ETSI TS 129 674 V16.1.0 (2020-07)

TECHNICAL SPECIFICATION

LTE;
5G;
Interface between the UE radio
Capability Management Function (UCMF)
and the Mobility Management Entity (MME);
Stage 3
(3GPP TS 29.674 version 16.1.0 Release 16)

Reference
DTS/TSGC-0429674vg10

Keywords
5G,LTE

ETSI

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Contents

Foreword

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can indicates that something is possible

cannot indicates that something is impossible

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will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

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might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present document specifies the UE Radio Capability Management Protocol used on the interface between the MME and UCMF as specified in 3GPP TS 23.401 [2]. In the related stage 2 specifications the prefix S17 is used for these common procedures realised by URCMP.

NOTE: As an alternative of URCMP, the MME could use SBI interface to access UCMF Services.

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".

[2]   3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".

[3]   IETF RFC 768: "User Datagram Protocol".

[4]   IETF RFC 791: "INTERNET PROTOCOL".

[5]   IETF RFC 8200: "Internet Protocol, Version 6 (Ipv6) Specification".

[6]   3GPP TS 23.003: "Numbering, addressing and identification".

[7]   3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".

[8]   3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".

[9]   3GPP TS 29.274: "3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".

[10]   IETF RFC 5905: "Network Time Protocol Version 4: Protocol and Algorithms Specification".

[11]   3GPP TS 38.413: "NG Radio Access Network (NG-RAN); NG Application Protocol (NGAP)".

3 Definitions of terms, symbols and abbreviations

3.1 Terms

void

3.2 Symbols

void

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

MME	Mobility Management Entity
URCMP	UE Radio Capability Management Protocol
UCMF	UE radio Capability Management Function

4 Protocol Stack

4.1 Introduction

The protocol stack for the control plane over the S17 reference points shall be as depicted in Figure 4.1-1. Clauses 4.2 and 4.3 further specify the related UDP and IP requirements.
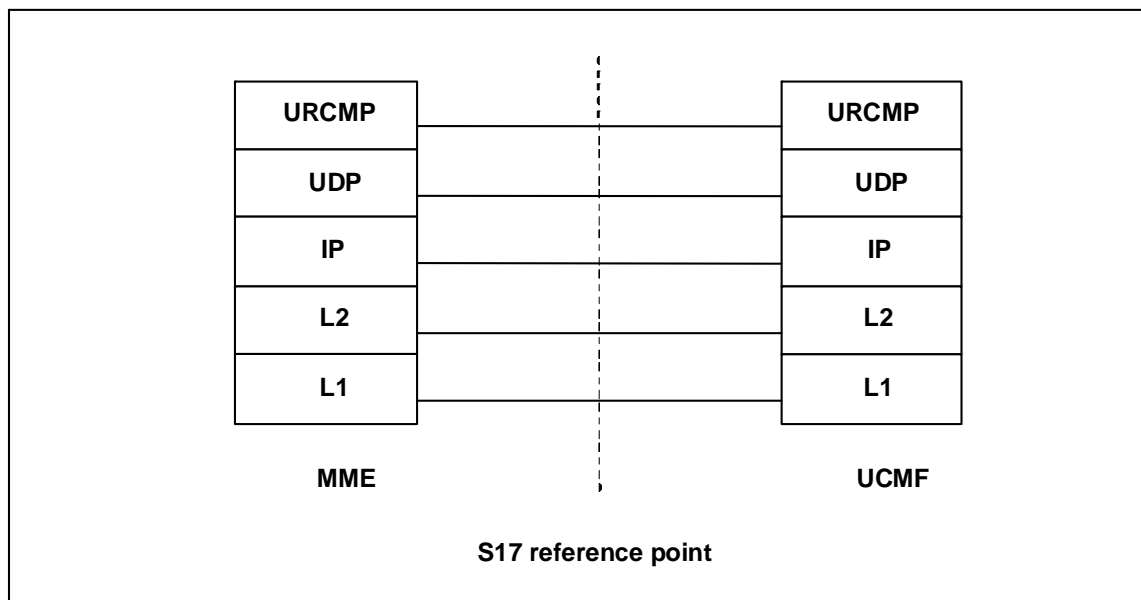
Figure 4.1-1: Control Plane stack over S17

4.2 UDP Header and Port Numbers

4.2.1 General

A User Datagram Protocol (UDP) compliant with IETF RFC 768 [3] shall be used.

4.2.2 Request Message

The UDP Destination Port number for a Request message shall be the one and only one configured by the operator for a given PLMN, e.g. in the range of 49152 to 65535.

The UDP Source Port for a Request message is a locally allocated port number at the sending entity.

NOTE: The locally allocated source port number can be reused for multiple Request messages.

4.2.3 Response Message

The UDP Destination Port value of a Response message shall be the value of the UDP Source Port of the corresponding Request message.

The UDP Source Port of a Response message shall be the value from the UDP Destination Port of the corresponding message.

4.3 IP Header and IP Addresses

4.3.1 General

In this clause, "IP" refers either to Ipv4 as defined by IETF RFC 791 [4] or Ipv6 as defined by IETF RFC 8200 [5]. A URCMP entity shall support both Ipv4 and Ipv6.

4.3.2 Request Message

The IP Destination Address of a Request message shall be an IP address of the peer entity.

The IP Source Address of a Request message shall be an IP address of the sending entity.

4.3.3 Response Message

The IP Destination Address of a Response message shall be copied from the IP Source Address of the corresponding Request message.

The IP Source Address of a Response message shall be copied from the IP destination address of the corresponding Request message.

5 General description

5.1 Introduction

This document describes the procedures, messages and information elements over the S17 reference point between the MME and the UCMF to support UE Radio Capability Signalling optimization as specified in clause 5.11.3A of 3GPP TS 23.401 [2].

The UE Radio Capability Management Protocol (URCMP) is used over S17 reference point.

6 Procedures

6.1 Introduction

The following clauses specify the procedures supported over the S17 reference points.

6.2 Node Related Procedures

6.2.1 General

The following clauses specify the node related procedures over the S17 reference points.

6.2.2   Heartbeat Procedure

6.2.2.1   General

Two messages are specified for URCMP heartbeat procedure: Heartbeat Request and Heartbeat Response. The use of these messages is further specified in clause 19B of 3GPP TS 23.007 [3] for EPC.

6.2.2.2   Heartbeat Request

The MME or UCMF may send a Heartbeat Request on a path to the peer node to find out if it is alive. Heartbeat Request messages may be sent for each peer which is known by the sender, e.g. based on the configuration.

An MME or a UCMF shall be prepared to receive a Heartbeat Request at any time and it shall reply with a Heartbeat Response message.

6.2.2.3   Heartbeat Response

The message shall be sent as a response to a received Heartbeat Request message.

6.2.3   Subscription Management Procedure

6.2.3.1   General

The URCMP Subscription Management Procedure shall be used to create or delete a subscription in the UCMF, where the subscription is to get notifications for one or more new dictionary entries creation or for the deletion of one or more PLMN Assigned UE Radio Capability IDs.

6.2.3.2   Procedures in the MME

To create or delete a subscription in the UCMF which is used to receive notifications afterwards, the MME shall initiate the Subscription Management Procedure by sending a Subscription Management Request message towards the UCMF including:

-    a "Subscription Management Operation Type" IE, which is set to either "Creation" or "Deletion";

-    the MME Address Information IE which is used to receive subsequent notifications from the UCMF if the operation type is set to "Creation". The MME address information includes an IP address;

-    the Subscription ID which is used to address a subscription in the UCMF if the operation code is set to "Deletion";

The MME shall create only one subscription in the UCMF.

When the MME receives the Subscription Management Response message with a successful cause for a subscription creation request, the MME function shall be prepared to receive subsequent notifications at the provided MME address.

6.2.3.3   Procedures in the UCMF

When the UCMF receives a Subscription Management Request message, it shall reply with a Subscription Management Response message.

