VLAN & Wireless Infrastructure

VLAN tagged over Wireless Uplink (PtMP)

&

CAPsMAN (Layer 3)

Who am I?

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- IT Manager at Angkor Hospital for Children for more than 15 years
- RouterOS user since 2009
- MTCNA, MTCRE, and MTCINE
- Other works, part time work on project for SI company to implement PtP, PtMP, and VLAN on Mikrotik Products

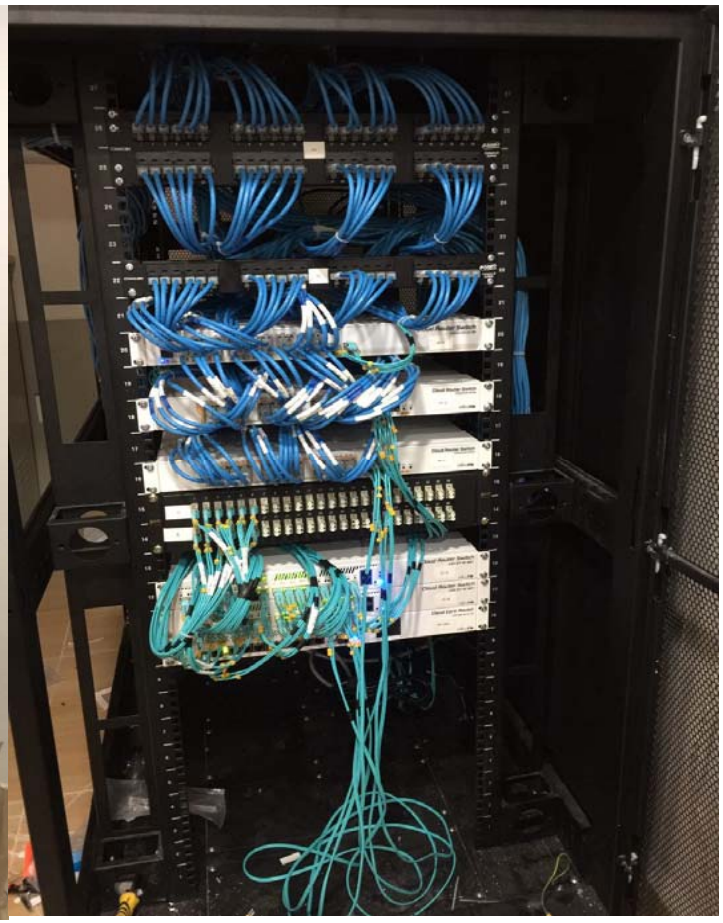
Implementation of VLAN for my last two projects

- **International School of Siem Reap (ISSR)**
  - CRS317 (All ports are SFP+)
  - CRS328 (Gigabit ports, PoE with two SFP+)
  - CRS326 (Gigabit port with two SFP+)

- **The Beige Resort**
  - RB951
  - RB260GSP (SwOS)

