MT: Mikrotik as switch and VLAN configuration

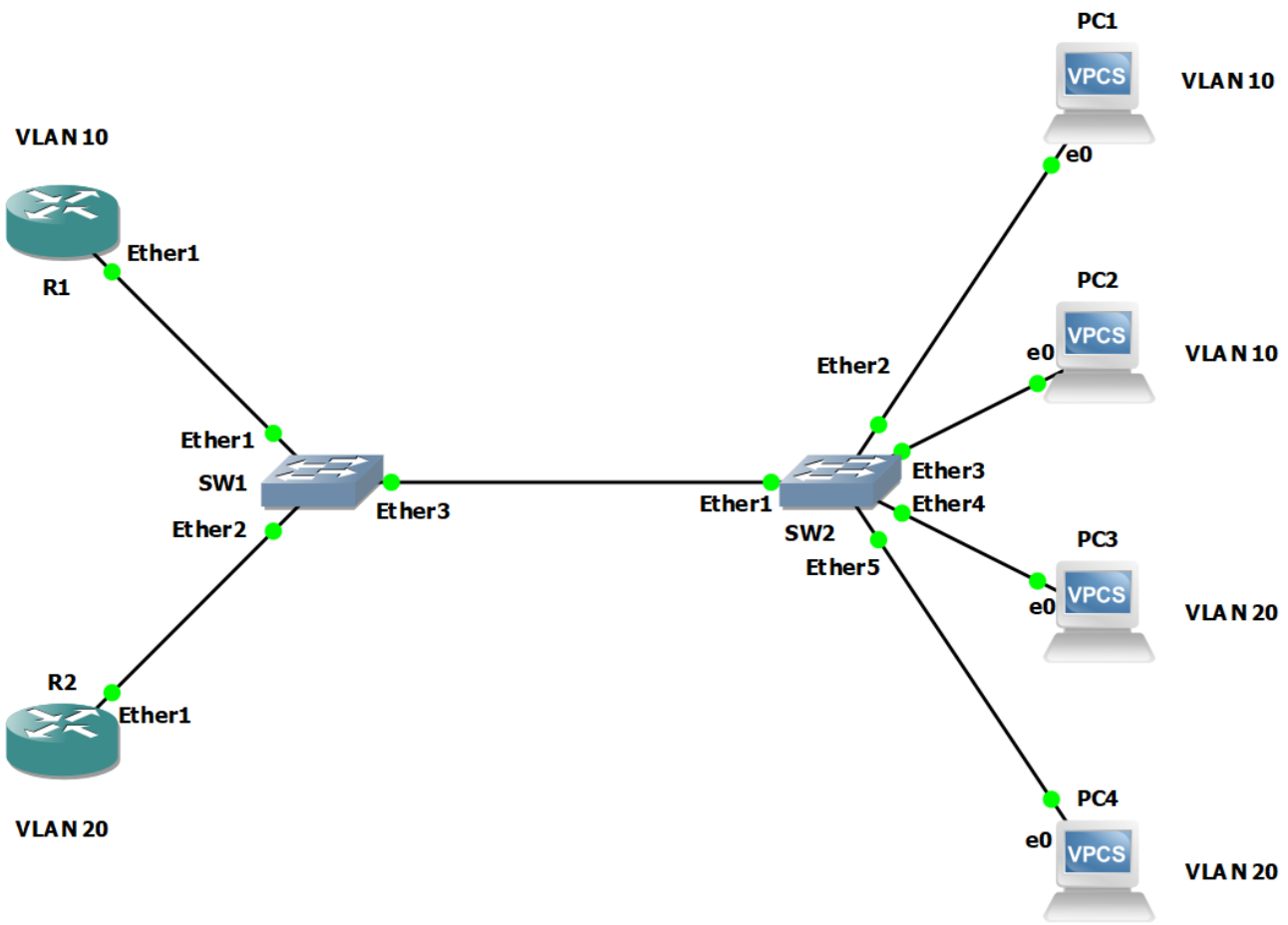
