**3GPP TSG-CT WG1 Meeting #129-eC1-212xxx**

**Electronic meeting, 19-23 April 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **24.301** | **CR** | **3506** | **rev** | **1** | **Current version:** | **17.2.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network | **x** |

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| --- |
|  |
| ***Title:***  | PDN connection establishment for UAS services |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | ID\_UAS |  | ***Date:*** | 2021-04-08 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)...Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | About UUAA at PDN connection Establishment (UUAA-SM), following stage 2 requirements were specified in TS 23.256:"*An UAV uses PDU Sessions or PDN Connections for communication with the USS and for C2 communication with a networked UAV-C.*""*An UAV may use either:**- a common PDU Session/PDN Connection for communication with the USS and C2 communication with the UAV-C, or**- separate PDU Sessions/PDN Connections for communication with the USS and C2 communication with the UAV-C respectively.**If a common PDU Session/PDN Connection is used, the UAV may establish the PDU Session/PDN Connection and enable the C2 communication during the same procedure, or the UAV may establish the PDU Session/PDN Connection for communication with the USS first and then later enable the C2 communication using the PDU Session/bearer modification procedure.* ""*The UAV shall indicate that the PDU Session/PDN Connection is for the UAV communication and/or C2 communication in the PDU Session Establishment/PDN Connectivity request.*"Based on above stage 2 requirements, following observations can be made in principle:1. To obtain the UAS services provided by the USS, the UAV needs to establish a new PDN connection.
2. The PDN connection can be used for three purposes:
	1. UAV communication with USS;
	2. UAV C2 communication;
	3. UAV communication with USS and UAV C2 communication.
3. The UAV needs to indicate the purpose of the PDN connection to the netwrok during the PDN connection establishement procedure.

To implement these observations in stage 3, it is better to define a new general ESM IE (named as "*ESM traffic type*") to indicate the purpose of the PDN connection for UAS services and also for future proof.The UUAA and/or C2 pairing authorization need also to be performed during such PDN connection establishement procedure for UAS services but due to currently it was not specified in TS 23.256, so this was captured as an EN for tracking in CT1. |
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| ***Summary of change:*** | It proposes to implement above stage 2 requirements on PDN connection establishement for UAS services. |
|  |  |
| ***Consequences if not approved:*** | The stage 2 requirements on PDN connection establishement for UAS services are not implemented in stage 3. |
|  |  |
| ***Clauses affected:*** | 2, 6.5.1.2, 8.3.20.1, 8.3.20.xx (new), 9.9.4.xx (new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\* \* \* First Change \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[1A] 3GPP TS 22.011: "Service accessibility".

[1B] Void.

[1C] 3GPP TS 22.278: "Service requirements for the Evolved Packet System (EPS)".

[2] 3GPP TS 23.003: "Numbering, addressing and identification".

[3] 3GPP TS 23.038: "Alphabets and language-specific information".

[4] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service Description; Stage 2".

[5] 3GPP TS 23.107: "Quality of Service (QoS) concept and architecture".

[6] 3GPP TS 23.122: "Non-Access-Stratum functions related to Mobile Station (MS) in idle mode".

[7] 3GPP TS 23.203: "Policy and charging control architecture".

[8] 3GPP TS 23.216: "Single Radio Voice Call Continuity (SRVCC); Stage 2".

[8A] 3GPP TS 23.221: "Architectural requirements".

[8B] 3GPP TS 23.251: "Network Sharing; Architecture and Functional Description".

[9] 3GPP TS 23.272: "Circuit Switched Fallback in Evolved Packet System; Stage 2".

[10] 3GPP TS 23.401: "GPRS enhancements for E-UTRAN access".

[11] 3GPP TS 23.402: "GPRS architecture enhancements for non-3GPP accesses".

[11A] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

[12] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".

[13] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core Network Protocols; Stage 3".

[13A] 3GPP TS 24.011: "Point-to-Point Short Message Service (SMS) support on mobile radio interface".

[13B] 3GPP TS 24.167: "3GPP IMS Management Object (MO); Stage 3".