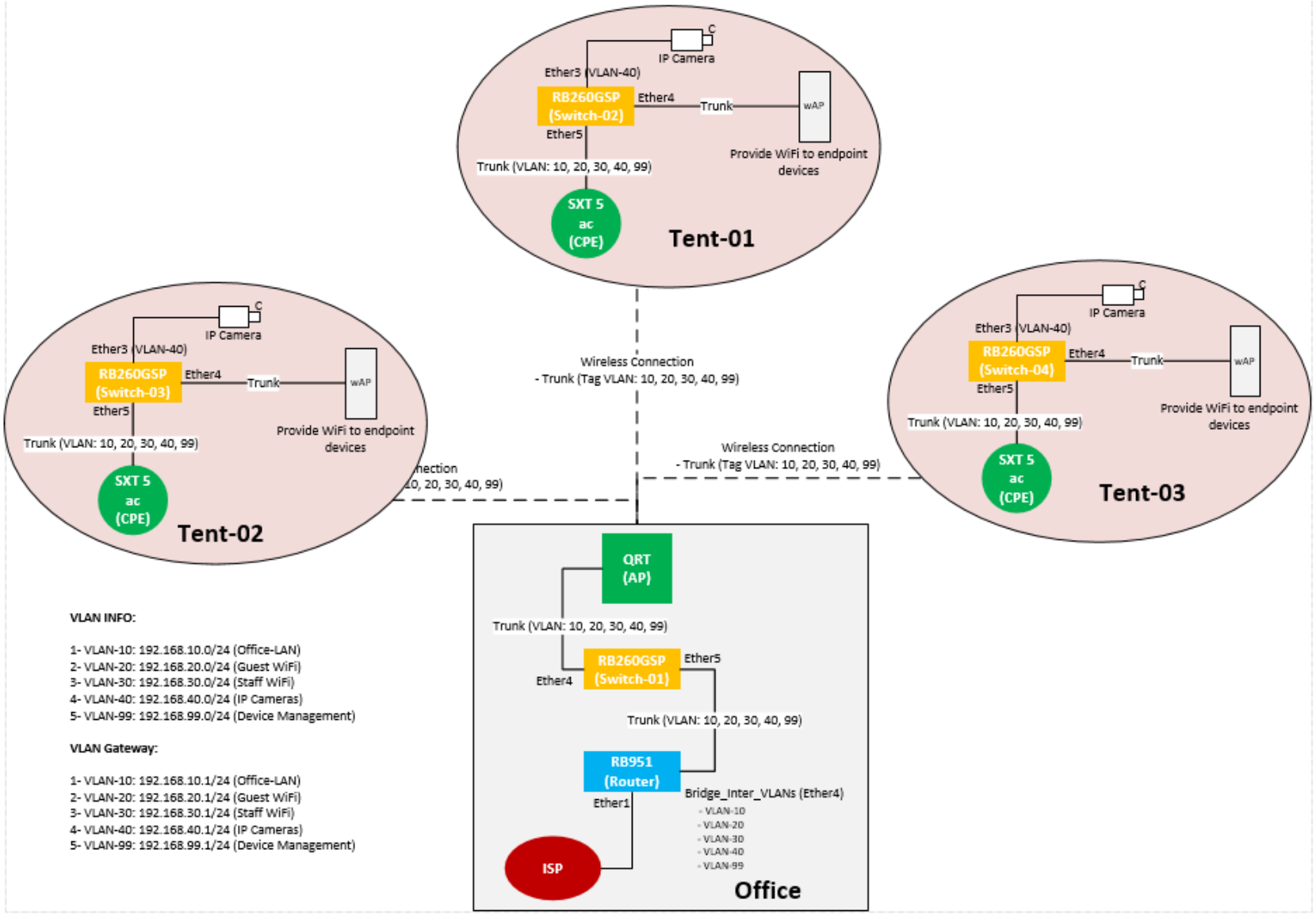
Project Activities

Project Activities (Continue…)