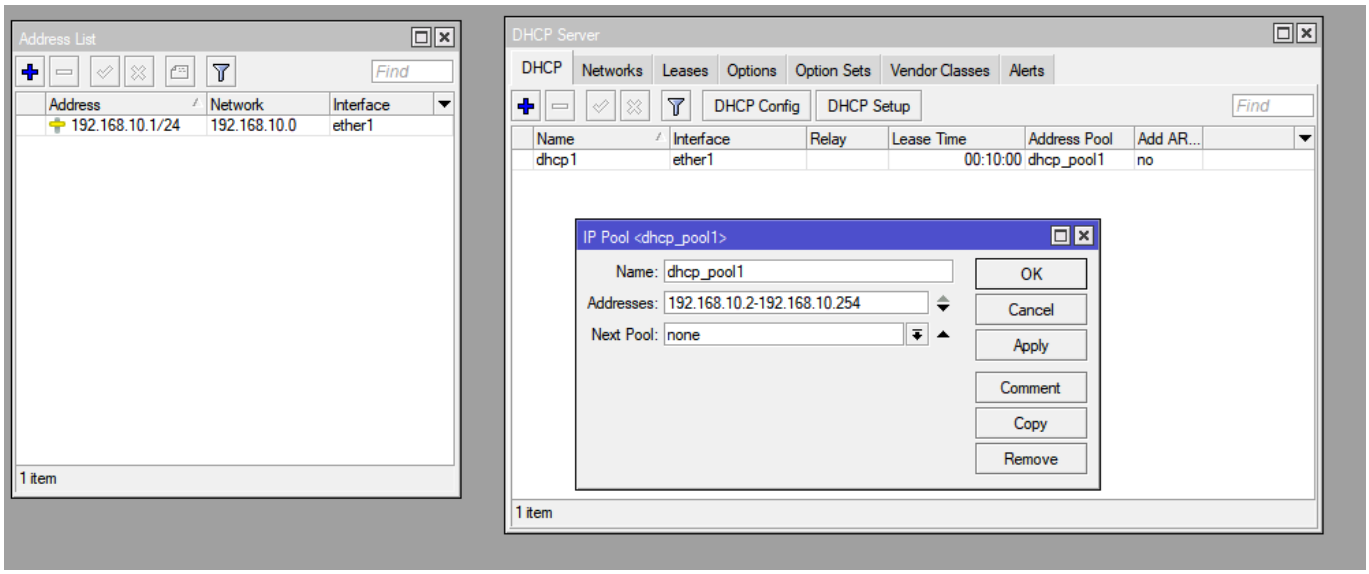
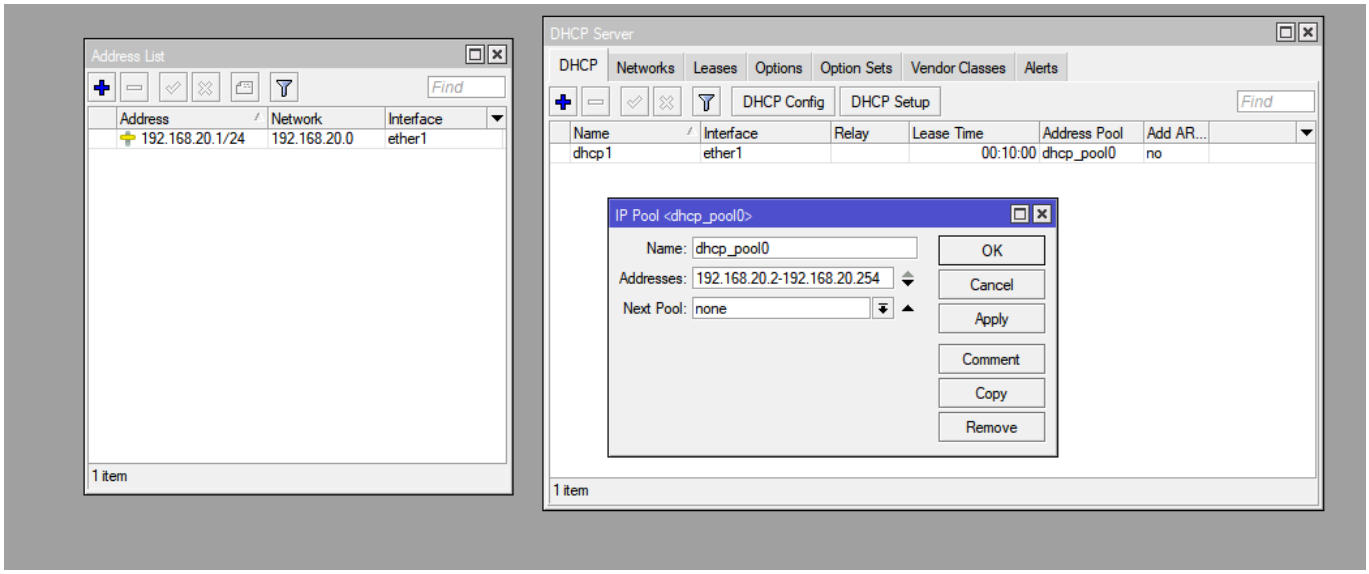


