FMX Data Flow Training

03-Dec-2019

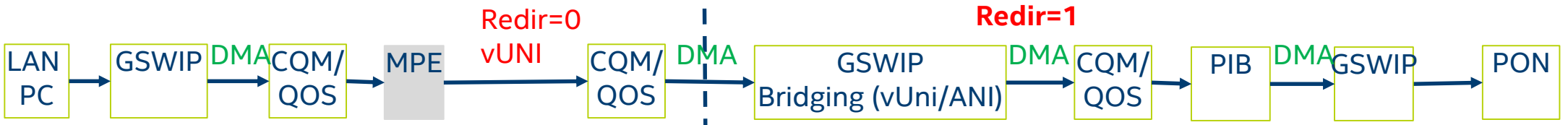
Connected Home Division

PON HGU Datapath (Single Box) – LAN <--> PON

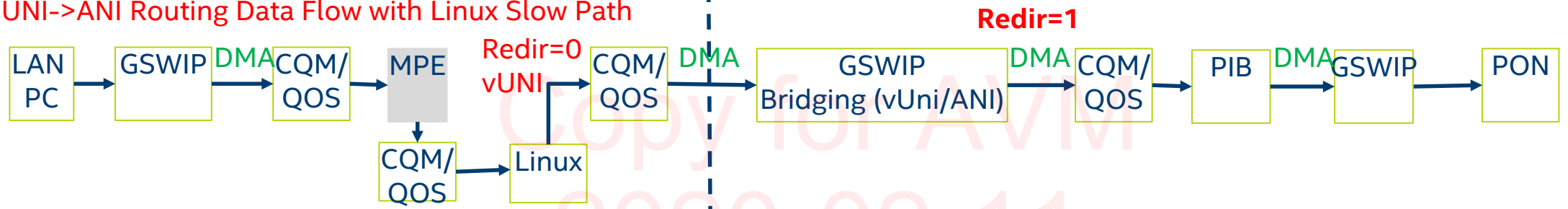
Upstream

FLM UNI->ANI Routing Data Flow with MPE Acceleration:

Share existing DMA as configured for PMAC0/1

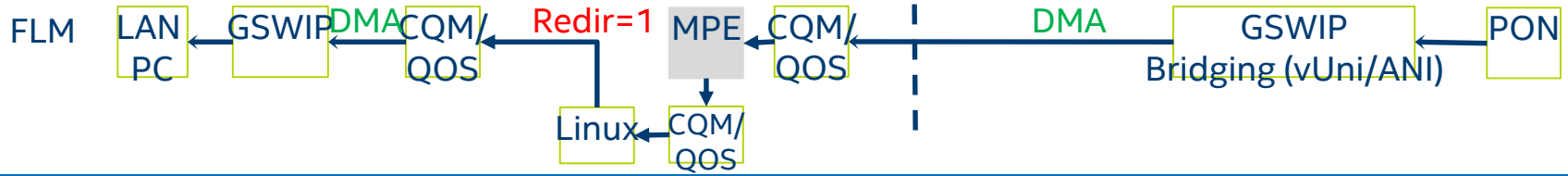


FLM UNI->ANI Routing Data Flow with Linux Slow Path



FLM ANI->UNI Routing Data Flow with MPE Acceleration:

FLM ANI->UNI Routing Data Flow with Linux Slow Path:



Downstream

Port 0 - Mpe / CPU
Port 2 - PON IP
Port 3 & 4 - LAN
Port 5/6 - vAni

HGU Model as per BBF TR-156

- Models HGU as if like it is a 2-box model (Ethernet Router + PON Modem).
  - PON Modem and Ethernet RG – 2 separate virtual entities within a HGU.
  - BBF TR-156i4

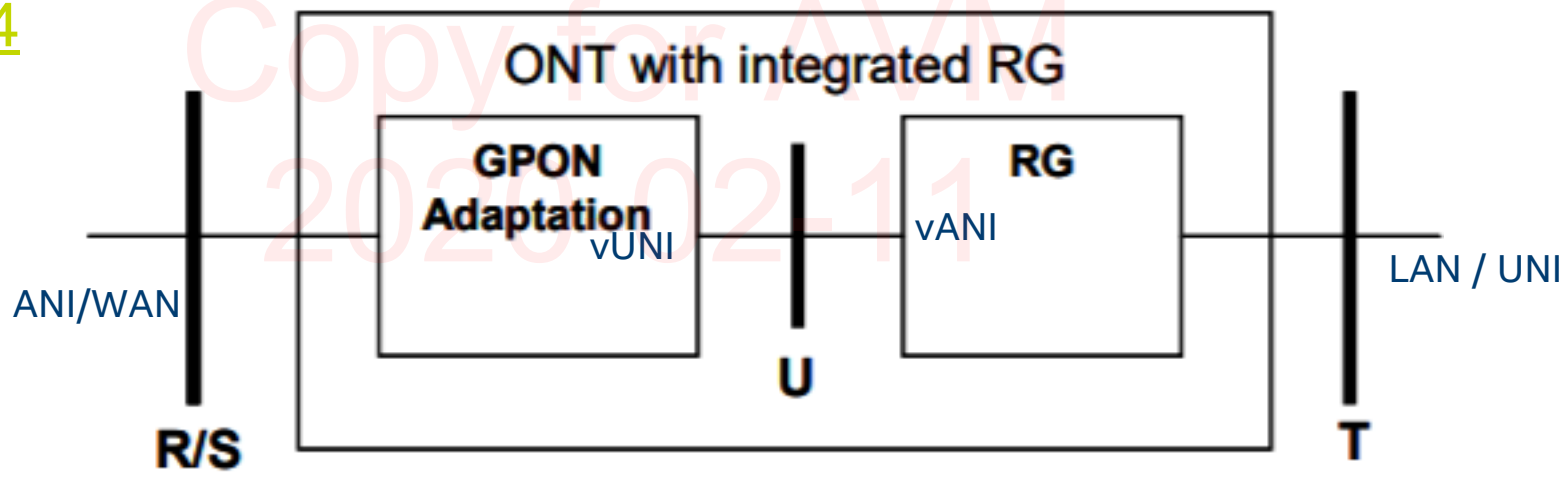


Figure 3 – ONT and RG as a single entity

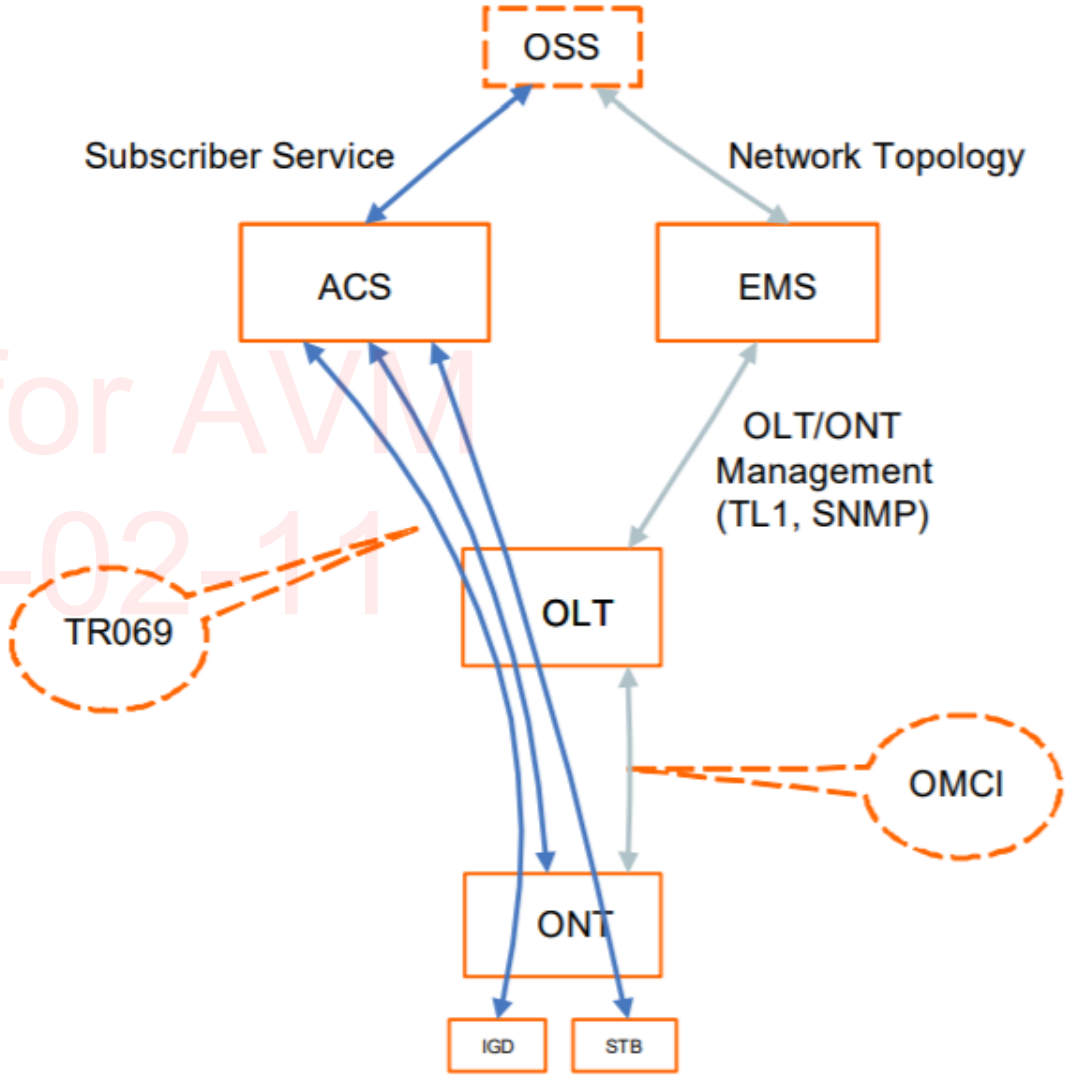
PON-CPE management model as per BBF TR-142

BBF TR-142 :

Dual Management :

OMCI/SIEPON & TR-069 based

config & mgmt from OSS/BSS.



TR-069 and OMCI

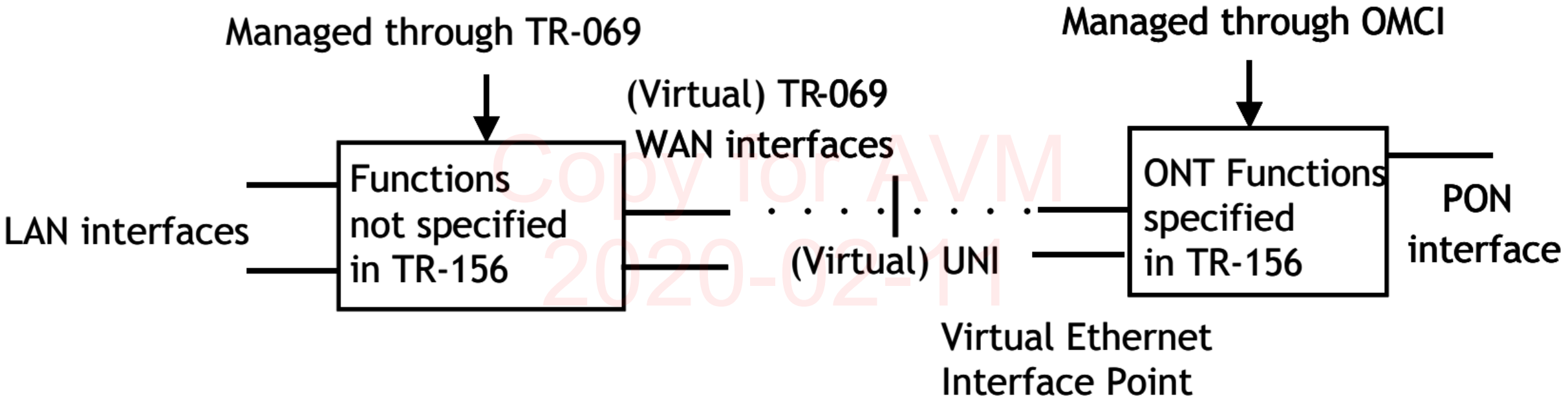


Figure 4: Concept of a Virtual UNI for OMCI and TR-069 domains of responsibilities