[13C] 3GPP TS 24.171: "NAS Signalling for Control Plane LCS in Evolved Packet System (EPS)".

[13D] 3GPP TS 24.229: "IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[13E] 3GPP TS 24.173: "IMS Multimedia telephony communication service and supplementary services; Stage 3".

[14] 3GPP TS 24.303: "Mobility Management based on DSMIPv6; User Equipment (UE) to network protocols; Stage 3".

[15] 3GPP TS 24.304: "Mobility management based on Mobile IPv4; User Equipment (UE) - foreign agent interface; Stage 3".

[15A] 3GPP TS 24.368: "Non-Access Stratum (NAS) configuration Management Object (MO)".

[15B] 3GPP TS 25.304: "User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode".

[15C] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[15D] 3GPP TS 24.341: "Support of SMS over IP networks; Stage 3".

[16] 3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

[16A] 3GPP TS 29.118: "Mobility Management Entity (MME) – Visitor Location Register (VLR) SGs interface specification".

[16B] 3GPP TS 29.212: "Policy and Charging Control (PCC); Reference points".

[16C] 3GPP TS 29.272: "Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol".

[16D] 3GPP TS 29.274: "Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".

[17] 3GPP TS 31.102: "Characteristics of the Universal Subscriber Identity Module (USIM) application".

[18] 3GPP TS 33.102: "3G security; Security architecture".

[19] 3GPP TS 33.401: "3GPP System Architecture Evolution; Security architecture".

[20] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description".

[21] 3GPP TS 36.304: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode".

[22] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) protocol specification".

[22A] 3GPP TS 36.355: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)".

[23] 3GPP TS 36.413: "Evolved Universal Terrestrial Access Network (E-UTRAN); S1 Application Protocol (S1AP)".

[23A] 3GPP TS 45.008: "Radio Access Network; Radio subsystem link control".

[24] Void.

[24A] IETF RFC 3633: "IPv6 Prefix Options for Dynamic Host Configuration Protocol (DHCP) version 6".

[25] Void.

[26] Void.

[27] Void.

[28] Void.

[29] ISO/IEC 10646: "Information technology – Universal Multiple-Octet Coded Character Set (UCS)".

[30] ITU-T Recommendation E.212: "The international identification plan for mobile terminals and mobile users".

[31] 3GPP TS 23.303: "Proximity-based services (ProSe); Stage 2".

[32] 3GPP TS 24.334: "Proximity-services (ProSe) User Equipment (UE) to Proximity-services (ProSe) Function Protocol aspects; Stage 3".

[33] 3GPP TS 23.380: "IMS restoration procedures".

[34] 3GPP TS 23.161: "Network-Based IP Flow Mobility (NBIFOM); Stage 2".

[35] 3GPP TS 24.105: "Application specific Congestion control for Data Communication (ACDC) Management Object (MO)".

[36] 3GPP TS 24.161: "Network-Based IP Flow Mobility (NBIFOM); Stage 3".

[37] IETF RFC 5795: "The RObust Header Compression (ROHC) Framework".

[38] 3GPP TS 36.323: "Evolved Universal Terrestrial Radio Access (E-UTRA); Packet Data Convergence Protocol (PDCP) specification".

[39] IETF RFC 6846: "RObust Header Compression (ROHC): A Profile for TCP/IP (ROHC-TCP)".

[40] IETF RFC 3095: "RObust Header Compression (ROHC): Framework and four profiles: RTP, UDP, ESP and uncompressed".

[41] IETF RFC 3843: "RObust Header Compression (ROHC): A Compression Profile for IP".

[42] IETF RFC 4815: "RObust Header Compression (ROHC): Corrections and Clarifications to RFC 3095".

[43] IETF RFC 5225: "RObust Header Compression (ROHC) Version 2: Profiles for RTP, UDP, IP, ESP and UDP Lite".

[44] 3GPP TS 36.306: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities".

[45] 3GPP TS 23.167: "IP Multimedia Subsystem (IMS) emergency sessions".

[46] 3GPP TS 22.101: "Service aspects; Service principles".

[47] 3GPP TS 23.285: "Architecture enhancements for V2X services".

