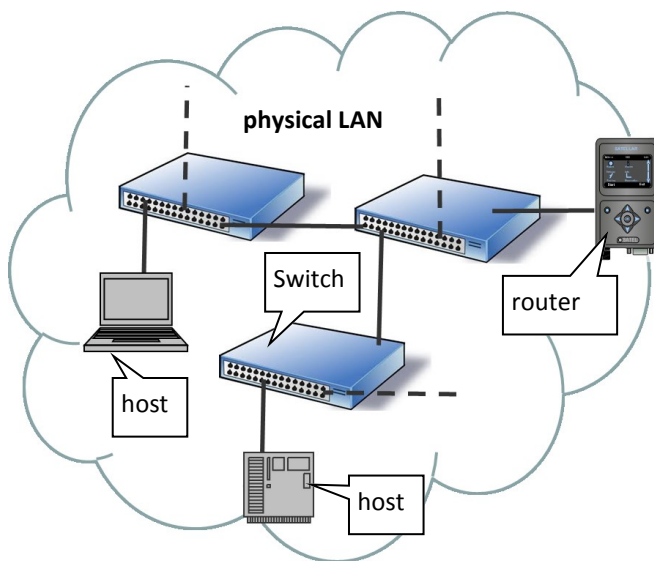
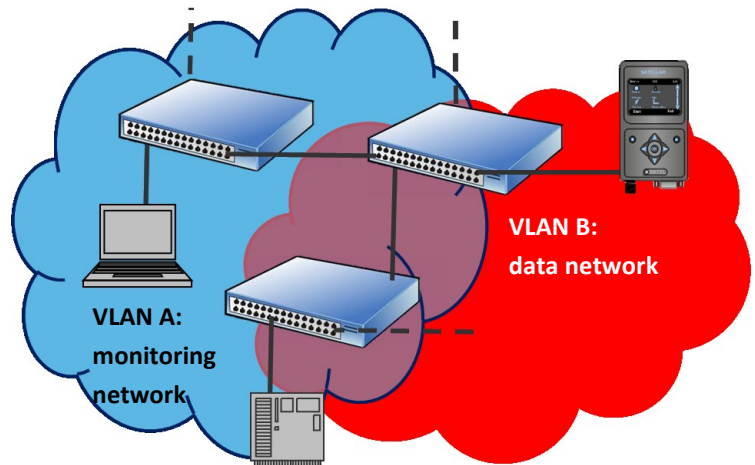


SATELLAR AND VLAN

1. OVERVIEW TO VIRTUAL LOCAL AREA NETWORKING

VLAN

Virtual Local Area Networking is a technology specified in IEEE 802.1Q standard. VLAN can be used to separate physical LAN to multiple virtual LANs and thus differentiate and control the access of devices connected physically to the same network. The following figure illustrates the separation of the physical LAN.

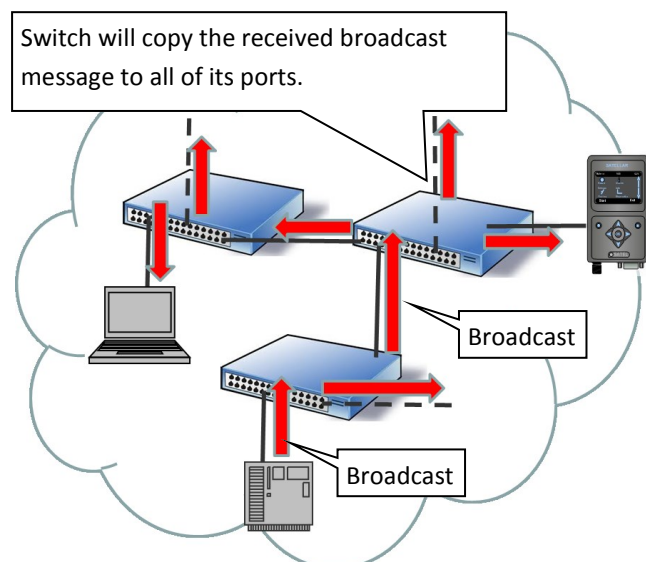


PHYSICAL LAN

Physical LAN is a network consisting of L2 devices such as switches and hubs. On the edges of the physical LAN are the host devices, such as PLCs, management computers and routers. SATELLAR radio modem functions as a router.

