**3GPP TSG-SA2 Meeting #146-e *S2-2105338***

**Online, , 16th Aug 2021 - 27th Aug 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.401** | **CR** | **3644** | **rev** | **-** | **Current version:** | **17.1.0** |  |
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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 |  | Radio Access Network |  | Core Network | **x** |

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| ***Title:*** | Handling of UE Radio Capability for Paging | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell, Vodafone | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | RACS | | | | |  | ***Date:*** | | | 2021-07-15 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | A |  | | | | | ***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 can be 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:*** | | The gNB(see TS 38.413) or the eNB (see TS 36.413) can pass to the AMF and MME respectively a UE Radio Capability for Paging IE as part of the UE Capability Info Indication message.  The AMF and MME as part of normal operation would store this information and send it to the gNB and eNB respectively in the paging message.  This information is extracted by the gNB and eNB respectively when the UE provides the UE Radio Capability Information via RRC.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | See for instance TS 36.413 8.9.2 Successful Operation   Figure 8.9.2-1: UE Capability Info Indication procedure. Successful operation.  The eNB controlling a UE-associated logical S1-connection initiates the procedure by sending a UE CAPABILITY INFO INDICATION message to the MME including the UE capability information. The UE CAPABILITY INFO INDICATION message may also include paging specific UE capability information within the *UE Radio Capability for Paging* IE. The UE capability information received by the MME shall replace previously stored corresponding UE capability information in the MME for the UE, as described in TS 23.401 [11].  ----------------------------------------------------------------------------- 9.2.1.98 UE Radio Capability for Paging This IE contains paging specific UE Radio Capability information.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description | | UE Radio Capability for Paging | M |  | OCTET STRING | Includes either the *UERadioPagingInformation* message as defined in 10.2.2 ofTS 36.331 [16], or the *UERadioPagingInformation-NB* message as defined in 10.6.2 of TS 36.331 [16]. |   =========================================================  See TS 38.313 8.14.1.2 Successful Operation   Figure 8.14.1.2-1: UE radio capability info indication  The NG-RAN node controlling a UE-associated logical NG connection initiates the procedure by sending a UE RADIO CAPABILITY INFO INDICATION message to the AMF including the UE radio capability information.  The UE RADIO CAPABILITY INFO INDICATION message may also include paging specific UE radio capability information within the *UE Radio Capability for Paging* IE.  ------------------------------------------------------------------- 9.3.1.68 UE Radio Capability for Paging This IE contains paging specific UE Radio Capability information.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | IE/Group Name | Presence | Range | IE type and reference | Semantics description | | UE Radio Capability for Paging of NR | O |  | OCTET STRING | Includes the RRC *UERadioPagingInformation* message as defined in TS 38.331 [18]. | | UE Radio Capability for Paging of E-UTRA | O |  | OCTET STRING | Includes the RRC *UERadioPagingInformation* message as defined in TS 36.331 [21]. | | UE Radio Capability for Paging of NB-IoT | O |  | OCTET STRING | Includes the RRC *UERadioPagingInformation-NB* message as defined in TS 36.331 [21]. | |   However the UCMF only stores the UE radio capabilities and does not store the UE Radio Capability for Paging. This means that MME would not receive this information from the UCMF (or have it locally stored as a mapped value of the UE Radio Capability ID in a local cache), if a UE registers indicating a UE Radio Capability ID (whether PLMN assigned or UE manufacturer assigned).  This for instance is the case of a returning UE to a PLMN for which the UE has already in its cache a valid PLMN assigned ID for the current radio configuration, or where it can use a manufacfurer-assigned ID, if the UCMF cannot provide to the MME the UE Radio Capability for Paging as per current specs, if the MME does not have the UE context stored then the MME would have to retrieve the UE Radio Capability for the UE from the RAN exaclty likwe it would for UEs that do not signal the UE Radio Capability ID.  In other words, the only way for the RAN and MME to obtain the UE Radio Capability for Paging would be to request the UE to upload the UE radio capability and this even if the UE has already provided these by means of a UE Radio Capability ID.  So, the RACS feature would not eliminate the need to retrieve the UE capability information from the RAN so that the RAN provides the UE radio Capability for Paging, even after the UE has provided the UE Radio Capability ID in a registration message, and this is counter to the goals of the work item on " Optimisations on UE radio capability signalling" which was aiming at avoiding retrieval of radio capability information from the UE if the Ue provides the UE Radio Capabilities ID | | | | | | | | |
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| ***Summary of change:*** | | Clarified that the *UE Radio Capability Information for Paging* the MME receives from the RAN is stored in the UCMF (i.e. this informaiton is passed to the UCMF). it is clarified that the UE manufacturer assigned ID mapped information provided by UE manufacturers needs to include the UE radio capability for paging information. | | | | | | | | |
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| ***Consequences if not approved:*** | | Reduced value of the RACS feature as the CN has still to retrieve the UE Radio capabilty for paging from the RAN as the information is not associated to the RACS UE Radio Capability ID. | | | | | | | | |
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| ***Clauses affected:*** | | 5.11.3a, 5.11.4, 5.2.7, 4.4.13 | | | | | | | | |
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|  | | **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 ... | | |
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| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

