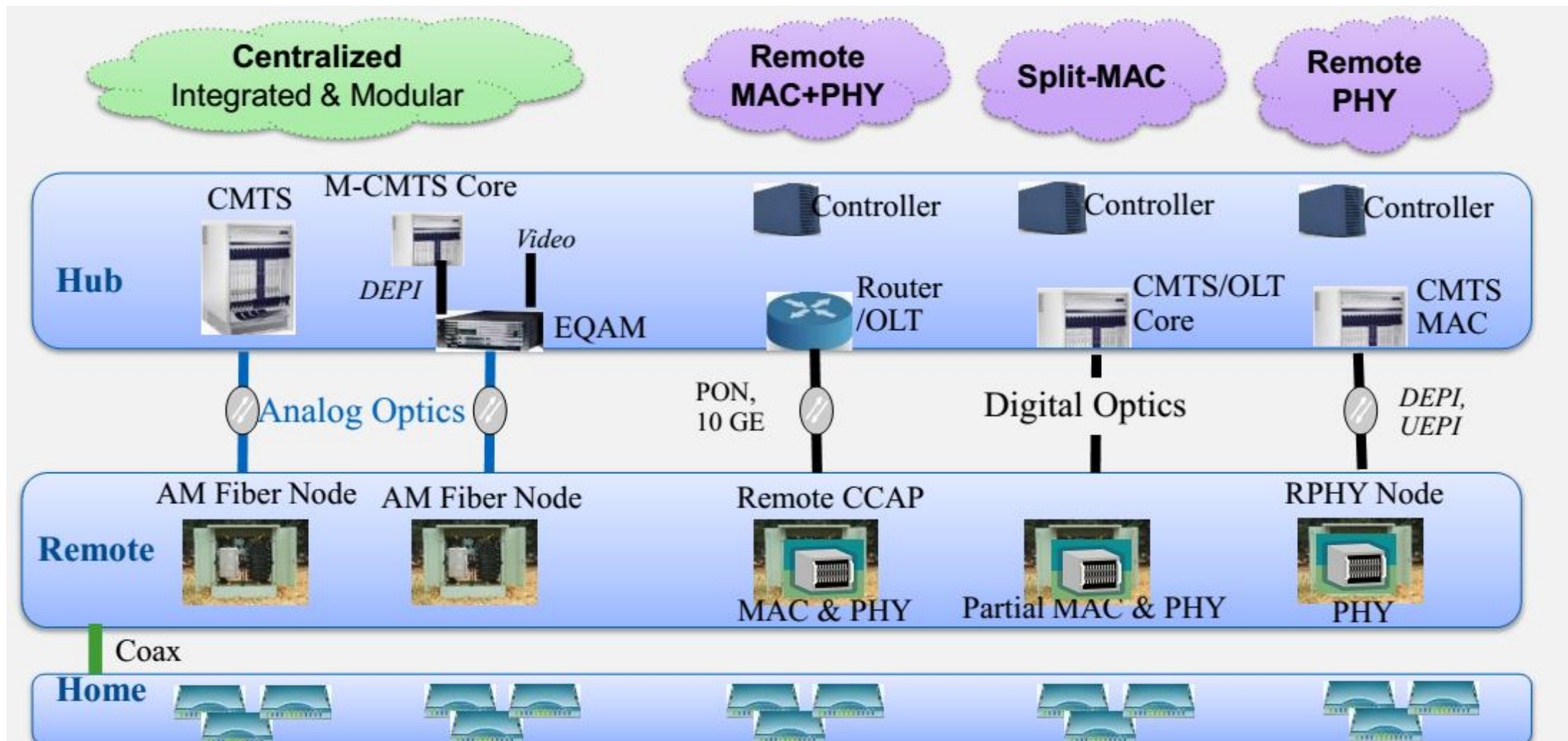# Distributed Access Architectures

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Objectives

- **Present current Cablelabs Distributed Access Architectures.**

- **Discuss if/how IEEE 1904.2 should support these architectures.**

Agenda

- **Cablelabs Distributed Access Architectures**

- **Remote MAC & PHY (R-MACPHY)**

  - Functional Modules of Distributed CMTS Architecture

  - R-MACPHY System Architecture

  - R-MACPHY Management Architecture

- **Remote PHY (R-PHY)**

  - L2TPv3 Pseudo-wires

  - R-PHY System Architecture

  - Example of R-PHY L2TPv3 Topologies

  - R-PHY Tunneling Protocols (use L2TPv3 – RFC3931).