TR-069 and OMCI

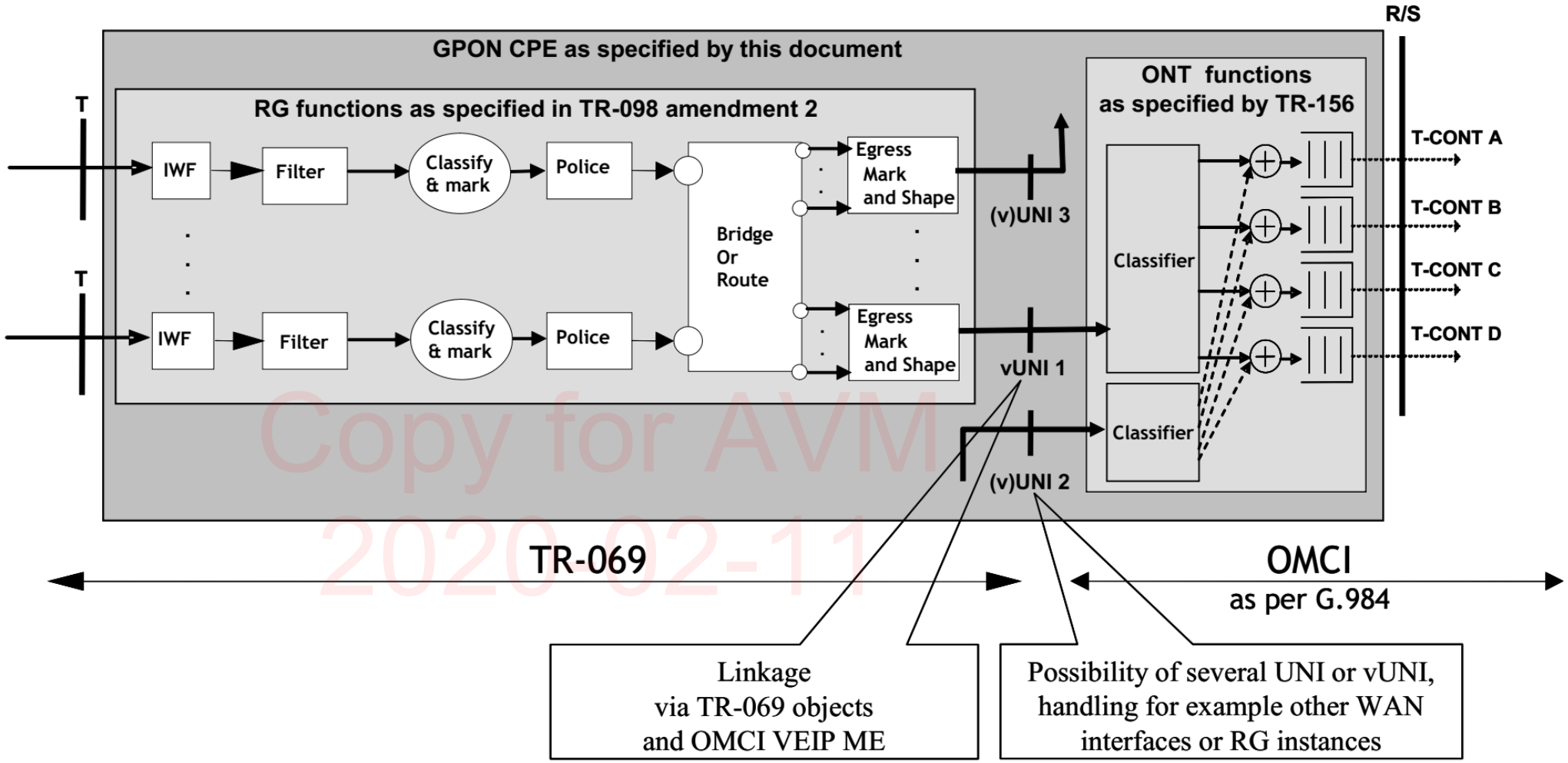
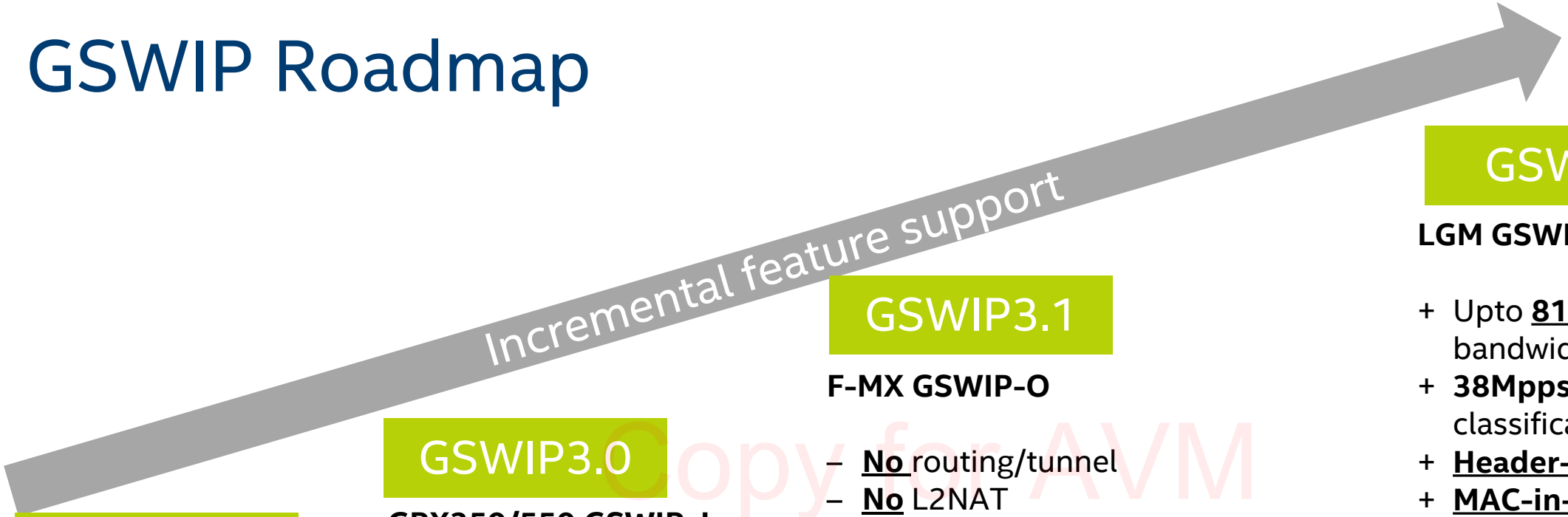


Figure 5: Representation of the upstream traffic; OMCI and TR-069 management of a multi-port single-subscriber GPON CPE

GSWIP Roadmap



GSWIP2.2

xRX300v2, F25G/F25S/F24S

+ **Per port** backpressure
+ Buffer **reservation**
+ **Double** VLAN editing
+ Port **trunking**
+ **1588/PTP**

GSWIP3.0

GRX350/550 GSWIP_L, PAE

+ **Central** QoS path support
+ **5-tuple** routing IPv4/IPv6/routing/NAT/6 RD/Dslite
+ **4k (RTL parameter)** routing entries
+ Tunnel **decapsulation:** L2TP/CAPWAP/GRE
+ **L2NAT**

GSWIP3.1

F-MX GSWIP-O

– **No** routing/tunnel
– **No** L2NAT
+ **10Gbps** MAC
+ **G.INT** support
+ Bridging and counting at **interface level** (WLAN VAP, GPON GEM, VLAN)
+ Upto **68Gbps**@666Mhz bandwidth
+ **31.7Mpps**@666Mhz classification packet rate
+ **OMCI** bridging and VLAN function support
+ OAM **delay and loss** measurement
+ **Enhanced 1588/PTP**

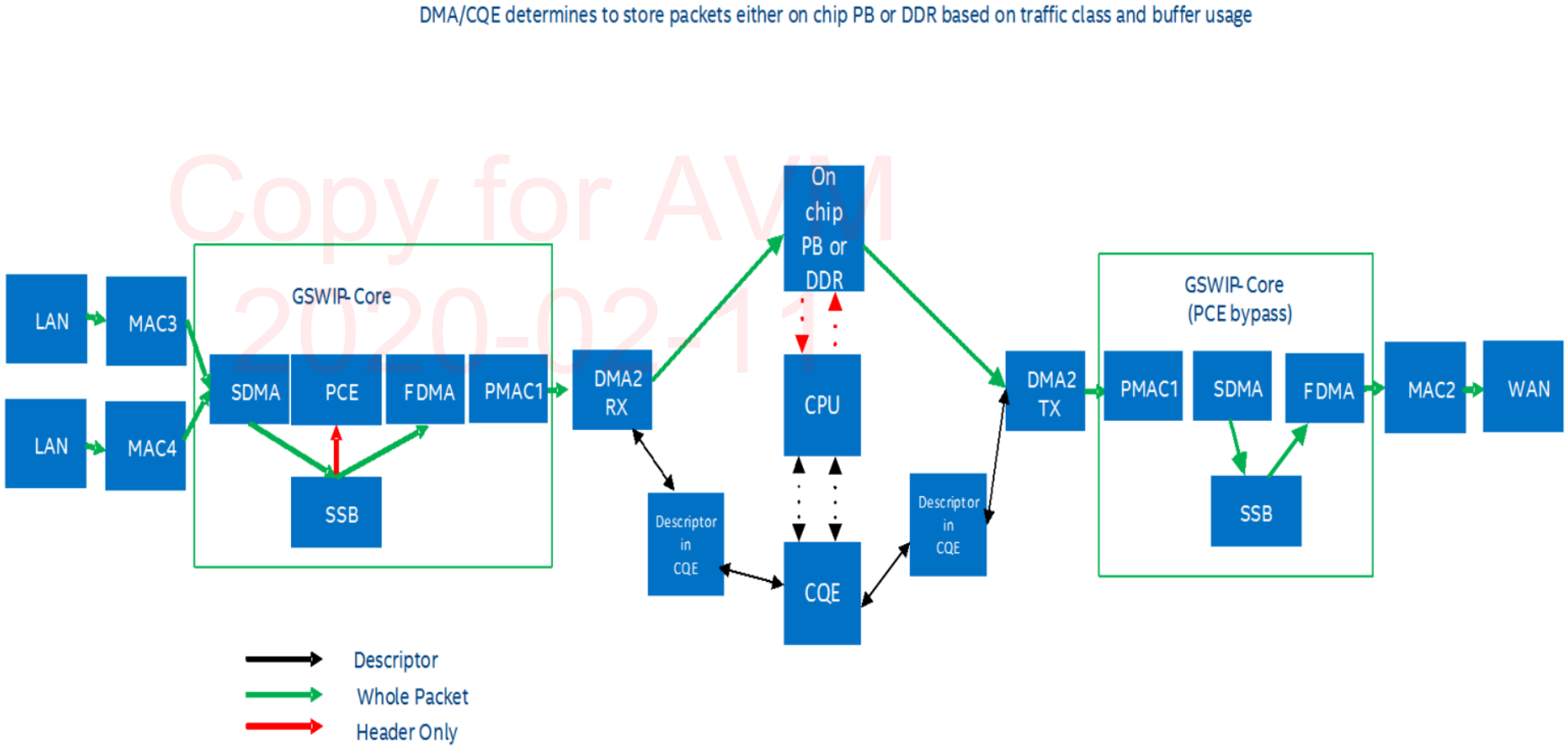
GSWIP3.2

LGM GSWIP-O

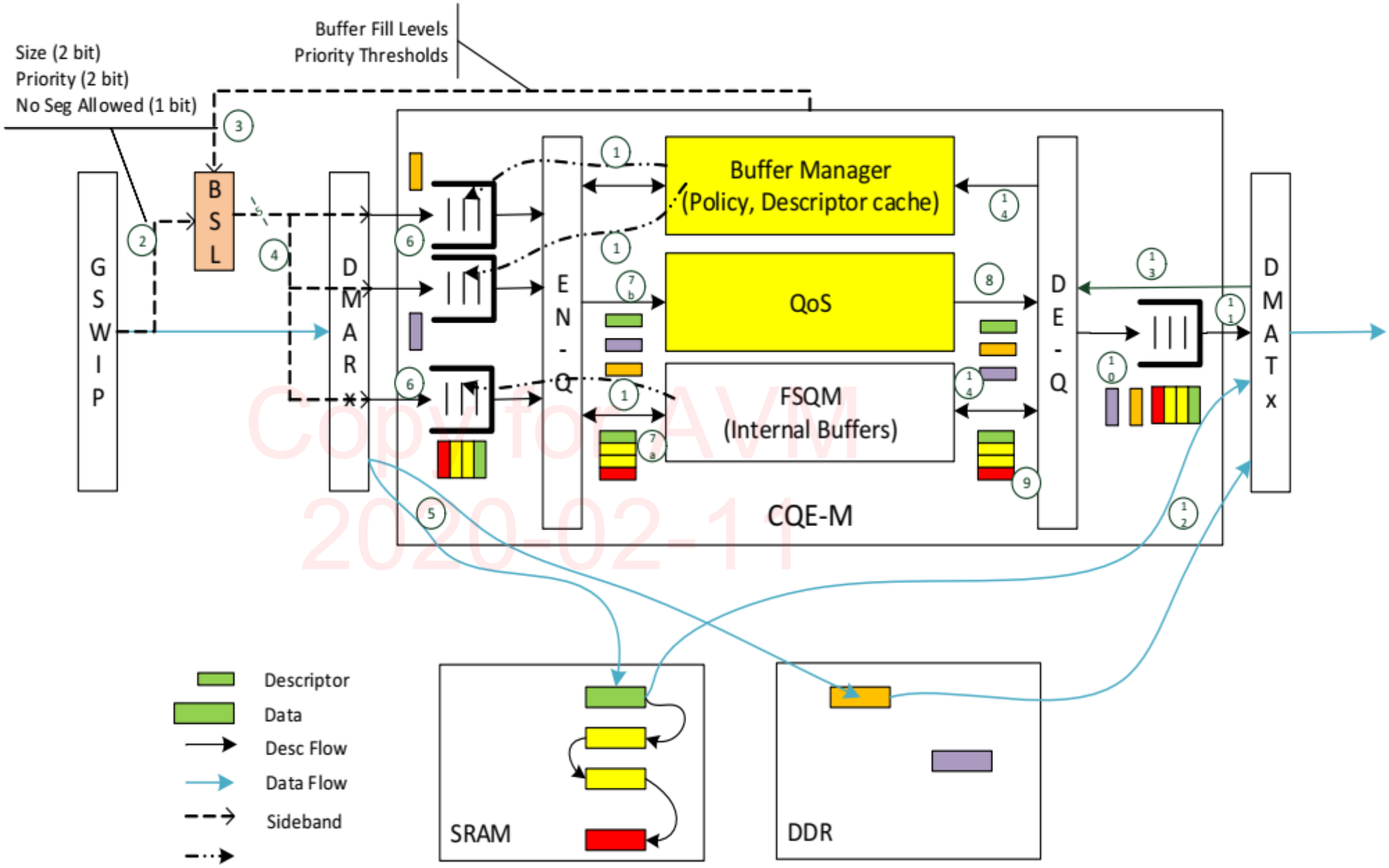
+ Upto **81Gbps**@800Mhz bandwidth
+ **38Mpps**@800Mhz classification packet rate
+ **Header-only** mode support
+ **MAC-in-MAC** mode
+ **Pre-parser** priority classification
+ **TCP/UDP/IP** checksum verification/generation
+ **Mirror** of PCE bypass path
+ **Pre-L2 header** with configurable size
+ **802.11 traffic flow** classification
+ **PMAC Egress CRC** insertion

