VLAN Configuration Report

COS370 / COS372 — Computer Networks

1. Network Topology

The VLAN lab uses three switches (S1, S2, S3) and four PCs. PC1 (188.16.0.53) and PC3 (188.16.0.54) belong to VLAN 10; PC2 (188.16.0.55) and PC4 (188.16.0.56) belong to VLAN 20. S1 connects to PC1 (e0/1, VLAN10) and PC2 (e0/2, VLAN20). S3 connects to PC3 (e0/1, VLAN10) and PC4 (e0/2, VLAN20). S1–S2 and S2–S3 are connected via 802.1Q trunk links.
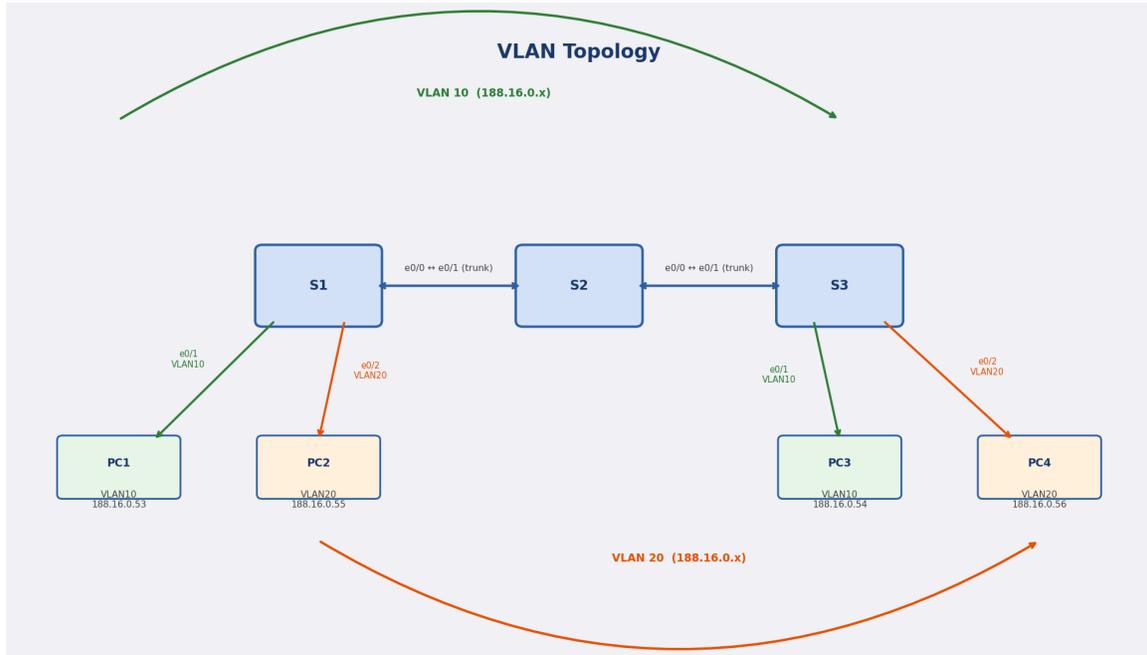

Figure 1 — VLAN Topology (S1, S2, S3, PC1–PC4)

2. Message Table

Two ICMP packets were captured: PC1 pings PC3 within VLAN 10. Both PCs are in the same VLAN so the traffic is switched (not routed).