### 5.11.3a UE Radio Capability Signalling optimization

With the increase of the size of UE radio capabilities driven e.g. by additional frequency bands and combinations thereof for E-UTRA and NR, an efficient approach to signal UE Radio Access Capability information over the radio interface and other network interfaces is defined with RACS.

In this Release of the specification, RACS does not apply to NB-IOT.

RACS works by assigning an identifier to represent a set of UE radio capabilities. This identifier is called UE Radio Capability ID. A UE Radio Capability ID can be either UE manufacturer-assigned or PLMN-assigned, as specified in clause 5.2.7. The UE Radio Capability ID is an alternative to the signalling of the UE Radio Capability information over the radio interface, within E-UTRAN, from E-UTRAN to NG-RAN, from MME to E-UTRAN and between CN nodes supporting RACS.

The UCMF (UE radio Capability Management Function) stores all UE Radio Capability ID mappings in a PLMN and is responsible for assigning every PLMN-assigned UE Radio Capability ID in this PLMN, see clause 4.4.13. The UCMF shall be configured with a Version ID for PLMN assigned UE Radio Capability IDs, defined in clause 4.4.13.

The UCMF stores the UE Radio Capability IDs alongside the UE Radio Capability information and the UE Radio Capability for Paging they map to. Each UE Radio Capability ID stored in the UCMF can be associated to one or both UE radio capabilities formats specified in TS 38.331 [89] and TS 36.331 [37]. The two UE radio capabilities formats shall be identifiable by the MME and UCMF and the MME shall store the TS 36.331 [37] format only.

An E-UTRAN which supports RACS can be configured to operate with one of two modes of operation when providing the UE radio capabilities to the MME when the E-UTRAN executes a UE Radio Capability Enquiry procedure (see TS 36.331 [37]) to retrieve UE radio capabilities from the UE.

- Mode of operation A): The E-UTRAN provides to the MME both UE Radio Capability formats (i.e the TS 36.331 [37] format and TS 38.331 [89] format).The E-UTRAN derives one of the formats using local transcoding of the other format it receives from the UE and extracts the E-UTRAN UE Radio Capability for Paging and NR UE Radio Capability for Paging from the UE Radio capabilities..

- Mode of operation B): The E-UTRAN provides to the MME the TS 36.331 [37] format only.

In a PLMN supporting RACS only in EPS, Mode of Operation B shall be configured.

If the PLMN supports RACS in both EPS and 5GS:

- If RAN nodes in the EPS and 5GS are configured in Mode of operation B, then the UCMF shall be capable to transcode between TS 38.331 [89] and TS 36.331 [37] formats. The UCMF shall be able to generate the RAT-specific UE Radio Capability for Paging information from the UE Radio capabilities.

- If E-UTRAN is configured to operate according to Mode A, then also the NG-RAN shall be configured to operate according to mode A and the UMCF is not required to transcode between TS 38.331 [89] and TS 36.331 [37] formats. .The MME shall provide the UCMF with the UE Radio Capability for Paging information..

When the E-UTRAN updates the MME with new UE radio capabilities information, the MME provides the information obtained from the E-UTRAN to the UCMF even if the MME already stores a UE Radio Capability ID for the UE. The UCMF then returns a value of UE Radio Capability ID. If the value is different from the one stored in the MME, the MME updates the UE Radio Capability ID it stores and provides this new value to the E-UTRAN (if applicable) and to the UE.