On success:

-    If the operation code is set to "Creation", the UCMF shall create a new subscription together with the MME address and the timestamp of the request to create the subscription, and include the following information in the Subscription Management Response message;

  -    a Subscription ID;

  -    the current highest Dictionary Entry ID which has been allocated in the UCMF;

- If the operation code is set to "Deletion", the UCMF shall delete the subscription and include a success cause code in the Subscription Management Response message;

On failure, the UCMF shall:

- return an appropriate error cause value, e.g. MANDATORY_IE_MISSING for the creation of a subscription, or SUBSCRIPTION_NOT_FOUND for the deletion of a subscription, discard all the received information.

6.2.4 Event Notification Procedure

6.2.4.1 General

The URCMP Event Notification Procedure shall be used to send a notification for an event, e.g. the creation of one or more new dictionary entries, towards an MME which has a valid subscription in the UCMF.

6.2.4.2 Procedures in the UCMF

When one or more new dictionary entries are created in the UCMF since the time of the creation of the subscription, or when a PLMN decides to switch to operate based on manufacturer-assigned UE Radio Capability ID for a particular type of UE, the UCMF shall initiate the Event Notification Procedure by sending an Event Notification Request message towards the MME including:

- an Event Type IE, which is set to either "Creation of Dictionary Entry" or "Deletion of PLMN-assigned UE Radio Capability ID" or "NEW_VERSION_ID_OF_PLMN_ASSIGNED_IDs";

- the updated highest Dictionary Entry ID if the Event Type is set to " CREATION_OF_DICTIONARY_ENTRY ";

- a new Version ID if the Event Type is set to " NEW_VERSION_ID_OF_PLMN_ASSIGNED_IDs";

- the Manufacturer Assigned operation requested list if the Event Type is set to " DELETION_OF_PLMN_ASSIGNED_IDS " which shall include one of the following (not both):;

  - one or more PLMN Assigned UE Radio Capability IDs to be deleted;

  - or, one or more Type Allocation Codes in corresponding to the PLMN Assigned UE Radio Capability IDs to be deleted.

6.2.4.3 Procedures in the MME

When the MME receives an Event Notification Request message, it shall reply with an Event Notification Response message.

On success, the MME:

- may determine and then retrieve those dictionary entries which are not available yet locally using the Dictionary Entry ID if the Event Type is set to " Creation of Dictionary Entry";

- shall retrieve affected UE contexts which are using those PLMN-assigned UE Radio Capability IDs which are to be deleted and behave as specified in clause 5.11.3a of 3GPP TS 23.401 [2] if the Event Type is set to "Deletion of PLMN-assigned UE Radio Capability ID";

- may determine to retrieve a new PLMN Assigned UE Radio Capability ID, e.g. for a UE with signalling connection established to the MME;

- shall include a success cause code in the Event Notification Response message;

On failure, the MME:

- shall return an appropriate error cause value in the Event Notification Response message, e.g. MANDATORY_IE_MISSING, and discard all the received information.

6.3 Session Related Procedures

6.3.1 General

The following clauses describe the session related procedures over the S17 reference points. A URCMP session refers to a signalling transaction addressing a dictionary entry containing the mapping information between the UE Radio Capability ID(s) and UE Radio Access Capability Information.

6.3.2 Create Dictionary Entry Procedure

6.3.2.1 General

The URCMP Create Dictionary Entry procedure shall be used to create a dictionary entry in the UCMF, and obtain a PLMN assigned UE Radio Capability ID.

6.3.2.2 Procedures in the MME

When the UE Radio Capability ID, either PLMN-assigned or Manufacturer-assigned, is not received by the MME from a UE, or from the source MME during an inter MME mobility procedure or if the MME receives a rejection response from the UCMF with the cause code "NO_DICTIONARY_ENTRY_FOUND" when it uses a Manufacturer-assigned UE Radio Capability ID to retrieve the corresponding UE Radio Access Capability Information, or if the MME recefves a rejection response from the UCMF with the cause code "OUT_DATED_VERSION_ID_IN_RAC_ID" when it uses a PLMN-assigned UE Radio Capability ID to retrieve the corresponding UE Radio Access Capability Information, the MME shall initiate the Create Dictionary Entry Procedure by sending a Create Dictionary Entry Request message towards the UCMF including:

- the UE Radio Access Capability Information, which is received from the eNB, encoded as specified in 3GPP TS 36.413 [8], and optionally also including information encoded as specified in 3GPP TS 38.413 [11]

- Type Allocation Code in the IMEI of the UE

When the MME receives a Create Dictionary Entry Response message with a successful cause, the MME function shall continue with the procedure which triggered the Create Dictionary Entry procedure as specified in 3GPP TS 23.401 [2].

6.3.2.3 Procedures in the UCMF

When the UCMF receives a Create Dictionary Entry Request message, it shall reply with a Create Dictionary Entry Response message.

On success, the UCMF shall create a new dictionary entry with received information and include the following information in the Create Dictionary Entry Response message;

- a dictionary entry ID;

- a PLMN assigned UE Radio Capability ID, if PLMN is configured to use a PLMN specific UE Radio Capability ID.

On failure, the UCMF shall:

- return an appropriate error cause value, e.g. MANDATORY_IE_MISSING, discard all the received information and not create any dictionary entry.

A UCMF configured to operate in Mode of Operation A (3GPPP TS 23.401, Clause 5.11.3a) shall reject the operation if the request does not contain UE Radio Access Capability Information in both the formats and UCMF is not able to find match of the received UE Radio Access Capability Information in its database.

6.3.3 Query Dictionary Entry Procedure

6.3.3.1 General

The URCMP Query Dictionary Entry procedure shall be used to retrieve UE Radio Access Capability Information from a dictionary entry in the UCMF.

6.3.3.2 Procedures in the MME

When the MME receives a UE Radio Capability ID from a UE or the source MME (during an inter MME mobility procedure), which is either PLMN-assigned or Manufacturer-assigned, while there is no corresponding UE Radio Access Capability Information stored in the MME, the MME shall initiate the Query Dictionary Entry Procedure by sending a Query Dictionary Entry Request message towards the UCMF including:

- a PLMN-assigned UE Radio Capability ID;

- or a Manufacturer-assigned UE Radio Capability ID;

- or a Dictionary Entry ID;

When the MME receives a Query Dictionary Entry Response message with a successful cause, the MME function shall continue with the procedure which triggered the Create Dictionary Entry procedure as specified in 3GPP TS 23.401 [2].

6.3.3.3 Procedures in the UCMF

When the UCMF receives a Query Dictionary Entry Request message, it shall look up the dictionary entries and reply with a Query Dictionary Entry Response message.

On success, the UCMF shall provide the information included in the dictionary entry which matches the query parameter in the Query Dictionary Entry Response message, and the following information shall be included (if available):

- the UE Radio Access Capability Information in correspondence to the querying parameter, e.g. the UE Radio Capability ID included in the request message;

- a PLMN specific UE Radio Capability ID if allocated, e.g. when the querying UE Radio Capability ID is a Manufacturer-assigned UE Radio Capability ID and if PLMN is configured to use a PLMN specific UE Radio Capability ID;

- the dictionary entry id;

- a Manufacturer-assigned UE Radio Capability ID if available;

- the Type Allocation Code.

    NOTE: The UCMF will not provide the information in a dictionary entry which is already included as a query parameter in the request message.

On failure, the UCMF shall:

- return an appropriate error cause value, e.g. NO_DICTIONARY_ENTRY_FOUND, OUT_DATED_VERSION_ID_IN_RAC_ID.

6.4 Reliable Delivery of URCMP Messages

Reliable delivery of URCMP messages is accomplished by retransmission of these messages as specified in this clause.

