Active router
                                                                             /Total
-------------------------------------------------------------------------------------------------
Default         99   --------------------------------T-------------    ANY    2 /11  VR-Default
itx             10   ----------------------------------------------    ANY    3 /3   VR-Default
Mgmt            4095 169.254.135.0  /16  ------------------------    ANY    0 /1   VR-Mgmt
-------------------------------------------------------------------------------------------------
Flags : (B) BFD Enabled, (c) 802.1ad customer VLAN, (C) EAPS Control VLAN,
        (d) Dynamically created VLAN, (D) VLAN Admin Disabled,
        (E) ESRP Enabled, (f) IP Forwarding Enabled,
        (F) Learning Disabled, (i) ISIS Enabled,
        (I) Inter-Switch Connection VLAN for MLAG, (k) PTP Configured,
        (l) MPLS Enabled, (L) Loopback Enabled, (m) IPmc Forwarding Enabled,
        (M) Translation Member VLAN or Subscriber VLAN, (n) IP Multinetting Enabled,
        (N) Network Login VLAN, (o) OSPF Enabled, (O) Virtual Network Overlay,
        (p) PIM Enabled, (P) EAPS protected VLAN, (r) RIP Enabled,
        (R) Sub-VLAN IP Range Configured, (s) Sub-VLAN, (S) Super-VLAN,
        (t) Translation VLAN or Network VLAN, (T) Member of STP Domain,
        (v) VRRP Enabled, (V) VPLS Enabled, (W) VPWS Enabled,
        (Y) Policy Enabled

Total number of VLAN(s) : 3
```

```
* S2.7 # show vlan
Untagged ports auto-move: Inform
-------------------------------------------------------------------------------------------------
Name            VID  Protocol Addr       Flags                        Proto  Ports  Virtual
                                                                             Active router
                                                                             /Total
-------------------------------------------------------------------------------------------------
Default         99   --------------------------------T-------------    ANY    1 /12  VR-Default
itx             10   ----------------------------------------------    ANY    2 /2   VR-Default
Mgmt            4095 169.254.62.0   /16  ------------------------    ANY    0 /1   VR-Mgmt
-------------------------------------------------------------------------------------------------
Flags : (B) BFD Enabled, (c) 802.1ad customer VLAN, (C) EAPS Control VLAN,
        (d) Dynamically created VLAN, (D) VLAN Admin Disabled,
        (E) ESRP Enabled, (f) IP Forwarding Enabled,
        (F) Learning Disabled, (i) ISIS Enabled,
        (I) Inter-Switch Connection VLAN for MLAG, (k) PTP Configured,
        (l) MPLS Enabled, (L) Loopback Enabled, (m) IPmc Forwarding Enabled,
        (M) Translation Member VLAN or Subscriber VLAN, (n) IP Multinetting Enabled,
        (N) Network Login VLAN, (o) OSPF Enabled, (O) Virtual Network Overlay,
        (p) PIM Enabled, (P) EAPS protected VLAN, (r) RIP Enabled,
        (R) Sub-VLAN IP Range Configured, (s) Sub-VLAN, (S) Super-VLAN,
        (t) Translation VLAN or Network VLAN, (T) Member of STP Domain,
        (v) VRRP Enabled, (V) VPLS Enabled, (W) VPWS Enabled,
        (Y) Policy Enabled

Total number of VLAN(s) : 3
```

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```
* S3.7 # show vlan
Untagged ports auto-move: Inform
-------------------------------------------------------------------------------------------------
Name            VID  Protocol Addr       Flags                      Proto  Ports  Virtual
                                                                           Active router
                                                                           /Total
-------------------------------------------------------------------------------------------------
Default         99   --------------------------------T-------------  ANY    2 /11  VR-Default
itx             10   ------------------------------------------------  ANY    3 /3   VR-Default
Mgmt            4095 169.254.65.0   /16  -------------------------  ANY    0 /1   VR-Mgmt
-------------------------------------------------------------------------------------------------
Flags : (B) BFD Enabled, (c) 802.1ad customer VLAN, (C) EAPS Control VLAN,
        (d) Dynamically created VLAN, (D) VLAN Admin Disabled,
        (E) ESRP Enabled, (f) IP Forwarding Enabled,
        (F) Learning Disabled, (i) ISIS Enabled,
        (I) Inter-Switch Connection VLAN for MLAG, (k) PTP Configured,
        (l) MPLS Enabled, (L) Loopback Enabled, (m) IPmc Forwarding Enabled,
        (M) Translation Member VLAN or Subscriber VLAN, (n) IP Multinetting Enabled,
        (N) Network Login VLAN, (o) OSPF Enabled, (O) Virtual Network Overlay,
        (p) PIM Enabled, (P) EAPS protected VLAN, (r) RIP Enabled,
        (R) Sub-VLAN IP Range Configured, (s) Sub-VLAN, (S) Super-VLAN,
        (t) Translation VLAN or Network VLAN, (T) Member of STP Domain,
        (v) VRRP Enabled, (V) VPLS Enabled, (W) VPWS Enabled,
        (Y) Policy Enabled

Total number of VLAN(s) : 3
```