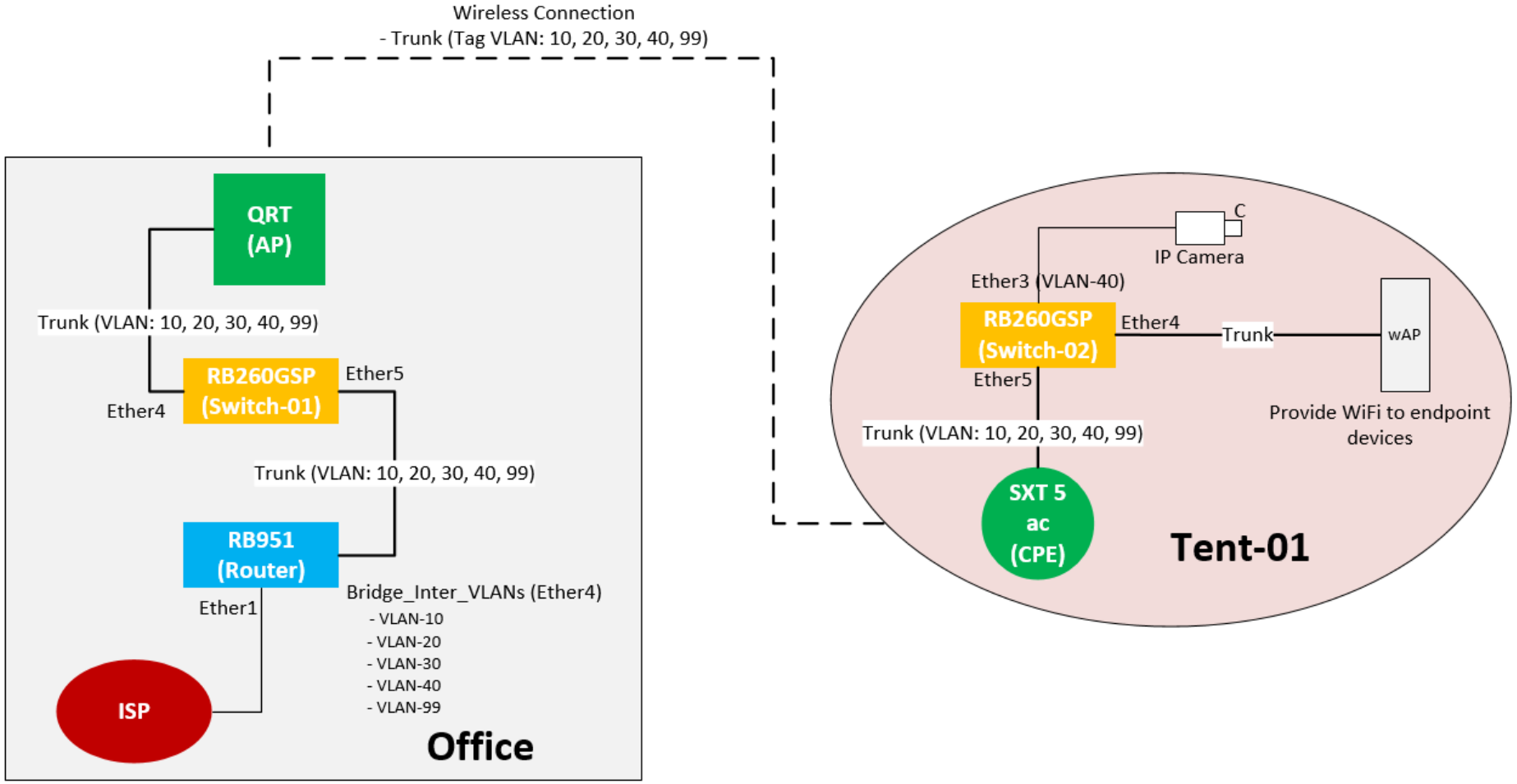


Project Activities (Continue…)

Network Diagram



Network Diagram - 01



IP Address Info

- Router - CAPsMAN (Core-RB):
  - Bridge_Inter_VLANs (ether4) and Sub-interface for inter-VLAN routing:
    - VLAN-10: 192.168.10.1/24 (Office-LAN)
    - VLAN-20: 192.168.20.1/24 (Guest WLAN)
    - VLAN-30: 192.168.30.1/24 (Staff WLAN)
    - VLAN-40: 192.168.40.1/24 (IP Camera)
    - VLAN-90: 192.168.99.1/24 (Management)
- Switch-01:
  - Management IP: 192.168.99.2/24
- Base-01 (PtMP):
  - Management IP: 192.168.99.3/24 (interface: VLAN-99)
- CPE:
  - Management IP: 192.168.99.5/24 (interface: VLAN-99)
- Switch-02:
  - Management IP: 192.168.99.4/24
- AP-01:
  - Management IP: 192.168.99.6/24 (interface: VLAN-99)

Steps of Configurations

1. Configure Router (RB951) for inter-VLAN routing, DHCP services for each VLAN, and CAPsMAN.
2. Configure Access Point (QRT 5) for PtMP and VLAN tagging
3. Configure CPE (SXT5-ac) and VLAN tagging
4. Configure Switch-01 (RB260GSP) for tag and untagged ports which connect between AP (QRT 5) and Router (RB951)
5. Configure Switch-02 (RB260GSP) for tag and untagged ports which connect between CPE (SXT5-ac) and endpoint devices
6. Configure AP-01 (wAP) to provide WiFi for client's devices

Step 1: Configure Router (RB951) for inter-VLAN routing & DHCP services for each VLAN

1- Add bridge interface and assign port ether4 to it:

```
/interface bridge
add name=bridge_Inter_VLANs

/interface bridge port
add bridge=bridge_Inter_VLANs interface=ether4
```

2- Add VLAN sub interface to bridge_Inter_VLANs:

```
/interface vlan
add interface=bridge_Inter_VLANs mtu=1508 name=VLAN-10 vlan-id=10
add interface=bridge_Inter_VLANs mtu=1508 name=VLAN-20 vlan-id=20
add interface=bridge_Inter_VLANs mtu=1508 name=VLAN-30 vlan-id=30
add interface=bridge_Inter_VLANs mtu=1508 name=VLAN-40 vlan-id=40
add interface=bridge_Inter_VLANs name=VLAN-99 vlan-id=99
```

Step 1: Configure Router (RB951) – Cont..

3- Assign IP address to each VLAN interface:

```
/ip address
add address=192.168.10.1/24 interface=VLAN-10 network=192.168.10.0
add address=192.168.20.1/24 interface=VLAN-20 network=192.168.20.0
add address=192.168.99.1/24 interface=VLAN-99 network=192.168.99.0
add address=192.168.30.1/24 interface=VLAN-30 network=192.168.30.0
add address=192.168.40.1/24 interface=VLAN-40 network=192.168.40.0
```

4- Add IP Pools for each VLAN:

```
/ip pool
add name=pool-VLAN10 ranges=192.168.10.20-192.168.10.254
add name=pool-VLAN20 ranges=192.168.20.20-192.168.20.254
add name=pool-VLAN30 ranges=192.168.30.20-192.168.30.254
add name=pool-VLAN40 ranges=192.168.40.20-192.168.40.254
```

Step 1: Configure Router (RB951) – Cont..

