

* **Ethernet Preamble (64 bits = 8 bytes)**
* The Ethernet preamble is a sequence of bits that precedes the actual data in an Ethernet frame.
* Its primary purpose is to signal the beginning of a frame and to allow the receiving device to synchronize its internal clock with the incoming data stream.

**The preamble consists of two parts:**

**● Preamble (7 bytes)**: A series of alternating 1s and 0s, ending with two consecutive 1s.

This helps the receiving device to synchronize its clock.

**● Start of Frame Delimiter (1 byte)**: A specific bit sequence (10101011) that indicates the end of

the preamble and the start of the actual data.

* **Ethernet Frame**

**● Destination MAC** :

These are six-byte addresses unique to each network interface card (NIC).

The destination address specifies where the frame is going

**● Source MAC :**

Hardware address of the source network adapter

the source address identifies the sender

**● Type or Length :**

A field that indicates either the protocol of the network layer (Ethernet II)

or the size of the data field (IEEE 802.3)

**● Data :**

The payload of the frame, which can be any network layer protocol data

The data must be at least 46 bytes , the NIC from the Sending Device will add padding (extra 0s)

**● Frame Check Sequence (FCS) :**

A cyclic redundancy check (CRC) that detects errors in the frame

**EtherType:**

The EtherType field directly enables devices to identify the specific type and contents of payload data inside an Ethernet frame on local networks.

Common EtherType values include:

**IPv4**: Defined as EtherType 0x0800, indicating the frame payload contains an IPv4 packet.

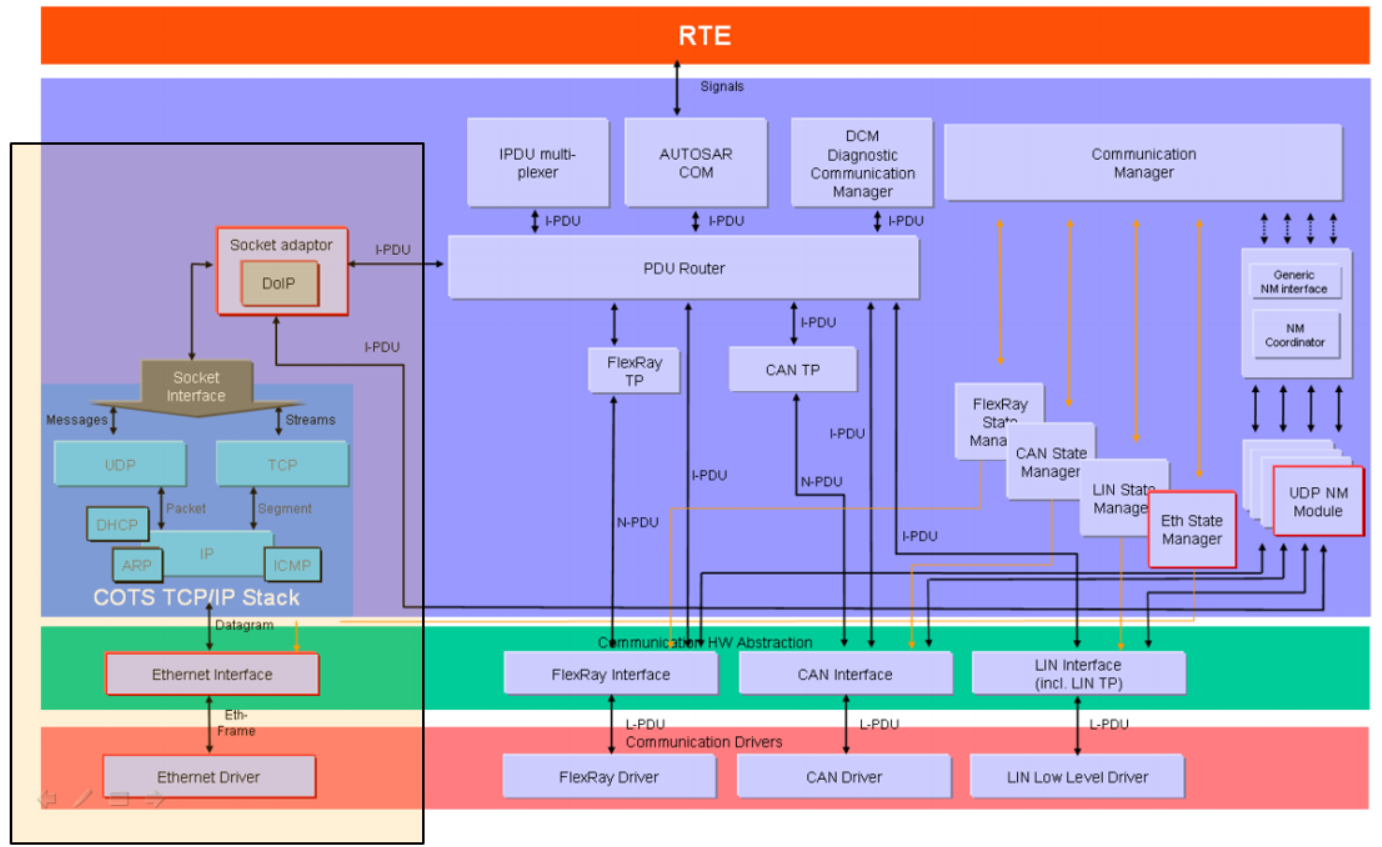
**IPv6**: EtherType 0x86DD signifies the presence of an IPv6 packet inside the frame.