A URCMP entity shall maintain, for each triplet of local IP address, local UDP port and remote peer's IP address, a sending queue with Request messages to be sent to that peer. Each message shall be sent with a Sequence Number and be held until a corresponding Response is received or until the URCMP entity ceases retransmission of that message. The Sequence Number shall be unique for each outstanding Request message sourced from the same IP/UDP endpoint. A URCMP entity may have several outstanding Requests waiting for replies.

When sending a Request message, the sending URCMP entity shall start a timer T1. The sending entity shall consider that the Request message has been lost if a corresponding Response message has not been received before the T1 timer expires. If so, the sending entity shall retransmit the Request message, if the total number of retry attempts is less than N1 times. The setting of the T1 timer and N1 counter is implementation specific.

A retransmitted URCMP message shall have the same message content, including the same URCMP header, UDP ports, source and destination IP addresses as the originally transmitted message.

A Request and its Response message shall have the same Sequence Number value, i.e. the Sequence Number in the URCMP header of the Response message shall be copied from the respective Request message. A Request and its Response messages are matched based on the Sequence Number and the IP address and UDP port.

Not counting retransmissions, a Request message shall be answered with a single Response message. Duplicated Response messages shall be discarded by the receiver. A received Response message not matching an outstanding Request message waiting for a reply should be discarded.

The URCMP entity should inform the upper layer when detecting an unsuccessful transfer of a Request message to enable the controlling upper entity to take any appropriate measure.

7 Messages and Message Formats

7.1 Introduction

7.2 Transmission Order and Bit Definitions

URCMP messages shall be transmitted in network octet order starting with octet 1 with the most significant bit sent first.

The most significant bit of an octet in a URCMP message is bit 8. If a field in a URCMP message spans over several octets, the most significant bit is bit 8 of the octet with the lowest number, unless specified otherwise.

7.3 Message Format

7.3.1 General

The format of a URCMP message is depicted in Figure 7.3.1-1.

					Bits				
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to m	URCMP message header							
m+1 to n	Zero or more Information Element(s)							
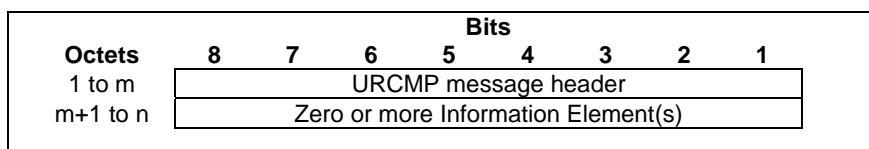
Figure 7.3.1-1: URCMP Message Format

A URCMP message shall contain the URCMP message header and may contain subsequent information element(s) dependent on the type of message.

7.3.2 Message Header

URCMP messages use a fixed length header. The message header length shall be a multiple of 4 octets. Figure 7.3.2.1-1 illustrates the format of the URCMP Header.

Octets	**Bits**							
	8	7	6	5	4	3	2	1
1	Version			Spare				
2	Message Type							
3	Message Length (1st Octet)							
4	Message Length (2nd Octet)							
5	Message Length (3rd Octet)							
6	Sequence Number (1st Octet)							
7	Sequence Number (2nd Octet)							
8	Sequence Number (3rd Octet)							
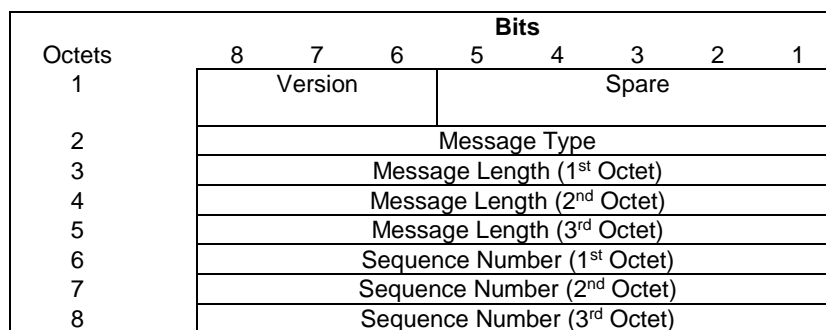
Figure 7.3.2-1: General format of URCMP Header

7.3.3   Usage of the URCMP Header

The format of the URCMP header is specified in clause 7.3.2.

The usage of the URCMP header shall be as defined below.

The first octet of the header shall be used is the following way:

-    Bit 1-5 are spare bits. The sending entity shall set it to "0" and the receiving entity shall ignore it.

-    Bits 6 to 8, which represent the URCMP version, shall be set to decimal 1 ("001").

The usage of the fields in octets 2 - n of the header shall be as specified below.

-    Octet 2 represents the Message type field, which shall be set to the unique value for each type of control plane message. Message type values are specified in Table 7.3-1 "Message types".

-    Octets 3 to 5 represent the Message Length field. This field shall indicate the length of the message in octets excluding the mandatory part of the URCMP header (the first 5 octets). The Sequence Number shall be included in the length count. The format of the Length field of information elements is specified in clause 8.2 "Information Element Format".

-    Octets 6 to 8 represent URCMP Sequence Number field.

7.3.4   Information Elements

7.3.4.1   General

The format of URCMP Information Elements are defined in clause 8.2.

7.3.4.2   Presence Requirements of Information Elements

Ies within URCMP messages shall be specified with one of the following presence requirement:

-    Mandatory: this means that the IE shall be included by the sending entity, and that the receiver diagnoses a "Mandatory IE missing" error when detecting that the IE is not present. A response including a "Mandatory IE missing" cause, shall include the type of the missing IE.

-    Conditional: this means that:

    -    the IE shall be included by sending entity if the conditions specified are met;

    -    the receiver shall check the conditions as specified in the corresponding message type description, based on the parameter combination in the message and/or on the state of the receiving node, to infer if a conditional IE shall be expected. Only if a receiver has sufficient information, if a conditional IE, which is necessary for the receiving entity to complete the procedure, is missing, then the receiver shall abort the procedure.

-    Conditional-Optional: this means that:

- the IE shall be included by a sending entity complying with the version of the specification, if the conditions specified in the relevant protocol specification are met. An entity, which is at an earlier version of the protocol and therefore is not up-to-date, cannot send this IE;

- the receiver need not check the presence of the IE in the message. If the receiver checks the presence of the Conditional-Optional IE, then the IE's absence shall not trigger any of the error handling procedures. The handling of an absence or erroneous such Ies shall be treated as Optional Ies as specified in clause 7.6.

- Optional: this means that:

  - the IE shall be included as a service option. Therefore, the IE may be included or not in a message. The handling of an absent optional IE, or an erroneous optional IE is specified in clause 7.6.

For conditional Ies, the clause describing the URCMP message explicitly defines the conditions under which the inclusion of each IE becomes mandatory or optional for that particular message. These conditions shall be defined so that the presence of a conditional IE only becomes mandatory if it is critical for the receiving entity. The definition might reference other protocol specifications for final terms used as part of the condition.

For grouped Ies, the presence requirement of the embedded IE shall follow the rules:

- If the grouped IE is Mandatory within a given message: the presence requirements of individual embedded Ies are as stated within the Mandatory grouped IE for the given message;

- if the grouped IE is Conditional within a given message: if the embedded IE in the grouped IE is Mandatory or Conditional, this embedded IE is viewed as Conditional IE by the receiver. If the embedded IE in the grouped IE is Conditional-Optional, this embedded IE is viewed as Optional IE by the receiver. If the embedded IE in the grouped IE is Optional, this embedded IE is viewed as Optional IE by the receiver;

- if the grouped IE is Conditional-Optional within a given message: if the embedded IE in the grouped IE is Mandatory or Conditional, this embedded IE is viewed as Conditional-Optional IE by the receiver. If the embedded IE in the grouped IE is Conditional-Optional, this embedded IE is viewed as Optional IE by the receiver. If the embedded IE in the grouped IE is Optional, this embedded IE is viewed as Optional IE by the receiver;

- if the grouped IE is Optional within a given message: all embedded Ies in the grouped IE are viewed as Optional Ies by the receiver.

