

# **Intel<sup>®</sup> Ethernet Controller X710/ XXV710/XL710**

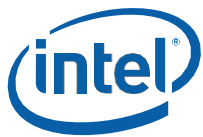
**Dynamic Device Personalization for GTP with Extension Headers**

---

**Ethernet Networking Division (ND)**

*April 2020*

Revision 1.1



## Revision History

---

Document Revision	Date	Comments
1.0	October 2019	Initial release (Intel Confidential).
1.1	April 2020	PFCP support with GTP



## 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 tunneling 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 ND release
0.0.1.11	Use new track Id. All PCTYPES to note section
0.0.3.15	Support PFCP

**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)



**Intel® Ethernet Controller X710/XXV710/XL710**  
**Dynamic Device Personalization for GTP**

3:5	Source MAC address (in outer or single L2 header)
6	Default S-tag (in outer or single L2 header)
7	0x00



8	Inner or single VLAN tag (in outer or single L2 header)			
	L3 Protocol Layers			
	G-PDU Inner IPv4		G-PDU Inner IPv6	
9	First eight words of the IPv4 header (up to including the source IP address)		First four words of the IPv6 header (up to including the hop limit)	
10				
11:12				
13:16			IPv6 source address	
17:20	0x00			
21:22	0x00			
23:26	0x00		IPv6 destination address	
27:28	Destination IP address			
	L4 Protocol Layers			
	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	
	DPDK Outer VLAN for QinQ			
37	S-tag (DPDK)	S-tag (DPDK)	S-tag (DPDK)	S-tag (DPDK)
	GTP Tunnel Layer and Flexible Payload			
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			



**Table 3. GTP Packet Field Vector**

	Tunnel Layer and Flexible Payload
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 Sets**

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 UL, IPv4 PDU	IP4-S, GTP TEID	GTP TEID
17	GTP-U, PDU Type UL, 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 PAY4
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 → GTP-U → IPv4</b>		<b>IPv4 → GTP-U → 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 → GTP-U → IPv4</b>		<b>IPv6 → GTP-U → IPv6</b>
175	IPv6 GTPU IPv4 PAY3	189	IPv6 GTPU IPv6 PAY3
176	IPv6 GTPU IPv4FRAG PAY3	190	IPv6 GTPU IPv6FRAG PAY
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 ICMPV6 PAY4



	<b>IPv4 → GTP-U with EH 85 → IPv4</b>		<b>IPv4 → GTP-U with EH 85 → IPv6</b>
7	IPv4 GTPU GTPEH85 IPv4 PAY3	155	IPv4 GTPU GTPEH85 IPv6FRAG PAY3
8	IPv4 GTPU GTPEH85 IPv4FRAG PAY3	156	IPv4 GTPU GTPEH85 IPv6 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
	<b>IPv6 → GTP-U with EH 85 → IPv4</b>		<b>IPv6 → GTP-U with EH 85 → IPv6</b>
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	IPv6 GTPU GTPEH85 PAY4		

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

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





## LEGAL

---

No license (express or implied, by estoppel or otherwise) to any intellectual property rights is granted by this document.

Intel disclaims all express and implied warranties, including without limitation, the implied warranties of merchantability, fitness for a particular purpose, and non-infringement, as well as any warranty arising from course of performance, course of dealing, or usage in trade.

This document contains information on products, services and/or processes in development. All information provided here is subject to change without notice. Contact your Intel representative to obtain the latest forecast, schedule, specifications and roadmaps.

The products and services described may contain defects or errors which may cause deviations from published specifications.

Copies of documents which have an order number and are referenced in this document may be obtained by calling 1-800-548-4725 or by visiting [www.intel.com/design/literature.htm](http://www.intel.com/design/literature.htm).

Intel and the Intel logo are trademarks of Intel Corporation in the U.S. and/or other countries.

\* Other names and brands may be claimed as the property of others.

© 2020 Intel Corporation.