5- Enable DHCP Sever for each VLAN:

```
/ip dhcp-server
add address-pool=pool-VLAN10 disabled=no interface=VLAN-10 lease-time=1d name=DHCP-VLAN10
add address-pool=pool-VLAN20 disabled=no interface=VLAN-20 lease-time=1d name=DHCP-VLAN20
add address-pool=pool-VLAN-30 disabled=no interface=VLAN-30 lease-time=1d name=DHCP-VLAN30
add address-pool=pool-VLAN-40 disabled=no interface=VLAN-40 lease-time=1d name=DHCP-VLAN40

/ip dhcp-server network
add address=192.168.10.0/24 dns-server=192.168.10.1 gateway=192.168.10.1
add address=192.168.20.0/24 dns-server=192.168.20.1 gateway=192.168.20.1
add address=192.168.30.0/24 dns-server=192.168.30.1 gateway=192.168.30.1
add address=192.168.40.0/24 dns-server=192.168.40.1 gateway=192.168.40.1
```

6- Other Settings:

```
/ip dns
set allow-remote-requests=yes

/system clock set time-zone-name=Asia/Phnom_Penh

/system identity set name=Core-RB
```

Step 1: Router (RB951) – CAPsMAN - Cont..

7- Add Channel:

```
/caps-man channel
add band=2ghz-b/g/n control-channel-width=20mhz frequency=2412 name=channel1
add band=2ghz-b/g/n control-channel-width=20mhz frequency=2437 name=channel6
add band=2ghz-b/g/n control-channel-width=20mhz frequency=2462 name=channel11
add band=5ghz-a/n/ac control-channel-width=20mhz frequency=5180 name=\
   channel_5G_36
add band=5ghz-a/n/ac control-channel-width=20mhz frequency=5220 name=\
   channel_5G_44
```

8- Add datapath for VLAN20 and VLAN30:

```
/caps-man datapath
add bridge=bridge_Inter_VLANs local-forwarding=yes name=guest_VLAN20 vlan-id=20
vlan-mode=use-tag
add bridge=bridge_Inter_VLANs client-to-client-forwarding=yes \
   local-forwarding=yes name=staff_VLAN30 vlan-id=30 vlan-mode=use-tag
```

Step 1: Router (RB951) – CAPsMAN - Cont..

9- Add Security Configuration:

```
/caps-man security
add authentication-types=wpa-psk,wpa2-psk encryption=aes-ccm \
   group-encryption=aes-ccm name=security_conf_VLAN20 passphrase=12345678
add authentication-types=wpa-psk,wpa2-psk encryption=aes-ccm \
   group-encryption=aes-ccm name=security_conf_VLAN30 passphrase=12345678
```

10- Add CAPsMAN Configuration:

```
/caps-man configuration
add datapath=guest_VLAN20 mode=ap name=conf_VLAN20 security=\
   security_conf_VLAN20 ssid=VLAN20
add datapath=staff_VLAN30 mode=ap name=conf_VLAN30 security=\
   security_conf_VLAN30 ssid=VLAN30
```

Step 1: Router (RB951) – CAPsMAN - Cont..

11- Add Access List:

```
/caps-man access-list
add action=accept allow-signal-out-of-range=10s disabled=no interface=any \
    signal-range=-80..10 ssid-regexp=""
add action=reject allow-signal-out-of-range=10s disabled=no interface=any \
    signal-range=-120..81 ssid-regexp=""
```

12- Add Provisioning:

```
/caps-man provisioning
add action=create-enabled master-configuration=conf_VLAN20 name-format=\
   identity slave-configurations=conf_VLAN30
```

12- Enable CAPsMAN Manager:

```
/caps-man manager
set enabled=yes package-path=/capsman upgrade-policy=suggest-same-version
```

Step 2: Configure Access Point (QRT 5) for PtMP and VLAN tagging

1- Setup wireless AP bridge:

```
/interface wireless
set [ find default-name=wlan1 ] band=5ghz-n/ac country=cambodia disabled=no
frequency-mode=superchannel mode=ap-bridge mtu=1508 nv2-preshared-
key=012779158 nv2-security=enabled radio-name=AP-01 ssid=AP-01 wireless-
protocol=nv2
```

2- Add bridge interface and add ether ports to bridge

```
/interface bridge add name=bridge1
/interface bridge port
add bridge=bridge1 interface=wlan1
add bridge=bridge1 interface=ether1
```

Step 2: Configure Access Point (QRT 5) – Cont..

3- Add VLAN 99 interface for device management:

```
/interface vlan
add interface=bridge1 mtu=1508 name=VLAN99 vlan-id=99
```

4- Assign IP address to VLAN-99 interface:

```
/ip address
add address=192.168.99.3/24 interface=VLAN99 network=192.168.99.0
```

5- Tag VLAN 10, 20, 30, 40, 99 to bridge1, ether1, wlan1 (In Cisco term called trunk port):

```
/interface bridge vlan
add bridge=bridge1 tagged=bridge1,ether1,wlan1 vlan-ids=99
add bridge=bridge1 tagged=ether1,bridge1,wlan1 vlan-ids=10
add bridge=bridge1 tagged=ether1,bridge1,wlan1 vlan-ids=20
add bridge=bridge1 tagged=ether1,bridge1,wlan1 vlan-ids=30
add bridge=bridge1 tagged=ether1,bridge1,wlan1 vlan-ids=40
```

Step 2: Configure Access Point (mANTBox 19s) – Cont..