In all of the above cases, appropriate error handling as described in clause 7.6 shall be applied for protocol errors of the embedded Ies.

Only the Cause IE at message level shall be included in the response if the Cause contains a value that indicates that the request is not accepted, regardless of whether there are other mandatory or conditional Ies defined for a given response message.

7.3.4.3 Grouped Information Elements

A Grouped IE is an IE which may contain other Ies.

Grouped Ies have a length value in the TLV encoding, which includes the added length of all the embedded Ies. Overall coding of a grouped IE with 4 octets long IE header is defined in clause 8.2. Each IE within a grouped IE also shall also contain 4 octets long IE header.

Grouped Ies are not marked by any flag or limited to a specific range of IE type values. The clause describing an IE in this specification shall explicitly state if it is a Grouped IE.

  NOTE: Each entry into each Grouped IE creates a new scope level. Exit from the grouped IE closes the scope level. The URCMP message level is the top most scope.

If more than one grouped Ies of the same type, but for a different purpose are sent with a message, these Ies shall have different IE types.

If more than one grouped Ies of the same type and for the same purpose are sent with a message, these Ies shall have exactly the same IE type to represent a list.

7.2.3.4 Information Element Type

An IE in a URCMP message or Grouped IE is identified by its IE Type and described by a specific row in the corresponding tables in clause 7.

If several Ies with the same Type are included in a URCMP message or Grouped IE, they represent a list for the corresponding IE name.

An IE Type value uniquely identifies a specific IE.

One IE type value is specified for Vendor Specific Ies.

7.4 Message Types

The URCMP message types to be used over the S17 reference points are defined in Table 7.4-1.

Table 7.4-1: Message Types

Message Type value (Decimal)	Message
0	Reserved
	URCMP Node related messages
1	Heartbeat Request
2	Heartbeat Response
3	Subscription Management Request
4	Subscription Management Response
5	Event Notification Request
6	Event Notification Response
7 to 49	For future use
	URCMP Session related messages
50	Create Dictionary Entry Request
51	Create Dictionary Entry Response
52	Query Dictionary Entry Request
53	Query Dictionary Entry Response
54 to 99	For future use
	Other messages
100 to 255	For future use

7.5 S17-AP Messages

7.5.1 URCMP Node Related Messages

7.5.1.1 General

This clause specifies the URCMP node related messages used over the S17 reference points.

7.5.1.2 Heartbeat Request

Table 7.5.1.2-1: Information Elements in Heartbeat Request

Information elements	P	Condition / Comment	IE Type
Recovery Time Stamp	M	This IE shall contain the time stamp when the URCMP entity was started.	Recovery Time Stamp

7.5.1.3 Heartbeat Response

Table 7.5.1.3-1: Information Elements in Heartbeat Response

Information elements	P	Condition / Comment	IE Type
Recovery Time Stamp	M	This IE shall contain the time stamp when the URCMP entity was started.	Recovery Time Stamp

7.5.1.4 Subscription Management Request

The Subscription Management Request shall be sent over the S17 interface by the MME to the UCMF to create a subscription in the UCMF to receive the notifications, or to delete an existing subscription.

Table 7.5.1.4-1: Information Elements in a Subscription Management Request

Information elements	P	Condition / Comment	IE Type
MME Address Information	C	This IE shall be included to contain the MME Address Information to receive the subsequent notifications for the subscription if the Subscription Management Operation Type indicates to create a new subscription.	MME Address Information
Subscription Management Operation Type	M		Subscription Management Operation Type
Subscription ID	C	This IE shall be included to contain the Subscription ID that allocated by the UCMF for this subscription if the Subscription Management Operation Type indicates to delete the subscription.	Subscription ID

7.5.1.5 Subscription Management Response

The Subscription Management Response shall be sent over the S17 interface by the UCMF to the MME as a reply to the Subscription Management Request.

Table 7.5.1.5-1: Information Elements in a Subscription Management Response

Information elements	P	Condition / Comment	IE Type
Cause	M		Cause
Dictionary Entry ID	C	This IE shall be included to contain the highest Dictionary Entry ID has been allocated in the UCMF if the cause indicates an acceptance code.	Dictionary Entry ID
Subscription ID	C	This IE shall be included to contain the Subscription ID that created in the UCMF for this subscription if the cause indicates an acceptance code and the request is to create a new subscription.	Subscription ID

7.5.1.6 Event Notification Request

The Event Notification Request shall be sent over the S17 interface by the UCMF to the MME to send a notification for the subscription created earlier by the MME.

Table 7.5.1.6-1: Information Elements in a Event Notification Request

Information elements	P	Condition / Comment	IE Type
Dictionary Entry ID	M	This IE shall be included to contain the highest Dictionary Entry ID has been allocated in the UCMF.	Dictionary Entry ID
Event Type	M		Event Type
Manufacturer Assigned Operation Requested List	C	This IE shall be present if the Event Type indicates to delete one or more PLMN assigned UE Radio Capability IDs.	Manufacturer Assigned Operation Requested List
Version ID	O	This IE may be present if Event Type indicates to notify a new version id of PLMN Assigned UE Radio Capability Id(s).	Version ID

Table 7.5.1.6-2: Manufacturer Assigned Operation Requested List IE in a Event Notification Request

Octet 1 and 2		Deletion of PLMN Assigned UE Radio Capability ID IE Type = 13 (decimal)	
Octets 3 and 4		Length = n	
Information elements	**P**	**Condition / Comment**	**IE Type**
PLMN Assigned UE Radio Capability ID	C	This IE shall be included to contain a PLMN Assigned UE Radio Capability ID to be deleted. Several IEs with the same IE type may be present to represent a list of PLMN Assigned UE Radio Capability IDs. The UCMF shall always provide a complete list of PLMN Assigned UE Radio Capability IDs to enable the AMF to overwrite the existing list.	PLMN Assigned UE Radio Capability ID
Type Allocation Code	C	This IE shall contain a Type Allocation Code in corresponding to the PLMN Assigned UE Radio Capability IDs to be deleted. Several IEs with the same IE type may be present to represent a list of Type Allocation Codes. The UCMF shall always provide a complete list of Type Allocation Codes to enable the AMF to overwrite the existing list.	Type Allocation Code

7.5.1.7 Event Notification Response

The Event Notification Response shall be sent over the S17 interface by the MME to the UCMF as a reply to the Event Notification Request.

Table 7.5.1.7-1: Information Elements in a Subscription Management Response

Information elements	P	Condition / Comment	IE Type
Cause	M		Cause

7.5.2   URCMP Session Related Messages

7.5.2.1   General

This clause specifies the URCMP session related messages used over the S17 interface.

7.5.2.2   Create Dictionary Entry Request

The Create Dictionary Entry Request shall be sent over the S17 interface by the MME to create a dictionary entry in the UCMF, and then to obtain a PLMN assigned UE Radio Capability ID.

Table 7.5.2.2-1: Information Elements in a Create Dictionary Entry Request

Information elements	P	Condition / Comment	IE Type
Type Allocation Code	M	This IE shall be included by the MME over S17 reference point.	Type Allocation Code
UE Radio Access Capability Information	M		UE Radio Access Capability Information

7.5.2.3   Create Dictionary Entry Response

The Create Dictionary Entry Response shall be sent over the S17 interface by the UCMF to the MME as a reply to the Create Dictionary Entry Request.

Table 7.5.2.3-1: Information Elements in a Create Dictionary Entry Response

Information elements	P	Condition / Comment	IE Type
Cause	M		Cause
Dictionary Entry ID	C	This IE shall be included to contain a dictionary entry identifier allocated by the UCMF for newly created dictionary entry as requested by the MME if the Cause indicates an acceptance code.	Dictionary Entry ID
PLMN Assigned UE Radio Capability ID	C	This IE shall be included to contain a PLMN Assigned UE Radio Capability ID allocated by the UCMF for the UE Radio Access Capability Information included in the request message if the cause indicates an acceptance code.	PLMN Assigned UE Radio Capability ID

7.5.2.4   Query Dictionary Entry Request

The Query Dictionary Entry Request shall be sent over the S17 interface by the MME to retrieve UE Radio Access Capability Information from a dictionary entry in the UCMF.