#	Source IP	Destination IP	Message	Protocol
			Message Table — VLAN (ICMP Ping)	
1	188.16.0.53	188.16.0.54	Echo (ping) request id=0x0195, seq=1/256, ttl=64	ICMP
2	188.16.0.54	188.16.0.53	Echo (ping) reply id=0x0195, seq=1/256, ttl=64	ICMP

Figure 2 — Captured ICMP Messages

3. ICMP Ping Flow

PC1 sends an Echo Request to PC3. Both are in VLAN 10, so the packet is forwarded by S1 → S2 (trunk) → S3 to PC3. PC3 replies along the same path.
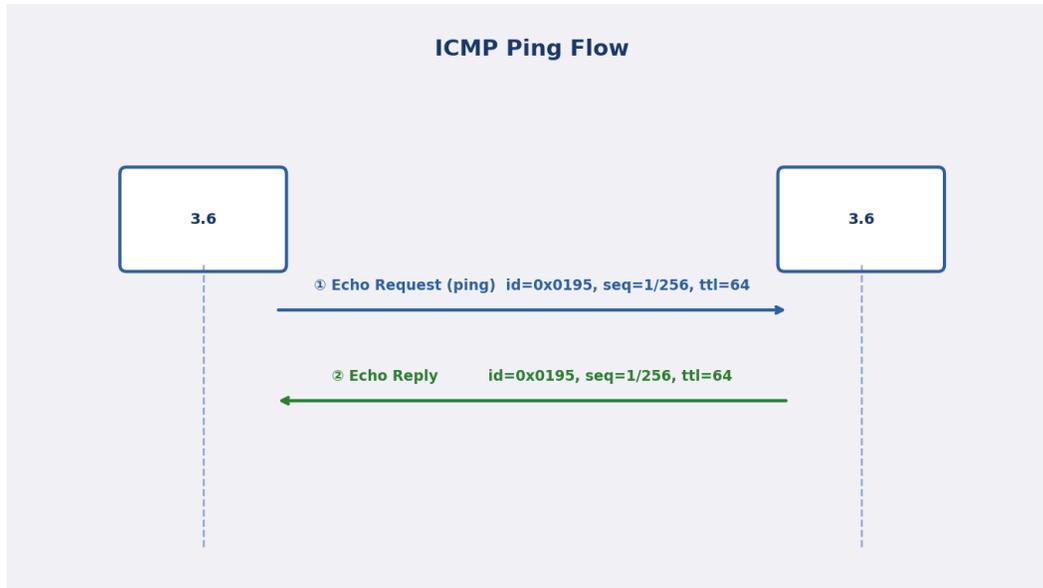
ICMP Ping Flow

| 3.6 | 3.6 |

① **Echo Request (ping)** id=0x0195, seq=1/256, ttl=64

② **Echo Reply** id=0x0195, seq=1/256, ttl=64

Figure 3 — ICMP Ping Flow (intra-VLAN)

4. Ethernet Frame Structure

Each ICMP packet is encapsulated in a standard Ethernet frame. On trunk links, an 802.1Q VLAN tag is inserted to carry VLAN membership across the switches.
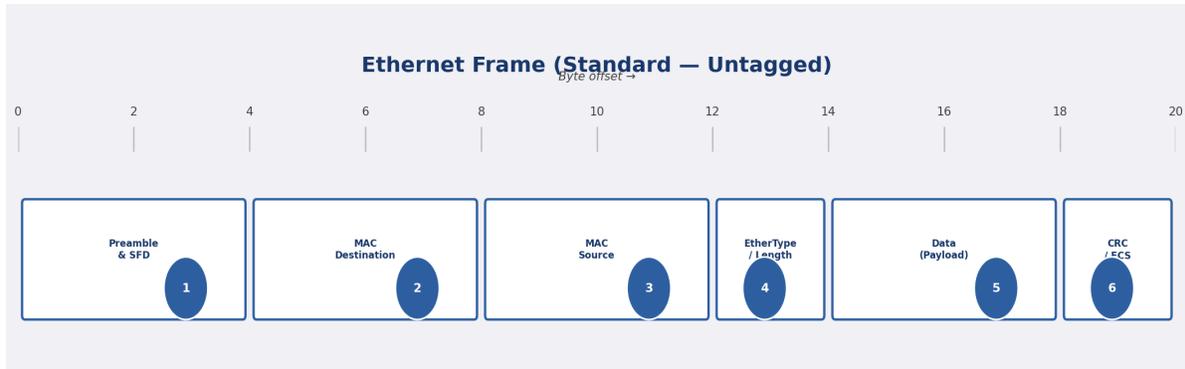
Ethernet Frame (Standard — Untagged)