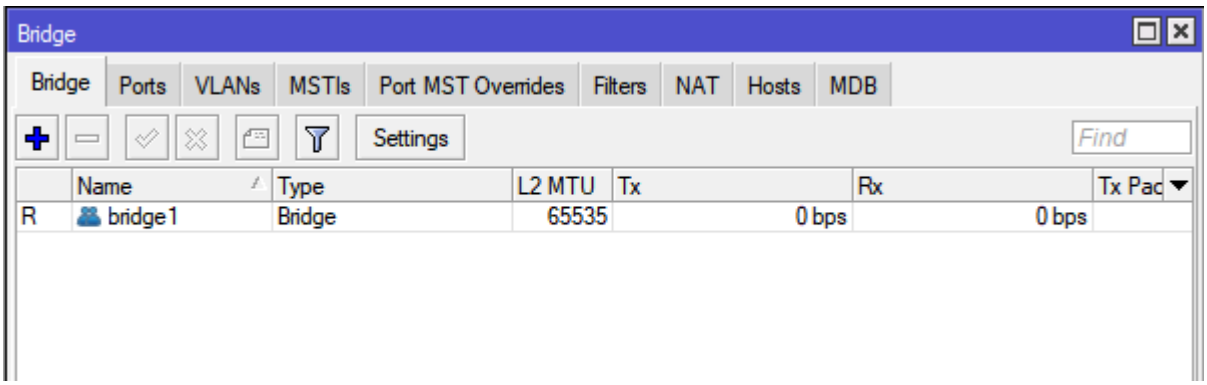
Diagram with GNS3 software



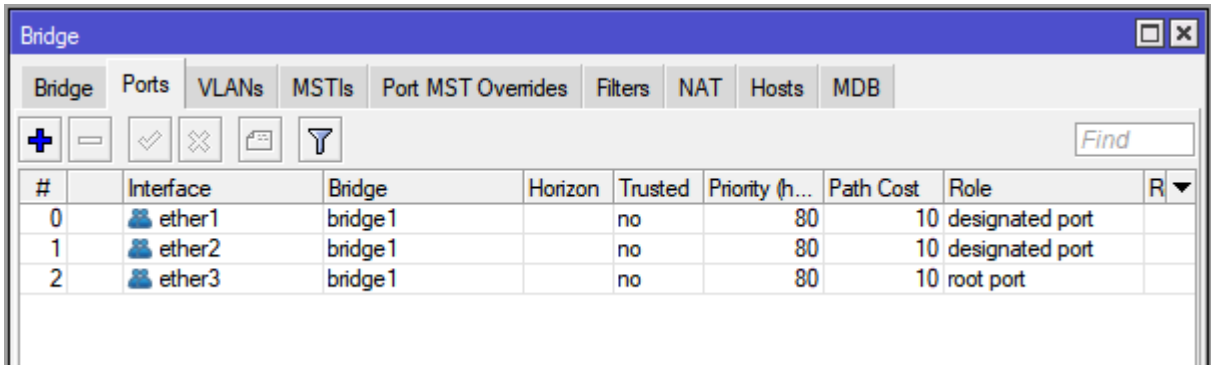
Router R1 configuration



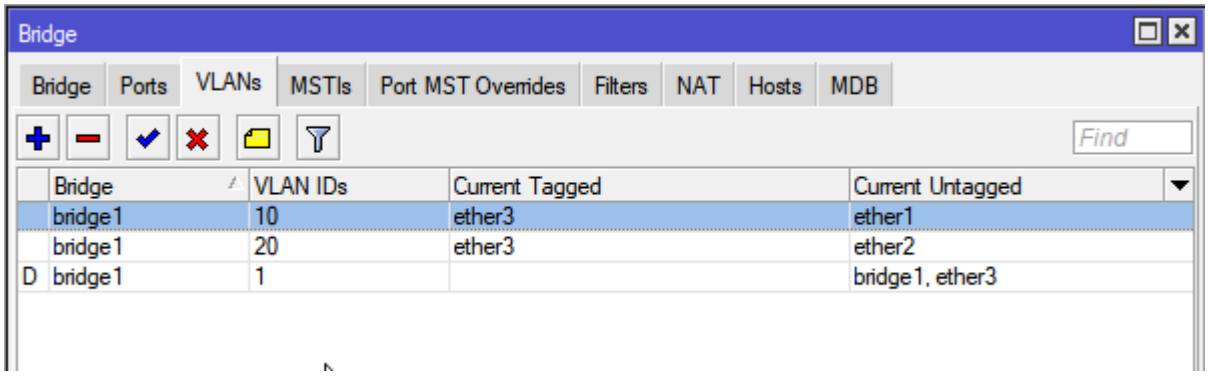
configuration of Router R2



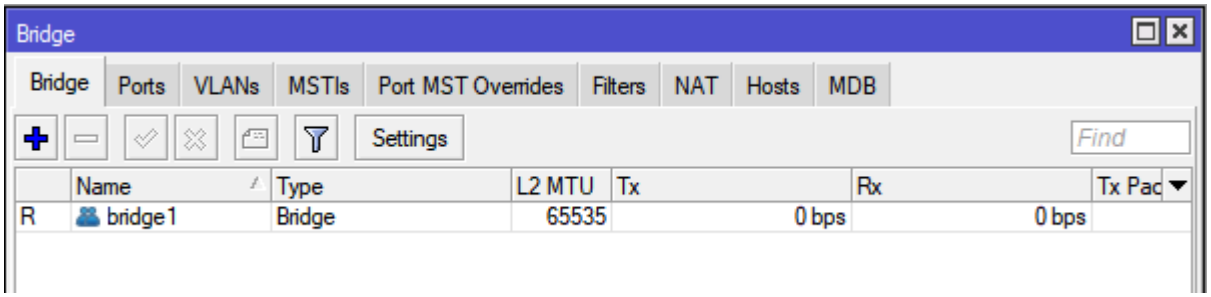
bridge configuration on SW1



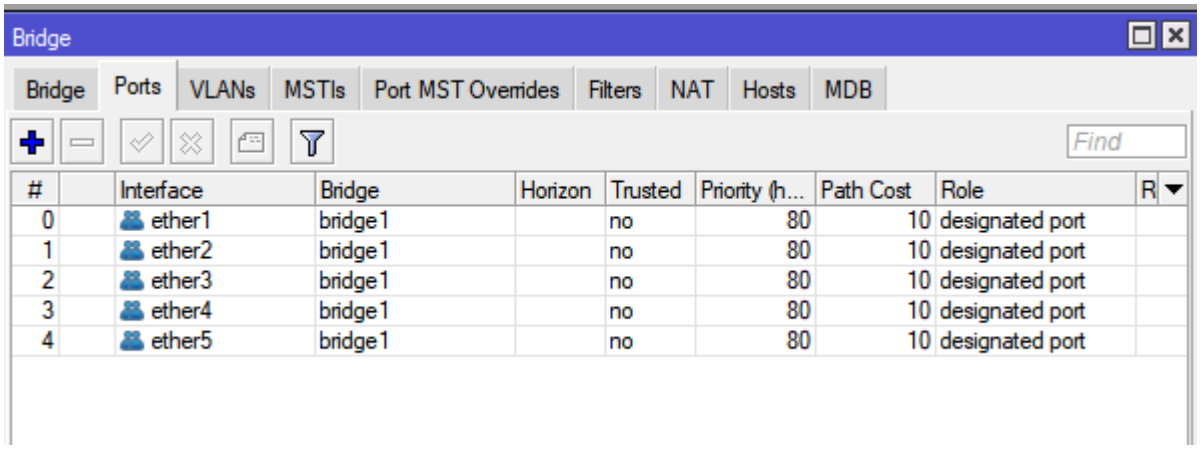
port settings on SW1



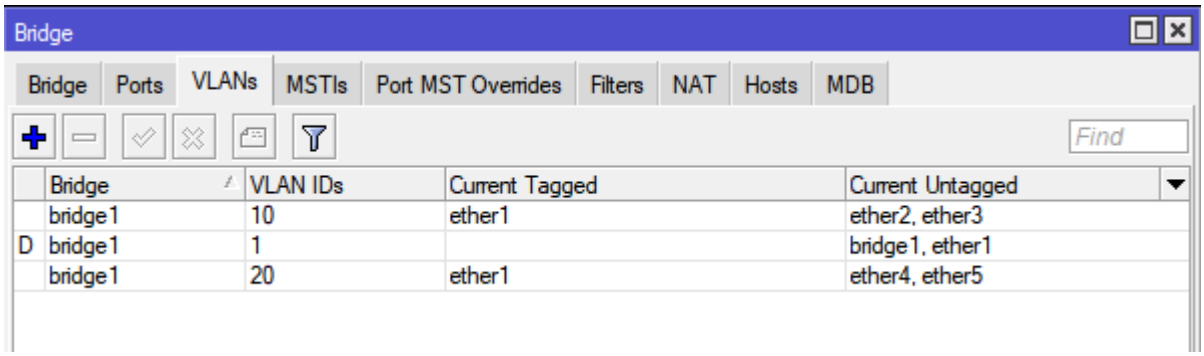
VLAN settings on SW1



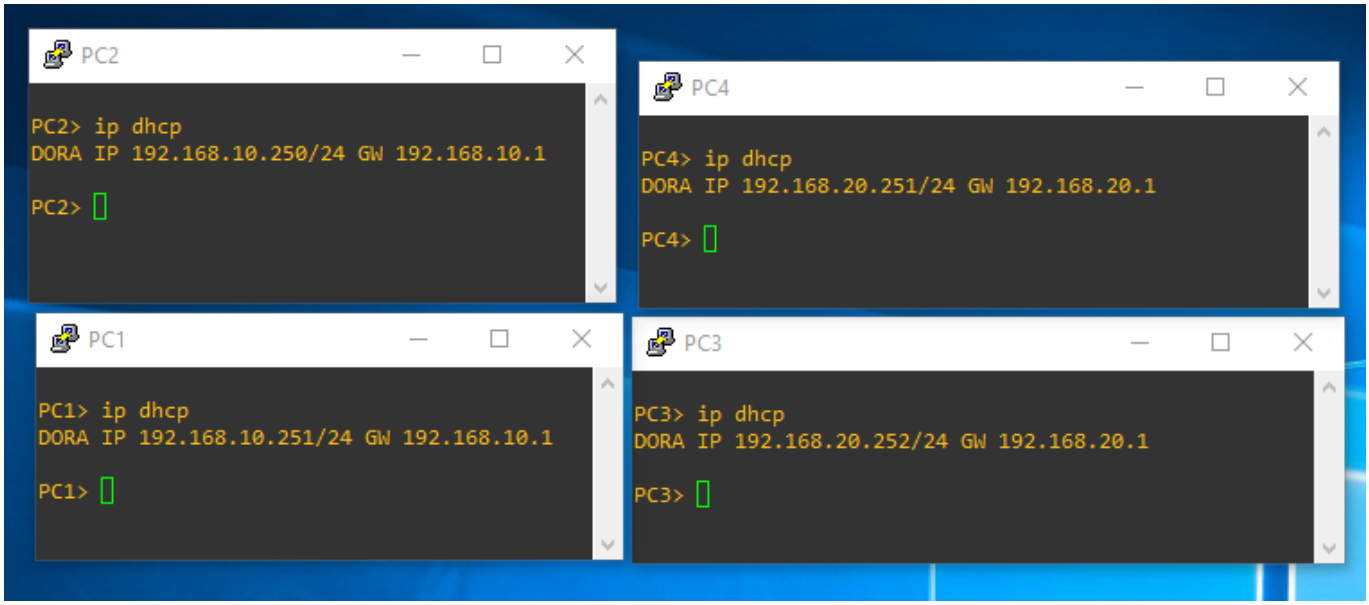
bridge configuration on SW2



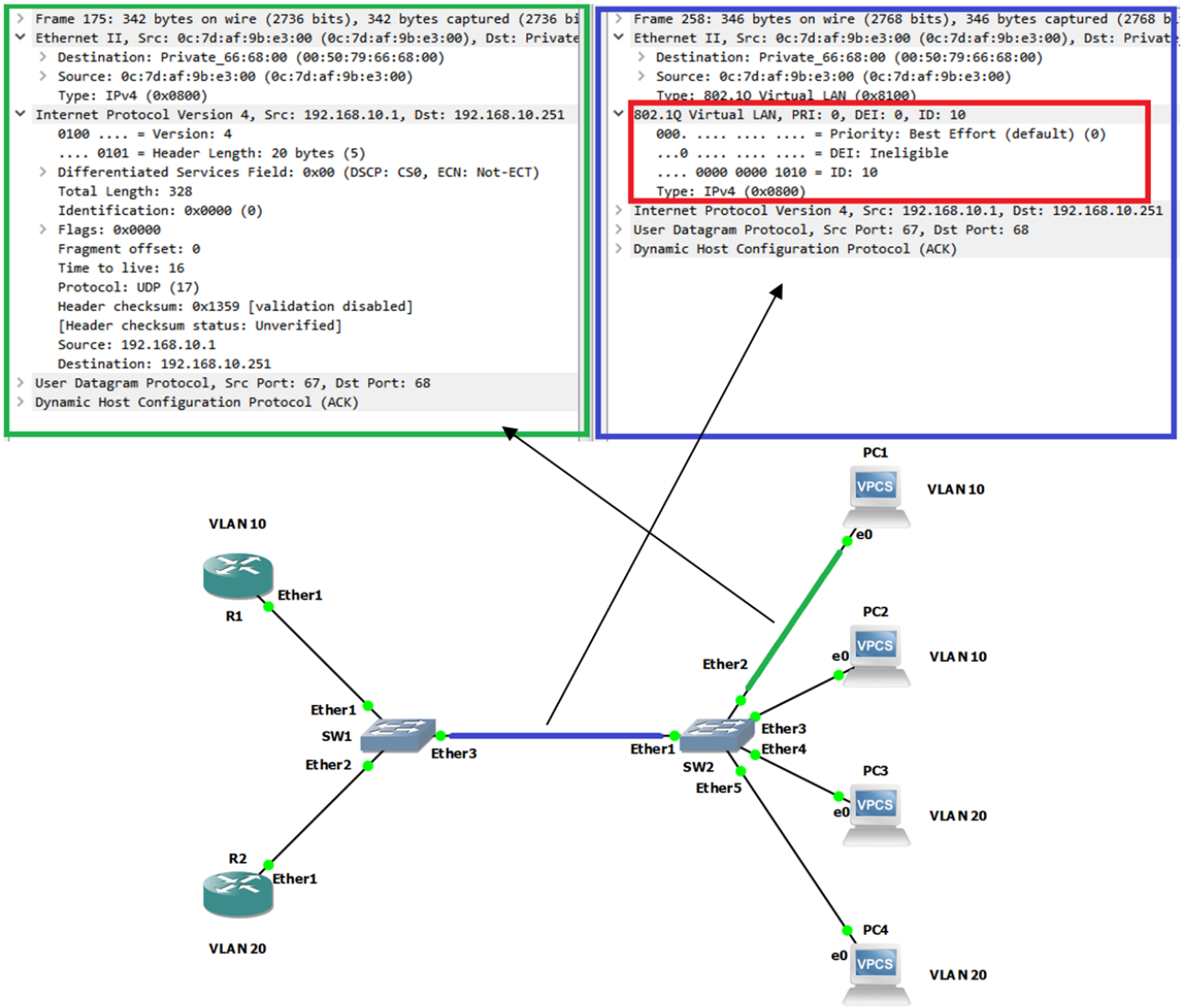
port settings on SW2



VLAN settings on SW2



DHCP test on end devices



CONCLUSIONS:

Managed devices (e.g. switches), operating according to the 802.1Q standard, use special frame marking (tagging). This is not additional encapsulation, but merely marking frames that they belong to a VLAN, communicating which network they belong to and that they are operating under the 802.1Q standard. For Ethernet frames using Ethernet II framing, the marking consists of inserting an extra 4 bytes between the source MAC address and the EtherType field. This is referred to as TPID (Tag Protocol Identifier). The first 2 additional bytes are a tag and always have the value 0x8100 to identify the frame as 802.1Q tagged.

The remaining 2 bytes called TCI (English: Tag Control Information) contain the following information:

- PCP field - a field consisting of three bits, used to indicate the priority of the frame. The use of this field is defined in the IEEE 802.1p standard
- CFI (Canonical Format Indicator) field - a one-bit identifier that tells which technology the LAN has been set up in. For Ethernet networks it has a value of zero, while for Token Ring it has a value of 1. This ensures that the two are working together. If a frame received on an Ethernet port has a CFI bit equal to one, it should not be forwarded because it is an untagged port.
- VLAN ID (VID) - A 12-bit field indicating which VLAN the frame belongs to. A value of zero means that the frame does not belong to any virtual network, a value of one is used for bridges and a value of 0xFFF is reserved for other purposes. The remaining 4094 values can be used to designate individual VLANs. An 802.1Q device, upon receiving such a frame, reads the VLAN ID and directs the frame to the appropriate virtual network.

Ethernet frame							
Preamble (8 bytes)	Destination MAC (6 bytes)	Source MAC (6 bytes)	EtherType (2 bytes)		Data field (46-1500 bytes)	CRC (4 bytes)	
Ethernet frame marked 802.1Q							
Preamble (8 bytes)	Destination MAC (6 bytes)	Source MAC (6 bytes)	**TPID 0x8100**	**TCI (2 bytes)**	EtherType (2 bytes)	Data field (46-1500 bytes)	CRC (4 bytes)

For frames using IEEE 802.2/SNAP encapsulation with the OUI field set to 00-00-00 (i.e. the ID field in the SNAP header set to EtherType), as may happen on LANs using a technique other than Ethernet, you set the EtherType field in the SNAP header to 0x8100 and add the above 4 bytes to the end of the SNAP header.

Changing the header and adding the extra bytes changes the FCS checksum, which must be recalculated.