    - **DEPI (Downstream External PHY Interface)**

    - **UPEI (Upstream External PHY Interface)**

Distributed Access Architectures
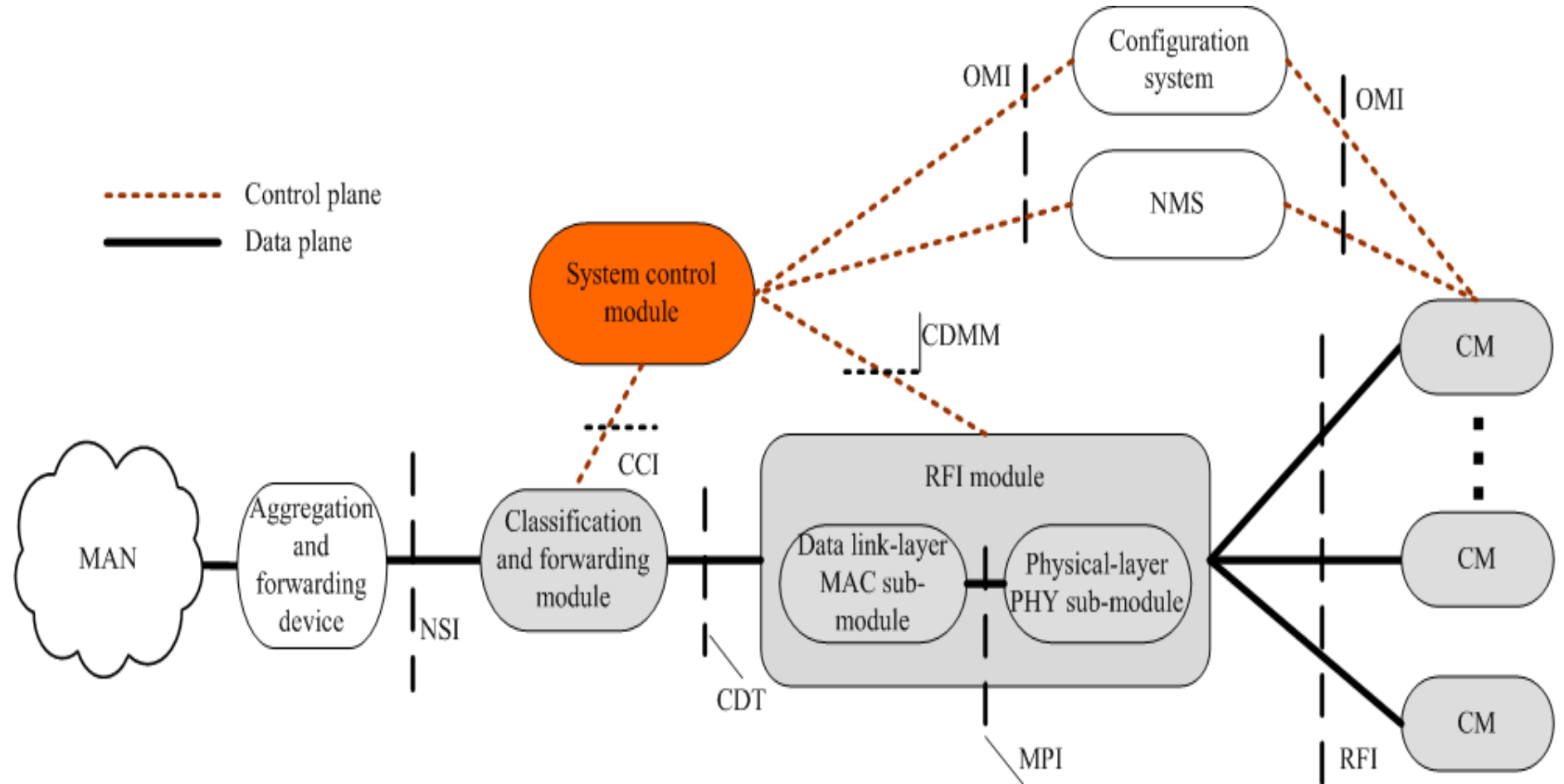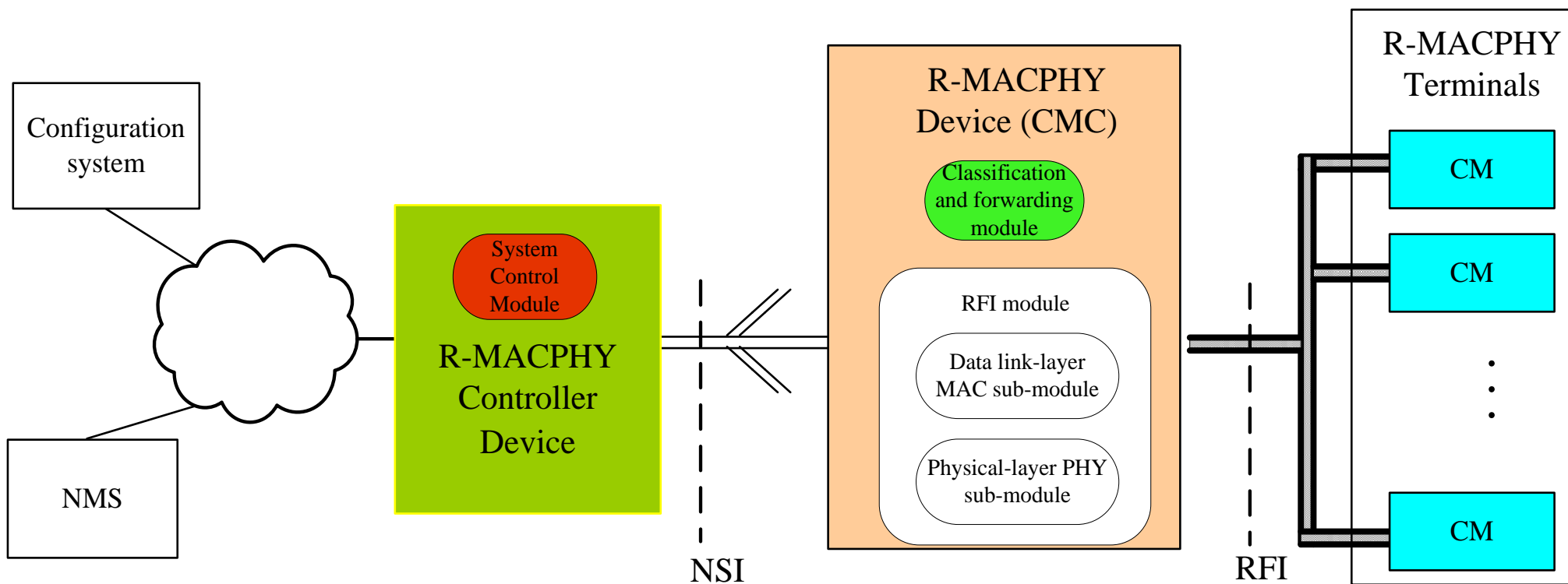
R-MACPHY