Byte offset →

| 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |

| Preamble & SFD **1** | MAC Destination **2** | MAC Source **3** | EtherType / Length **4** | Data (Payload) **5** | CRC / FCS **6** |

Figure 4a — Standard Ethernet Frame Layout (numbered)

Ethernet Frame Field Reference

#	Field Name	Role / Notes
1	Preamble & SFD	7 bytes preamble + 1 byte SFD — synchronisation
2	MAC Destination	6 bytes — destination MAC address
3	MAC Source	6 bytes — source MAC address
4	EtherType / Length	2 bytes — 0x0800 = IPv4, 0x0806 = ARP
5	Data (Payload)	46–1500 bytes — encapsulated IP packet / payload
6	CRC / FCS	4 bytes — frame check sequence (error detection)

Figure 4b — Ethernet Frame Field Reference

5. 802.1Q Tagged Frame (Trunk Link)

On trunk ports between switches, a 4-byte 802.1Q tag (VLAN ID 10 for VLAN10 traffic) is inserted after the source MAC. This allows both VLANs to share the same physical link while remaining logically separated.
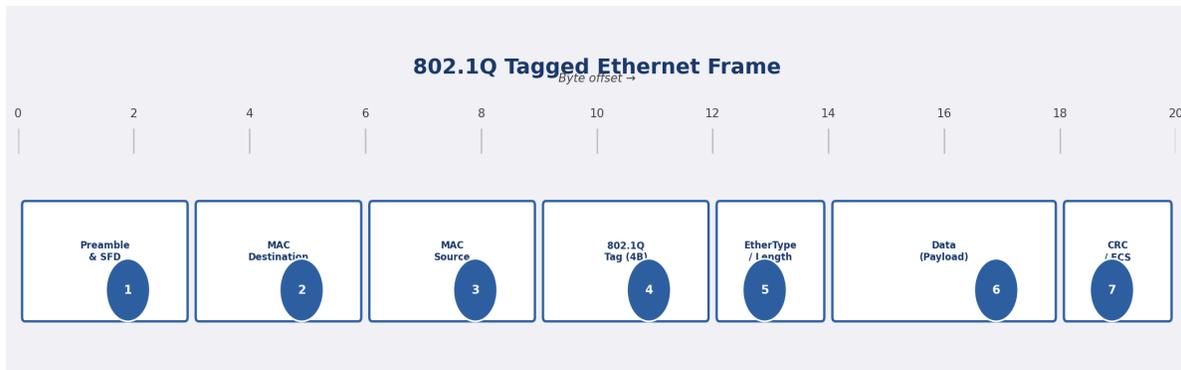

Figure 5a — 802.1Q Tagged Ethernet Frame Layout (numbered)

802.1Q Tag Field Reference

#	Field Name	Role / Notes
1	Preamble & SFD	7 bytes preamble + 1 byte SFD — synchronisation
2	MAC Destination	6 bytes — destination MAC address
3	MAC Source	6 bytes — source MAC address
4	802.1Q Tag (4 B)	TPID 0x8100 + TCI (PCP 3-bit, DEI 1-bit, VID 12-bit)
5	EtherType / Length	2 bytes — 0x0800 = IPv4 (inner type after tag)
6	Data (Payload)	46–1500 bytes — encapsulated IP packet
7	CRC / FCS	4 bytes — frame check sequence