Table 7.5.2.4-1: Information Elements in a Query Dictionary Entry Request

Information elements	P	Condition / Comment	IE Type
Dictionary Entry ID	C	This IE shall be included if the MME uses a Dictionary Entry ID to retrieve a dictionary entry. (NOTE 1)	Dictionary Entry ID
PLMN Assigned UE Radio Capability ID	C	This IE shall be included if the MME uses a PLMN Assigned UE Radio Capability ID to retrieve a dictionary entry. (NOTE 1)	PLMN Assigned UE Radio Capability ID

Manufacturer Assigned UE Radio Capability ID	C	This IE shall be included if the MME uses a Manufacturer Assigned UE Radio Capability ID to retrieve a dictionary entry. (NOTE 1)	Manufacturer Assigned UE Radio Capability ID
NOTE 1:		At least one of query parameters, Dictionary Entry ID, PLMN Assigned UE Radio Capability ID, Manufacture Assigned UE Radio Capability ID or Type Allocation Code shall be used to retrieve a dictionary entry.	

7.5.2.5 Query Dictionary Entry Response

The Query Dictionary Entry Response shall be sent over the S17 interface by the UCMF to the MME as a reply to the Query Dictionary Entry Request.

Table 7.5.2.5-1: Information Elements in a Query Dictionary Entry Response

Information elements	P	Condition / Comment	IE Type
Cause	M		Cause
Dictionary Entry ID	C	This IE shall be included to contain a dictionary entry identifier if the Cause indicates an acceptance cause.	Dictionary Entry ID
PLMN Assigned UE Radio Capability ID	C	This IE shall be included to contain a PLMN Assigned UE Radio Capability ID if allocated for the UE Radio Access Capability Information in the dictionary entry and if the Cause indicates an acceptance cause.	PLMN Assigned UE Radio Capability ID
Manufacturer Assigned UE Radio Capability ID	C	This IE shall be included to contain a Manufacturer Assigned UE Radio Capability ID if available for the UE Radio Access Capability Information in the dictionary entry and if the Cause indicates an acceptance cause.	Manufacturer Assigned UE Radio Capability ID
UE Radio Access Capability Information	C	This IE shall be included to provide the UE Radio Access Capability Information if the Cause indicates an acceptance cause. [NOTE]	UE Radio Access Capability Information
Type Allocation Code	C	This IE shall be included to provide the Type Allocation Code in corresponding to the UE Radio Access Capability in the dictionary entry if the Cause indicates an acceptance cause.	Type Allocation Code
NOTE:		In this message, "UE Radio Access Capability Information" only contains "UE Radio Access Capability Information (EPS)" field. "UE Radio Access Capability Information (5GS)" shall not be present.	

7.6 Error Handling

7.6.1 Protocol Errors

A protocol error is defined as a message or an Information Element received from a peer entity with an unknown type, or if it is unexpected, or if it has an erroneous content.

The term silently discarded is used in the following clauses to mean that the receiving URCMP entity's implementation shall discard such a message without further processing or that the receiving URCMP entity discards such an IE and continues processing the message. The conditions for the receiving URCMP entity to silently discard an IE are specified in the subsequent clauses.

The handling of unknown, unexpected or erroneous URCMP messages and IEs shall provide for the forward compatibility of URCMP. Therefore, the sending URCMP entity shall be able to safely include in a message a new conditional-optional or an optional IE. Such an IE may also have a new type value. Any legacy receiving URCMP entity shall, however, silently discard such an IE and continue processing the message.

If a protocol error is detected by the receiving URCMP entity, it should log the event including the erroneous message and may include the error in a statistical counter.

For Response messages containing a rejection Cause value, see clause 7.3.4.2.

The receiving URCMP entity shall apply the error handling specified in the subsequent clauses.

If the received erroneous message is a reply to an outstanding URCMP message, the URCMP transaction layer shall stop retransmissions and notify the URCMP application layer of the error even if the reply is silently discarded.

7.6.2   URCMP Message of Invalid Length

If a URCMP entity receives a message, which is too short to contain the respective URCMP header, the URCMP-PDU shall be silently discarded.

If a URCMP entity receives a Request message within an IP/UDP packet of a length that is inconsistent with the value specified in the Length field of the URCMP header, then the receiving URCMP entity should log the error and shall send the Response message with Cause IE value set to "Invalid Length".

If a URCMP entity receives a Response message within an IP/UDP packet of a length that is inconsistent with the value specified in the Length field of the URCMP header, then the receiving URCMP entity should log the error and shall silently discard the message.

7.6.4   Unknown URCMP Message

If a URCMP entity receives a message with an unknown Message Type value, it shall silently discard the message.

7.6.5   Unexpected URCMP Message

If a URCMP entity receives an unexpected request message, for example a known message that is sent over an interface for which the message is not defined, or a message that is sent over an interface for which the message is defined, but the direction is incorrect, then the URCMP entity shall silently discard the message and shall log an error.

If a URCMP entity receives an unexpected response message which is not a request message, for example a message for which there is no corresponding outstanding request, it shall discard the message and may log an error.

7.6.6   Missing Information Elements

A URCMP entity shall check if all mandatory IEs are present in the received Request message. If one or more mandatory information elements are missing in the received Request message, the URCMP entity should log the error and shall send a Response message with Cause IE value set to "Mandatory IE missing" with the type of the missing mandatory IE.

If a URCMP entity receives a Response message with Cause IE value set to "Mandatory IE missing", it shall notify its upper layer.

A URCMP entity shall check if all mandatory IEs are present in the received Response message without a rejection Cause value. If one or more mandatory information elements are missing, the URCMP entity shall notify the upper layer and should log the error.

A URCMP entity shall check if conditional information elements are present in the received Request message, if possible (i.e. if the receiving entity has sufficient information available to check if the respective conditions were met). If one or more conditional information elements are missing, a URCMP entity should log the error and shall send a Response message with Cause IE value set to "Conditional IE missing" together with the type of the missing conditional IE.

A URCMP entity shall check if conditional information elements are present in the received Response message without a rejection Cause value, if possible (i.e. if the receiving entity has sufficient information available to check if the respective conditions were met). If one or more conditional information elements are missing, a URCMP entity shall notify the upper layer and should log the error.

Absence of an optional information element shall not trigger any error handling.

7.6.7 Semantically incorrect Information Element

Apart from Echo Request message, the receiver of a URCMP signalling message Request including a mandatory or a verifiable conditional information element with a semantically invalid Value shall discard the request, should log the error, and shall send a response with Cause IE value set to "Mandatory IE incorrect" together with a type and instance of the offending IE.

The receiver of a URCMP signalling message Response including a mandatory or a verifiable conditional information element with a semantically invalid Value shall notify the upper layer that a message with this sequence number has been received and should log the error.

If a URCMP entity receives an information element with a value which is shown as reserved, it shall treat that information element as invalid and should log the error. If the invalid IE is received in a Request, and it is a mandatory IE or a verifiable conditional IE, the URCMP entity shall send a response with Cause set to "Mandatory IE incorrect" together with a type and instance of the offending IE.

The principle is: the use of reserved values invokes error handling; the use of spare values can be silently discarded and for IEs with spare values used, processing shall be continued ignoring the spare values.

The receiver of a URCMP signalling message including an optional information element with a Value that is not in the range defined for this information element value shall discard this IE, but shall treat the rest of the message as if this IE was absent and continue processing. The receiver shall not check the content of an information element field that is defined as "spare".