Data Flows: Upstream CQEM Mode

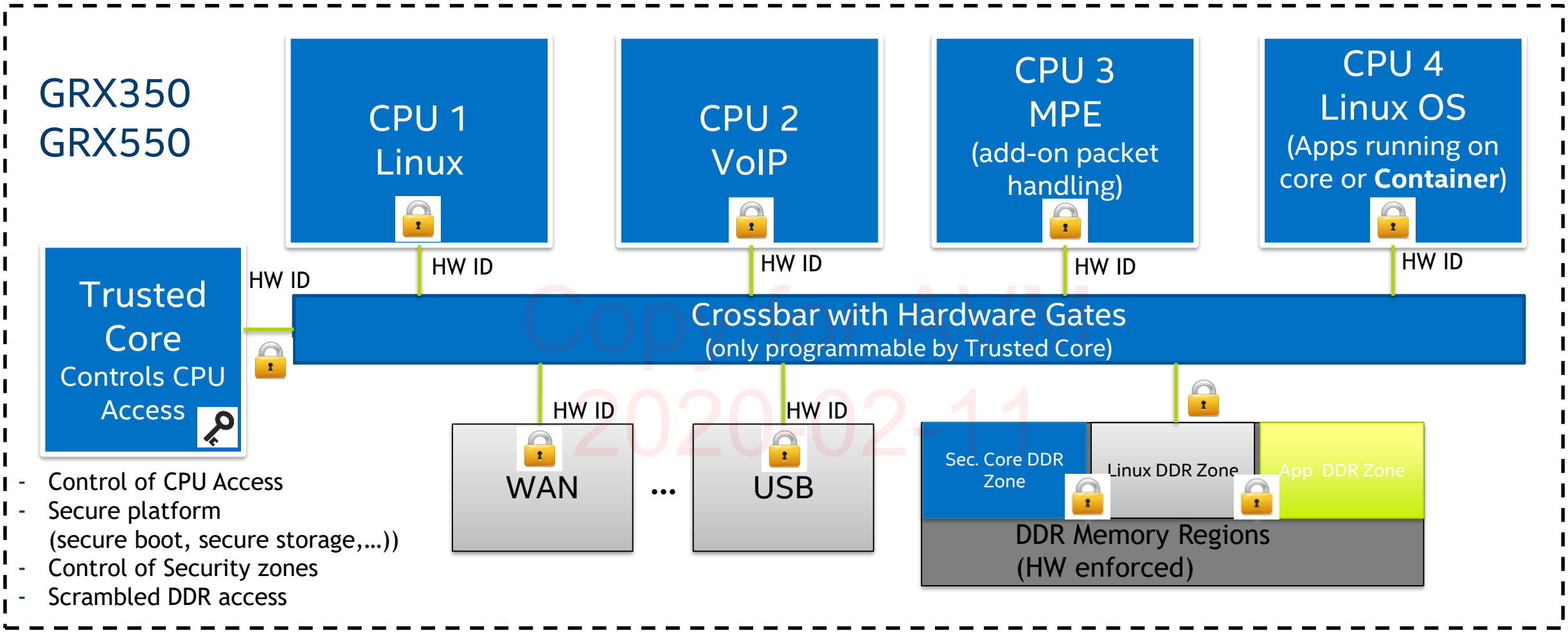
In PON mode, CQEM is always needed in upstream because of its TDM nature



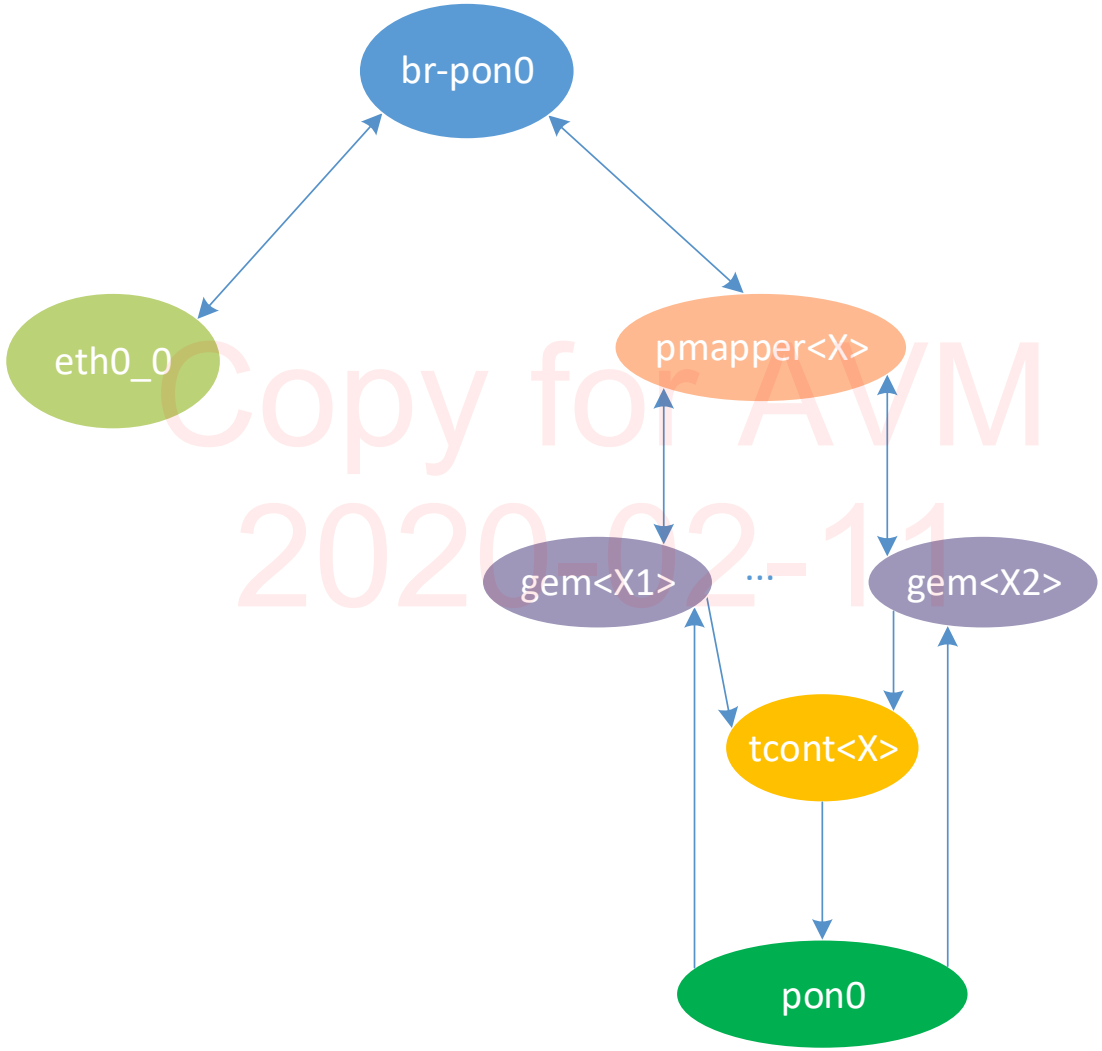
QoS



CPU Cluster



SFU/SFP PON Bridge – Linux config example



SW pmapper Config

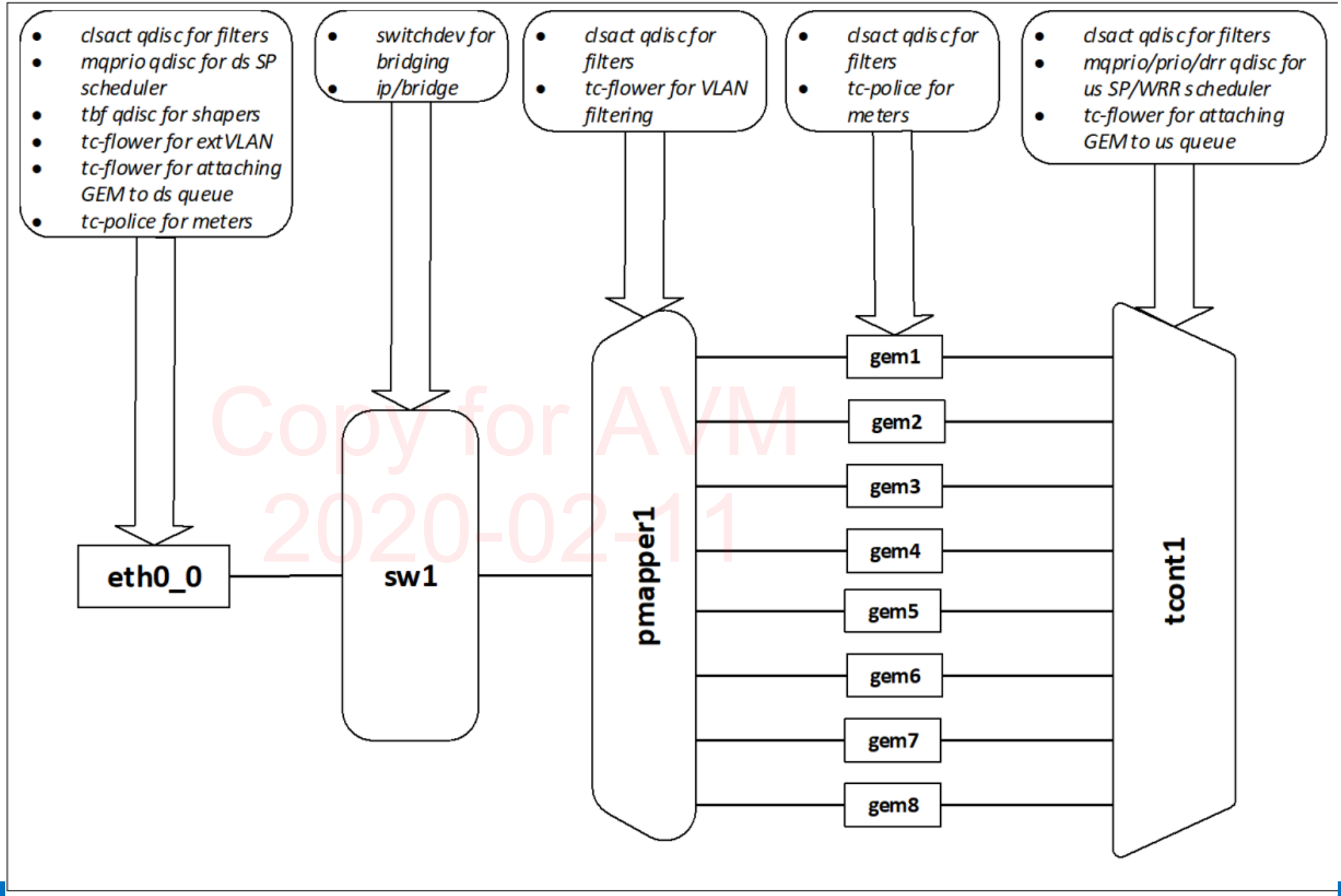
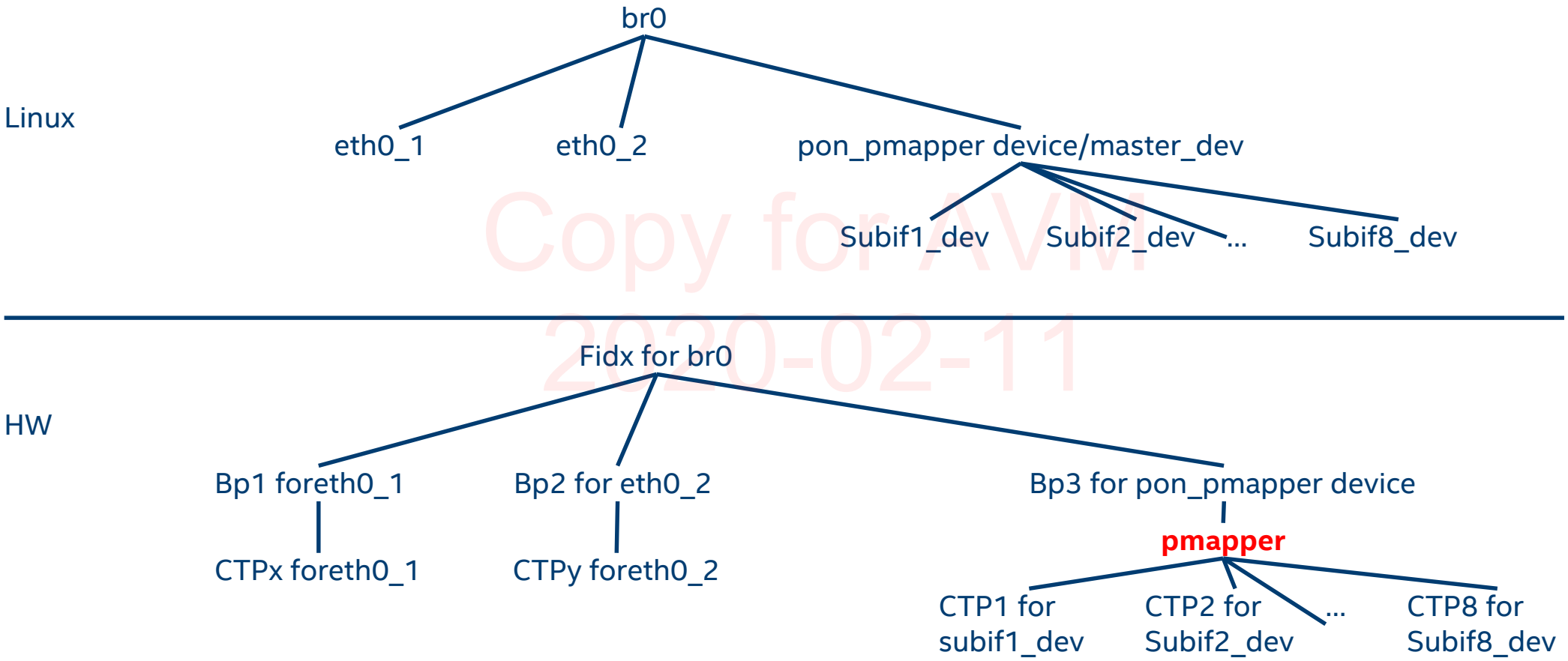
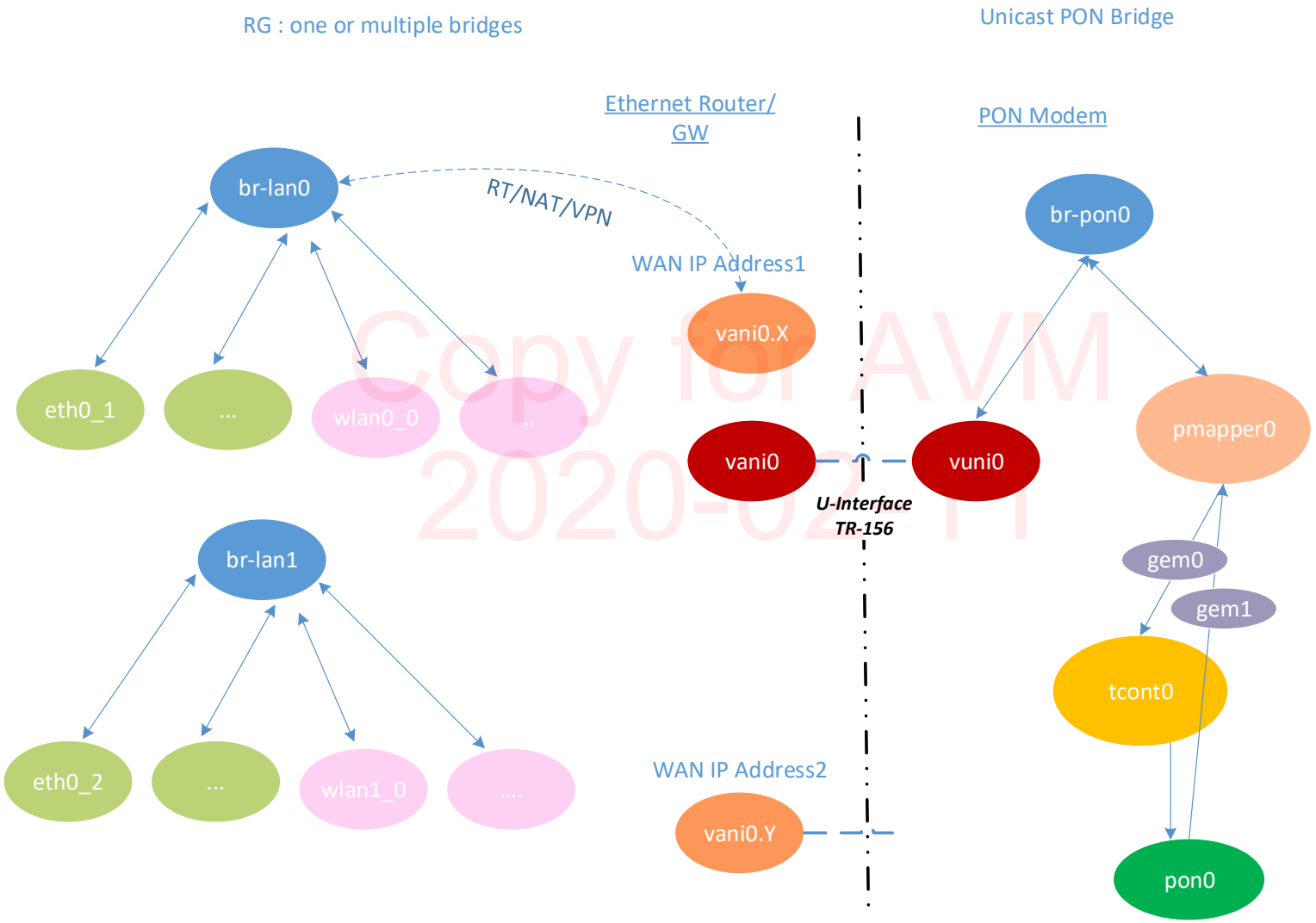