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## 2.2. Configuración de STP

**1. (0.5 puntos) ¿Cuál es la configuración predeterminada de STP (Default Binding Mode) en los switches EXOS?**

**S1#show stpd detail**

```
* S2.7 # show stpd detail

Stpd: s0                Stp: ENABLED            Number of Ports: 12
Rapid Root Failover: Disabled
Operational Mode: MSTP                  Default Binding Mode: 802.1D
```

**2. (0.5 puntos) Verifica la conectividad entre PC-1 y PC-2. Desde PC-1, ¿Es posible hacer ping a PC-2?**

No es posible hacer ping de PC1 al PC-2 al no tener la VLAN correctamente configurada.

```
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

PC-1> ping 192.168.10.3

192.168.10.3 icmp_seq=1 timeout
192.168.10.3 icmp_seq=2 timeout
192.168.10.3 icmp_seq=3 timeout
192.168.10.3 icmp_seq=4 timeout
192.168.10.3 icmp_seq=5 timeout

PC-1>
```

**3. (1 punto) Agrega la VLAN itx al proceso de STP en los switches S1, S2 y S3. Por ejemplo:**

**S1#configure stpd s0 add itx ports 1,2**
**S1#enable stpd**
**S1#show stpd detail**

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```
* S2.10 # show stpd detail

Stpd: s0                Stp: ENABLED            Number of Ports: 12
Rapid Root Failover: Disabled
Operational Mode: MSTP                  Default Binding Mode: 802.1D
MSTI Instance:  CIST
802.1Q Tag: (none)
Ports: 1,2,3,4,5,6,7,8,9,10,
       11,12
Participating Vlans: Default,itx
Auto-bind Vlans: Default
Bridge Priority           : 32768             Bridge Priority Mode: 802.1t
Operational Bridge Priority: 32768
BridgeID                  : 80:00:0c:ba:94:64:3e:00
Designated root           : 80:00:0c:ba:94:1e:87:00
CIST Root                 : 80:00:0c:ba:94:1e:87:00
CIST Regional Root        : 80:00:0c:ba:94:64:3e:00
External RootPathCost     : 200000     Internal RootPathCost: 0
Root Port    : 2
MaxAge      : 20s       HelloTime     : 2s      ForwardDelay     : 15s
CfgBrMaxAge : 20s       CfgBrHelloTime: 2s      CfgBrForwardDelay: 15s
RemainHopCount: 20      CfgMaxHopCount: 20
Topology Change Time           : 35s            Hold time        : 1s
Topology Change Detected       : FALSE          Topology Change  : FALSE
Number of Topology Changes     : 8
Time Since Last Topology Change: 452s
Topology Change initiated locally on Port 1
Topology Change last received on Port 1 from 0c:ba:94:4f:41:00
Backup Root               : Off         Backup Root Activated  : FALSE
Loop Protect Event Window : 180s        Loop Protect Threshold : 3
New Root Trap             : On          Topology Change Trap   : Off
Tx Hold Count             : 6
Participating VLANs:
VLAN                                     Tag    Number of Ports
          Ports
--------------------------------------------------------------------------------
Default                                  99     12
          1(B),2(F),3(D),4(D),5(D),6(D),7(D),8(D),
          9(D),10(D),11(D),12(D)
itx                                      10     2
          1(B),2(F)
Flags: B-Blocking, D-Disabled, F-Forwarding, I-Listening, L-Learning
```

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```
* S3.10 # show stpd detail

Stpd: s0                Stp: ENABLED            Number of Ports: 11
Rapid Root Failover: Disabled
Operational Mode: MSTP                  Default Binding Mode: 802.1D
MSTI Instance:  CIST
802.1Q Tag: (none)
Ports: 1,2,4,5,6,7,8,9,10,11,
       12
Participating Vlans: Default,itx
Auto-bind Vlans: Default
Bridge Priority            : 32768              Bridge Priority Mode: 802.1t
Operational Bridge Priority: 32768
BridgeID                   : 80:00:0c:ba:94:4f:41:00
Designated root            : 80:00:0c:ba:94:1e:87:00
CIST Root                  : 80:00:0c:ba:94:1e:87:00
CIST Regional Root         : 80:00:0c:ba:94:4f:41:00
External RootPathCost      : 200000     Internal RootPathCost: 0
Root Port    : 1
MaxAge       : 20s       HelloTime     : 2s      ForwardDelay     : 15s
CfgBrMaxAge : 20s        CfgBrHelloTime: 2s      CfgBrForwardDelay: 15s
RemainHopCount: 20       CfgMaxHopCount: 20
Topology Change Time           : 35s             Hold time        : 1s
Topology Change Detected       : FALSE           Topology Change  : FALSE
Number of Topology Changes     : 18
Time Since Last Topology Change: 476s
Topology Change initiated locally on Port 2
Topology Change last received on Port 1 from 0c:ba:94:1e:87:00
Backup Root                : Off         Backup Root Activated  : FALSE
Loop Protect Event Window : 180s         Loop Protect Threshold : 3
New Root Trap              : On          Topology Change Trap   : Off
Tx Hold Count              : 6
Participating VLANs:
VLAN                                     Tag    Number of Ports
          Ports
--------------------------------------------------------------------------------
Default                                  99     11
          1(F),2(F),4(D),5(D),6(D),7(D),8(D),9(D),
          10(D),11(D),12(D)
itx                                      10     2
          1(F),2(F)
Flags: B-Blocking, D-Disabled, F-Forwarding, I-Listening, L-Learning
```