All semantically incorrect optional information elements in a URCMP signalling message shall be treated as not present in the message.

7.6.8 Unknown or unexpected Information Element

The receiver of a URCMP message including an unexpected information element with a known Type value that is not defined for this message shall discard the IE and log an error. The receiver shall process the message.

NOTE: An Information Element in an encoded URCMP message or grouped IE is identified by the IE Type.

7.6.9 Repeated Information Elements

An Information Element is repeated if there is more than one IE with the same IE Type in the scope of the URCMP message (or in the scope of the grouped IE). Such an IE is a member in a list.

If an information element is repeated in a URCMP signalling message in which repetition of the information element is not specified, only the contents of the information element appearing first shall be handled and all subsequent repetitions of the information element shall be ignored. When the number of repetitions of information elements is specified, only the contents of specified repeated information elements shall be handled and all subsequent repetitions of the information element shall be ignored.

8 Information elements

8.1 Information Elements Format

Figure 8.1-1 depicts the format of an Information Element.

	Bits							
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to 2	Type = xxx (decimal)							
2 to 3	Length = n							
p to (p+1)	Enterprise ID							
k to (n+4)	IE specific data or content of a grouped IE							

Figure 8.1-1: Information Element Format

NOTE 1: If the Bit 8 of Octet 1 is not set, this indicates that the IE is defined by 3GPP and the Enterprise ID is absent. If Bit 8 of Octet 1 is set, this indicates that the IE is defined by a vendor and the Enterprise ID is present identified by the Enterprise ID.

An IE has the following mandatory fields:

- Type: this field indicates the type of the Information Element. IE type values within the range of 0 to 32767 are reserved for IE defined by 3GPP and are listed in clause 8.2. IE type values within the range of 32768 to 65535 are used for vendor-specific IE and the value allocation is controlled by the vendor.

- Length: this field contains the length of the IE excluding the first four octets, which are common for all IEs (Type and Length) and is denoted "n" in Figure 8.1-1 and in Figure 8.1-2. Bit 8 of the lowest numbered octet is the most significant bit and bit 1 of the highest numbered octet is the least significant bit.

An IE has the following optional fields:

- Enterprise ID: if the IE type value is within the range of 32768 to 65535, this field shall contain the IANA-assigned "SMI Network Management Private Enterprise Codes" value of the vendor defining the IE. The Enterprise ID set to "10415" (IANA-assigned "SMI Network Management Private Enterprise Codes") shall not be used for the vendor specific IEs.

For illustration, Figure 8.1-2 depicts the format of a Information Element (IE) defined by 3GPP and is specified in this specification. For IE's defined by 3GPP, the IE type shall be within the range of 0 to 32767.

	Bits							
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to 2	Type = xxx (decimal)							
3 to 4	Length = n							
5 to (n+4)	IE specific data or content of a grouped IE							

Figure 8.1-2: 3GPP defined Information Element Format

NOTE 2: Bit 8 of Octet 1 is not set. This indicates that the Information Element type value has been allocated by 3GPP.

For illustration, Figure 8.1-3 depicts the format of a vendor-specific Information Element, which content is not specified and the IE type value shall be within the range of 32768 to 65535.

	Bits							
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to 2	Type = xxx (decimal)							
3 to 4	Length = n							
5 to 6	Enterprise ID							
7 to (n+4)	IE specific data or content of a grouped IE							

Figure 8.1-3: Vendor-Specific Information Element Format

NOTE 3: Bit 8 of Octet 1 is set. This indicates that the IE type value has been allocated by the vendor identified by the Enterprise ID. The content of this IE is vendor specific and therefore out of scope of this specification.

8.2 Information Elements Types

8.2.0 General

A URCMP message may contain several IEs. In order to have forward compatible type definitions for the URCMP IEs, all of them shall be TLV (Type, Length, Value) coded. URCMP IE type values are specified in the Table 8.2.0-1. The last column of this table indicates whether the IE is:

- Fixed Length: the IE has a fixed set of fields, and a fixed number of octets;

- Variable Length: the IE has a fixed set of fields, and has a variable number of octets.
  For example, the last octets may be numbered similar to "5 to (n+4)". In this example, if the value of the length field, n, is 0, then the last field is not present;

- Extendable: the IE has a variable number of fields, and has a variable number of octets.
  The last fields are typically specified with the statement: "These octet(s) is/are present only if explicitly specified". The legacy receiving entity shall ignore the unknown octets.

In order to improve the efficiency of troubleshooting, it is recommended that the IEs should be arranged in the signalling messages as well as in the grouped IEs, according to the order the IEs are listed in the message definition table or grouped IE definition table in clause 7. However the receiving entity shall be prepared to handle the messages with IEs in any order.

Within IEs, certain fields may be described as spare. These bits shall be transmitted with the value set to 0 to allow for future features, the receiver shall not evaluate these bits.

Table 8.2.0-1: Information Element Types

IE Type value (Decimal)	Information elements	Comment / Reference	Number of Fixed Octets
0	Reserved		
1	Cause	Fixed Length / 8.2.1	1
2	Type Allocation Code	Fixed Length / 8.2.2	4
3	PLMN Assigned UE Radio Capability ID	Variable Length / 8.2.3	Not Applicable
4	Manufacturer Assigned UE Radio Capability ID	Variable Length / 8.2.4	Not Applicable
5	Dictionary ID	Fixed Length / 8.2.5	4
6	UE Radio Access Capability Information	Extendable / 8.2.6	1
7	Subscription Management Operation Type	Fixed Length / 8.2.7	1
8	MME Address Information	Variable Length / 8.2.8	Not Applicable
9	Subscription ID	Fixed Length / 8.2.9	4
10	Event Type	Fixed Length / 8.2.10	1
11	Recovery Time Stamp	Fixed Length / 8.2.11	4
12	Manufacturer Assigned Operation Requested List	Extendable / Table 7.5.1.6-2	Not Applicable
13	Version ID	Fixed Length / 8.2.xx	1
14 to 65535	Spare. For future use.		

8.2.1 Cause

Cause IE is coded as depicted in Figure 8.2.1-1.

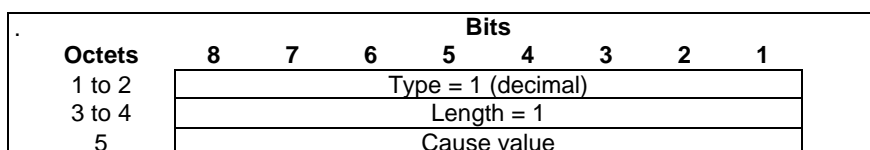| .		Bits							
Octets	8	7	6	5	4	3	2	1
1 to 2	Type = 1 (decimal)							
3 to 4	Length = 1							
5	Cause value							

Figure 8.2.1-1: Cause

The Cause value shall be included in a response message. In a response message, the Cause value indicates the acceptance or the rejection of the corresponding request message. The Cause value indicates the explicit reason for the rejection.