6- Add Default Route:

```
/ip route
add distance=1 gateway=192.168.99.1
```

7- Set Time Zone:

```
/system clock
set time-zone-name=Asia/Phnom_Penh
```

8- Set System Identity:

```
/system identity set name=Base-01
```

9- Enable VLAN Filtering:

```
/interface bridge
set bridge1 vlan-filtering=yes
```

Step 3: Configure CPE (SXT5-ac) and VLAN tagging

1- Add bridge interface and add ether ports to bridge:

```
/interface bridge add name=bridge1
/interface bridge port
add bridge=bridge1 interface=wlan1
add bridge=bridge1 interface=ether1
```

2- Setup CPE wireless as Station Bridge:

```
/interface wireless

set [ find default-name=wlan1 ] band=5ghz-a/n/ac country=cambodia
disabled=no frequency-mode=superchannel mode=station-bridge mtu=1508
nv2-preshared-key=012779158 nv2-security=enabled radio-name=CPE-01
ssid=AP-01 wireless-protocol=nv2
```

Step 3: Configure CPE (SXT5-ac) – Cont..

3- Add VLAN 99 interface for device management:

```
/interface vlan
add interface=bridge1 mtu=1508 name=VLAN99 vlan-id=99
```

4- Assign IP address to VLAN-99 interface:

```
/ip address
add address=192.168.99.5/24 interface=VLAN99 network=192.168.99.0
```

5- Tag VLAN 10, 20, 30, 40, 99 to bridge1, ether1, wlan1 (In Cisco term called trunk port):

```
/interface bridge vlan
add bridge=bridge1 tagged=bridge1,ether1,wlan1 vlan-ids=10,20, 30, 40, 99
```

Step 3: Configure CPE (SXT5-ac) – Cont..

6- Add Default Route:

```
/ip route
add distance=1 gateway=192.168.99.1
```

7- Set Time Zone:

```
/system clock
set time-zone-name=Asia/Phnom_Penh
```

8- Set System Identity:

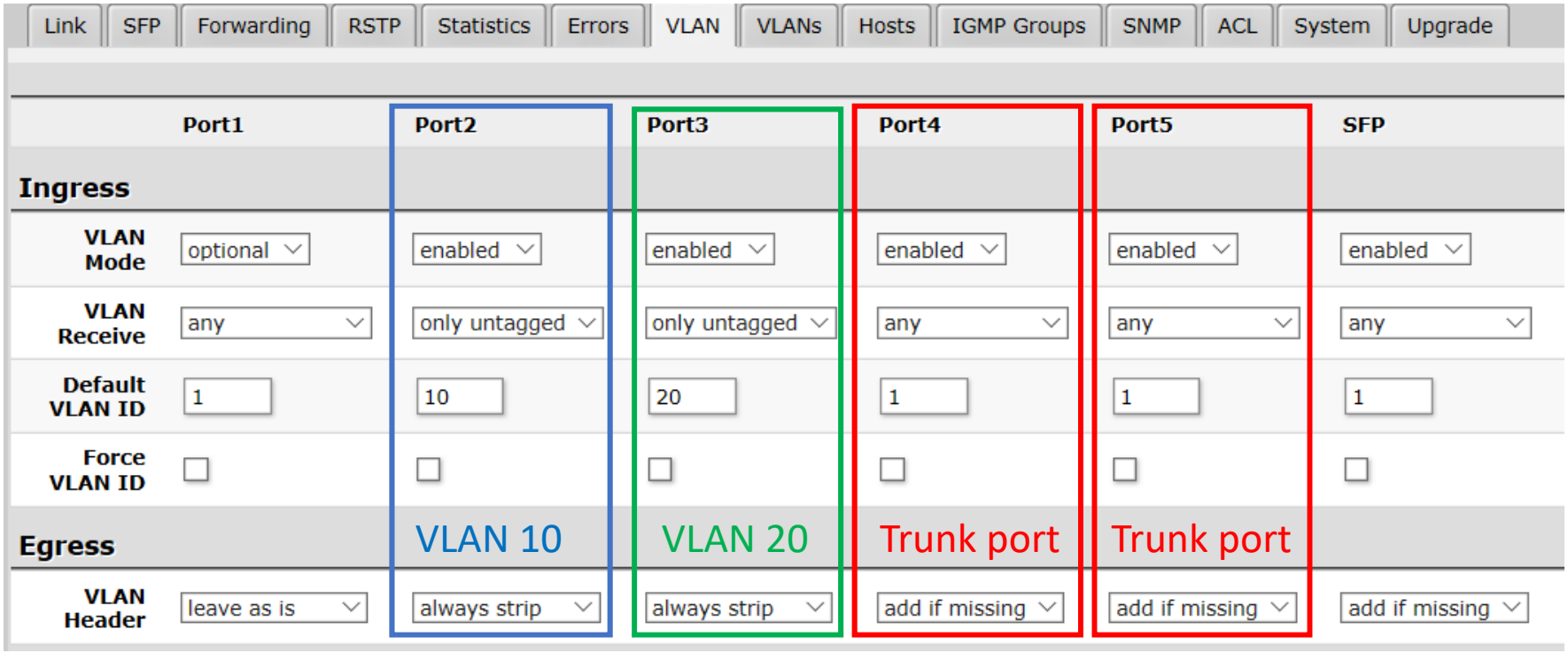
```
/system identity set name=CPE-01
```