Figure 15 OMCI Data Path and QoS Flow Mapped to Linux* Network Devices

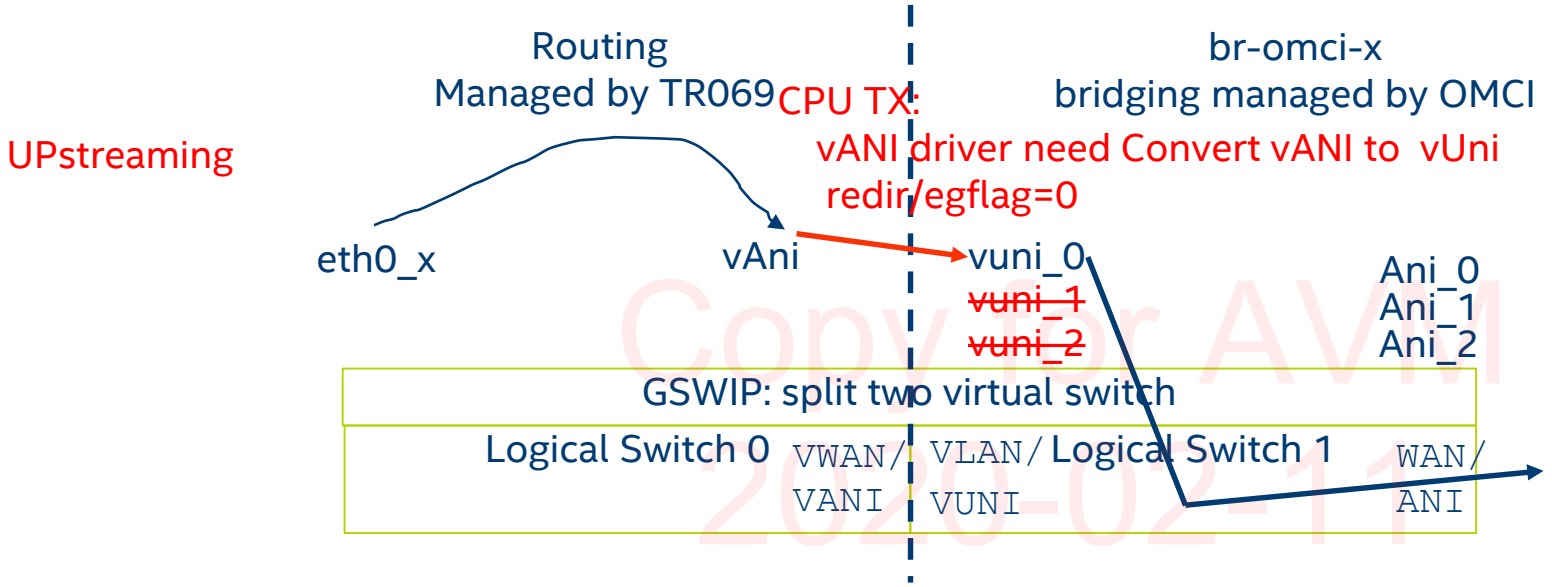
Datapath bridge port mapping via pmapper



HGU Linux Config example



PON HGU Datapath (Single Box)–vANI TX /Upstream



vANI driver need convert vANI to vUNI's device and subif

vAni driver's xmit/TX API:

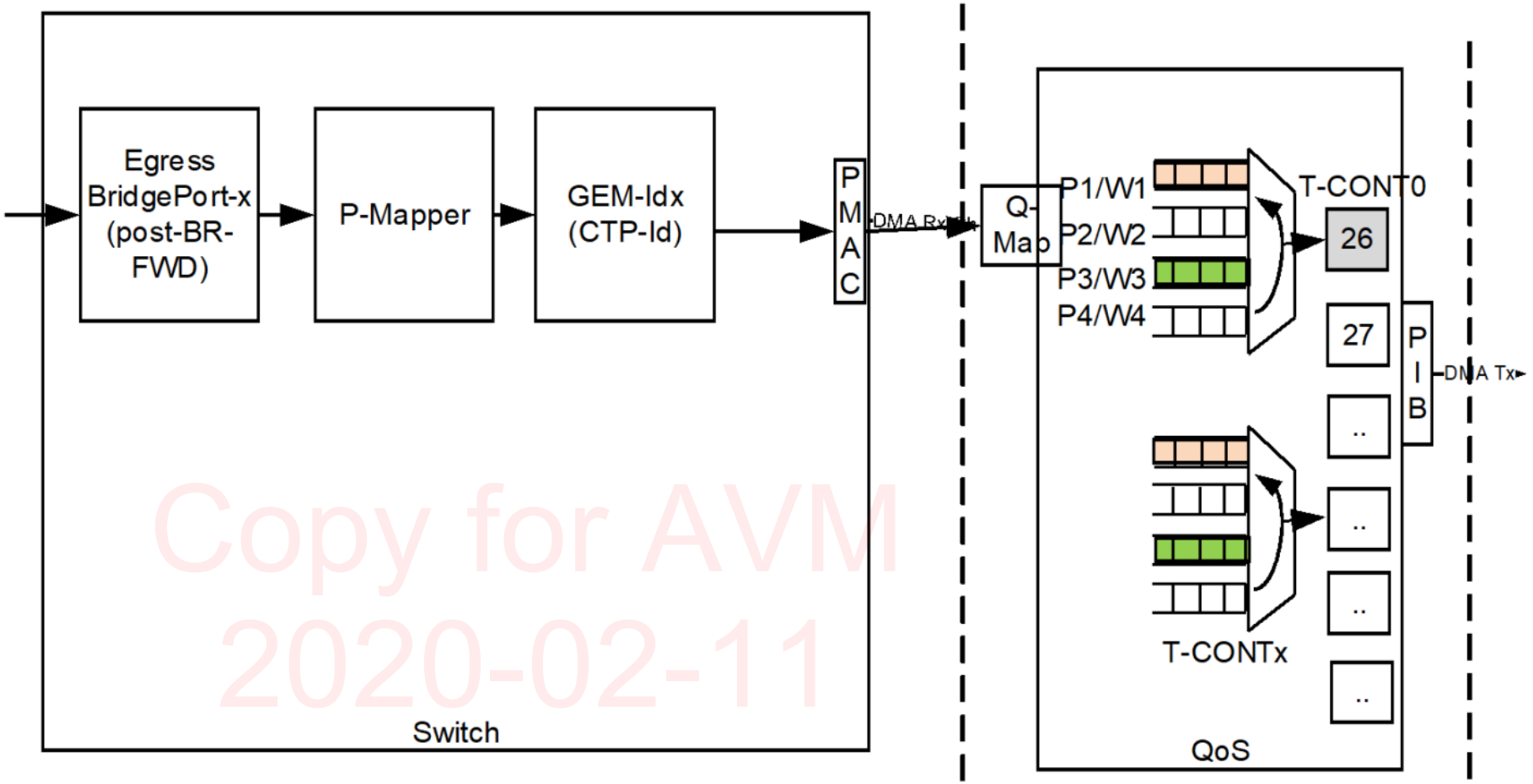
- convert vANI to vUNI_0 (skb->dev) and vUNI's dp_subif_t
- call dp_xmit

vAni no need rx API

dp_xmit

- redir/egflag must set to 0
- set up 1 BP and 1 CTP for vANI and VUNI respectively