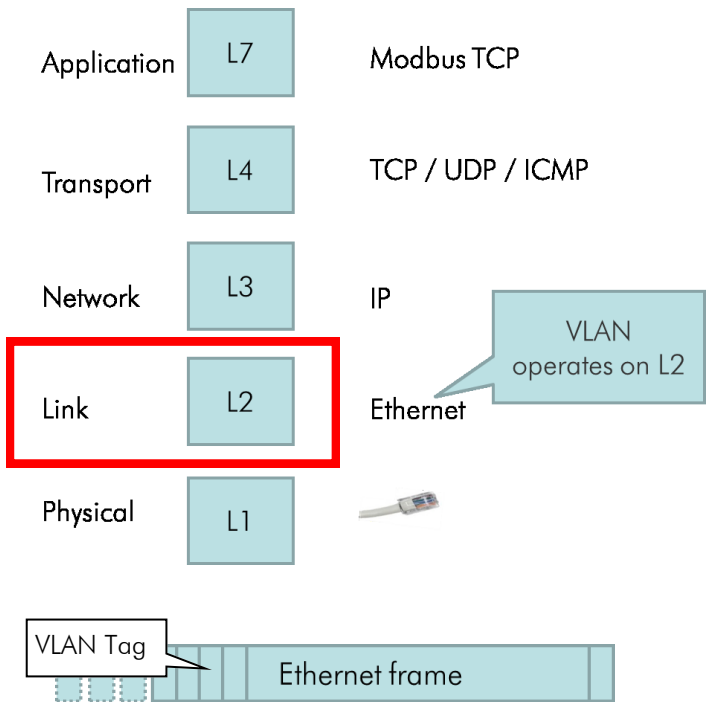
BROADCAST DOMAIN

Boundaries for a LAN can also be defined by the reach of the broadcasts sent to the network. An example of such broadcast is the ARP (Address Resolution Protocol) request, which is used by the Ethernet protocol to find the MAC address of the specific IP destination address.



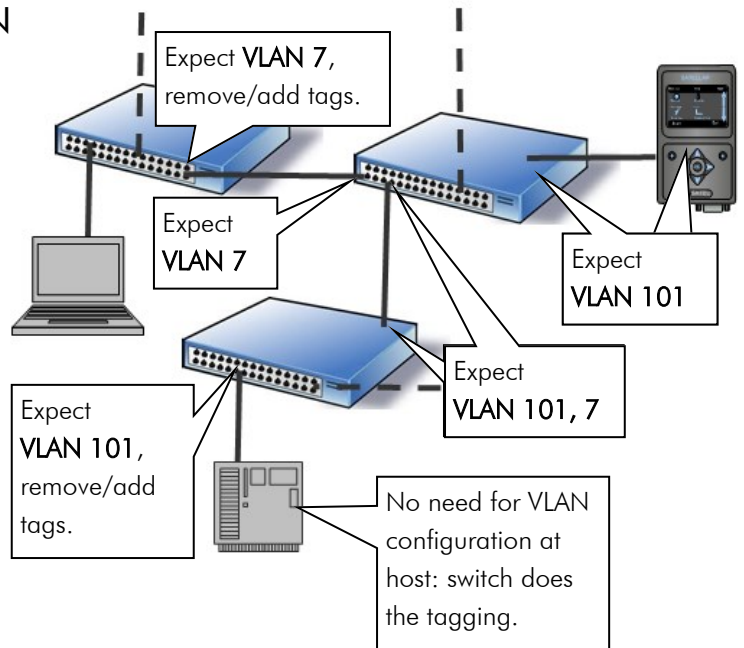
VLAN TAG

According to the standard IEEE 802.1Q, Ethernet frame is extended with an optional VLAN Tag, which uniquely defines the LAN. This tag is used to differentiate Ethernet frame processing. The Ethernet protocol is a link layer protocol (Layer 2, L2). Switches are the network devices that provide the forwarding functionality for L2. Therefore, the VLAN configuration and accordingly the network separation in the network is applied by switch configuration.