9- Enable VLAN Filtering:

```
/interface bridge
set bridge1 vlan-filtering=yes
```

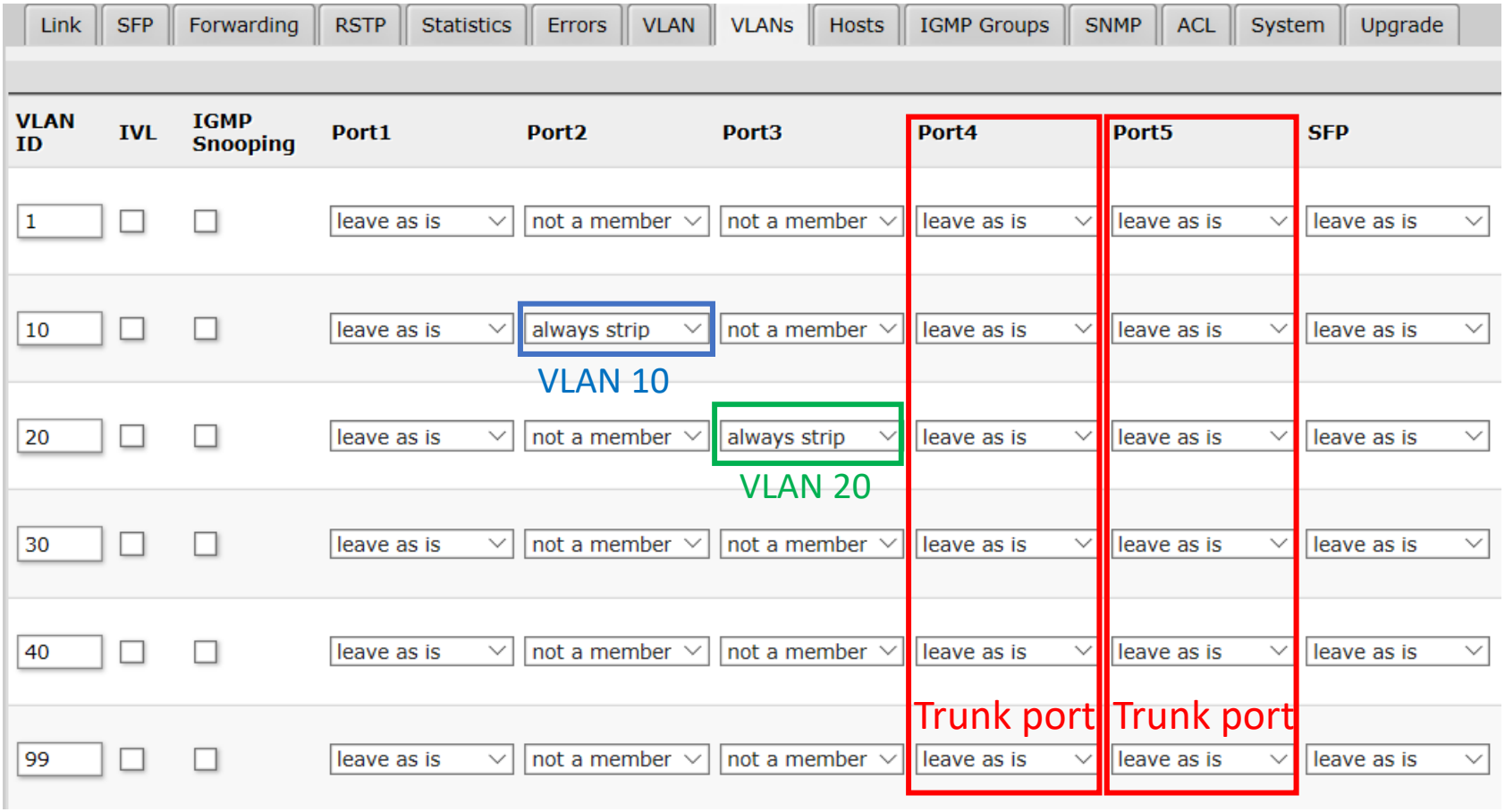
Step 4: Configure Switch-01 (RB260GSP) for tag and untagged ports which connect between AP (mANTBox 19s) and Router (RB951)