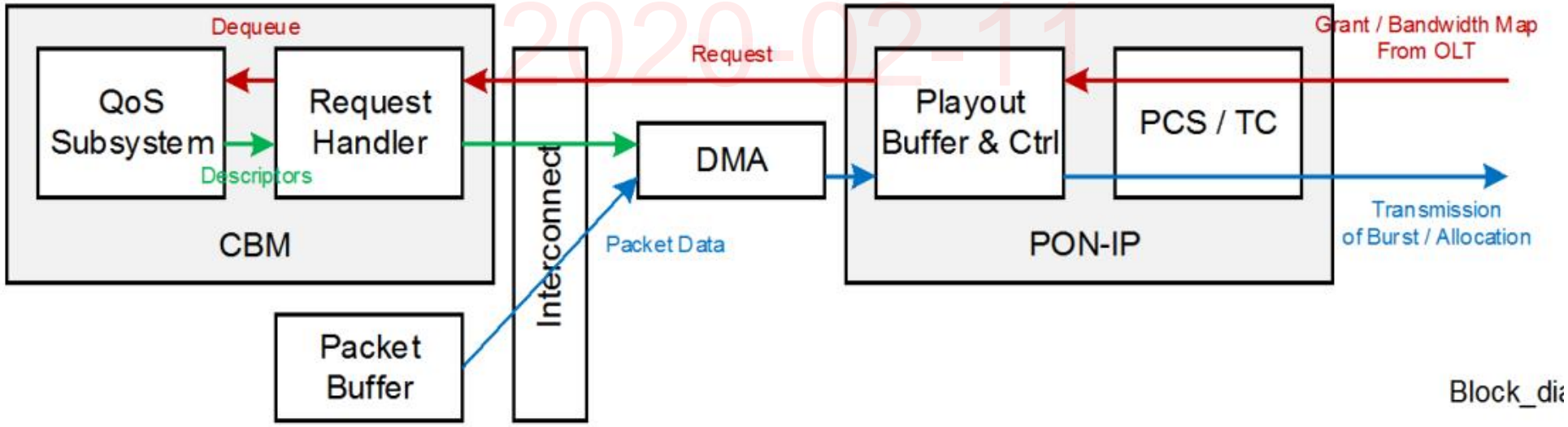
US PON-IP



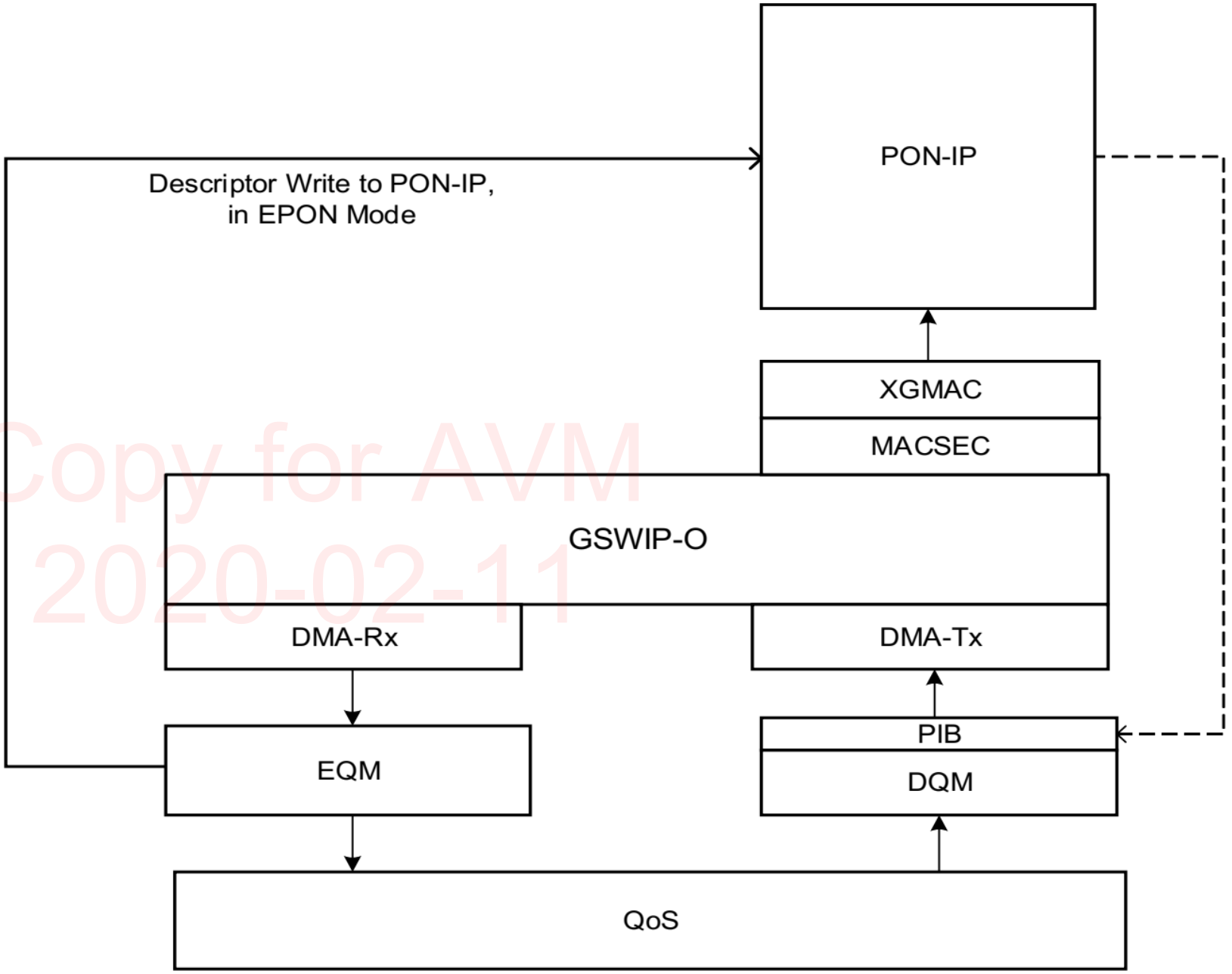
Upstream GPON QoS Flow

Upstream Flow Control

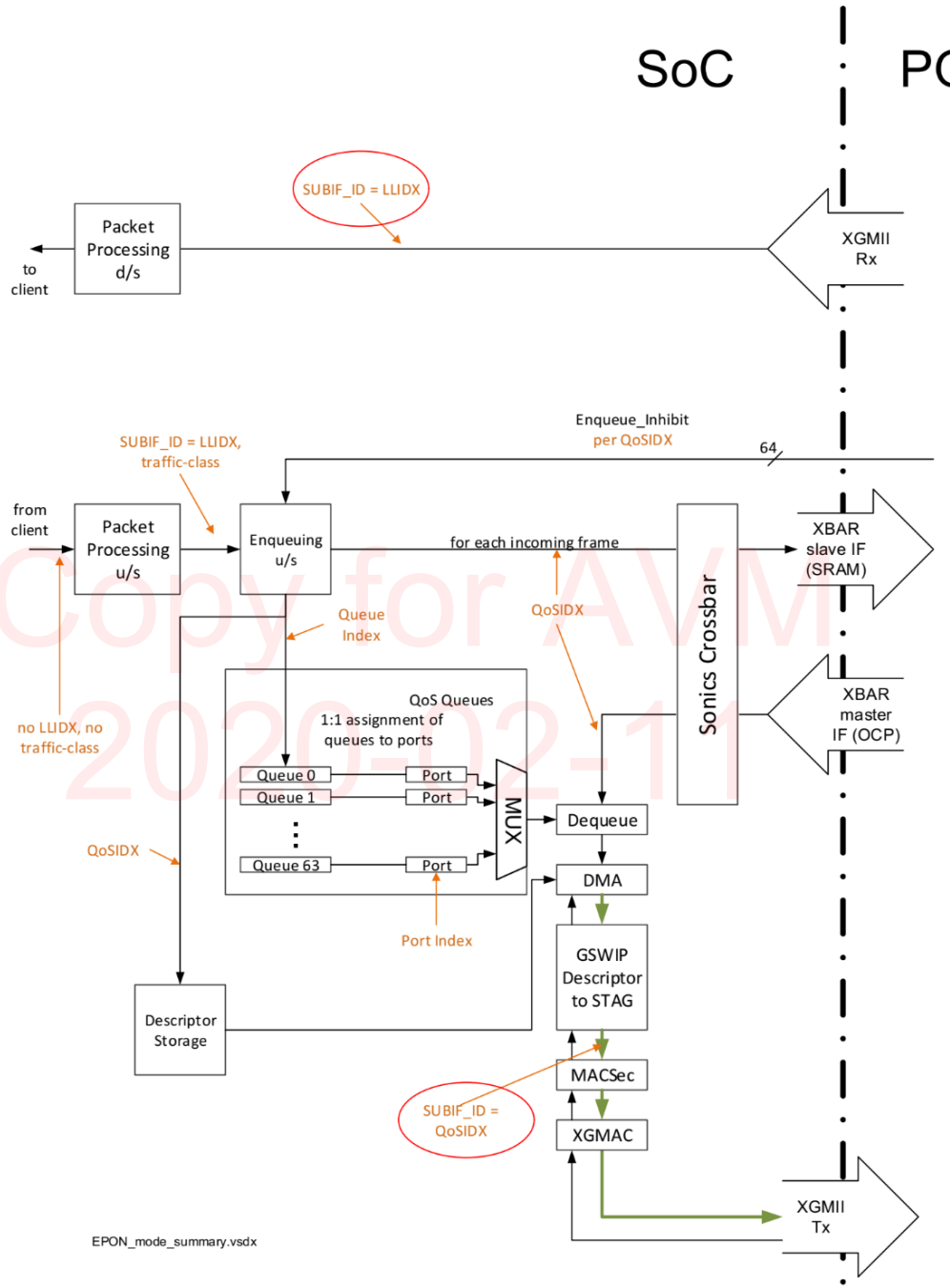
- OLT grants based on continuous monitoring of DBRu/Reports
- Grants defined by AllocID/LLID, Start Time and Size
- GPON modes: Prefetching into Playout Buffer to decouple SoC



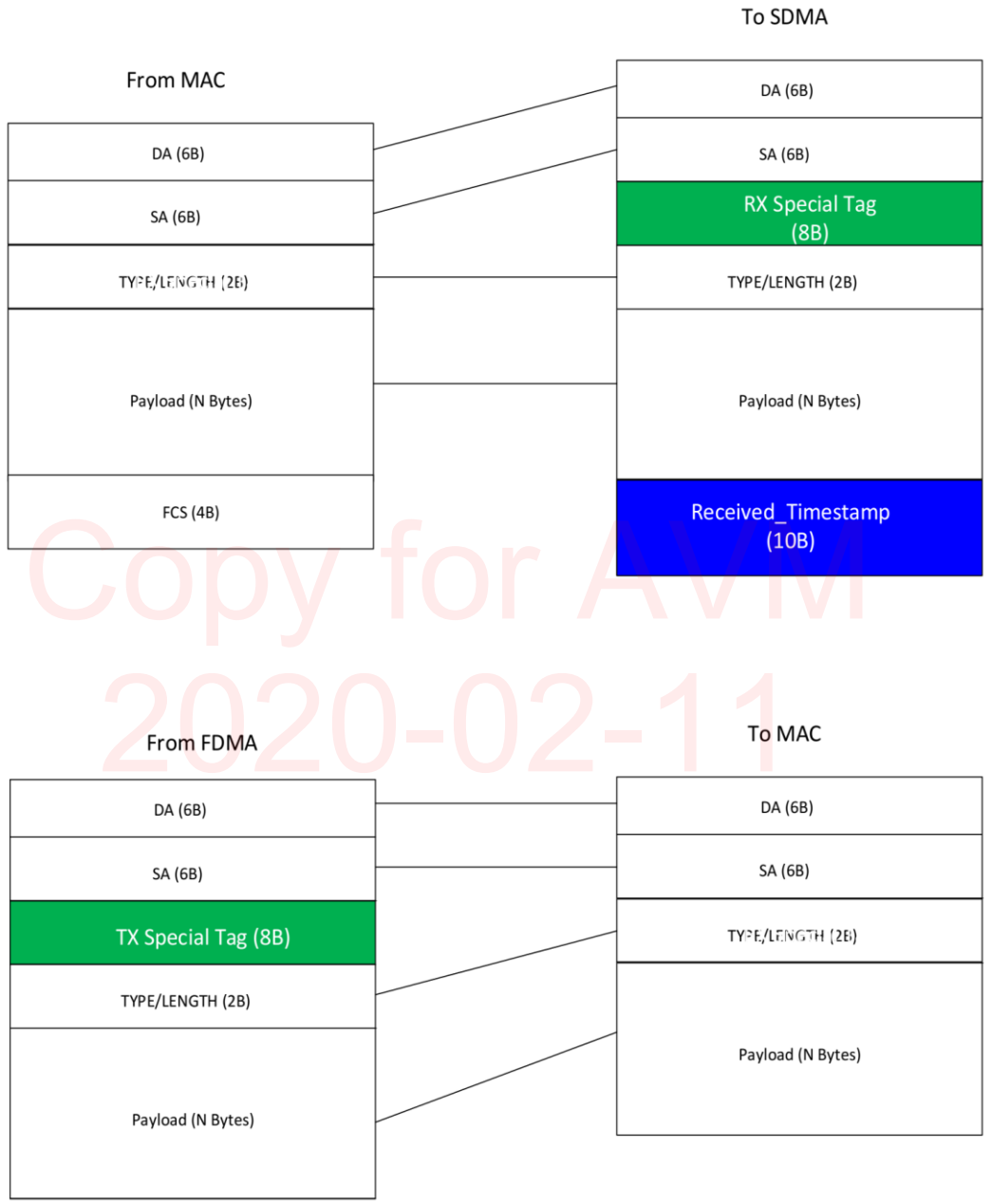
PON-IP Flow



PON-IP US Flow

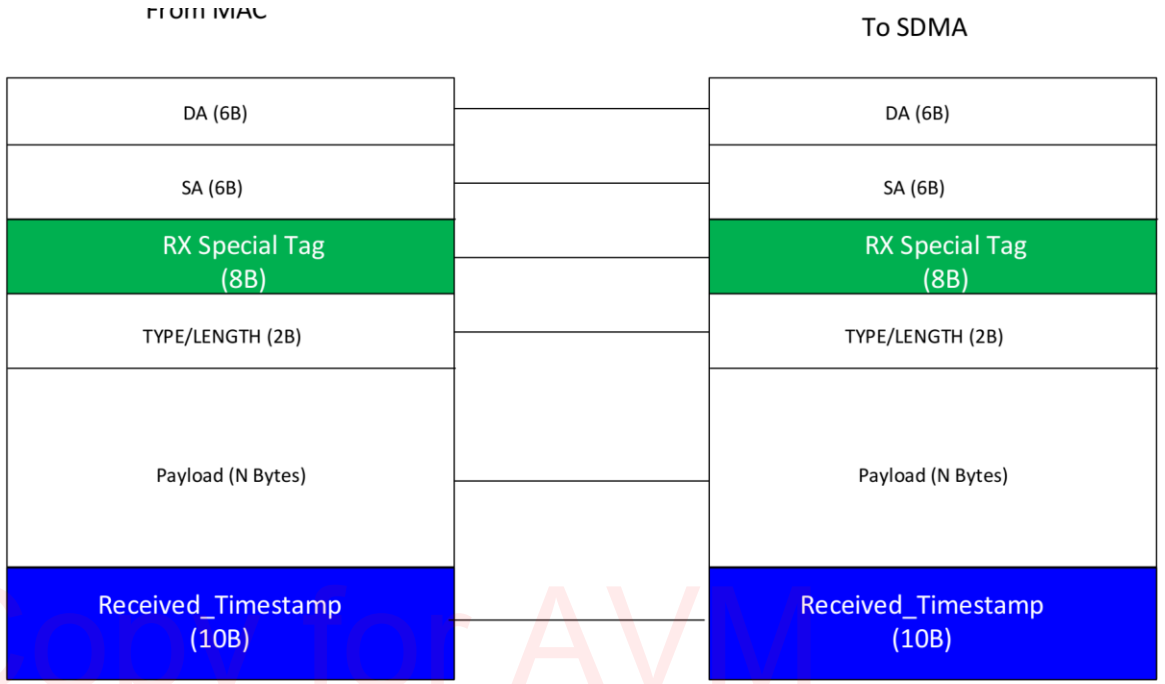


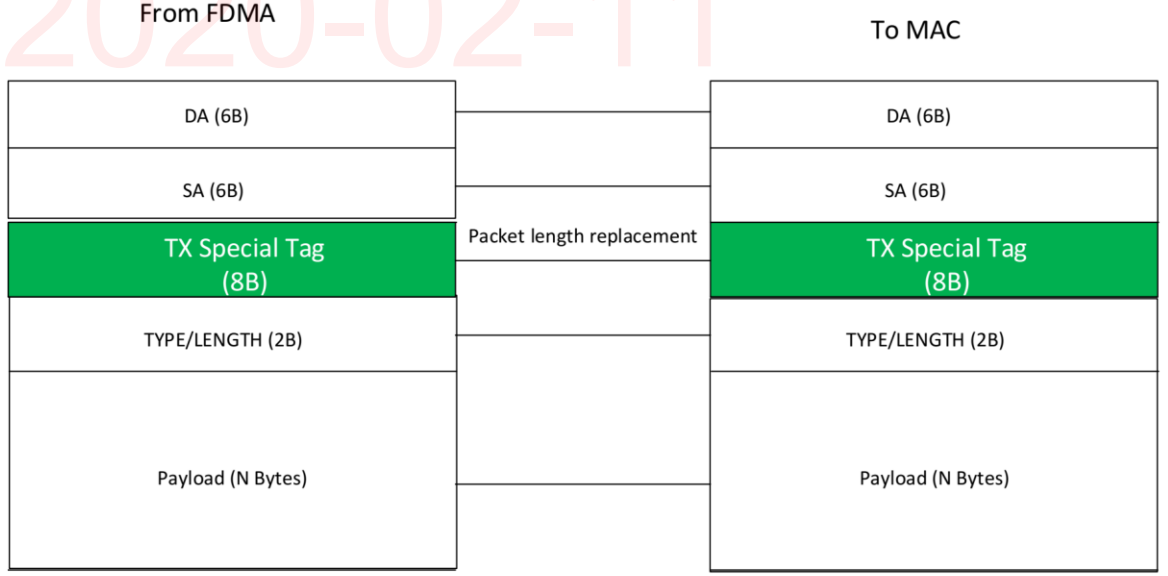
Special Tag Eth WAN



re 217 Packet Format Handed by Switch Side Adaption Layer (Non-PON-IP and Non-G.INT Functiona Mode)

Special Tag PON WAN





gure 219 Packet Format Handed by Switch Side Adaption Layer (PON-IP functional mode)