[48] 3GPP TS 24.302: "Access to the 3GPP Evolved Packet Core (EPC) via non-3GPP access networks; Stage 3".

[49] 3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification".

[50] 3GPP TS 24.623: "Extensive Markup Language (XML) Configuration Access Protocol (XCAP) over the Ut interface for Manipulating Supplementary Services".

[51] 3GPP TS 24.250: "Protocol for Reliable Data Service; Stage 3".

[52] 3GPP TR 38.913: "Study on Scenarios and Requirements for Next Generation Access Technologies".

[53] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) specification".

[54] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[55] IETF RFC 5031: "A Uniform Resource Name (URN) for Emergency and Other Well-Known Services".

[56] 3GPP TS 33.501: "Security architecture and procedures for 5G System".

[57] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS)".

[58] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[59] 3GPP TS 23.502: "Procedures for the 5G System".

[xx] 3GPP TS 23.256: "Support of Uncrewed Aerial Systems (UAS) connectivity, identification and tracking; Stage 2".

\* \* \* Next Change \* \* \* \*

#### 6.5.1.2 UE requested PDN connectivity procedure initiation

In order to request connectivity to a PDN, the UE shall send a PDN CONNECTIVITY REQUEST message to the MME, start timer T3482 and enter the state PROCEDURE TRANSACTION PENDING (see example in figure 6.5.1.2.1).

When the PDN CONNECTIVITY REQUEST message is sent together with an ATTACH REQUEST message, the UE shall not start timer T3482 and shall not include the APN.

NOTE 1: If the UE needs to provide protocol configuration options which require ciphering or provide an APN, or both, during the attach procedure, the ESM information transfer flag is included in the PDN CONNECTIVITY REQUEST. The MME then at a later stage in the PDN connectivity procedure initiates the ESM information request procedure in which the UE can provide the MME with protocol configuration options or APN or both.

In order to request a PDN connection for emergency bearer services or for access to RLOS, the UE shall not include an APN in the PDN CONNECTIVITY REQUEST message or, when applicable, in the ESM INFORMATION RESPONSE message.

In order to request connectivity to a PDN using the default APN, the UE includes the access point name IE in the PDN CONNECTIVITY REQUEST message or, when applicable, in the ESM INFORMATION RESPONSE message, according to the following conditions:

- if use of a PDN using the default APN requires PAP/CHAP, then the UE should include the Access point name IE; and

- in all other conditions, the UE need not include the Access point name IE.

In order to request connectivity to an additional PDN using a specific APN, the UE shall include the requested APN in the PDN CONNECTIVITY REQUEST message.

In the PDN type IE the UE shall either indicate the IP version capability of the IP stack associated with the UE or non IP or Ethernet as specified in subclause 6.2.2.

If the PDN type value of the PDN type IE is set to IPv4 or IPv6 or IPv4v6 and the UE indicates "Control plane CIoT EPS optimization supported" in the UE network capability IE of the ATTACH REQUEST message, the UE may include the Header compression configuration IE in the PDN CONNECTIVITY REQUEST message.

When the connectivity to a PDN is to be transferred from a non-3GPP access network to the 3GPP access network, the UE shall set the PDN type value of the PDN type IE to:

- IPv4, if the previously allocated home address information consists of an IPv4 address only;

- IPv6, if the previously allocated home address information consists of an IPv6 prefix only; or

- IPv4v6, if the previously allocated home address information consists of both an IPv4 address and an IPv6 prefix.

The UE shall set the request type to "initial request" when the UE is establishing a new PDN connectivity to a PDN in an attach procedure or in a stand-alone PDN connectivity procedure or when the UE is a 5G-RG and requests establishment of a PDN connection as a user-plane resource of an MA PDU session to be established. The UE shall set the request type to "emergency" when the UE is requesting a new PDN connectivity for emergency bearer services. The UE shall set the request type to "handover" when the connectivity to a PDN is to be transferred from a non-3GPP access network to the 3GPP access network, when the UE initiates the procedure to add 3GPP access to the PDN connection which is already established over WLAN, when the UE supporting N1 mode requests transfer of an existing non-emergency PDU session in 5GS or when the UE is a 5G-RG and requests establishment of a PDN connection as a user-plane resource of an already established MA PDU session. The UE shall set the request type to "handover of emergency bearer services" when a PDN connection for emergency bearer services is to be transferred from a WLAN to the 3GPP access network or when the UE supporting N1 mode requests transfer of an existing emergency PDU session in 5GS. The UE shall set the request type to "RLOS" when the UE is requesting a new PDN connection for RLOS.