PLMN-assigned UE Radio Capability ID is assigned to the UE using the GUTI Reallocation procedure, Attach Accept or TAU Accept as defined in present specification. In order to be able to interpret the UE Radio Capability ID a network entity or node may store a local copy of the mapping between the UE Radio Capability ID and its corresponding UE Radio Capability information i.e. a dictionary entry. When no mapping is available between a UE Radio Capability ID and the corresponding UE Radio Capability information in a network entity or node, this network entity or node shall be able to retrieve it and store it.

- An MME which supports RACS shall store such UE Radio Capability ID mapping at least for all the UEs that it serves that have a UE Radio Capability ID assigned.

- The E-UTRAN performs local caching of the UE Radio Capability information for the UE Radio Capability IDs for the UEs it is serving, and potentially for other UE Radio Capability IDs according to suitable local policies.

- When the E-UTRAN needs to retrieve the mapping of a UE Radio Capability ID to the corresponding UE Radio Capability information, it queries the MME using S1 signalling defined in TS 36.413 [36].

- When the MME needs to get the UE Radio Capability Information and the UE Radio Capability for Paging associated to a UE Radio Capability ID it provides the UE Radio capability ID to the UCMF with an indication that it is requesting the TS 36.331 [37] format, and the UCMF returns a mapping of the UE Radio Capability ID to the corresponding UE Radio Capability information in TS 36.331 [37] format to the MME along with the E-UTRAN UE Radio Capability for Paging.

- When the MME needs to obtain a PLMN assigned UE Radio Capability ID for a UE from the UCMF, it provides the UE Capability information it has for the current radio configuration of the UE and the IMEI/TAC for the UE. The MME shall provide to the UCMF the UE Radio Capability information (and at least in Mode A, the UE Radio Capability for Paging) obtained from the E-UTRAN in one or both the TS 38.331 [89] and TS 36.331 [37] formats depending on how the RAN is configured. The UCMF stores the association of IMEI/TAC with this UE Radio Capability ID and the UE Radio Capability information and the UE Radio Capability for Paging in all the formats it receives. The UE Radio Capability information formats the MME provides shall be identifiable at the UCMF.

- UEs, MMEs and RAN nodes which support RACS learn the current value of the Version ID when a new PLMN assigned UE Radio Capability ID is received from the UCMF and the Version ID it contains is different from the ones in their PLMN assigned UE Radio Capability ID cache. For a PLMN, PLMN assigned UE Radio Capability IDs related to old values (i.e. not current value) of the Version ID can be removed from cache but, if so, prior to removing any cached PLMN-assigned UE radio Capability IDs with the current value of the Version ID. The MME, RAN and UE may still continue to use the stored PLMN assigned UE Radio Capability IDs with old values of the Version ID, until these are purged from cache. If an out of date PLMN assigned UE Radio Capability ID is removed from an MME cache, the MME shall proceed to assign a new PLMN assigned UE Radio Capability ID to all the UEs for which the UE context includes the removed PLMN-assigned UE Radio Capability ID, using the GUTI Reallocation procedure, or when these UEs perform a Tracking Area Update. If the MME attempts to resolve a PLMN assigned UE Radio capability ID with an old Version ID, the UCMF shall return an error code indicating that this Version ID is no longer current.

- If at any time the MME has neither a valid UE Radio Capability ID nor any stored UE radio capabilities for the UE, the MME may trigger the RAN to provide the UE Radio Capability information and subsequently request the UCMF to allocate a UE Radio Capability ID.

- The RAN, in order to support MOCN network sharing scenarios, shall be capable to cache PLMN assigned UE Radio Capability IDs per PLMN ID.

A network may utilise the PLMN-assigned UE Radio Capability ID, without involving the UE, e.g. for use with legacy UEs.

Mutual detection of the support of the RACS feature happens between E-UTRAN nodes at X2 setup and between E-UTRAN and MME at S1 setup time. To allow for a mix of RACS-supporting and non-RACS-supporting RAN nodes over the X2 interfaces, the UE Radio Capability ID should be included in the Path Switch signalling during X2 based handover and Handover Request during S1 based handover between MME and E-UTRAN. In addition, RACS-supporting RAN nodes can be discovered across inter-CN node boundaries e.g. using the Configuration Transfer procedure. The support of RACS by peer MMEs or AMFs is based on configuration in a PLMN or across PLMNs.