1

Functional Modules of the Distributed CMTS Architecture

System control module: This logical module is responsible for Configuration and management of the RFI module and the classification and forwarding module. For example, during CM registration, the system control module parses service flows and classification information reported by the CM and configures the classification and forwarding module accordingly. In addition, the system control module works with the NMS and the configuration system for service configuration and management.
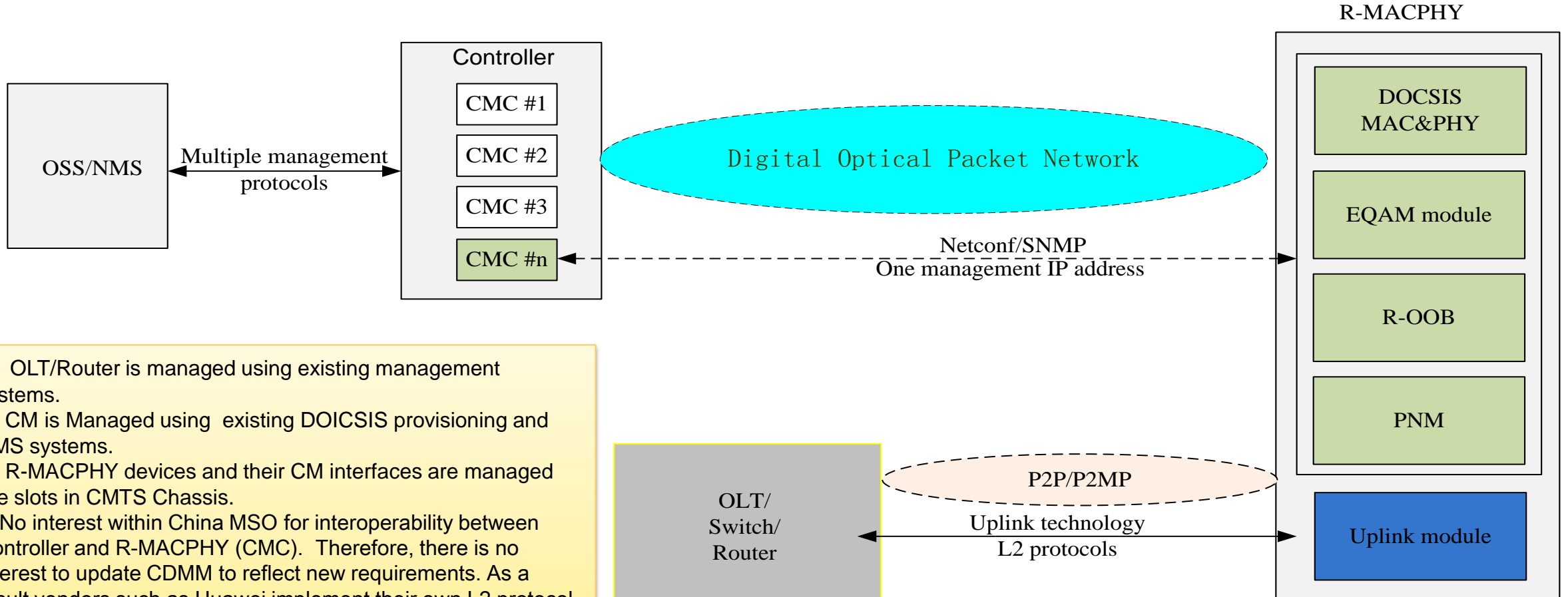
R-MACPHY Architecture

> R-MACPHY Controller manages the configuration of the of the R-MACPHY device.
> The Controller can be either a separate device or a component embedded in an aggregation and switching device, such as a router, a switch, or an OLT

R-MACPHY Management Using the Controller

R-MACPHY

Controller

CMC #1

CMC #2

CMC #3

CMC #n

OSS/NMS

Multiple management protocols

Digital Optical Packet Network

Netconf/SNMP
One management IP address

DOCSIS MAC&PHY

EQAM module

R-OOB

PNM

> OLT/Router is managed using existing management systems.
> CM is Managed using existing DOICSIS provisioning and NMS systems.
> R-MACPHY devices and their CM interfaces are managed like slots in CMTS Chassis.
> No interest within China MSO for interoperability between Controller and R-MACPHY (CMC). Therefore, there is no interest to update CDMM to reflect new requirements. As a result vendors such as Huawei implement their own L2 protocol.
> Huawei proposes Netconf/SNMP as the management protocol between the controller and R-MACPHY node.