Table 8.2.1-1: Cause values

Message Type	Cause value (decimal)	Meaning	Description
	0	Reserved.	Shall not be sent and if received the Cause shall be treated as an invalid IE
Acceptance in a response	1	Request accepted (success)	"Request accepted (success)" is returned when the PFCP entity has accepted a request.
	2-63	Spare.	This value range shall be used by Cause values in an acceptance response message. See NOTE 1.
Rejection in a response	64	Request rejected (reason not specified)	This cause shall be returned to report an unspecified rejection cause
	65	Mandatory IE missing	This cause shall be returned when the receiver detects that a mandatory IE is missing in a request message
	66	Conditional IE missing	This cause shall be returned when the receiver detects that a Conditional IE is missing in a request message.
	67	Invalid length	This cause shall be returned when the receiver detects that an IE with an invalid length in a request message
	68	Mandatory IE incorrect	This cause shall be returned when the receiver detects that a Mandatory IE is incorrect in a request message, e.g. the Mandatory IE is malformed or it carries an invalid or unexpected value.
	69	NO_DICTIONARY_ENTRY_FOUND	This cause shall be used by the UCMF if a dictionary entry cannot be found to match the query parameter included in the request message.
	70	SUBSCRIPTION_NOT_FOUND	This cause shall be used by the UCMF if the subscription to be deleted cannot be found.
	71	OUT_DATED_VERSION_ID_IN_RAC_ID	The version id in the requested PLMN Assigned UE Radio Capability Id is out-dated.
	72 to 255	Spare for future use in a response message. See NOTE 2.	This value range shall be used by Cause values in a rejection response message. See NOTE 2.
NOTE 1:	This value is or may be used in future version of the specification. If the receiver cannot comprehend the value, it shall be interpreted as an unspecified acceptance cause. Unspecified/unrecognized acceptance cause shall be treated in the same ways as the cause value 1 " Request accepted (success)".		
NOTE 2:	This value is or may be used in a future version of the specification. If the receiver cannot comprehend the value, it shall be interpreted as an unspecified rejection cause. Unspecified/unrecognized rejection cause shall be treated in the same ways as the cause value 32 "Request rejected (reason not specified)".		

8.2.2   Type Allocation Code

Type Allocation Code (TAC) is the first 8 digits in an IMEI (15 decimal digits) or an IMEISV (16 decimal digits). See clause 6.2 of 3GPP TS 23.003 [6]. The Type Allocation Code shall be encoded as in Figure 8.2.2-1.

				Bits				
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to 2	Type = 2 (decimal)							
3 to 4	Length = 4							
5 - 8	Type Allocation Code							

Figure 8.2.2-1: Type Allocation Code

Each digit of the Type Allocation Code digits is encoded with BCD coding, starting with the first digit coded in bits 4 to 1 of octet 5, the last digit coded in bits 8 to 5 of octet 8.

8.2.3   PLMN Assigned UE Radio Capability ID

The PLMN Assigned UE Radio Capability ID shall be encoded as in Figure 8.2.3-1.

				Bits				
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to 2	Type = 3 (decimal)							
3 to 4	Length = n							
5 - n	PLMN Assigned UE Radio Capability ID							

Figure 8.2.3-1: PLMN Assigned UE Radio Capability ID

The PLMN Assigned UE Radio Capability ID field shall be encoded as the "UE radio capability ID" IE (starting from octet 3) as specified in clause the clause 9.9.3.60 of 3GPP TS24.301 [7].

8.2.4   Manufacturer Assigned UE Radio Capability ID

The Manufacturer Assigned UE Radio Capability ID shall be encoded as in Figure 8.2.4-1.

				Bits				
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to 2	Type = 4 (decimal)							
3 to 4	Length = n							
5 - n	Manufacturer Assigned UE Radio Capability ID							

Figure 8.2.4-1: PLMN Assigned UE Radio Capability ID

The Manufacturer Assigned UE Radio Capability ID field shall be encoded as the "UE radio capability ID" IE (starting from octet 3) as specified in clause the clause 9.9.3.60 of 3GPP TS24.301 [7].

8.2.5   Dictionary Entry ID

The Dictionary Entry ID IE is coded as in Figure 8.2.5-1. The Dictionary Entry ID identifies a dictionary entry including the mapping between UE Radio Access Capability Information and UE Radio Capability ID(s), Type Allocation Code.

				Bits				
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to 2	Type = 5 (decimal)							
3 to 4	Length = 4							
5 to 8	Dictionary Entry ID							

Figure 8.2.5-1: Dictionary Entry ID

Octets 5 to 8 shall contain the Dictionary Entry ID and shall be encoded as an Unsigned32 binary integer value.

8.2.6 UE Radio Access Capability Information

The UE Radio Access Capability Information IE type shall be encoded as shown in Figure 8.2.6-1.

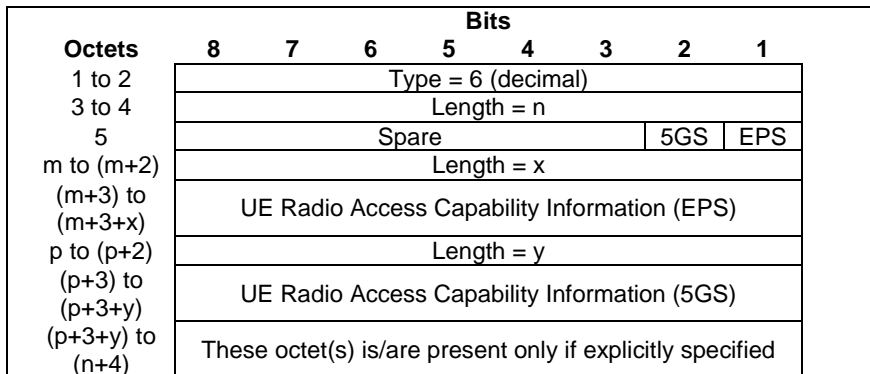|					Bits				
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to 2	Type = 6 (decimal)							
3 to 4	Length = n							
5	Spare						5GS	EPS
m to (m+2)	Length = x							
(m+3) to (m+3+x)	UE Radio Access Capability Information (EPS)							
p to (p+2)	Length = y							
(p+3) to (p+3+y)	UE Radio Access Capability Information (5GS)							
(p+3+y) to (n+4)	These octet(s) is/are present only if explicitly specified							

Figure 8.2.6-1: UE Radio Access Capability Information

The following flags are coded within Octet 5:

- Bit 1 – EPS: If this bit is set to "1", then the UE Radio Access Capability Information (EPS) field shall be present, otherwise the UE Radio Access Capability Information (EPS) field shall not be present.

- Bit 2 – 5GS: If this bit is set to "1", then the UE Radio Access Capability Information (5GS) field shall be present, otherwise the UE Radio Access Capability Information (5GS) field shall not be present.

- Bit 3 to 8 Spare, for future use and set to 0.

Octets "m to (m+2)", shall be present when EPS bit is set to 1. When present, it represents length of UE Radio Access Capability Information (EPS) field.

The UE Radio Access Capability Information (EPS) field, when present, shall be encoded as an OctetString which contains the OCTET STRING of UE Radio Capability IE specified in clause 9.2.1.27 of 3GPP TS 36.413 [8]).

Octets "p to (p+2)", shall be present when 5GS bit is set to 1. When present, it represents length of UE Radio Access Capability Information (5GS) field

The UE Radio Access Capability Information (5GS) field, when present, shall be encoded as an OctetString which contains the OCTET STRING of UE Radio Capability IE specified in clause 9.3.1.74 of 3GPP TS 38.413 [x]).

NOTE: Annex B of 3GPP TS 29.274 [9] specifies how to retrieve an OCTET STRING from a S1AP IE.

8.2.7 Subscription Management Operation Type

The Subscription Management Operation Type IE type shall be encoded as shown in Figure 8.2.7-1. The Subscription Management Operation Type indicates the intention for a Subscription Management Request message.

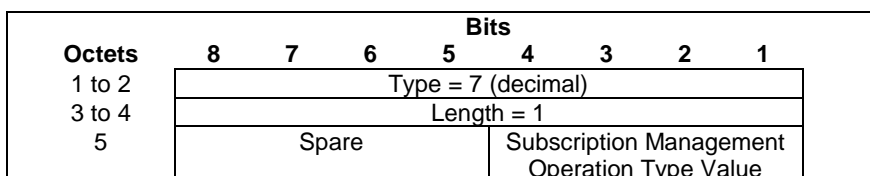|					Bits				
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to 2	Type = 7 (decimal)							
3 to 4	Length = 1							
5	Spare				Subscription Management Operation Type Value			

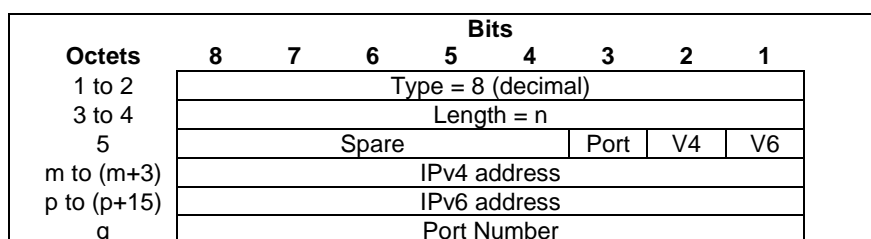**Figure 8.2.7-1: Subscription Management Operation Type**

The Subscription Management Operation Type value shall be encoded as a 4 bits binary integer as specified in Table 8.2.7-1.

