



# **Intel® Ethernet Controller X710/ XXV710/XL710**

**Dynamic Device Personalization for GTP with Extension Headers**

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**Ethernet Products Group (EPG)**

*October 2020*

Revision 1.0  
632982



## Revision History

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Document Revision	Date	Comments
1.0	October 2020	Initial release (Intel Public).

## 1.0 Introduction

This document describes the Dynamic Device Personalization (DDP) functionality supported by the Intel® Ethernet Controller X710/XXV710/XL710 starting with firmware version 6.01.

The DDP profile (0x80000010) contains the X710/XXV710/XL710 parser graph for PFCP, GTP-C and GTP-U protocols with optional Extension Headers for GTP-U.

GTP is the main tunnelling protocol LTE and required industry wide for multiple customers around the globe. The 5G standard evolved and a new Extension Header (EH) type 0x85 had been introduced to carry QoS Flow Identifier which must be present for every 5G network packets. This DDP adds support packets with EH and be able to parse encapsulated packets and extract fields for switch/RSS/FDIR filters. In total up to 3 Extension Headers per GTP-U packet supported.

**Table 1. Terms and Definitions**

Term	Definition
DDP	Dynamic device personalization.
GPRS	General packet radio service.
GTPv1	GPRS tunneling protocol, version 1.
GTP-C	GTP control protocol.
GTP-U	GTP user data tunneling.
PDU	Protocol data unit.
G-PDU	GTP-U non-signaling PDU
TEID	Tunnel endpoint identifier.
PFCP	Packet Forwarding Control Protocol
SEID	Session Endpoint Identifier

**Table 2. Version History**

Version	Description
0.0.1.10	Initial EPG release.
0.0.1.11	Use new track ID. All PCTYPES to note section.
0.0.3.15	Support PFCP.
1.0.0.0	Production version.

**Table 3. GTP Packet Field Vector**

Word Num	Protocol Layers					
<b>L2 Protocol Layers</b>						
0:2	Destination MAC address (in outer or single L2 header).					
3:5	Source MAC address (in outer or single L2 header).					
6	Default S-tag (DPDK: word 37).					
7	0x00.					
8	Inner or single VLAN tag (in outer or single L2 header).					
<b>L3 Protocol Layers</b>						
		G-PDU Inner IPv4	G-PDU Inner IPv6			
9	First eight words of the IPv4 header (up to including the source IP address).		First eight words of the IPv4 header (up to including the source IP address).			
10						
11:12			IPv6 source address.			
13:16						
17:20	0x00.		IPv6 destination address.			
21:22	0x00.					
23:26	0x00.					
27:28	Destination IP address.					
<b>L4 Protocol Layers</b>						
		TCP	UDP	SCTP	ICMP	
29:30	First 16 bytes of the TCP header.		First 8 bytes of the UDP header.		First 8 bytes of the SCTP header.	Words 0, 1 of the header.
31:32						0x00.
33:36			0x00.		0x00.	
<b>DPDK Outer VLAN for QinQ</b>						
37	S-tag (DPDK).	S-tag (DPDK).	S-tag (DPDK).	S-tag (DPDK).		
<b>GTP Tunnel Layer and Flexible Payload</b>						
38:39	0x00.					
40:41	First 4 octets of the PDU Session Container Extension Header (if there is any).					
42:45	First 8 octets of the GTP header.					
46	0x00.					
47	0x00.					
<b>Tunnel Layer and Flexible Payload</b>						
48:49	0x00.					
50:57	Outer destination IP address or flexible payload.					

**Note:** DPDK (up to release 17.11) forces flexible payload to the first 16 bytes of the payload and overrides the outer destination IP address. Starting from DPDK 18.02, the flexible payload is extracted only if enabled by the flow director configuration.

**Table 4. Packet Classifier Types and Input Set**

PCTYPE	PCTYPE Description	Hash Input Set	FD Input Set
12	IPv4 PFCP Session	IP4-S, IP4-D	
13	IPv4 PFCP Node	IP4-S, IP4-D	
14	IPv6 PFCP Session	IP6-S, IP6-D	
15	IPv6 PFCP Node	IP6-S, IP6-D	
16	GTP-U, PDU Type DL, IPv4 PDU	IP4-S, GTP TEID	GTP TEID
17	GTP-U, PDU Type DL, IPv6 PDU	IP6-S, GTP TEID	GTP TEID
18	GTP-U, PDU Type DL, IPv4 PDU	IP4-D, GTP TEID	GTP TEID
19	GTP-U, PDU Type DL, IPv6 PDU	IP6-D, GTP TEID	GTP TEID
22	GTP-U, IPv4 PDU	IP4-S, IP4-D, GTP TEID	GTP TEID
23	GTP-U, IPv6 PDU	IP6-S, IP6-D, GTP TEID	GTP TEID
24	GTP-U, non PDU	GTP TEID	GTP TEID
25	GTP-C, IPv4	GTP TEID	GTP TEID
38	GTP-C, IPv6	GTP TEID	GTP TEID