OLT/ Switch/ Router

P2P/P2MP

Uplink technology
L2 protocols

Uplink module

PNM is used for MER Reporting, Symbol Capture, FEC Error Reporting PHY Stats Reporting
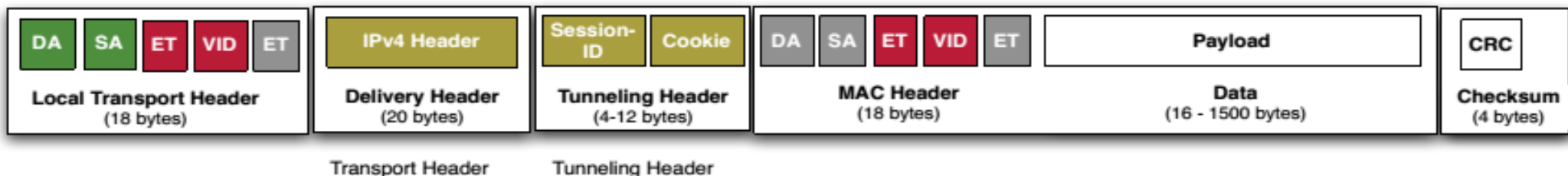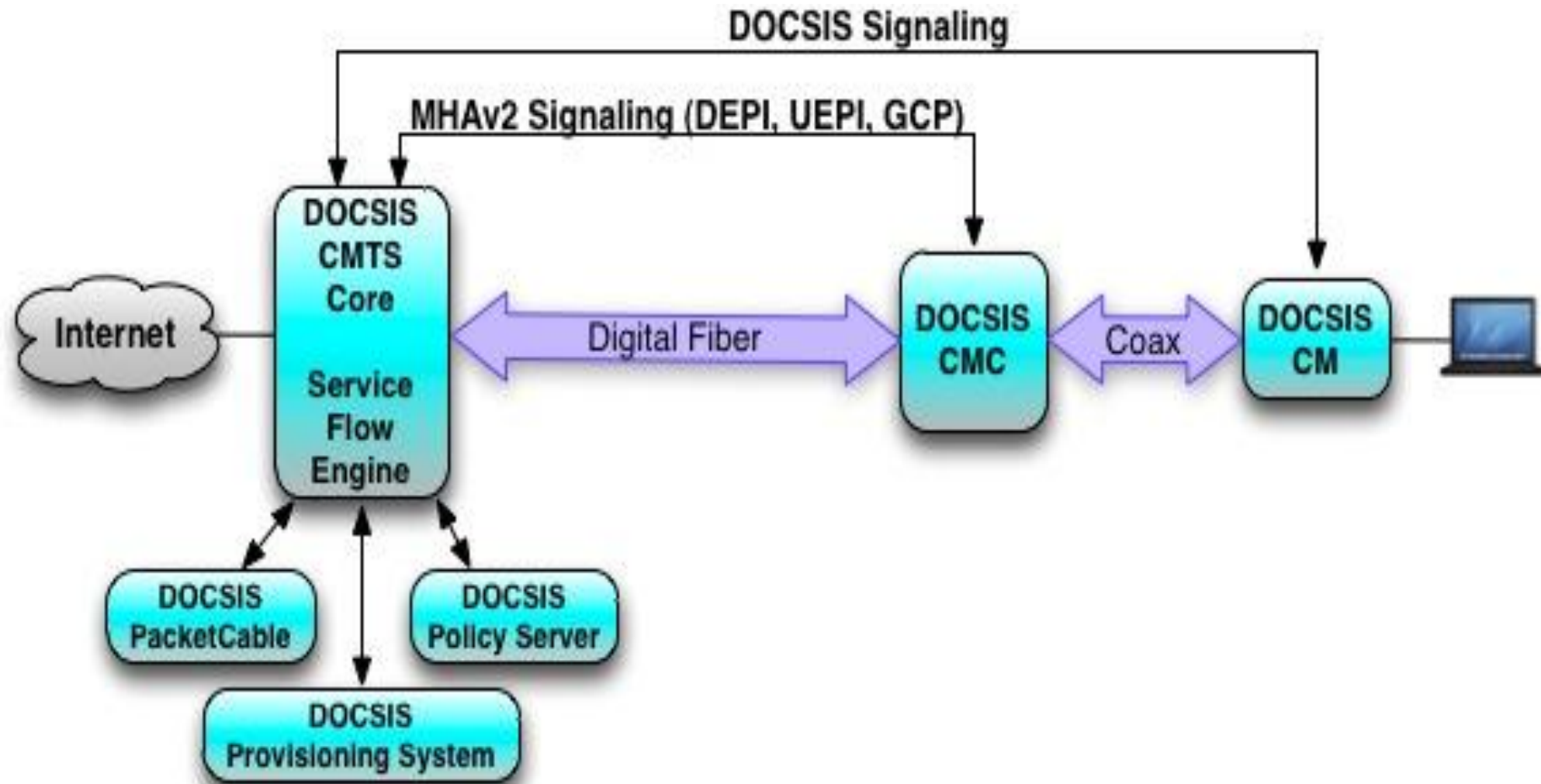
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2 R-PHY

L2TPv3 Tunnels and Pseudo-wires

- The base protocol that is used for the DEPI is the Layer 2 Tunneling Protocol Version 3, or L2TPv3 for short [RFC3931].

- L2TPv3 is an IETF protocol that is a generic protocol for creating a pseudowire (PW)

- PW is defined in RFC 3955 (Pseudo-wire Emulation Edge to Edge Architecture – PWE3) as an Emulation of Point to point connection over a packet switching network (PSN).

- L2TPv3 tunnel can carry more than one session (PW).