Table 8.2.7-1: Subscription Management Operation Type value

Subscription Management Operation Type	Values (Decimal)
Create a subscription	0
Delete a subscription	1
Spare	2 to 15

8.2.8 MME Address Information

The MME Address Information IE type shall be encoded as shown in Figure 8.2.8-1.

Octets	Bits 8	7	6	5	4	3	2	1
1 to 2	Type = 8 (decimal)							
3 to 4	Length = n							
5	Spare					Port	V4	V6
m to (m+3)	IPv4 address							
p to (p+15)	IPv6 address							
q	Port Number							

Figure 8.2.8-1: MME Address Information

The following flags are coded within Octet 5:

- Bit 1 – V6: If this bit is set to "1", then the IPv6 address field shall be present, otherwise the IPv6 address field shall not be present.

- Bit 2 – V4: If this bit is set to "1", then the IPv4 address field shall be present, otherwise the IPv4 address field shall not be present.

- Bit 3 – Port: If this bit is set to "1", then the Port Number field shall be present, otherwise the IPv4 address field shall not be present.

- Bit 4 to 8 Spare, for future use and set to 0.

Octets "m to (m+3)" or "p to (p+15)" (IPv4 address / IPv6 address fields), if present, shall contain the address value.

Octet q, if present, shall contain the port number that the MME has allocated to receive the notifications.

8.2.9 Subscription ID

The Subscription ID IE is coded as in Figure 8.2.9-1. The Subscription ID identifies a subscription identifier created in the UCMF.

Octets	Bits 8	7	6	5	4	3	2	1
1 to 2	Type = 10 (decimal)							
3 to 4	Length = 4							
5 to 8	Subscription ID							
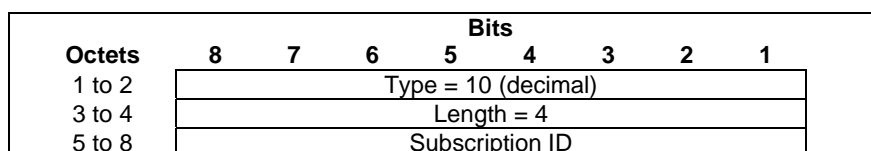
Figure 8.2.9-1: Subscription ID

Octets 5 to 8 shall contain the Subscription ID and shall be encoded as an Unsigned32 binary integer value.

8.2.10   Event Type

The Event Type IE type shall be encoded as shown in Figure 8.2.10-1. The Event Type represents different type of events included in a notification from the UCMF.
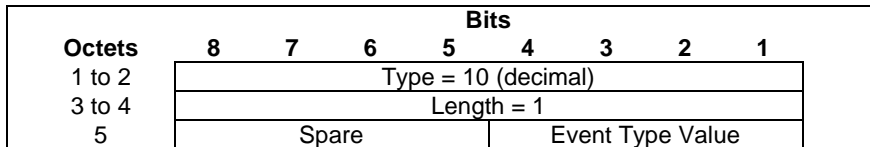
				Bits				
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to 2	Type = 10 (decimal)							
3 to 4	Length = 1							
5	Spare				Event Type Value			

Figure 8.2.10-1: Event Type

The Event Type value shall be encoded as a 4 bits binary integer as specified in Table 8.2.10-1.

Table 8.2.10-1: Event Type value

Event Type Value	Values (Decimal)
CREATION_OF_DICTIONARY_ENTRY	0
DELETION_OF_PLMN_ASSIGNED_IDS	1
NEW_VERSION_ID_OF_PLMN_ASSIGNED_IDs	3
Spare	4 to 15

8.2.11   Recovery Time Stamp

The Recovery Time Stamp IE is coded as shown in Figure 8.2.11-1. It indicates the UTC time when the URCMP entity started. Octets 5 to 8 are encoded in the same format as the first four octets of the 64-bit timestamp format as defined in clause 6 of IETF RFC 5905 [10].

NOTE: The encoding is defined as the time in seconds relative to 00:00:00 on 1 January 1900.
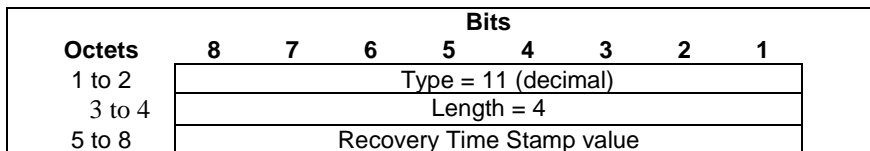
				Bits				
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to 2	Type = 11 (decimal)							
3 to 4	Length = 4							
5 to 8	Recovery Time Stamp value							

Figure 8.2.11-1: Recovery Time Stamp

8.2.12   Version ID

The Version ID IE is coded as in Figure 8.2.12-1.The Version Id included in a PLMN Assigned UE Radio Capability ID is specified as in clause 29.2 of 3GPP TS 23.003 [6].

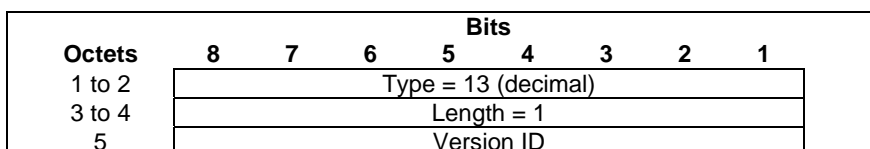|				**Bits**				
Octets	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1 to 2	Type = 13 (decimal)							
3 to 4	Length = 1							
5	Version ID							

Figure 8.2.12-1: Version Id

Octets 5 to 8 shall contain the Version ID and shall be encoded as an Unsigned8 binary integer value.

Annex A (informative): Change history

Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	New
2019-09	CT4#93	C4-193850			Intial draft	0.1.0
2019-10	CT4#94	C4-194243			Subscription management and Event Notification procedures	0.2.0
2019-10	CT4#94	C4-194244			URCMP general protocol aspects	0.2.0
2019-11	CT4#95	C4-195086			Messages and IEs for Create/Query Dictionary Entry Procedure	0.3.0
2019-11	CT4#95	C4-195087			Messages and IEs for Subscription Management/Event Notification Procedure and Heartbeat procedure	0.3.0
2019-12	CT#86	CP-193070			TS presented for information	1.0.0
2019-12	CT#86	CP-193286			A title and abbreviation were updated/added	1.0.1
2020-03	CT4#96e	C4-200624			Event Notification for Deletion	1.1.0
2020-03	CT4#96e	C4-200625			Other alignment with stage 2 requirements and cleanup	1.1.0
2020-03	CT#87e	CP-200068			TS presented for approval	2.0.0
2020-03	CT#87e				Approved at CT#87e	16.0.0
2020-06	CT#88e	CP-201035	0001	-	Destination Port used for URCMP Request messages	16.1.0
2020-06	CT#88e	CP-201035	0002	1	Multiple Coding Formats Supports in RAC-Information	16.1.0
2020-06	CT#88e	CP-201035	0003	-	New application error at receiving out-dated UE RAC-ID	16.1.0
2020-06	CT#88e	CP-201035	0004	1	Populating New Version Id via Notification	16.1.0

History

Document history		
V16.1.0	July 2020	Publication