Parser Results to CPU

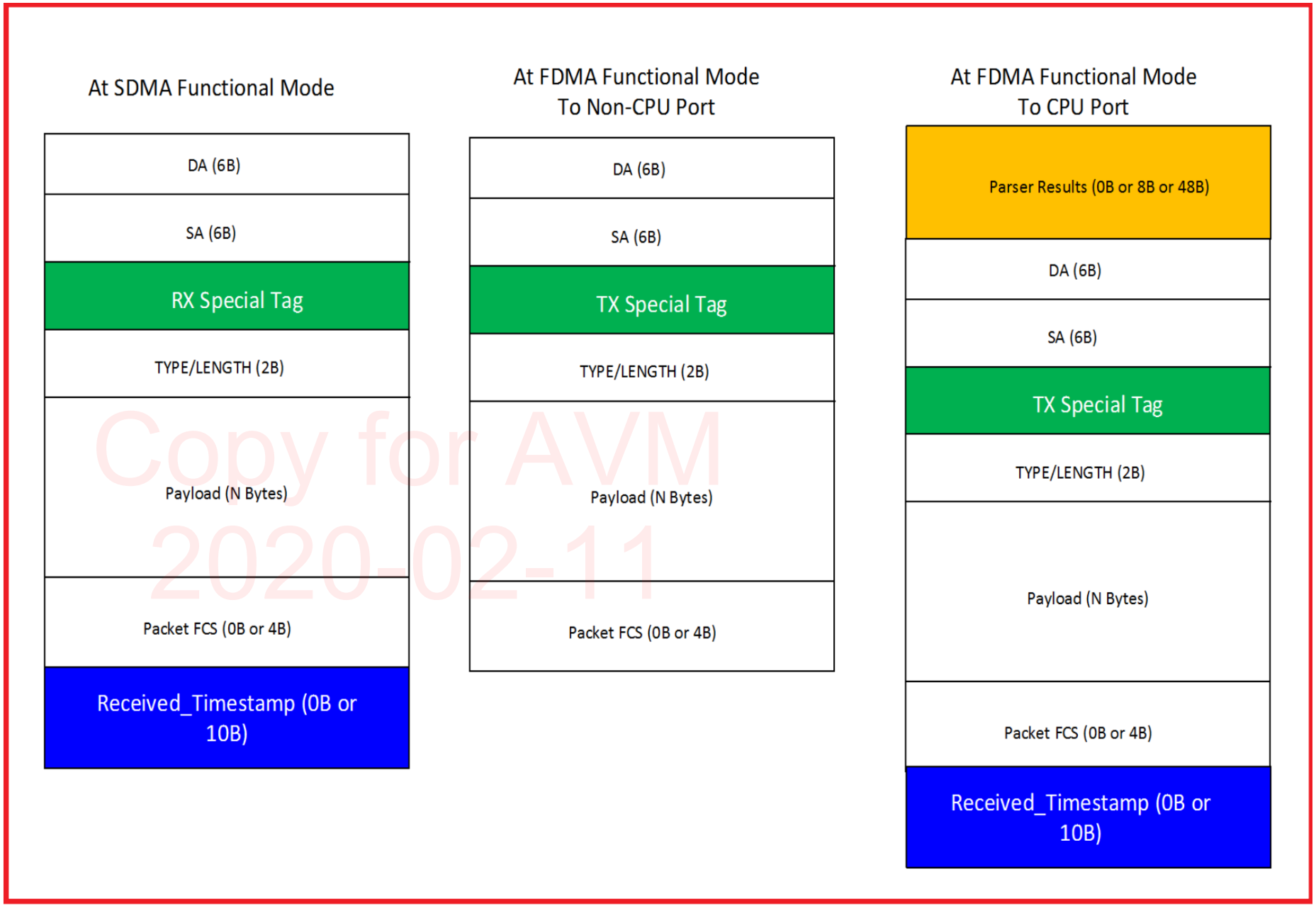
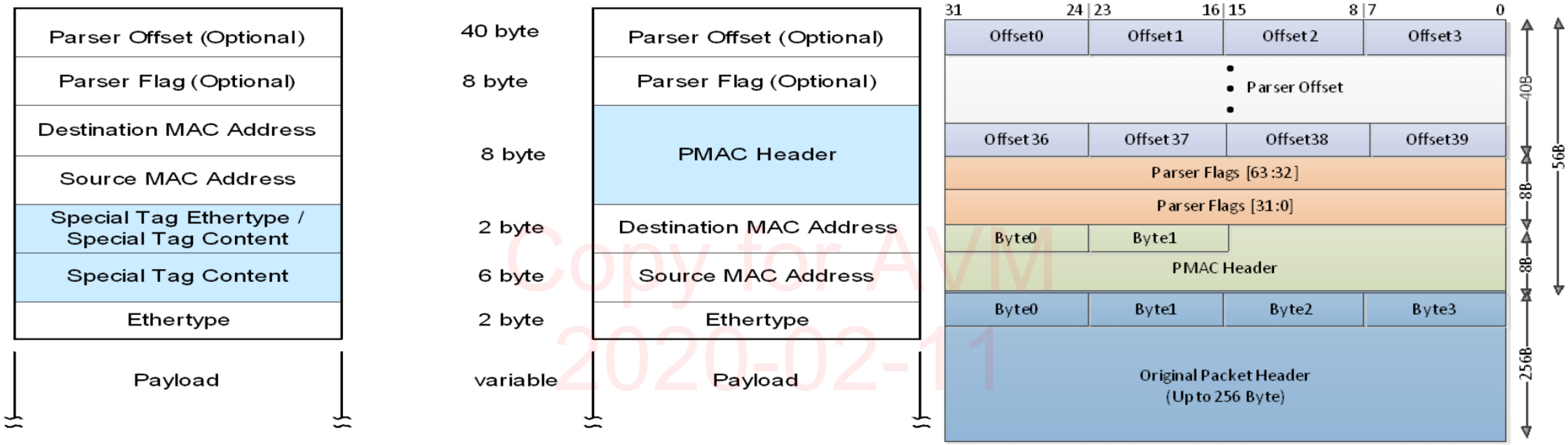


Figure 19 **Packet Format At SDMA/FDMA Interface: Functional Mode**

Parser Results + PMAC Header to CPU



Parser Flags (Microcode Output Flags)

Bit-31	Bit-30	Bit-29	Bit-28	Bit-27	Bit-26	Bit-25	Bit-24	Bit-23	Bit-22	Bit-21	Bit-20	Bit-19	Bit-18	Bit-17	Bit-16	Bit-15	Bit-14	Bit-13	Bit-12	Bit-11	Bit-10	Bit-9	Bit-8	Bit-7	Bit-6	Bit-5	Bit-4	Bit-3	Bit-2	Bit-1	Bit-0
LRO Exception Flag	L2TP Data Flag	UDP Hdr Flag after 2nd IP Hdr	Inner IPv6 with Extension Header	EAPOL Flag	IP Fragment Flag	TCP Ack Flag	Outer IPv6 with Extension Header	IPv4 with Option Flag	IGMP Flag	UDP Hdr Flag after 1st IP Hdr	TCP Flag	RT Exception Flag (CPU handled)	Inner IPv6 Flag	Inner IPv4 Flag	Outer IPv6 Flag	Outer IPv4 Flag	PPPoE Session Flag	SNAP encapsulated Flag	4th VLAN Tag Flag	3rd VLAN Tag Flag	2nd VLAN Flag	1st VLAN Flag	Special Tag Flag	Reserved (Future Use)	Reserved (Future Use)	Reserved (Future Use)	Length Encapsulated Flag	GRE Flag	CAPWAP Flag	Parser Error Flag	WoL Flag

Figure 7 Parser Bit Flags

Special Tag Format

- Record_ID = PTP Sequence_ID
- EtherType = 0x88C3

igure 215 Special Tag Handed by MAC Adaption Layer

Special Tag PON US

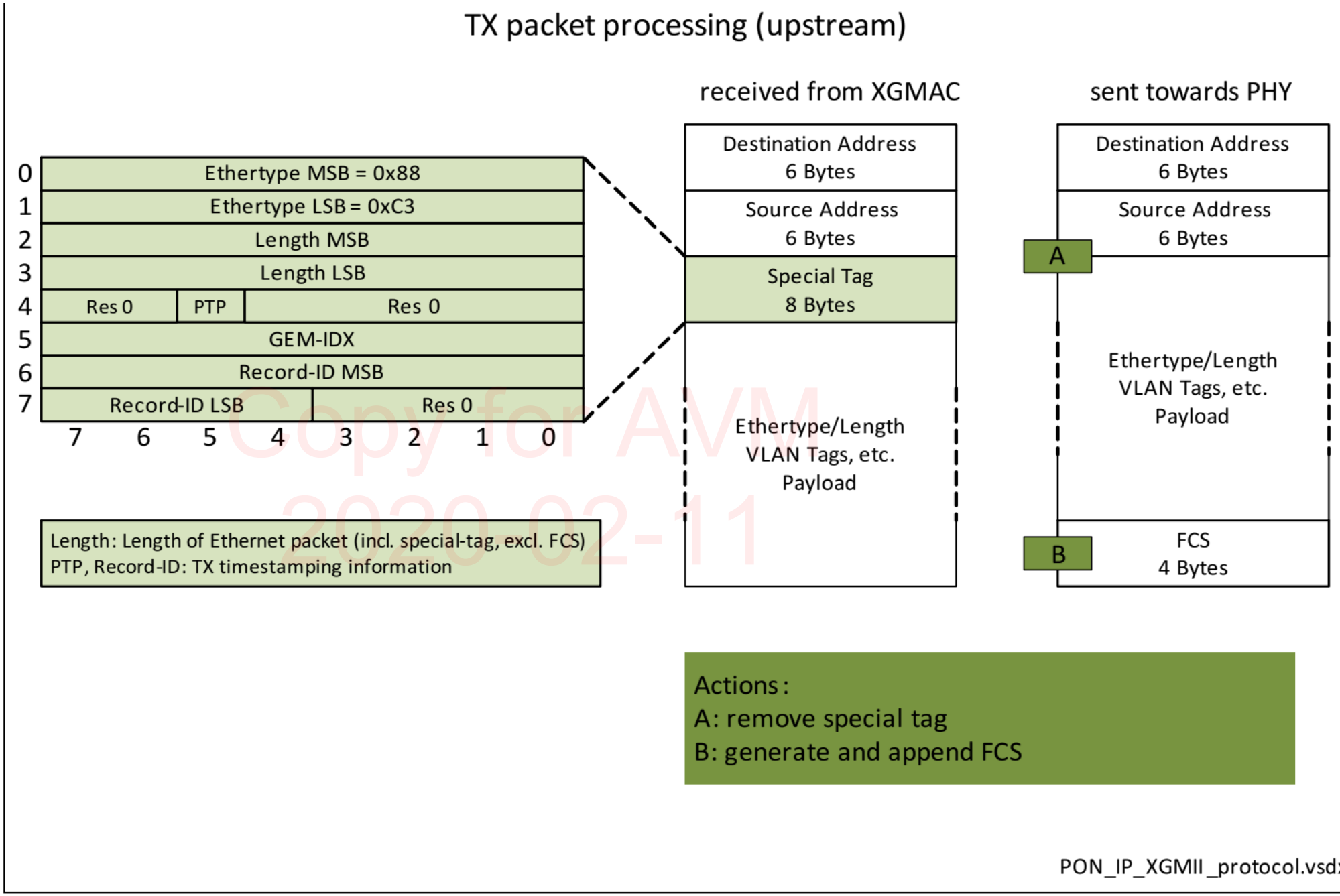
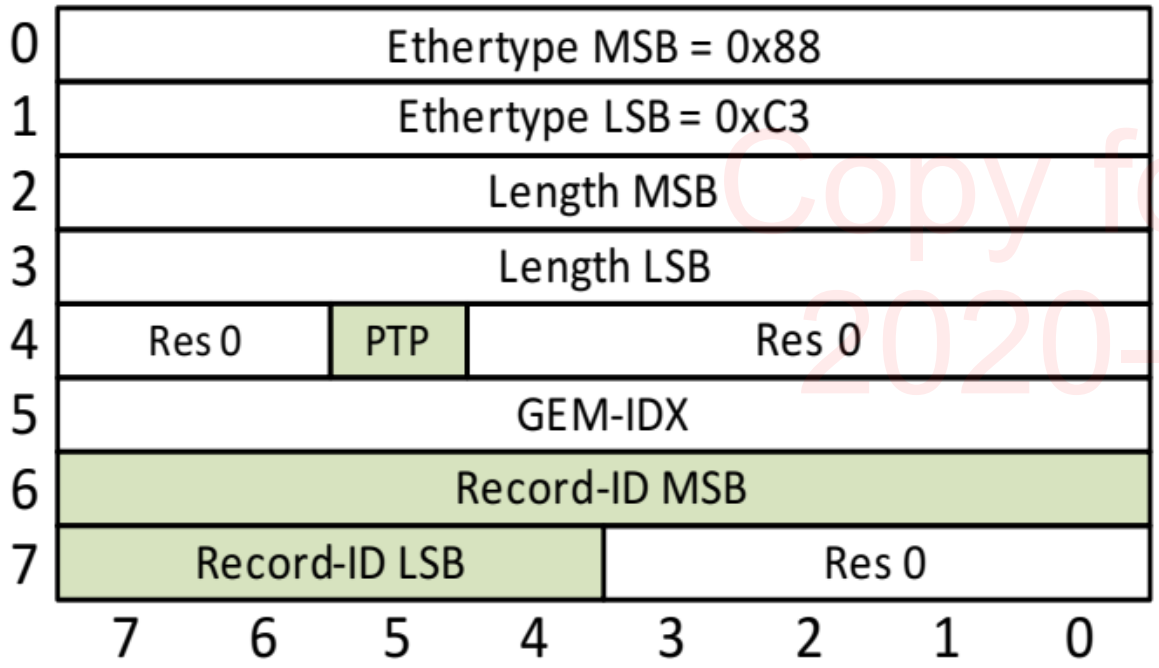


Figure 231 XGMII Packet Format Upstream (TX)

Special Tag
PON US

Timestamping information contained in TX special tag



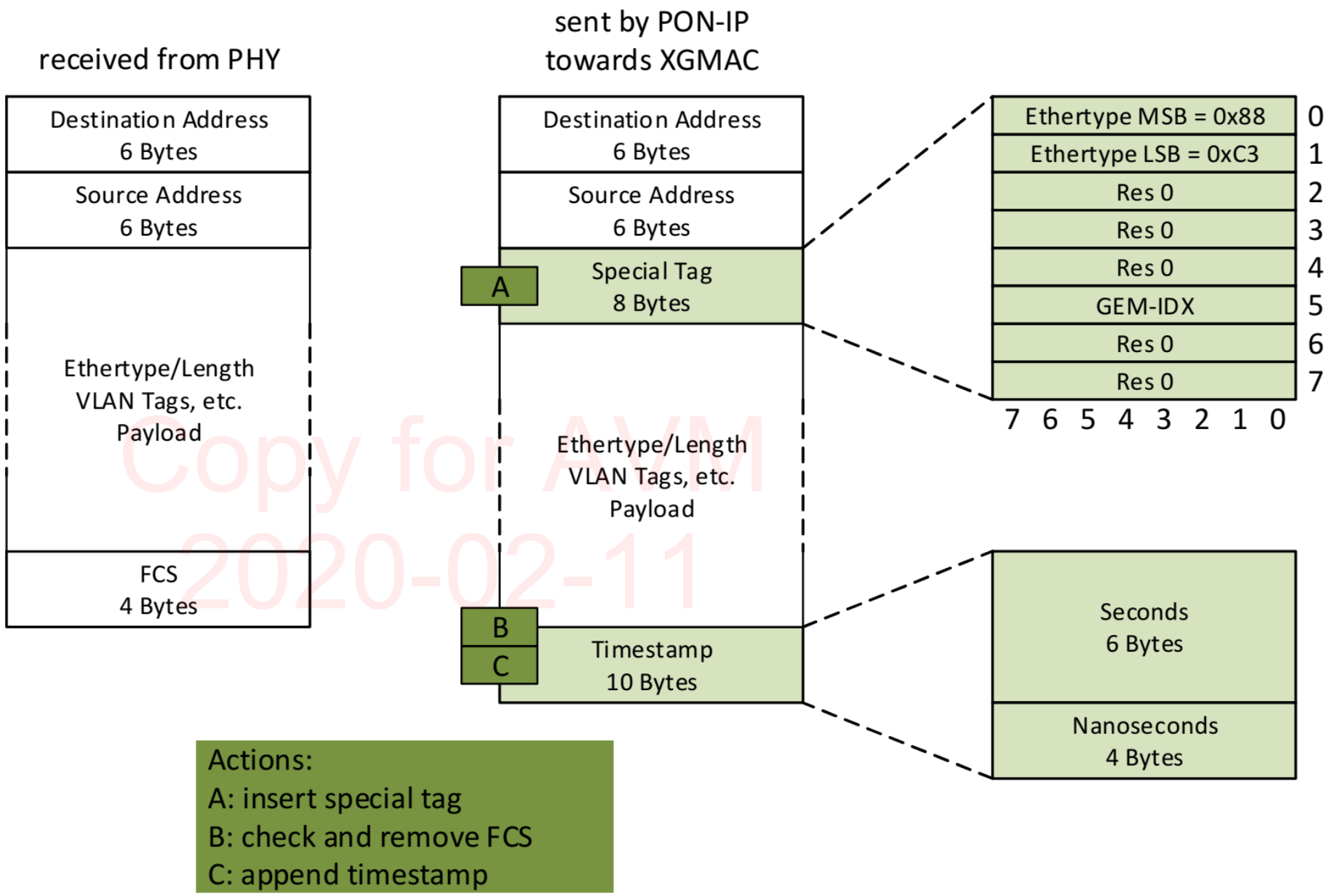
PTP 1: Time-stamping packet, 0: No time-stamping packet