- There is an optional L2-Specific Sublayer is an intermediary layer between the L2TP session header and the start of the tunneled frame.
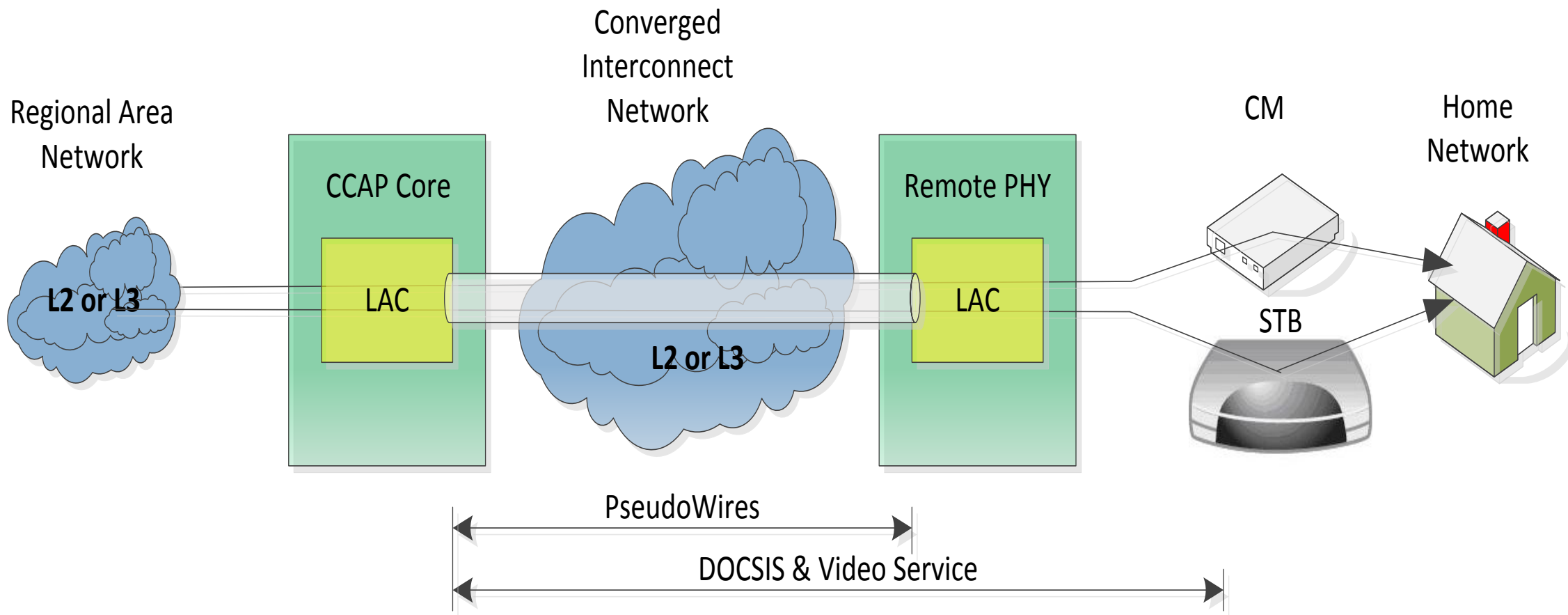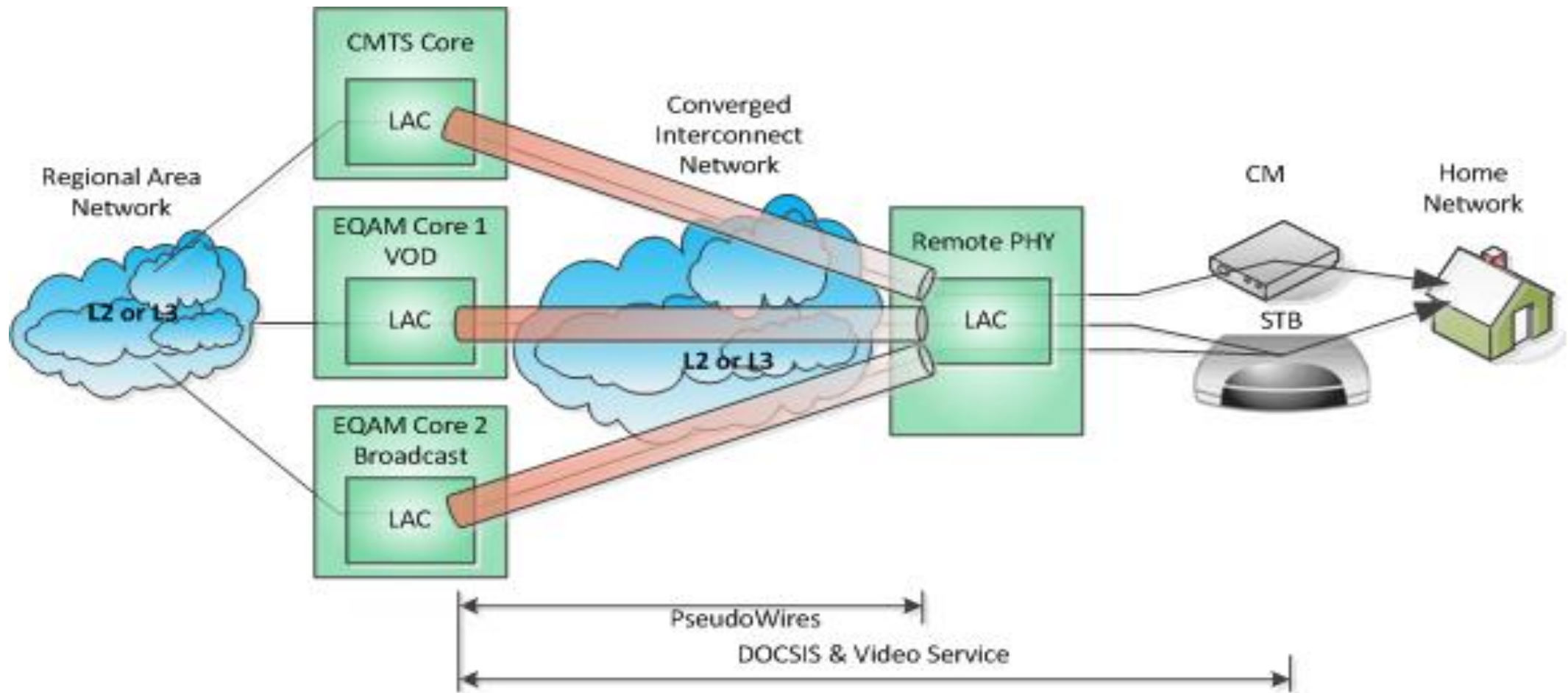
L2TPv3

DA	SA	ET	VID	ET	IPv4 Header	Session-ID	Cookie	DA	SA	ET	VID	ET	Payload	CRC

Local Transport Header (18 bytes) | **Delivery Header** (20 bytes) | **Tunneling Header** (4-12 bytes) | **MAC Header** (18 bytes) / **Data** (16 - 1500 bytes) | **Checksum** (4 bytes)