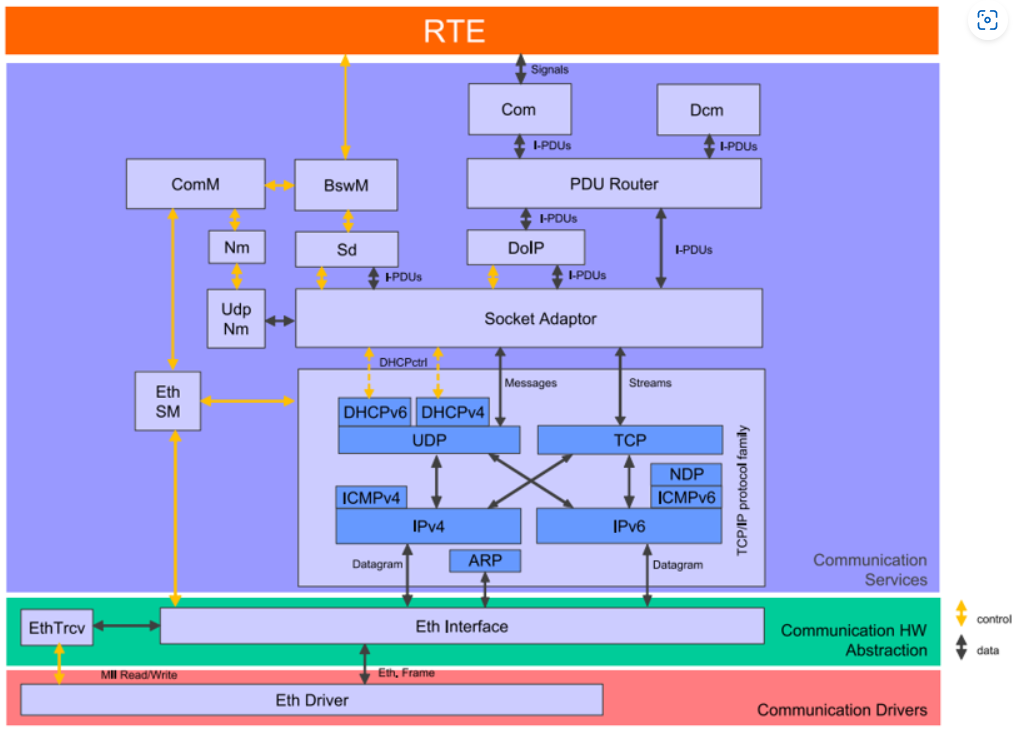
**ARP**: The Address Resolution Protocol used to map IP addresses to MAC addresses is identified by EtherType 0x0806.

**VLAN**: Virtual LAN tagging protocols use EtherType 0x8100 to multiplex multiple virtual networks over a shared physical medium.

**[MPLS](https://networkengineering101.com/how-ethernet-frame-formats-identify-payload-types/" \t "https://www.bing.com/_blank)**[: Multiprotocol Label Switching, EtherType 0x8847 and 0x8848, tags packets for optimized forwarding and routing1](https://networkengineering101.com/how-ethernet-frame-formats-identify-payload-types/" \t "https://www.bing.com/_blank).

**An Ethernet frame has a minimum size of 64 bytes and a maximum size of 1,518 bytes.**





**VLAN & security zones**

* The first level of the security architecture aims to restrict the access to the in-vehicle network by using
* The division of the network into several security zones.
* An actual, physical separation is usually not possible.
* This is why the division occurs by means of virtual LANs (VLANs) in accordance with IEEE 802.1Q. Here, a VLAN tag is inserted between the Ethernet Header and the data.
* This tag provides unique identification for all Ethernet messages of a VLAN.
* The VLAN tag is added or removed at the switch or directly in the control device.
* This makes it possible to achieve a clear and efficient separation of data traffic involving external devices (e.g., diagnostic test devices) and purely internal communication.
* Further security zones are formed based on vehicle domains, such as infotainment system or powertrain, or on the type of message (e.g., audio/video, time-sensitive control data, non-time-sensitive control data) via separate VLANs, where a control device may belong to several security zones.

**Advantages of automotive Ethernet**

1) High Speed

2) It can transfer large data

3) Single Twisted pair 2 wire cable, hence low weight.

4) Better Startup time

**Use Cases of automotive Ethernet**

1) Diagnostics

2) ECU Programming

3) Infotainment

4) ADAS/AD