Record ID[11:0] Session ID (meaningful for PTP packets only)

PON_IP_XGMII_protocol.vsdx, Page: TX timestamp, September 5, 2017

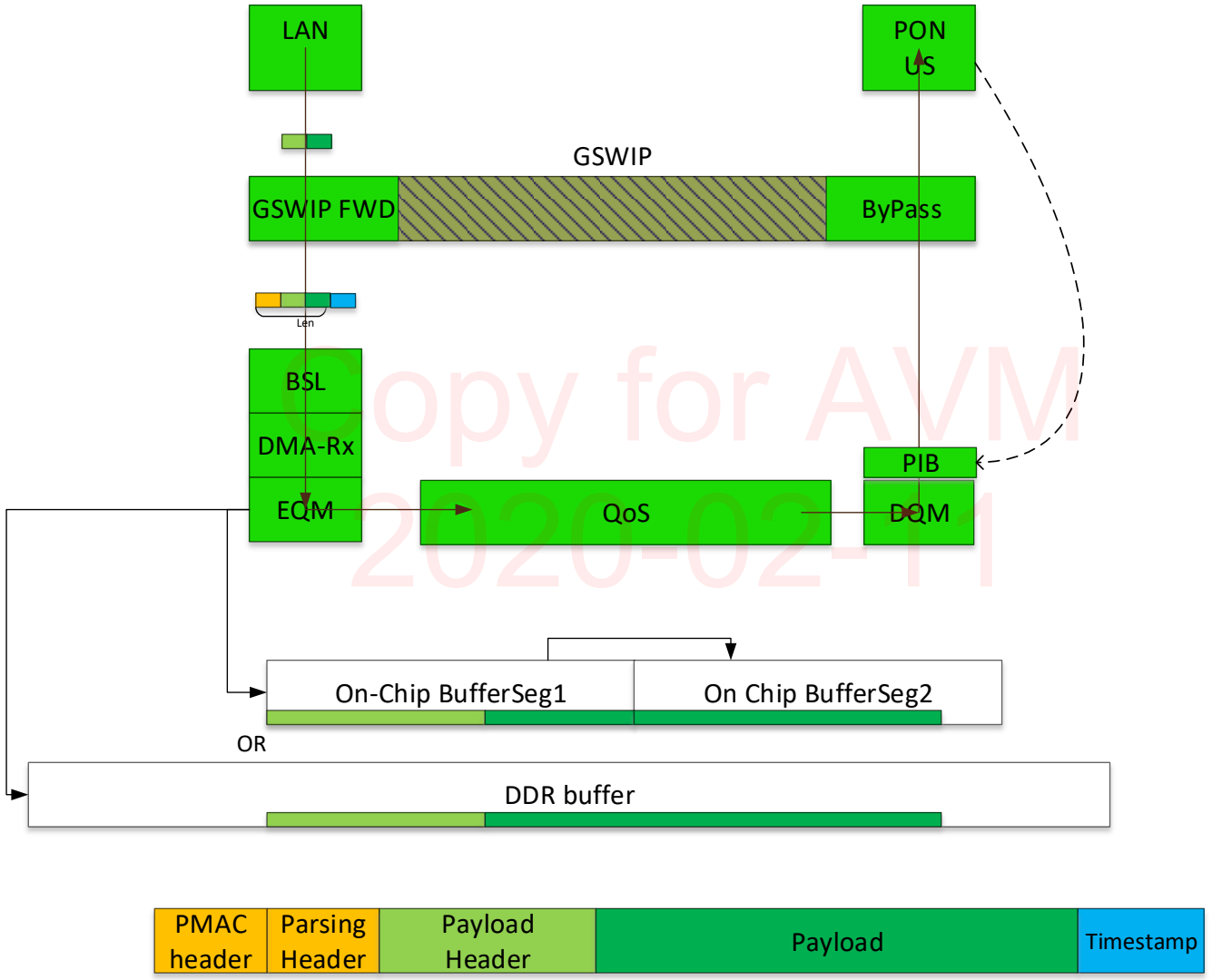
TX Time-stamping Information

Special Tag
PON DS

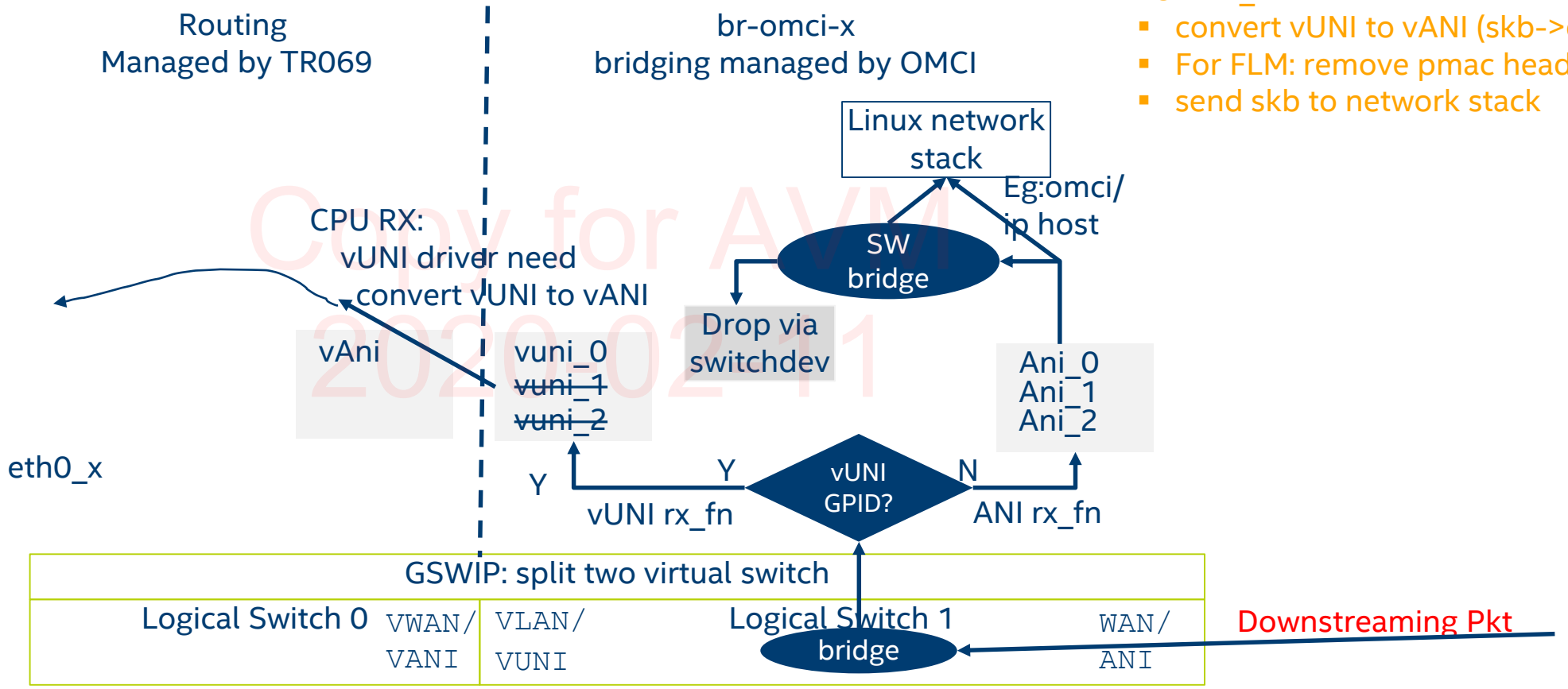


PON_IP_XGMII_protocol.vsdx, Page: RX, July 6, 2016

PON-US flow in 10G PON



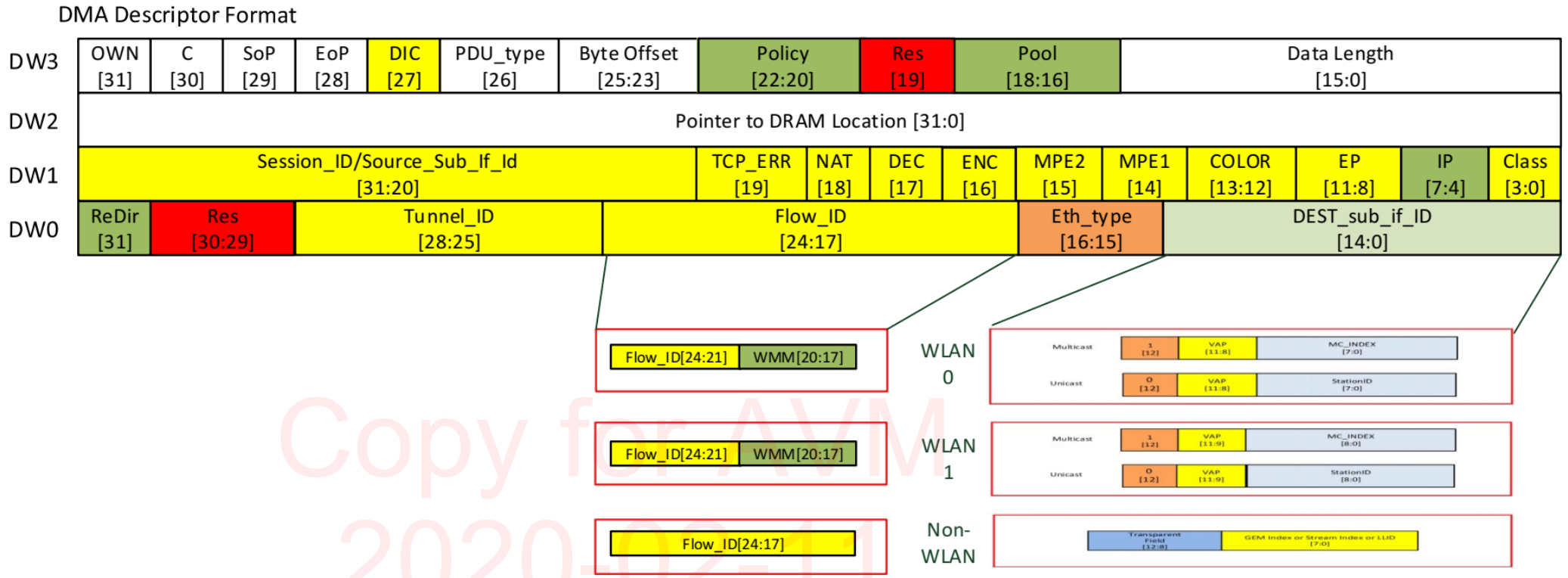
PON HGU Datapath (Single Box)–vUNI RX/Downstream



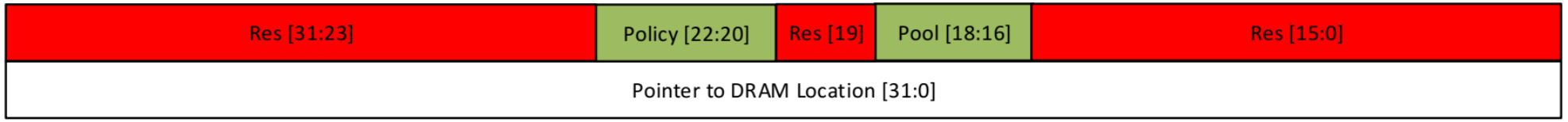
vUNI rx_fn
- convert vUNI to vANI (skb->dev)
- For FLM: remove pmac header
- send skb to network stack