**Table 5. Packet Types**

PTYPE	Description	PTYPE	Description
<b>PFCP Types</b>		<b>PFCP Session Types</b>	
25	IPv4 PFCP PAY4	32	IPv4 PFCP Session PAY
39	IPv6 PFCP PAY4	47	IPv6 PFCP Session PAY4
<b>GTP-C Types</b>		<b>GTP-U non-PDU Types</b>	
167	IPv4 GTPC PAY4	181	IPv4 GTPU PAY
168	IPv6 GTPC PAY4	182	IPv6 GTPU PAY4
<b>IPv4 --&gt; GTP-U --&gt; IPv4</b>		<b>IPv4 --&gt; GTP-U --&gt; IPv6</b>	
169	IPv4 GTPU IPv4 PAY3	183	IPv4 GTPU IPv6FRAG PAY3
170	IPv4 GTPU IPv4FRAG PAY3	184	IPv4 GTPU IPv6 PAY3
171	IPv4 GTPU IPv4 UDP PAY4	185	IPv4 GTPU IPv6 UDP PAY4
172	IPv4 GTPU IPv4 TCP PAY4	186	IPv4 GTPU IPv6 TCP PAY4
173	IPv4 GTPU IPv4 SCTP PAY4	187	IPv4 GTPU IPv6 SCTP PAY4
174	IPv4 GTPU IPv4 ICMP PAY4	188	IPv4 GTPU IPv6 ICMPV6 PAY4
<b>IPv6 --&gt; GTP-U --&gt; IPv4</b>		<b>IPv6 --&gt; GTP-U --&gt; IPv6</b>	
175	IPv6 GTPU IPv4 PAY3	189	IPv6 GTPU IPv6 PAY3
176	IPv6 GTPU IPv4FRAG PAY3	190	IPv6 GTPU IPv6FRAG PAY3
177	IPv6 GTPU IPv4, UDP PAY4	191	IPv6 GTPU IPv6 UDP PAY4
178	IPv6 GTPU IPv4, TCP PAY4	113	IPv6 GTPU IPv6 TCP PAY4
179	IPv6 GTPU IPv4, SCTP PAY4	120	IPv6 GTPU IPv6 SCTP PAY4
180	IPv6 GTPU IPv4, ICMP PAY4	128	IPv6 GTPU IPv6 ICMP6 PAY4
<b>IPv4 --&gt; GTP-U with EH 85 --&gt; IPv4</b>		<b>IPv4 --&gt; GTP-U with EH 85 --&gt; IPv6</b>	
7	IPv4 GTPU GTPEH85 IPv4 PAY3	155	IPv4 GTPU GTPEH85 IPv6 PAY3
8	IPv4 GTPU GTPEH85 IPv4FRAG PAY3	156	IPv4 GTPU GTPEH85 IPv6FRAG PAY3
9	IPv4 GTPU GTPEH85 IPv4 UDP PAY4	157	IPv4 GTPU GTPEH85 IPv6 UDP PAY4
12	IPv4 GTPU GTPEH85 IPv4 TCP PAY4	158	IPv4 GTPU GTPEH85 IPv6 TCP PAY4
13	IPv4 GTPU GTPEH85 IPv4 SCTP PAY4	159	IPv4 GTPU GTPEH85 IPv6 SCTP PAY4
14	IPv4 GTPU GTPEH85 IPv4 ICMP PAY4	160	IPv4 GTPU GTPEH85 IPv6 ICMPV6 PAY4

**Table 5. Packet Types**

IPv6 --> GTP-U with EH 85 --> IPv4		IPv6 --> GTP-U with EH 85 --> IPv6	
15	IPV6 GTPU GTPEH85 IPV4 PAY3	161	IPV6 GTPU GTPEH85 IPV6 PAY3
16	IPV6 GTPU GTPEH85 IPV4FRAG PAY3	162	IPV6 GTPU GTPEH85 IPV6FRAG PAY3
17	IPV6 GTPU GTPEH85 IPV4 UDP PAY4	163	IPV6 GTPU GTPEH85 IPV6 UDP PAY4
18	IPV6 GTPU GTPEH85 IPV4 TCP PAY4	2	IPV6 GTPU GTPEH85 IPV6 TCP PAY4
19	IPV6 GTPU GTPEH85 IPV4 SCTP PAY4	4	IPV6 GTPU GTPEH85 IPV6 SCTP PAY4
20	IPV6 GTPU GTPEH85 IPV4 ICMP PAY4	5	IPV6 GTPU GTPEH85 IPV6 ICMPV6 PAY4
<b>GTP-U with PDU</b>			
21	IPV4 GTPU GTPEH85 PAY4		
154	IPV4 GTPU GTPEH85 PAY4		

**Note:** Due to limited number of packet types available, some packet types numeration is not sequential.

Double tunnelling is not supported. This profile has also removed support for NSH, VXLAN-GRE, and GRE.

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