If the UE supports DSMIPv6, the UE may include a request for obtaining the IPv6 address and optionally the IPv4 address of the home agent in the Protocol configuration options IE in the PDN CONNECTIVITY REQUEST message. The UE may also include a request for obtaining the IPv6 Home Network Prefix. The UE shall request the IPv6 Home Network Prefix only if the UE has requested the home agent IPv6 address. The requested home agent address(es) and the Home Network Prefix are related to the APN the UE requested connectivity for.

The UE may set the ESM information transfer flag in the PDN CONNECTIVITY REQUEST message to indicate that it has ESM information, i.e. protocol configuration options, APN, or both, that needs to be sent after the NAS signalling security has been activated between the UE and the MME.

If the UE supports A/Gb mode or Iu mode or both, the UE shall indicate the support of the network requested bearer control procedures (see 3GPP TS 24.008 [13]) in A/Gb mode or Iu mode in the protocol configuration options IE.

If the UE supports N1 mode and the request type is:

a) "initial request" or "emergency", the UE shall generate a PDU session ID, associate the PDU session ID with the PDN connection that is being established, and include the PDU session ID in the protocol configuration options IE or the extended protocol configuration options IE;

b) "handover" or "handover of emergency bearer services", and the UE requests:

1) transfer of an existing PDU session in 5GS or establishment of a PDN connection as a user-plane resource of an already established MA PDU session, the UE shall associate the PDU session ID of the PDU session with the PDN connection that is being established for the existing PDU session and include the PDU session ID in the protocol configuration options IE or the extended protocol configuration options IE; or

2) transfer of an existing PDN connection in a non-3GPP access connected to the EPC and a PDU session ID is associated with the existing PDN connection, the UE shall include the PDU session ID in the protocol configuration options IE or the extended protocol configuration options IE.

NOTE 2: The UE can also have an S-NSSAI associated with the PDN connection, if the S-NSSAI was provided by the network during the PDN connection establishment via non-3GPP access to EPC (see 3GPP TS 24.302 [48]). The UE stores this S-NSSAI for later use during inter-system change from S1 mode to N1 mode.

If the UE supporting N1 mode supports receiving QoS rules with the length of two octets or QoS flow descriptions with the length of two octets via the extended protocol configuration options IE, the UE shall include the QoS rules with the length of two octets support indicator or the QoS flow descriptions with the length of two octets support indicator, respectively, in the protocol configuration options IE or the extended protocol configuration options IE.

Protocol configuration options provided in the ESM INFORMATION RESPONSE message replace any protocol configuration options provided in the PDN CONNECTIVITY REQUEST message.

When the UE initiates the procedure to add 3GPP access to the PDN connection that is already established over WLAN, the UE shall provide the same APN as that of the PDN connection established over WLAN in the PDN connectivity procedure as specified in the subclause 6.2.2 of 3GPP TS 23.161 [34].

If the UE supports APN rate control, the UE shall include an APN rate control support indicator and an additional APN rate control for exception data support indicator in the protocol configuration options IE or extended protocol configuration options IE.

If the UE supports DNS over (D)TLS (see 3GPP TS 33.501 [24]), the UE shall include the extended protocol configuration options IE in the PDN CONNECTIVITY REQUEST message and include DNS server security information indicator.

NOTE 3: Support of DNS over (D)TLS is based on the informative requirements as specified in 3GPP TS 33.501 [24].

If requested by the upper layers to establish a PDN connection for the UAV communication with USS only, the UE shall include the ESM traffic type IE in the PDN CONNECTIVITY REQUEST message and shall set the IE to "UAV-USS communication" (see 3GPP TS 23.256 [xx]).