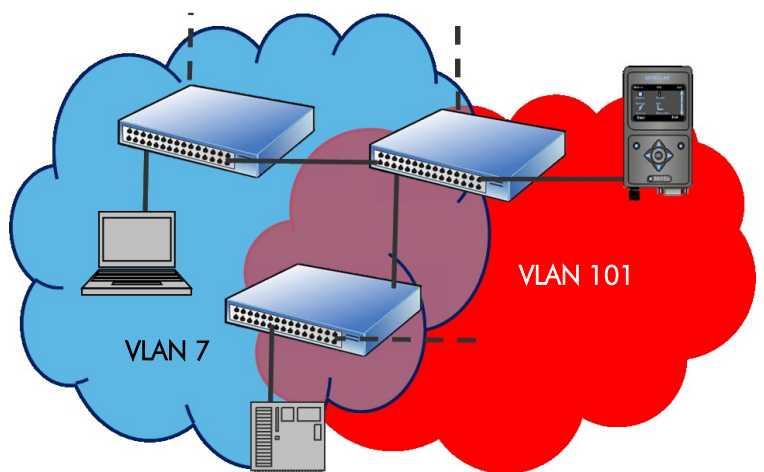
SWITCH CONFIGURATION FOR VLAN

For each Ethernet network, it is the switch configuration that defines how the physical LAN has been separated to different VLANs. Switch ports are assigned to one or more separate VLANs. Switches only forward traffic between ports belonging to the same VLAN. Switch ports can also be set to operate without any VLAN configuration. Depending on the switch vendor and model, the VLAN configuration in the switch port can be set to allow certain VLAN tags and add or modify the IDs in the tags of ingress or egress ethernet frames.



VLAN SEPARATION

With VLAN tagging to ethernet frames and proper switch port configuration, the physical network has now been separated to two individual virtual networks, VLANs.

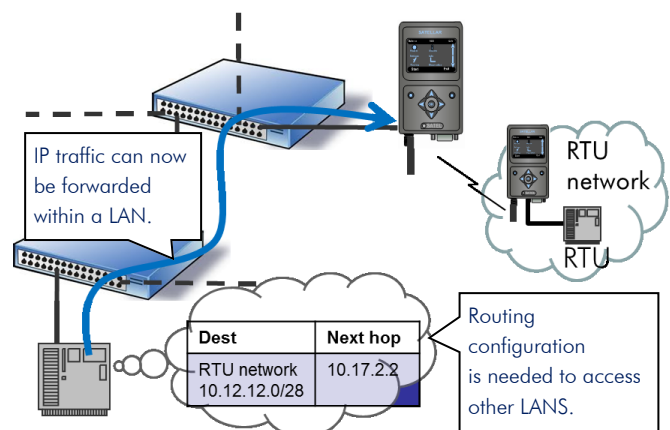
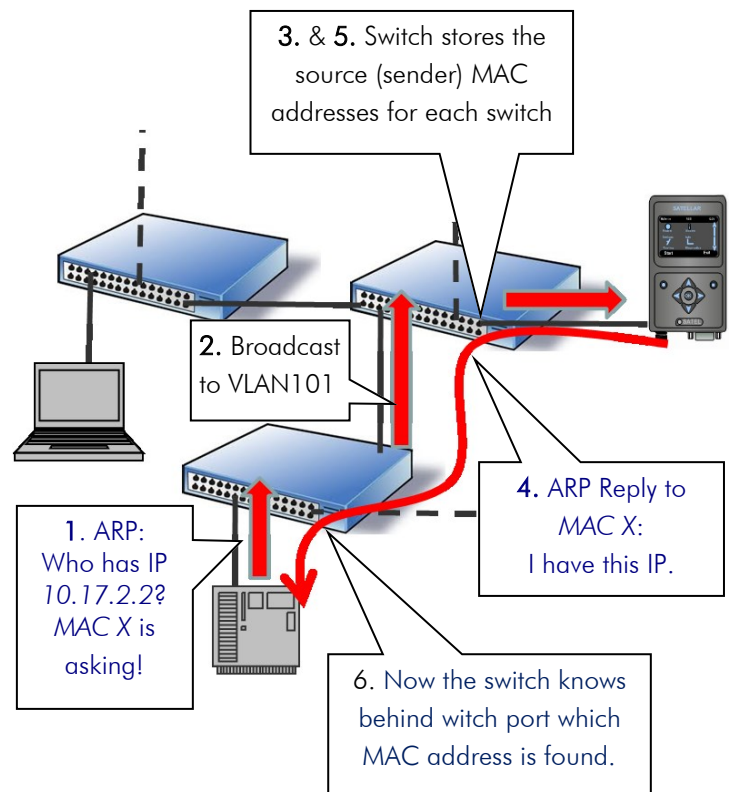
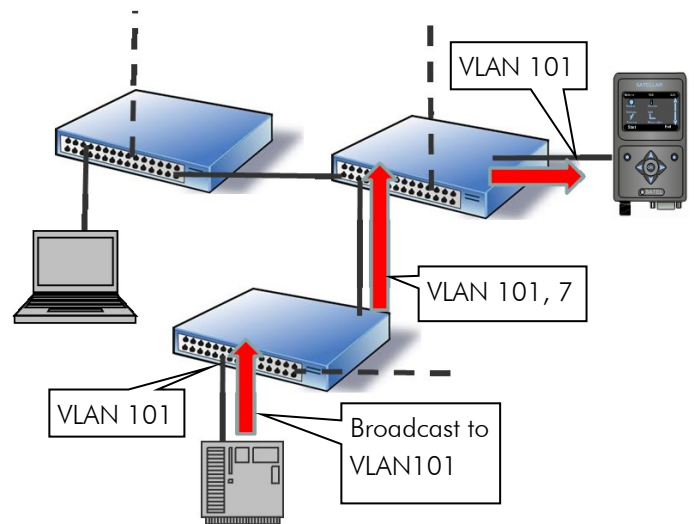