A UE that supports WB-EUTRA and/or NR indicates its support for RACS to MME using UE Core Network Capability as defined in clause 5.11.3.

A UE that supports RACS and is already assigned with an applicable UE Radio Capability ID in the PLMN, shall signal the UE Radio Capability ID in Attach procedure, as defined in clause 5.3.2, and Tracking Area Update procedure, as defined in clause 5.3.3 and based on triggers defined in TS 24.301 [46]. If both PLMN-assigned and UE manufacturer-assigned UE Radio Capability IDs are available in the UE and applicable in the PLMN, the UE shall signal the PLMN-assigned UE Radio Capability ID. The UE shall delete the PLMN-assigned UE Radio Capability ID(s) for the related PLMN upon receiving an indication from this PLMN.

When a PLMN decides to request a particular type of UE to use UE manufacturer-assigned UE Radio Capability ID(s):

- The UCMF sends either a Nucmf\_UECapabilityManagement\_Notify or URCMP Event Notification Request message defined in TS 29.674 [91] to the MME including either a list of UE Radio Capability IDs (if the UE was previously using any PLMN assigned IDs) or the IMEI/TAC values corresponding to UE types that are requested to use UE manufacturer-assigned UE Radio Capability ID. These values are stored in a "UE Manufacturer Assigned operation requested list" in the MME.

- The MME uses the Registration Accept message or the UE Configuration Update command message to request the UE to delete all the PLMN-assigned UE Radio Capability ID(s) for this PLMN if the UE is, respectively, registering or is registered with PLMN assigned UE Radio Capability ID or IMEI/TAC values matching one value in the UE manufacturer-assigned operation requested list.

NOTE 1: It is expected that in a given PLMN the UCMF and MMEs will be configured to either use a UE manufacturer-assigned operation requested list based on a list of PLMN assigned UE Radio Capability IDs or a list of TACs, but not both.

NOTE 2: The strategy for triggering of the deletion of PLMN-assigned UE Radio Capability ID(s) in the UE by the MME is implementation-specific (e.g. can be used only towards UEs in ECM-Connected state).

- a UE that receives indication to delete the all the PLMN-assigned UE Radio Capability IDs in the Registration Accept message, or UE Configuration Update command message, deletes any PLMN-assigned UE Radio Capability IDs for this PLMN. The UE proceeds to register with a UE manufacturer-assigned UE Radio Capability ID that is applicable to the current UE Radio configuration.

- When the "UE Manufacturer Assigned operation requested list" contains PLMN assigned UE Radio Capability IDs, the UCMF shall avoid re-assigning PLMN assigned UE Radio Capability IDs that were added to the "UE Manufacturer Assigned operation requested list" in the MMEs to any UE.

- The MME stores a PLMN assigned ID in the UE manufacturer-assigned operation requested list for a time duration that is implementation specific, but TACs are stored until the UCMF require to remove certain TACs from the list (i.e. the list of TACs which are requested to use UE manufacturer-assigned UE Radio Capability IDs in the MME and UCMF is synchronised at all times).

- The UCMF can request at any time the MME to remove PLMN assigned ID(s) or TAC(s) values form the UE manufacturer-assigned operation requested list.

NOTE 3: The MME can decide to remove a UE Radio Capability ID related to selected PLMN from the "UE Manufacturer Assigned operation requested list" list e.g. because no UE with that UE Radio Capability ID has connected to the network for long time. If later a UE with such UE Radio Capability ID connects to the network, the MME contacts the UCMF to resolve the UE Radio Capability ID, and at this point the UCMF can trigger again the deletion of the UE Radio Capability ID by including this in the UE manufacturer-assigned operation requested list of the MME.

The serving MME stores the UE Radio Capability ID for a UE in the UE context and provides this UE Radio Capability ID to E-UTRAN as part of the UE context information using S1 signalling. During inter PLMN mobility, the new MME shall delete the UE Radio Capability ID received from the old MME, unless the operator policy indicates that all UE Radio Capability IDs used in the old PLMN are also valid in the new PLMN.