Transport Header | Tunneling Header

R-PHY System Architecture

R-PHY L2TPv3 Topology

Regional Area Network

CCAP Core

LAC

L2 or L3

Converged Interconnect Network

L2 or L3

Remote PHY

LAC

CM

STB

Home Network

PseudoWires

DOCSIS & Video Service
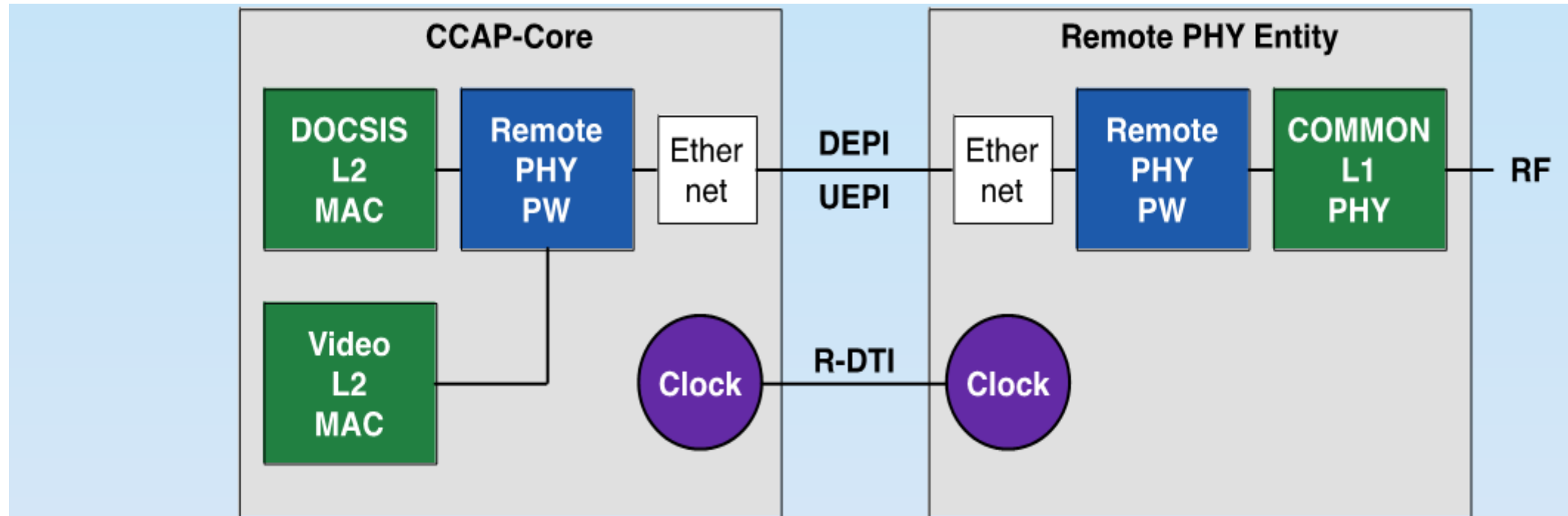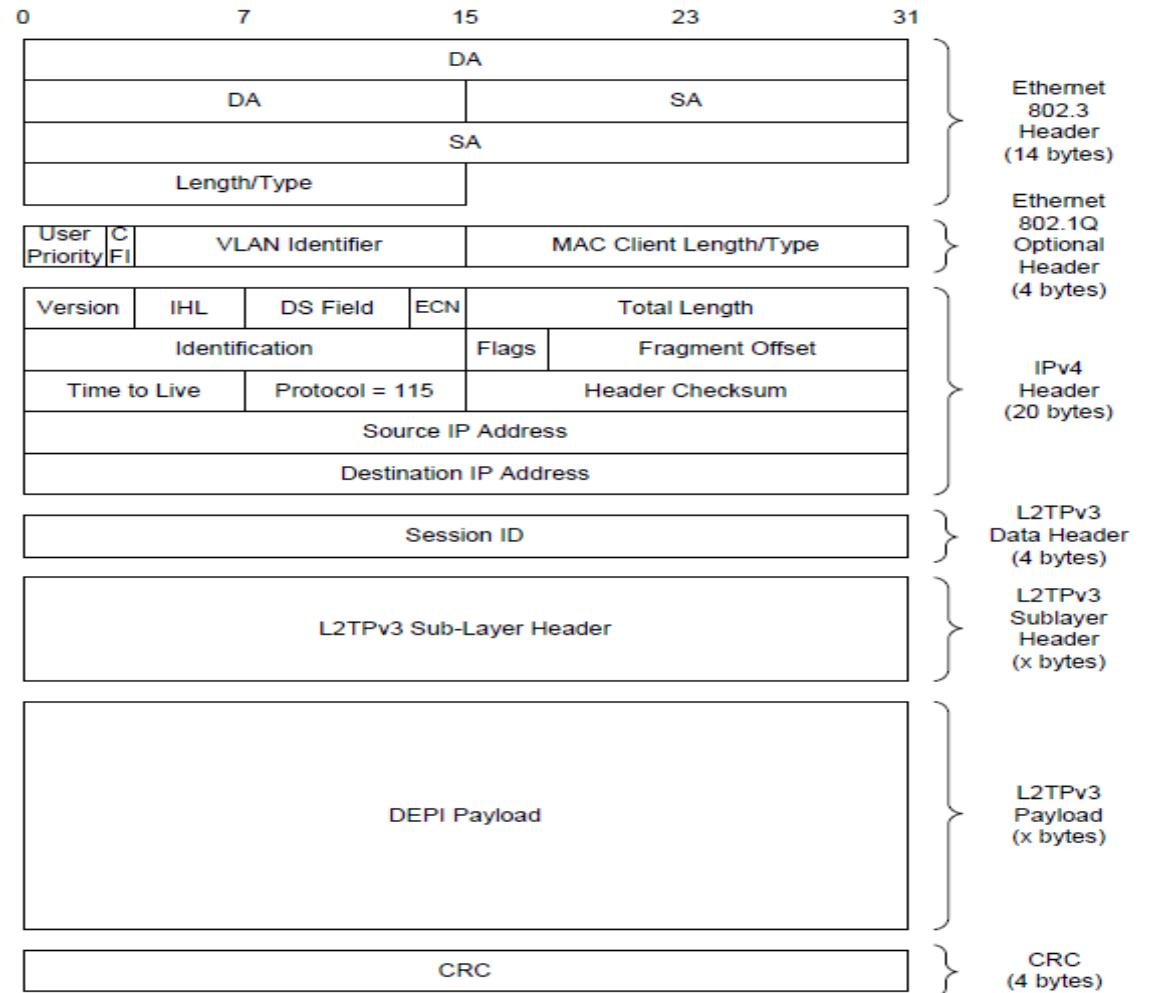
R-PHY L2TPv3 Topology – Multiple Tunnels

Remote PHY Pseudo-wires

- DEPI is the downstream pseudowire (PW)
- UEPI is the upstream pseudowire (based on DEPI)

Downstream External PHY Interface (DEPI)

- Data plane protocol for DS direction
- Based on L2TPv3
- Support IP encapsulation

Downstream External PHY Interface (DEPI)