BROADCAST WITH VLAN

When an Ethernet frame, for example broadcast, is received by the switch from a port that belongs to certain VLAN, switch forwards the frame only to ports that have been assigned to the same VLAN. This way the switch and host configuration for VLAN define separate broadcast domains.

VLAN AND IP NETWORKING

The IP communication between two devices in a LAN requires the end-points to know each others MAC addresses (the Ethernet addresses). The host that has an IP packet to be delivered, sends an ARP request to network, to query which host and MAC address has the intended destination IP address. Only the host with matching IP address replies with its own MAC address and stores the initiating party's MAC address. Now both end-points know each others MAC addresses and the Ethernet communication to carry the IP traffic can start. The ARP requests are broadcasts, and thus sent and received only within one VLAN. Thus, forwarding Ethernet and IP traffic is only possible within a broadcast domain, or VLAN. For IP forwarding between VLANs, routing functionality is required. SATELLAR does provide the routing functionality and functions as a router.

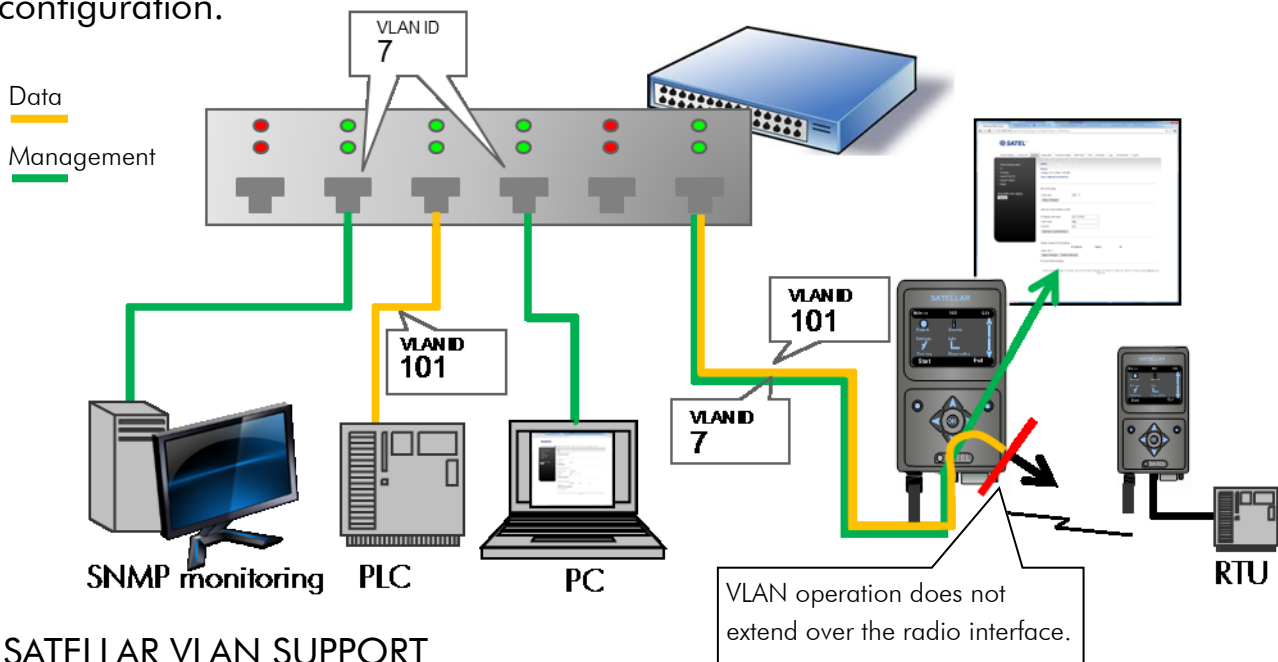


SATELLAR AND VLAN

2. VIRTUAL LOCAL AREA NETWORKING USE CASE EXAMPLE

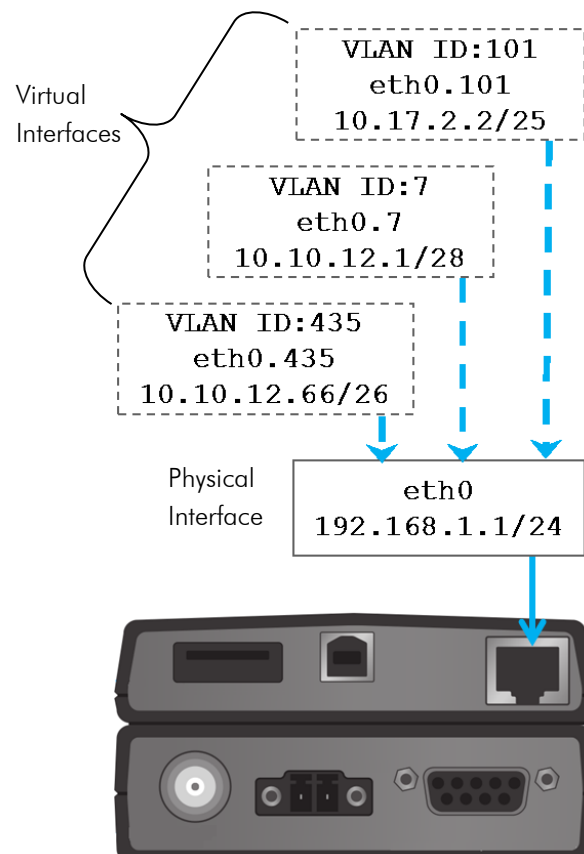
DATA AND MANAGEMENT SEPARATION

Typical usage scenario for VLANs is to separate data network and management network by assigning them to different VLANs. In many cases, the automation networks already have this kind of separation applied by their switch configuration.



SATELLAR VLAN SUPPORT