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```
* S1.13 # show stpd detail

Stpd: s0                Stp: ENABLED            Number of Ports: 11
Rapid Root Failover: Disabled
Operational Mode: MSTP                  Default Binding Mode: 802.1D
MSTI Instance:  CIST
802.1Q Tag: (none)
Ports: 1,2,4,5,6,7,8,9,10,11,
       12
Participating Vlans: Default,itx
Auto-bind Vlans: Default
Bridge Priority           : 32768             Bridge Priority Mode: 802.1t
Operational Bridge Priority: 32768
BridgeID                  : 80:00:0c:ba:94:1e:87:00
Designated root           : 80:00:0c:ba:94:1e:87:00
CIST Root                 : 80:00:0c:ba:94:1e:87:00
CIST Regional Root        : 80:00:0c:ba:94:1e:87:00
External RootPathCost     : 0  Internal RootPathCost: 0
Root Port   : ----
MaxAge      : 20s       HelloTime     : 2s      ForwardDelay     : 15s
CfgBrMaxAge : 20s       CfgBrHelloTime: 2s      CfgBrForwardDelay: 15s
RemainHopCount: 20      CfgMaxHopCount: 20
Topology Change Time          : 35s             Hold time        : 1s
Topology Change Detected      : FALSE           Topology Change  : FALSE
Number of Topology Changes    : 9
Time Since Last Topology Change: 504s
Topology Change initiated locally on Port 1
Topology Change last received on Port 2 from 0c:ba:94:64:3e:00
Backup Root               : Off         Backup Root Activated  : FALSE
Loop Protect Event Window : 180s        Loop Protect Threshold : 3
New Root Trap             : On          Topology Change Trap   : Off
Tx Hold Count             : 6
Participating VLANs:
VLAN                                    Tag     Number of Ports
         Ports
--------------------------------------------------------------------------------
Default                                 99      11
         1(F),2(F),4(D),5(D),6(D),7(D),8(D),9(D),
         10(D),11(D),12(D)
itx                                     10      2
         1(F),2(F)
Flags: B-Blocking, D-Disabled, F-Forwarding, I-Listening, L-Learning
```

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**4. (0.5 puntos) Verifica la conectividad entre PC-1 y PC-2. Desde PC-1, ¿Es posible hacer ping a PC-2?**

Al ya tener configurado la VLAN itx, ya es posible hacer ping de PC-1 al PC-2.