1- SwitchOS VLAN Configuration on Interfaces (IP Address: 192.168.99.2/24):



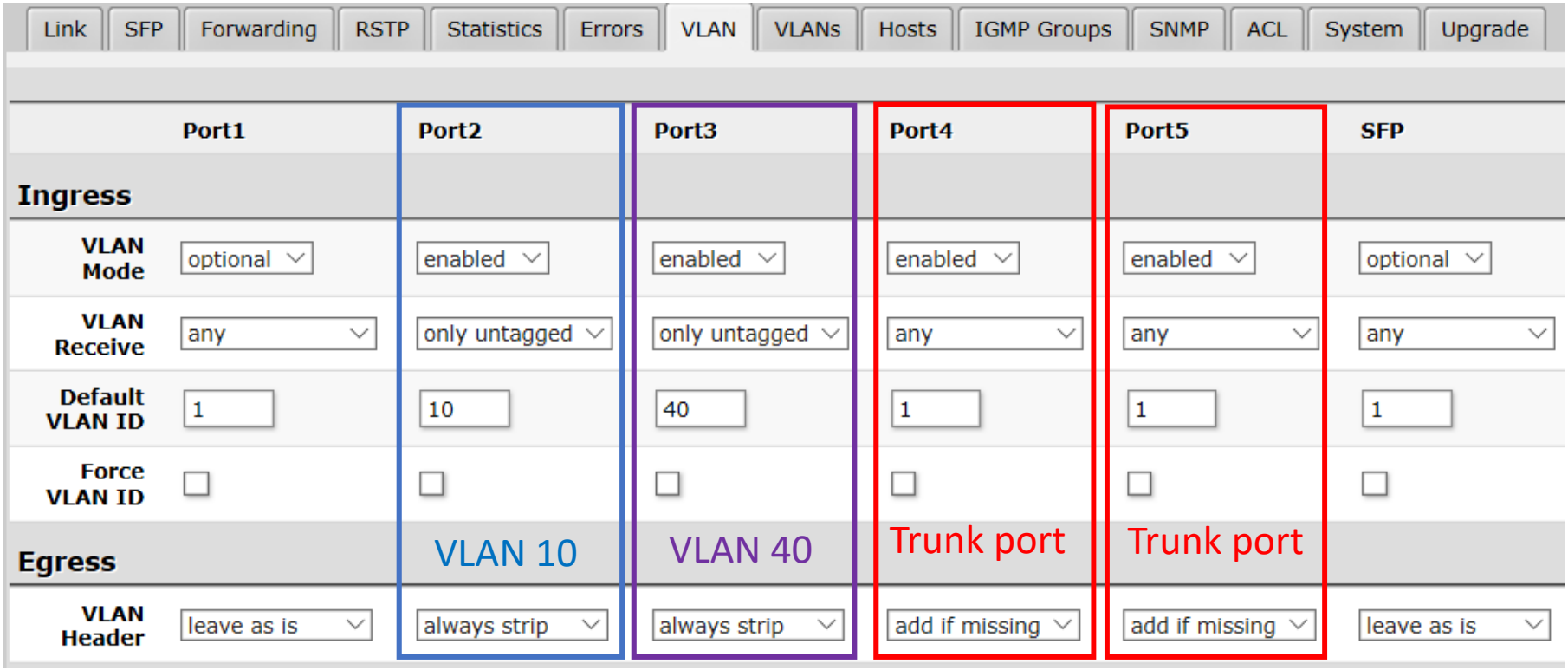
Step 4: Configure Switch-01 – Cont..

2- SwitchOS VLAN table Configuration:



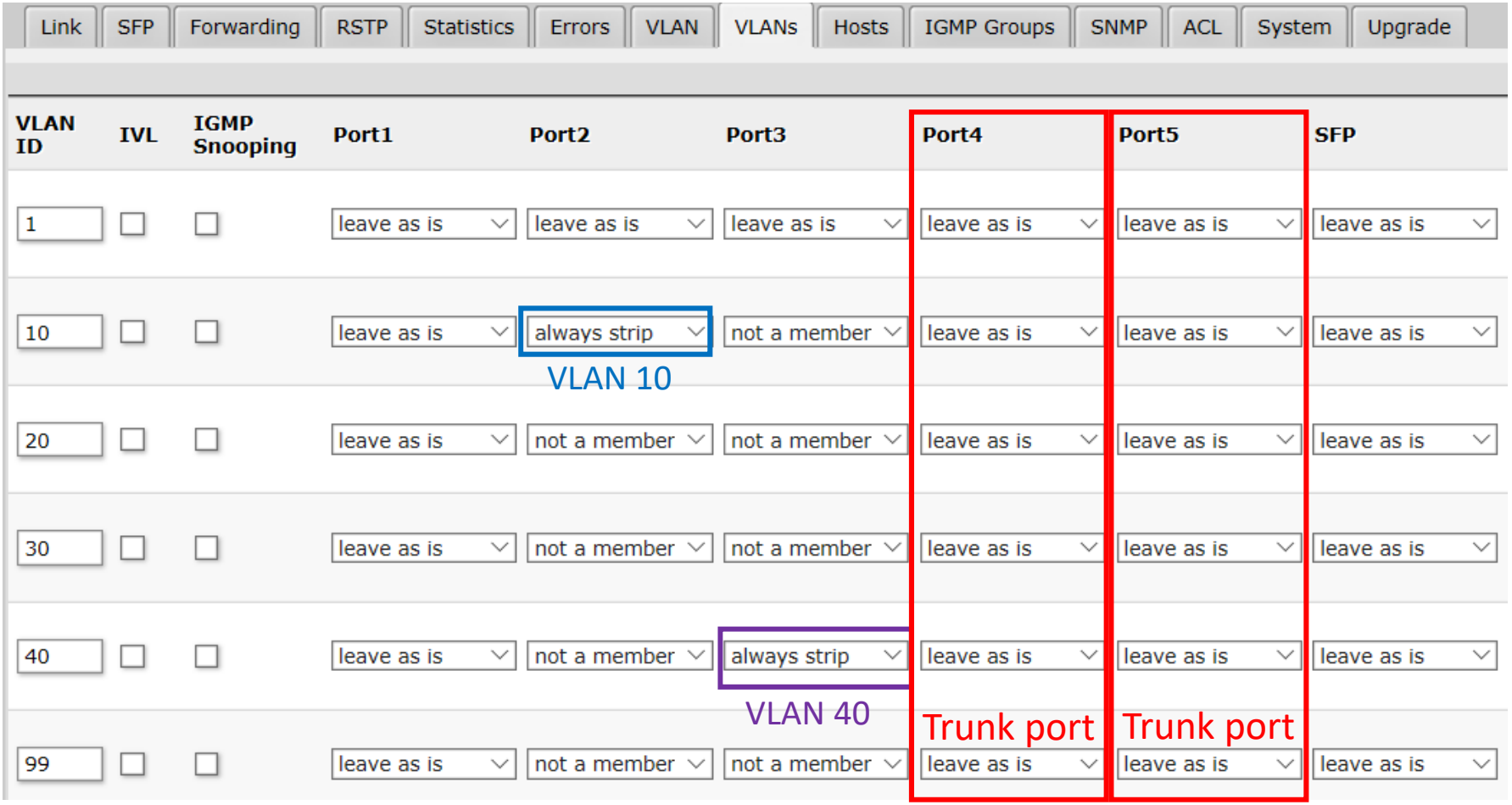
Step 5: Configure Switch-02 (RB260GSP) for tag and untagged ports which connect between CPE and endpoint devices

1- SwitchOS VLAN Configuration on Interfaces (IP Address: 192.168.99.4/24):



Step 5: Configure Switch-01 – Cont..

2- SwitchOS VLAN table Configuration:



Step 6: Configure AP-01 to provide WiFi for client's devices

1- Add bridge interface with disabled VLAN filtering & add ports to bridge:

```
/interface bridge
add name=bridge1 vlan-filtering=no

/interface bridge port
add bridge=bridge1 interface=ether1
add bridge=bridge1 interface=wlan1
```

2- Add VLAN99 as sub-interface of bridge interface:

```
/interface vlan
add interface=bridge1 name=VLAN99 vlan-id=99
```

3- Assign IP address to VLAN99:

```
/ip address
add address=192.168.99.6/24 interface=VLAN99 network=192.168.99.0
```

Step 6: Configure AP-01 – Cont..

4- : Tagged VLAN 10, 20, 30, 40, 99

```
/interface bridge vlan
add bridge=bridge1 tagged=ether1,wlan1,bridge1 vlan-ids=10,20,30,40,99
```

5- : Enable CAP client

```
/interface wireless cap
set bridge=bridge1 caps-man-addresses=192.168.99.1 caps-man-names=Core-RB \
   discovery-interfaces=bridge1 enabled=yes interfaces=wlan1 static-virtual=yes
```

6- : Other Settings

```
/ip dns set allow-remote-requests=yes servers=192.168.99.1
/ip route add distance=1 gateway=192.168.99.1
/system clock set time-zone-name=Asia/Phnom_Penh
/system identity set name=AP-01
```

Show prepared LAB & Try it

WiFi Info:

SSID-1: VLAN20

SSID-2: VLAN30

Password: 12345678

Note:

VLAN20: 192.168.20.0/24

VLAN30: 192.168.30.0/24

Thank you!

Q & A

(I LOVE RouterBoard)