Figure 5b — 802.1Q Tagged Frame Field Reference

6. 802.1Q Tag Detail

The 4-byte tag in this capture is 0x8100000a: TPID=0x8100, PCP=000, DEI=0, VID=10 (VLAN 10).
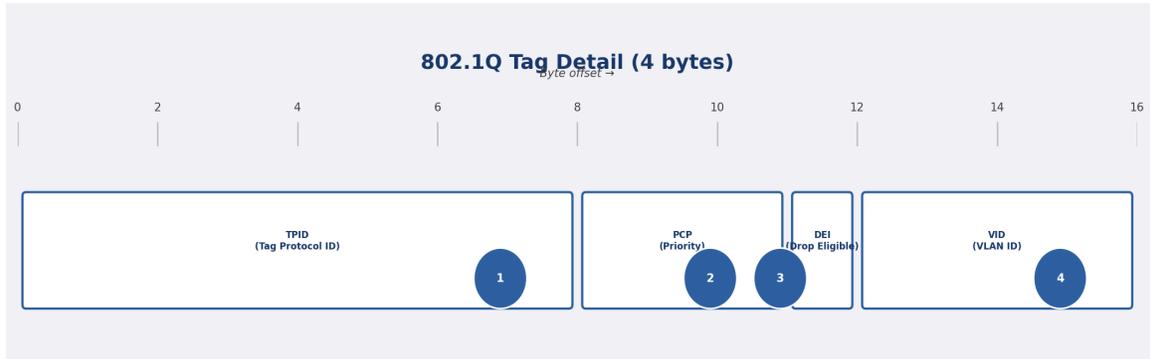

Figure 6a — 802.1Q Tag Fields (numbered)

802.1Q Tag Field Reference

#	Field Name	Role / Notes
1	TPID — Tag Protocol ID	0x8100 — identifies this as an 802.1Q tagged frame
2	PCP — Priority Code Point	3 bits — Class of Service (0 = best effort)
3	DEI — Drop Eligible	1 bit — may be dropped under congestion (formerly CFI)
4	VID — VLAN Identifier	12 bits — VLAN ID (0–4094); e.g. 10 or 20 in this lab

Figure 6b — 802.1Q Tag Field Reference

7. ICMP Packet Structure

The Echo Request (M1) is from 188.16.0.53 → 188.16.0.54 (id=0x0195, seq=1/256, ttl=64). The Echo Reply (M2) returns from 188.16.0.54 → 188.16.0.53. Both share the ICMP structure shown below.
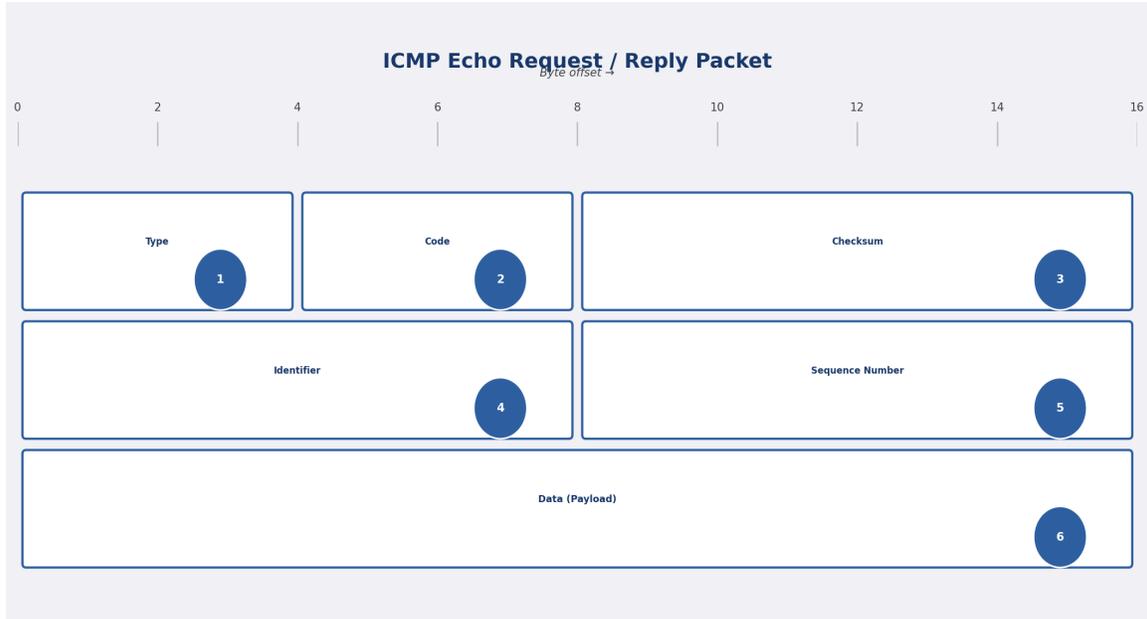