If requested by the upper layers to establish a PDN connection for the UAV C2 communication only, the UE shall include the ESM traffic type IE in the PDN CONNECTIVITY REQUEST message and shall set the IE to "UAV C2 communication" (see 3GPP TS 23.256 [xx]).

If requested by the upper layers to establish a PDN connection for both the UAV communication with USS and the UAV C2 communication, the UE shall include the ESM traffic type IE in the PDN CONNECTIVITY REQUEST message and shall set the IE to "UAV-USS communication and UAV C2 communication" (see 3GPP TS 23.256 [xx]).

Editor's note: It is FFS on whether the network can use other information to identify the established PDN connection is for the UAV communication with USS and/or the UAV C2 communication.

Editor's note: It is FFS on how to perform the UAV USS authentication and authorization (UUAA) and/or C2 pairing authorization during the PDN connectivity procedure.



Figure 6.5.1.2.1: UE requested PDN connectivity procedure

\* \* \* Next Change \* \* \* \*

#### 8.3.20.1 Message definition

This message is sent by the UE to the network to initiate establishment of a PDN connection. See table 8.3.20.1.

Message type: PDN CONNECTIVITY REQUEST

Significance: dual

Direction: UE to network

Table 8.3.20.1: PDN CONNECTIVITY REQUEST message content

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| IEI | Information Element | Type/Reference | Presence | Format | Length |
|  | Protocol discriminator | Protocol discriminator9.2 | M | V | 1/2 |
|  | EPS bearer identity | EPS bearer identity9.3.2 | M | V | 1/2 |
|  | Procedure transaction identity | Procedure transaction identity9.4 | M | V | 1 |
|  | PDN connectivity request message identity | Message type9.8 | M | V | 1 |
|  | Request type | Request type9.9.4.14 | M | V | 1/2 |
|  | PDN type | PDN type9.9.4.10 | M | V | 1/2 |
| D- | ESM information transfer flag | ESM information transfer flag9.9.4.5 | O | TV | 1 |
| 28 | Access point name | Access point name9.9.4.1 | O | TLV | 3-102 |
| 27 | Protocol configuration options | Protocol configuration options9.9.4.11 | O | TLV | 3-253 |
| C- | Device properties | Device properties9.9.2.0A | O | TV | 1 |
| 33 | NBIFOM container | NBIFOM container9.9.4.19 | O | TLV | 3-257 |
| 66 | Header compression configuration | Header compression configuration9.9.4.22 | O | TLV | 5-257 |
| 7B | Extended protocol configuration options | Extended protocol configuration options9.9.4.26 | O | TLV-E | 4-65538 |
| XX | ESM traffic type | ESM traffic type9.9.4.xx | O | TV | 1 |

\* \* \* Next Change \* \* \* \*

#### 8.3.20.xx ESM traffic type

This IE shall be included in the message when the UE is requested by the upper layers to establish a new PDN connection for UAS services.

\* \* \* Next Change \* \* \* \*

#### 9.9.4.xx ESM traffic type

The purpose of the ESM traffic type information element is to indicate the traffic type of an ESM message.

The ESM traffic type information element is coded as shown in figure 9.9.4.xx.1 and table 9.9.4.xx.1.

The ESM traffic type is a type 1 information element.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| ESM traffic type IEI | 0Spare | ESM traffic type value | octet 1 |

Figure 9.9.4.xx.1: ESM traffic type information element

Table 9.9.4.xx.1: ESM traffic type information element

|  |
| --- |
| ESM traffic type value (octet 1, bit 1 to bit 3) |
| Bits |
| 3 | 2 | 1 |  |  |
| 0 | 0 | 1 |  | No traffic type |
| 0 | 1 | 0 |  | UAV-USS communication |
| 0 | 1 | 1 |  | UAV C2 communication |
| 1 | 0 | 0 |  | UAV-USS communication and UAV C2 communication |
| 1 | 1 | 1 |  | reserved |
|  |
| All other values are unused and shall be interpreted as "No traffic type", if received by the network. |

\* \* \* End of Change \* \* \* \*