NOTE 4: If MME decides to allocate TAIs of multiple PLMN IDs as part of Tracking Area to the UE then MME provides the UE Radio Capability ID of the new selected PLMN to the eNodeB during UE mobility, whether the UE Radio Capability ID is taken from stored UE context previously assigned by the same new selected PLMN or generated freshly each time a new PLMN is selected is up to MME implementation.

The UE stores the PLMN-assigned UE Radio Capability ID in non-volatile memory when in EMM-DEREGISTERED state and can use it again when it registers in the same PLMN.

NOTE 5: It is assumed that UE does not need to store the access stratum information (i.e. UE-EUTRA-Capability and UE-NR-Capability specified in TS 36.331 [37] and TS 38.331 [89], respectively) that was indicated by the UE to the network when the PLMN-assigned UE Radio Capability ID was assigned by the network. However, it is assumed that the UE does store the related UE configuration (e.g. whether or not GERAN or UTRAN or MBMS is enabled/disabled).

At any given time at most one UE Radio Capability ID is stored in the UE context in CN and RAN.

The number of PLMN-specific UE Radio Capability IDs that the UE stores in non-volatile memory is left up to UE implementation. However, to minimise the load (e.g. from radio signalling) on the Uu interface and to provide smoother inter-PLMN mobility (e.g. at land borders) the UE shall be able to store at least the latest 16 PLMN-assigned UE Radio Capability IDs (along with the PLMN that assigned them). This number is independent of the UE manufacturer-assigned UE Radio Capability ID(s) the UE may store.

It shall be possible for a UE to change, e.g. upon change in its usage settings, the set of UE radio capabilities in time and signal the associated UE Radio Capability ID, if available. The UE stores the mapping between the UE Radio Capability ID and the corresponding UE Radio Capability information for every UE Radio Capability ID it stores.

If the UE's Radio Capability information changes and there is no associated UE Radio Capability ID for the updated UE Radio Capability information, the UE shall perform capability update procedure as defined in clause 5.11.3.

The E-UTRAN may apply RRC filtering of UE radio capabilities when it retrieves the UE Radio Capability information from the UE as defined in TS 36.331 [37].

NOTE 6: In a RACS supporting PLMN, the filter of UE radio capabilities configured in E-UTRAN is preferably as wide in scope as possible (e.g PLMN-wide). In this case, it corresponds e.g. to the super-set of bands, band-combinations and RATs the PLMN deploys and not only to the specific E-UTRAN node or region.

NOTE 7: If the filter, included in the UE Radio Capability information, of UE radio capabilities configured in two E-UTRAN nodes is different, during handover between these two nodes, it is possible that the target E-UTRAN node might need to enquire the UE for its UE Radio Capability information again and trigger re-allocation of a PLMN-assigned UE Radio Capability ID leading to extra signalling. Additionally, a narrow filter might reduce the list of candidate target nodes.

If a UE supports both NB-IoT and possibly other RATs the UE handles the RACS procedures as follows:

- Since there is no support for RACS in NB-IoT, if the UE supports RACS in non-NB-IoT RATs (i.e. for WB-EUTRA and/or NR):

- NB-IoT specific UE Radio Capability information is handled in UE, RAN and MME according to clause 5.11.2.

- when the UE is not camping on NB-IoT, the UE provides UE radio capabilities for other RATs but not NB-IoT UE radio capabilities, according to TS 36.331 [37]. As a result the UE Radio Capability ID that is assigned by the network corresponds only to the UE radio capabilities of the non-NB-IoT RATs. The UE uses the UE Radio Capability IDs assigned only in Attach and TAU procedures performed over non-NB-IoT RATs.

Support for RACS in 5GS is defined in TS 23.501 [83] and TS 23.502 [84].

Next CHANGE

### 5.11.4 UE Radio Capability for Paging Information

Depending upon the features implemented in the E-UTRAN, this procedure may assist the E-UTRAN in optimising the radio paging procedures, or this procedure can be essential for mobile terminating services to succeed.

Using procedures specified in TS 36.413 [36] , the eNodeB shall upload the UE Radio Capability for Paging Information to the MME in the S1 interface UE CAPABILITY INFO INDICATION message (in a separate IE from the UE Radio Capability). As specified in TS 36.331 [37], the UE Radio Capability for Paging Information may contain UE Radio Paging Information provided by the UE to the eNodeB, and other information derived by the eNodeB (e.g. band support information) from the UE Radio Capability information.