Figure 7a — ICMP Packet Layout (numbered)

#	Field Name	Role / Notes
ICMP Echo Field Reference		
1	Type	8 = Echo Request, 0 = Echo Reply
2	Code	0 — always zero for Echo Request/Reply
3	Checksum	16-bit ones-complement checksum of ICMP message
4	Identifier	0x0195 — used to match requests with replies
5	Sequence Number	Starts at 1/256, increments per ping
6	Data (Payload)	Arbitrary pattern bytes (0x00–0x3f in this capture)

Figure 7b — ICMP Field Reference Table

8. S1 Configuration Commands

S1 creates VLAN 10 and 20, assigns e0/1 to VLAN 10 and e0/2 to VLAN 20 (access ports), and sets e0/0 as an 802.1Q trunk toward S2.

```
 1  config terminal
 2  hostname S1
 3  vlan10
 4  vlan20
 5  interface e0/1
 6  switchport mode access
 7  switchport access vlan 10
 8  interface e0/2
 9  switchport mode access
10  switchport access vlan 20
11  exit
12  interface e0/0
13  switchport trunk encapsulation dot1q
14  switchport mode trunk
15  show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Et0/3, Et1/0–Et3/3
10	VLAN0010	active	Et0/1
20	VLAN0020	active	Et0/2

VLAN	MAC Address	Type	Port
1	aabb.cc00.0300	DYNAMIC	Et0/0
10	0050.7966.6800	DYNAMIC	Et0/1
10	0050.7966.6802	DYNAMIC	Et0/0

9. S2 Configuration Commands

S2 is a pure trunk switch — both e0/1 (toward S1) and e0/2 (toward S3) are configured as 802.1Q trunk ports carrying all VLANs.

```
 1  config terminal
 2  hostname s2
 3  vlan10
 4  vlan20
 5  interface e0/1
 6  switchport trunk encapsulation dot1q
 7  switchport mode trunk
 8  interface e0/2
 9  switchport trunk encapsulation dot1q
10  switchport mode trunk
11  exit
12  show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Et0/0, Et0/3, Et1/0–Et3/3
10	VLAN0010	active	—
20	VLAN0020	active	—

VLAN	MAC Address	Type	Port
1	aabb.cc00.0300	DYNAMIC	Et0/2
10	0050.7966.6800	DYNAMIC	Et0/1
10	0050.7966.6802	DYNAMIC	Et0/2

10. S3 Configuration Commands

S3 mirrors S1: e0/1 = VLAN 10 access (PC3), e0/2 = VLAN 20 access (PC4), e0/0 = 802.1Q trunk toward S2.

```
 1  config terminal
 2  hostname S3
 3  vlan10
 4  vlan20
 5  interface e0/1
 6  switchport mode access
 7  switchport access vlan 10
 8  interface e0/2
 9  switchport mode access
10  switchport access vlan 20
11  exit
12  interface e0/0
13  switchport trunk encapsulation dot1q
14  switchport mode trunk
15  show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Et0/3, Et1/0–Et3/3
10	VLAN0010	active	Et0/1
20	VLAN0020	active	Et0/2

VLAN	MAC Address	Type	Port
1	aabb.cc00.0100	DYNAMIC	Et0/0
1	aabb.cc00.0220	DYNAMIC	Et0/0
20	0050.7966.6801	DYNAMIC	Et0/0
20	0050.7966.6803	DYNAMIC	Et0/2