- **Based on L2TPv3 with IP Encapsulation**

- **Only Session ID as L2TPv3 Data Header. Cookies are not used.**

- **Supports both DOCSIS Packet Streaming Protocols (PSP) and DOCSIS MPEG Transport (D-MPT)**
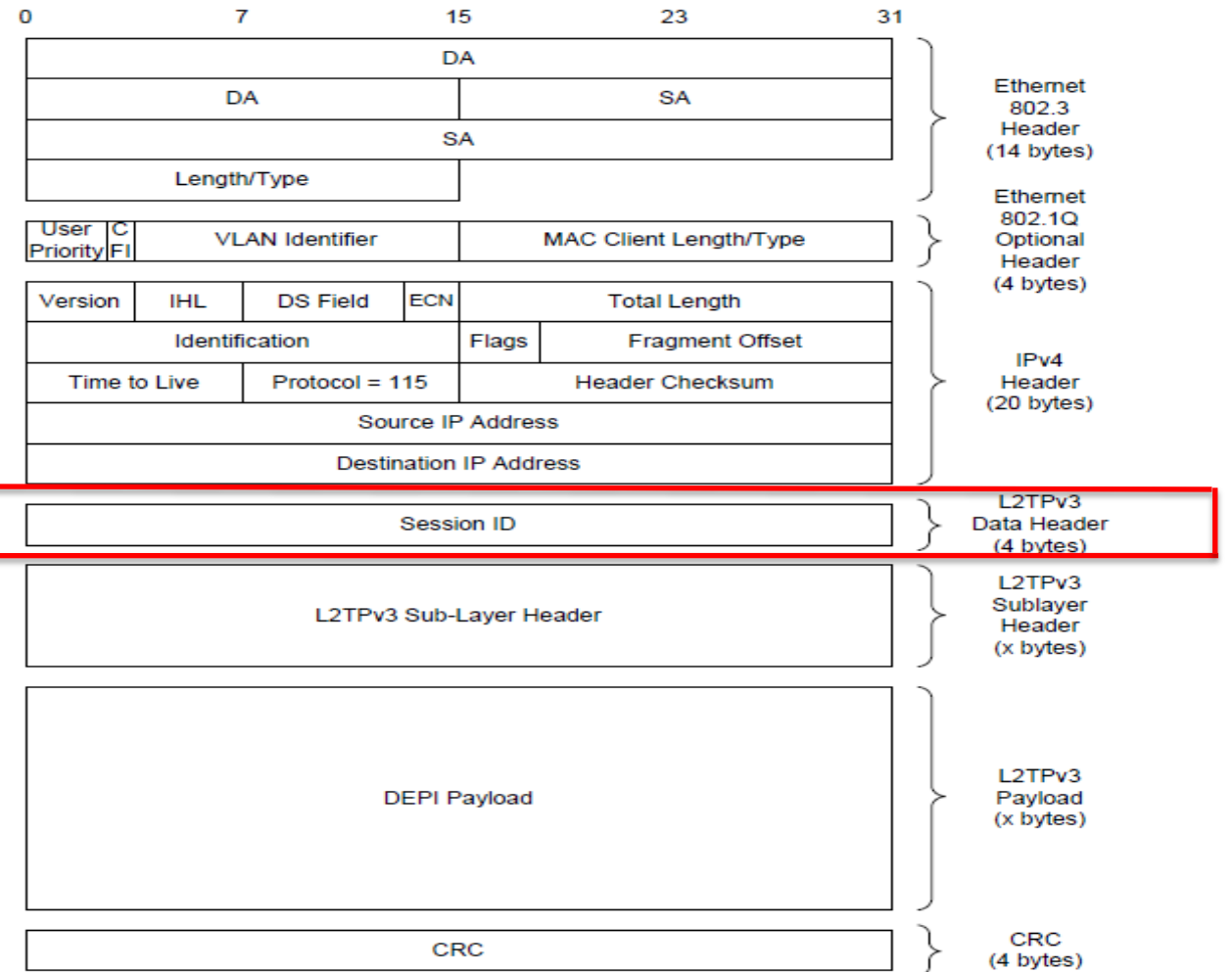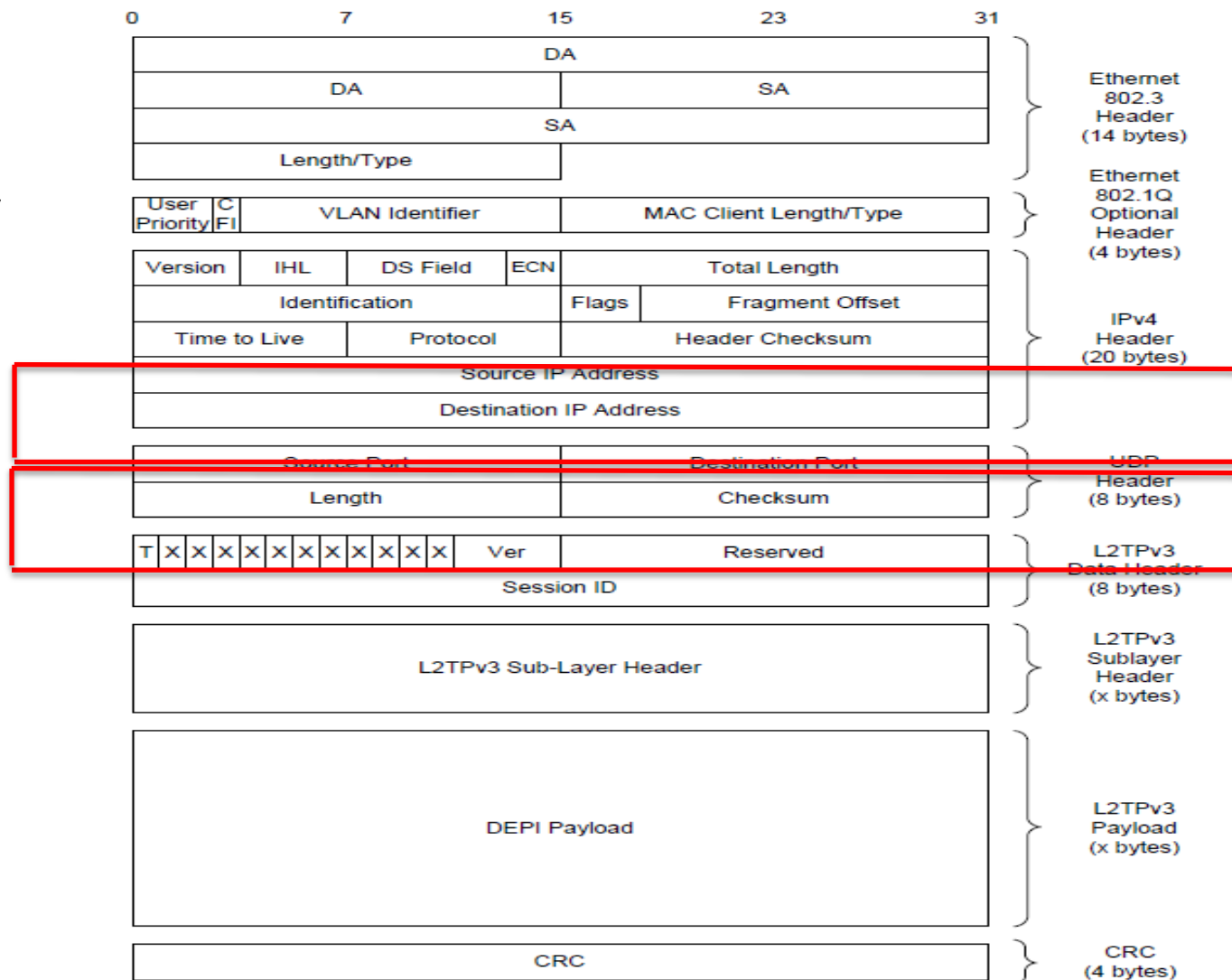
Upstream External PHY Interface (UEPI)