```
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

PC-1> ping 192.168.10.3

84 bytes from 192.168.10.3 icmp_seq=1 ttl=64 time=1.694 ms
84 bytes from 192.168.10.3 icmp_seq=2 ttl=64 time=2.008 ms
84 bytes from 192.168.10.3 icmp_seq=3 ttl=64 time=2.058 ms
84 bytes from 192.168.10.3 icmp_seq=4 ttl=64 time=1.997 ms
84 bytes from 192.168.10.3 icmp_seq=5 ttl=64 time=2.209 ms

PC-1>
```

## 2.3. Asignación manual del Designated root

**1. (1 punto) ¿Cuál es el Bridge Priority por defecto que tienen los switches?**

```
* S2.10 # show stpd detail

Stpd: s0               Stp: ENABLED           Number of Ports: 12
Rapid Root Failover: Disabled
Operational Mode: MSTP                  Default Binding Mode: 802.1D
MSTI Instance:  CIST
802.1Q Tag: (none)
Ports: 1,2,3,4,5,6,7,8,9,10,
       11,12
Participating Vlans: Default,itx
Auto-bind Vlans: Default
Bridge Priority           : 32768           Bridge Priority Mode: 802.1t
Operational Bridge Priority: 32768
```

**2. (1 punto) ¿Cuál es la dirección MAC de cada uno de los switches?**

Como se ha visto en las imágenes anteriores

S1 -> 0c:ba:94:1e:87:00
S2 -> 0c:ba:94:64:3e:00
S3 -> 0c:ba:94:4f:41:00

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**3. (1 punto) ¿Cuál es el switch escogido como Designated root? ¿Por qué se lo ha designado como tal?**

```
* S1.13 # show stpd detail

Stpd: s0                Stp: ENABLED            Number of Ports: 11
Rapid Root Failover: Disabled
Operational Mode: MSTP                  Default Binding Mode: 802.1D
MSTI Instance:  CIST
802.1Q Tag: (none)
Ports: 1,2,4,5,6,7,8,9,10,11,
       12
Participating Vlans: Default,itx
Auto-bind Vlans: Default
Bridge Priority            : 32768              Bridge Priority Mode: 802.1t
Operational Bridge Priority: 32768
BridgeID                   : 80:00:0c:ba:94:1e:87:00
Designated root            : 80:00:0c:ba:94:1e:87:00
```

Se ha designado al tener la dirección MAC de menor valor.

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**4. (1 punto) Identifica el switch que tenga uno de sus puertos bloqueados y configúralo como Designated root. Por ejemplo:**

**S1#configure stpd s0 priority 4096**

```
* S2.12 # show stpd detail

Stpd: s0                Stp: ENABLED            Number of Ports: 12
Rapid Root Failover: Disabled
Operational Mode: MSTP                  Default Binding Mode: 802.1D
MSTI Instance:  CIST
802.1Q Tag: (none)
Ports: 1,2,3,4,5,6,7,8,9,10,
       11,12
Participating Vlans: Default,itx
Auto-bind Vlans: Default
Bridge Priority           : 4096              Bridge Priority Mode: 802.1t
Operational Bridge Priority: 4096
BridgeID                  : 10:00:0c:ba:94:64:3e:00
Designated root           : 10:00:0c:ba:94:64:3e:00
CIST Root                 : 10:00:0c:ba:94:64:3e:00
CIST Regional Root        : 10:00:0c:ba:94:64:3e:00
External RootPathCost     : 0  Internal RootPathCost: 0
Root Port    : ----
MaxAge      : 20s       HelloTime     : 2s      ForwardDelay     : 15s
CfgBrMaxAge : 20s       CfgBrHelloTime: 2s      CfgBrForwardDelay: 15s
RemainHopCount: 20      CfgMaxHopCount: 20
Topology Change Time          : 35s             Hold time        : 1s
Topology Change Detected      : FALSE           Topology Change  : FALSE
Number of Topology Changes    : 10
Time Since Last Topology Change: 9s
Topology Change initiated locally on Port 1
Topology Change last received on Port 1 from 0c:ba:94:4f:41:00
Backup Root               : Off         Backup Root Activated  : FALSE
Loop Protect Event Window : 180s        Loop Protect Threshold : 3
New Root Trap             : On          Topology Change Trap   : Off
Tx Hold Count             : 6
Participating VLANs:
VLAN                                     Tag    Number of Ports
         Ports
-------------------------------------------------------------------------------
Default                                  99     12
         1(F),2(F),3(D),4(D),5(D),6(D),7(D),8(D),
         9(D),10(D),11(D),12(D)
itx                                      10     2
         1(F),2(F)
Flags: B-Blocking, D-Disabled, F-Forwarding, I-Listening, L-Learning
```

**5. (1 punto) Verifica el estado de los puertos del switch anterior. ¿Por qué todos están en Forwarding?**

Al ser el root, el switch ha de poder comunicarse con todos los demás dispositivos que forman la VLAN por eso es necesario que sus puertos estén en Forwarding.