Target network may already have an extensive VLAN configuration applied in the switches. SATELLAR support for VLAN allows easy integration to pre-configured networks. Because SATELLAR is a router on the edge of the broadcast domain, VLANs are not extended to or over the radio interface. SATELLAR is configured to VLAN by setting up a new virtual interface with the desired VLAN ID and IP address. SATELLAR will accept or initiate communication with these IP addresses only with matching ethernet VLAN tag. All VLAN interfaces share the same physical ethernet interface.



SATELLAR AND VLAN

3. CONFIGURING VLAN IN SATELLAR

ENABLING VLAN OPERATION

Configuration parameters for VLAN operation are available under **Routing** tab, in **VLAN** application. Create new VLAN interface by providing the IP address (**step 1**), name (**2**) and the VLAN id (**3**), and then select **Add New VLAN Interface** (**4**). This creates an entry to the VLAN listing. The VLANs listed in the table are enabled when **VLAN state** parameter is switched to ON (**5**). All configurations are taken into use by selecting **Commit Changes** (**step 6**).

VLAN PARAMETERS

VLAN state

Turns the VLAN functionality on or off.

IP address with mask

Defines the IP address and the network for the created VLAN interface.

VLAN Name

Description or name for the VLAN for the user identification.

VLAN ID

Uniquely identifies the VLAN. The ID to expect on incoming frames and add to outgoing frames. Value between 0-4096.

Proxy ARP

Set the Proxy ARP on/off for the specific VLAN interface.

6 Finalize VLAN configuration by selecting **Commit Changes**.

5 To enable or disable VLAN functionality: select ON or OFF.

1 IP address with mask: 10.10.12.66/26

2 VLAN name: rtu

3 VLAN ID: 453

4 Add New VLAN Interface

Modify existing VLAN interfaces:	IP Address	Name	ID	Proxy ARP
VLAN eth0.101	10.17.2.2/25	data	101	OFF
VLAN eth0.7	10.10.12.1/28	management	7	OFF
VLAN eth0.453	10.10.12.66/26	rtu	453	OFF

Uncommitted changes

Added VLAN: 10.10.12.66/26 rtu 453 0

Commit Changes Cancel applied changes