- Only session ID is used. No Cookies
- Based on L2TPv3 with IP encapsulation
- Supports PSP.

THANK YOU

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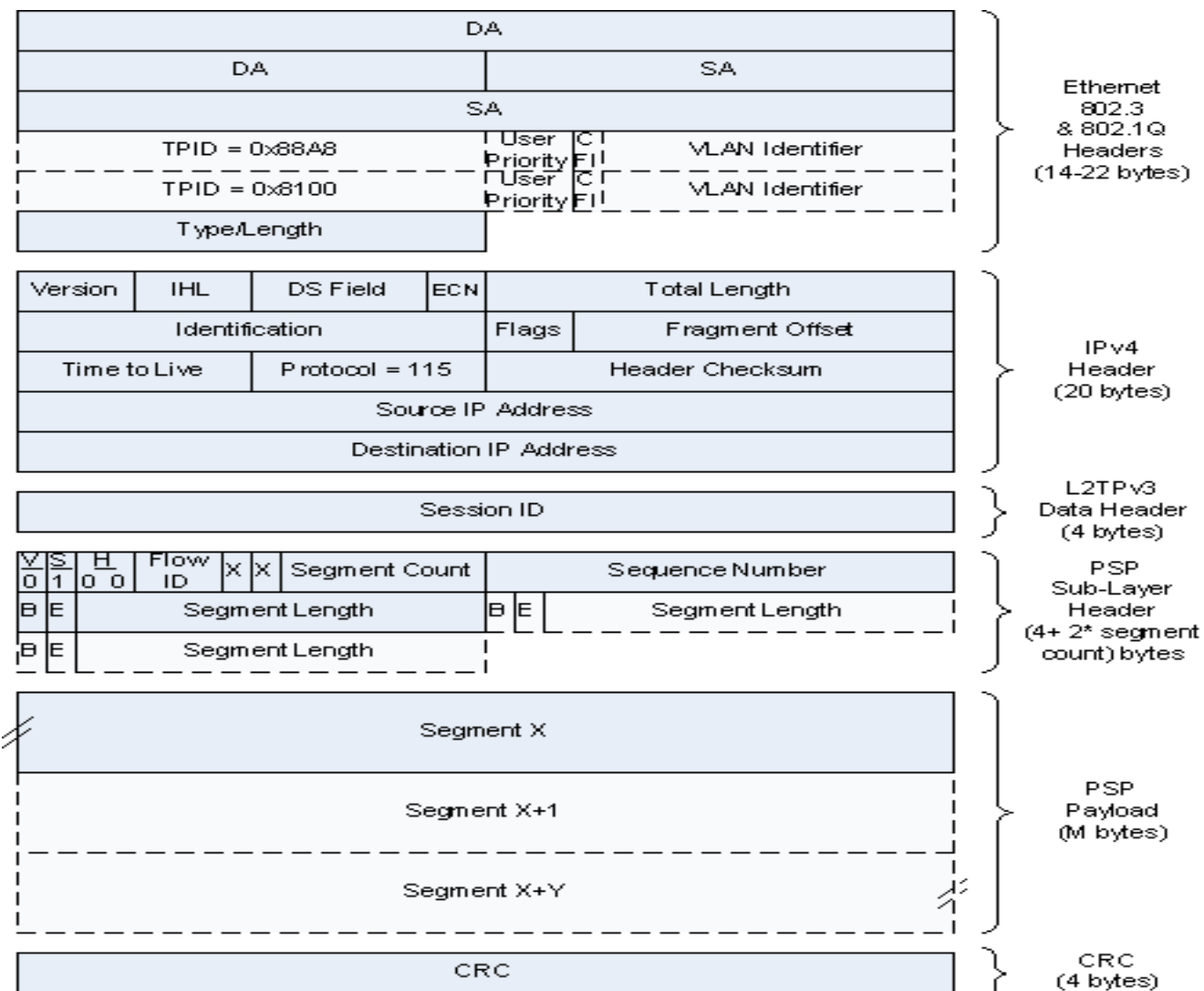
L2TPv3 UDP encapsulation (Not Used in R-PHY)

- **Protocol ID is 17 (UDP)**

- **Use 8 bytes L2TPv3 Data Header**

UMT Discovery Protocol – EPoC Use Case

Version 3 (EPOC use case)