vUNI driver need convert vUNI to vANI device/subif

Desc



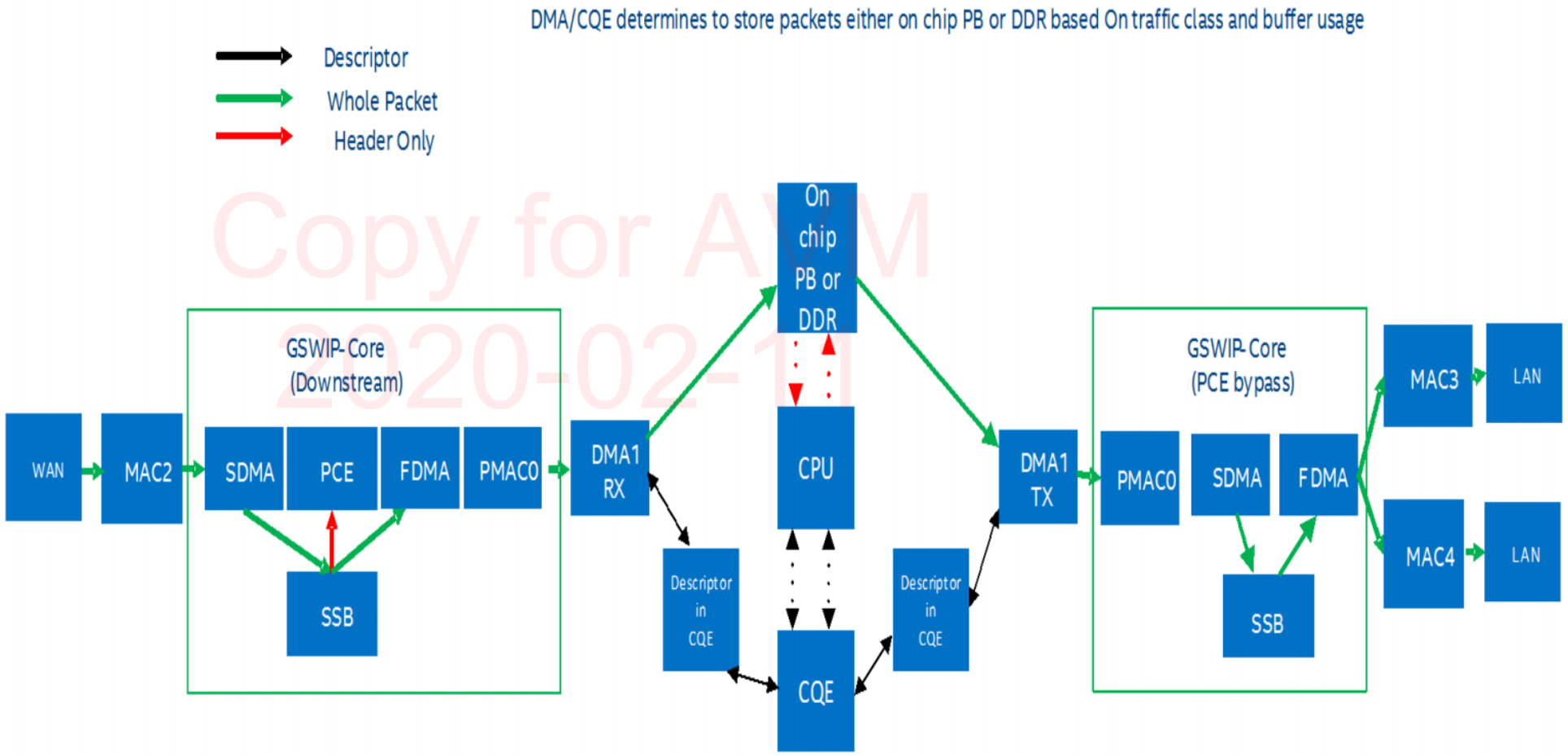
CPU/ACA Buffer Return Format



igure 118 DMA Descriptor and Buffer Return Command

Data Flows: Downstream CQEM Mode

Enables queueing and QoS if LAN interface is slow or temporarily unavailable

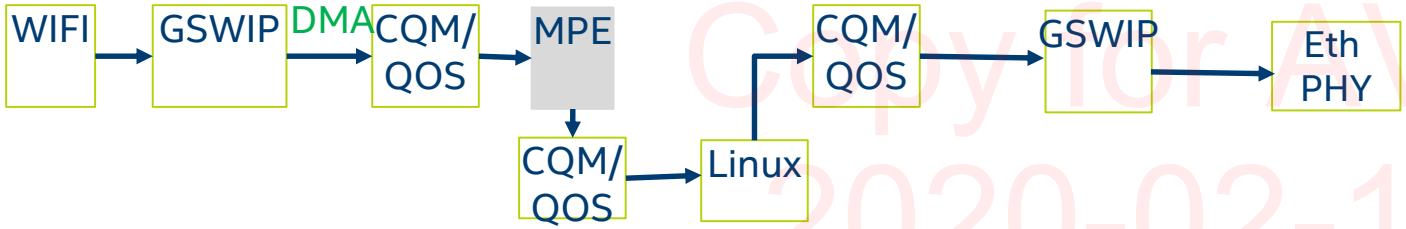


PON HGU Datapath (Single Box Routed) – WiFi <--> Eth WAN

Upstream

FLM WIFI->ANI Routing Data Flow with MPE Acceleration:

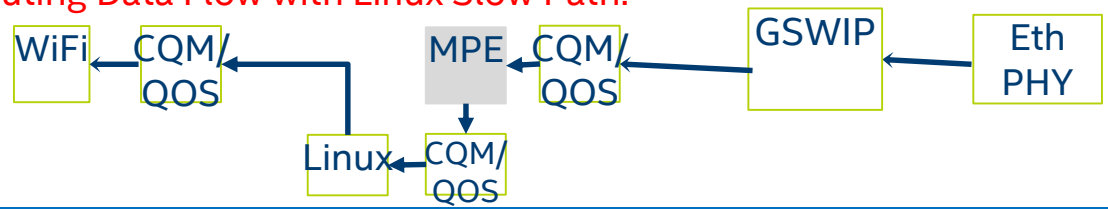
FLM WIFI->ANI Routing Data Flow with Linux Slow Path



Downstream

FLM ANI->UNI Routing Data Flow with MPE Acceleration:

FLM ANI->UNI Routing Data Flow with Linux Slow Path:

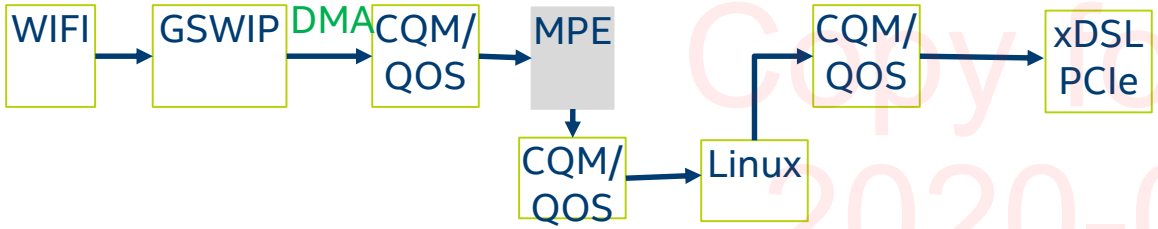


PON HGU Datapath (Single Box Routed) – WiFi <--> xDSL

Upstream

FLM WIFI->ANI Routing Data Flow with MPE Acceleration:

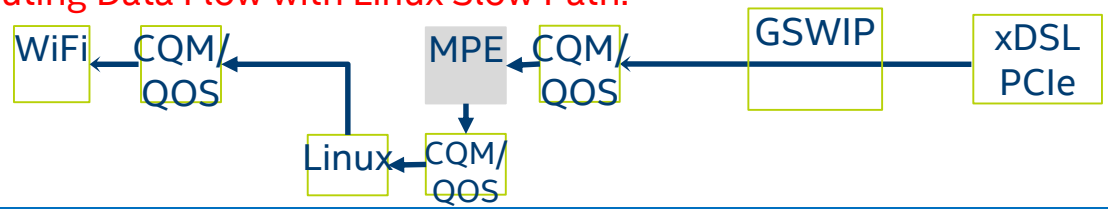
FLM WIFI->ANI Routing Data Flow with Linux Slow Path



Downstream

FLM ANI->UNI Routing Data Flow with MPE Acceleration:

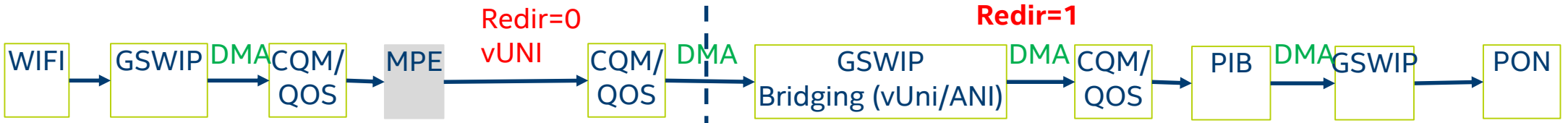
FLM ANI->UNI Routing Data Flow with Linux Slow Path:



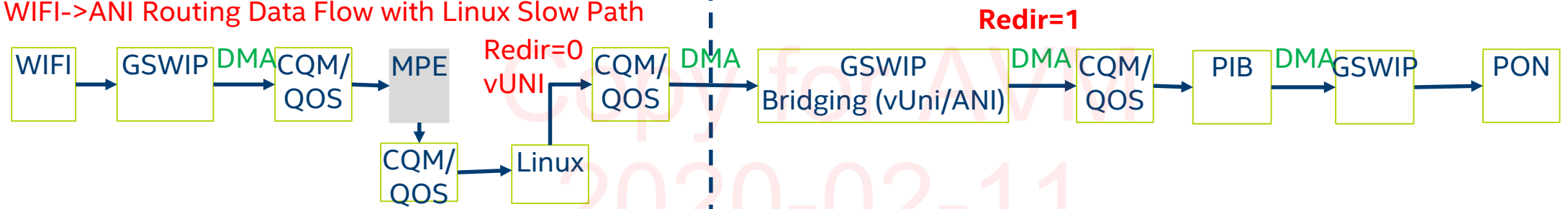
PON HGU Datapath (Single Box Routing) – WiFi <--> PON

Upstream

FLM WIFI->ANI Routing Data Flow with MPE Acceleration:



FLM WIFI->ANI Routing Data Flow with Linux Slow Path



Downstream

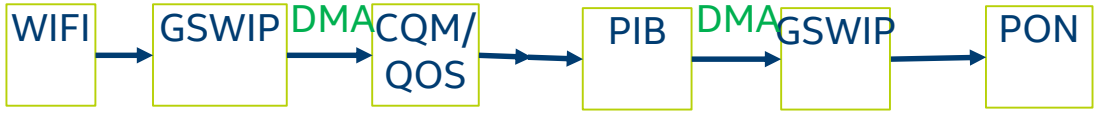
FLM ANI->UNI Routing Data Flow with MPE Acceleration:

FLM ANI->UNI Routing Data Flow with Linux Slow Path:

PON HGU Datapath (Single Box Bridging) – WiFi <--> PON

Upstream

FLM WIFI->ANI Bridging



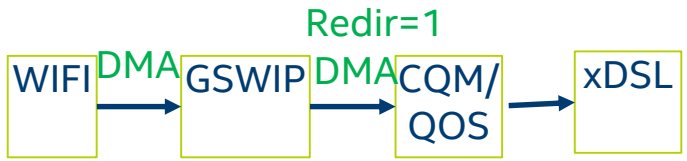
Downstream

FLM ANI->UNI Bridging

PON HGU Datapath (Single Box Bridging) – WiFi <--> xDSL

Upstream

WiFi to DSL Bridging



Downstream

DSL to WiFi Bridging

PON HGU Datapath (Single Box)-Bridging

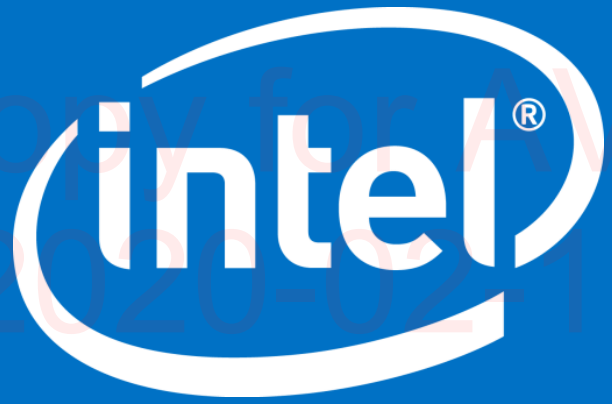
Default LAN to LAN

Default Wifi to LAN

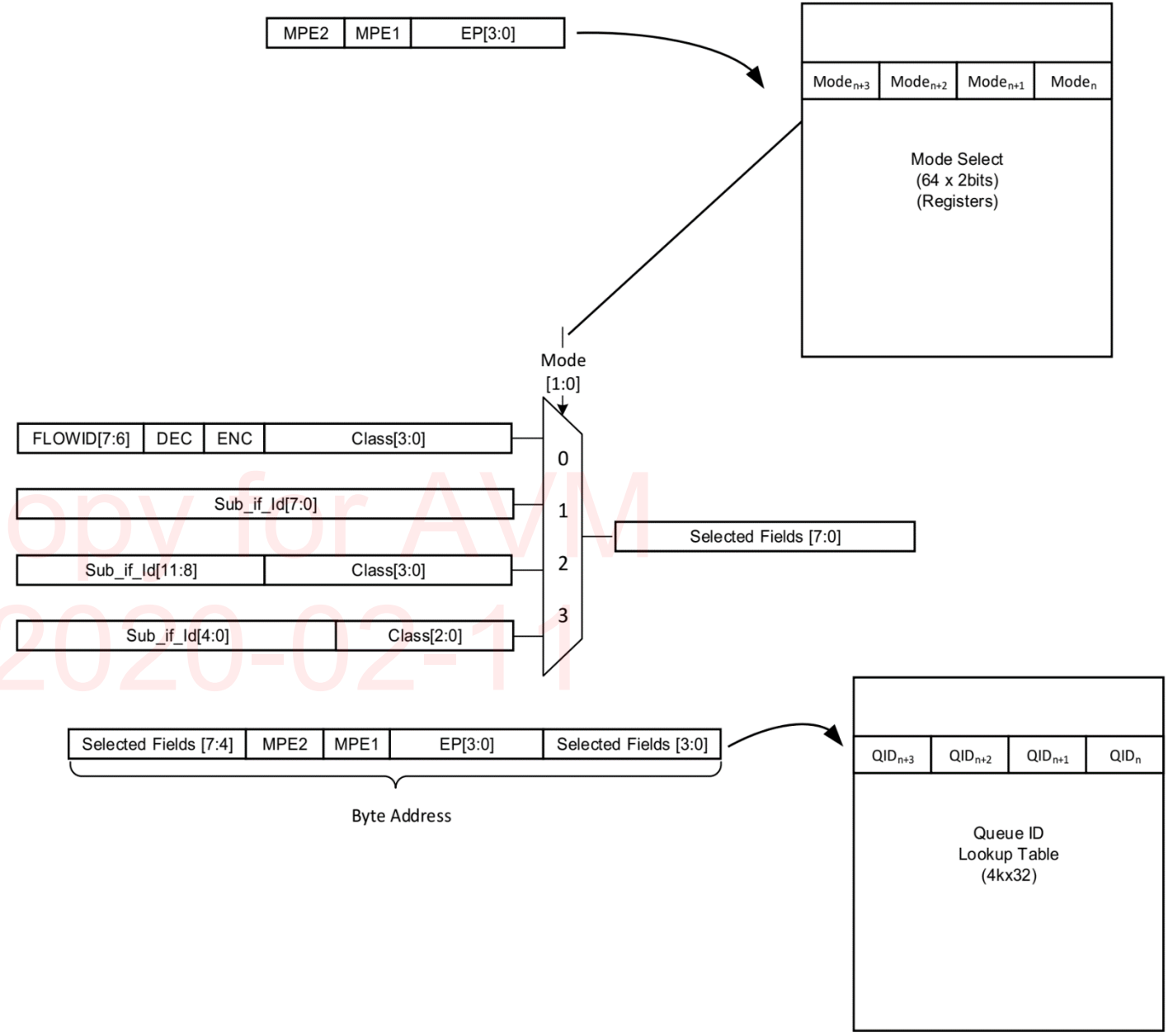
LAN to LAN using QoS (non-default)

WiFi to LAN using QoS (Non-default)

LAN to Wifi using QoS (Non-default)



Queue ID Computation



igure 121 Queue ID Computation