The UE Radio Capability for Paging Information for NB-IoT and WB-E-UTRAN are separately stored in the MME. The RAT Type (derived from the UE's Tracking Area Code) is used to determine which RAT the information relates to.

The handling of the UE Radio Capability for Paging Information with RACS is described in clause 5.11.3a.

If a UE supports both NB-IoT and WB-E-UTRAN, the UE and eNodeB handle the UE Radio Capability for Paging Information as follows:

- when the UE is camping on NB-IoT the UE provides only NB-IoT information to the network;

- when the UE is camping on WB-E-UTRAN, the UE provides only WB-E-UTRAN information to the network.

Typically this information is sent to the MME at the same time as the eNodeB uploads the UE Radio Capability information. The MME stores the UE Radio Capability for Paging Information in the MME context. When it needs to page, the MME provides the UE Radio Capability for Paging Information for that RAT to the eNodeB as part of the S1 paging message. The eNodeB may use the UE Radio Capability for Paging Information to enhance the paging towards the UE and/or to calculate when or how to broadcast paging information or the Wake Up Signal to the UE, see TS 36.304 [34].

If the UE is performing an Attach procedure or a Tracking Area Update procedure for the "first TAU following GERAN/UTRAN/ Attach" or for "UE radio capability update", the MME shall delete all UE Radio Capability for Paging Information that it has stored for that UE.

If the UE Radio Capability for Paging Information changes for either RAT, the UE shall follow the same procedures as if the UE Radio Capability changes.

In order to handle the situations of connected mode inter-MME change, the UE Radio Capability for Paging Information is sent to the target MME as part of the MM Context information. The UE Radio Capability for Paging Information is only applicable for MMEs, i.e. it is not applicable for SGSNs. Therefore, it will not be included by MME during context transfers towards SGSNs.

Next CHANGE

### 5.2.7 UE Radio Capability ID

The UE Radio Capability ID is a short pointer with format defined in TS 23.003 [9] that is used to uniquely identify a set of UE Radio Capabilities (excluding UTRAN and NB-IoT capabilities). The UE Radio Capability ID is assigned either by the serving PLMN or by the UE manufacturer, as follows:

- UE manufacturer-assigned: The UE Radio Capability ID may be assigned by the UE manufacturer in which case it includes the UE manufacturer information (i.e. a Vendor ID). In this case, the UE Radio Capability ID uniquely identifies a set of UE radio capabilities and the UE Radio Capability for Paging for this manufacturer in any PLMN.

- PLMN-assigned: If a UE manufacturer-assigned UE Radio Capability ID is not used by the UE or the serving network, or it is not recognised by the serving PLMN UCMF, the UCMF may allocate UE Radio Capability IDs for the UE corresponding to different sets of UE radio capabilities the PLMN may receive from the UE at different times. In this case, the UE Radio Capability IDs the UE receives are applicable to the serving PLMN and uniquely identify the corresponding sets of UE radio capabilities and the UE Radio Capability for Paging(s) in this PLMN. The PLMN assigned UE Radio Capability ID includes a Version ID in its format. The value of the Version ID is the one configured in the UCMF, at time the UE Radio Capability ID value is assigned. The Version ID value makes it possible to detect whether a UE Radio Capability ID is current or outdated.

NOTE: For the case the PLMN is configured to store PLMN assigned IDs in the UE manufacturer-assigned operation requested list defined in clause 5.11.3a, then the algorithm for assignment of PLMN Assigned UE Radio Capability ID shall assign different UE Radio Capability IDs for UEs with different IMEI/TAC value.

The type of UE Radio Capability ID (UE manufacturer-assigned or PLMN-assigned) is distinguished when a UE Radio Capability ID is signalled.

Next CHANGE

### 4.4.13 UCMF

The UCMF is used for storage of dictionary entries corresponding to either PLMN-assigned or UE manufacturer-assigned UE Radio Capability IDs. An MME may subscribe with the UCMF to obtain from the UCMF new values of UE Radio Capability ID that the UCMF assigns for the purpose of caching them locally.

Provisioning of UE manufacturer-assigned UE Radio Capability ID entries in the UCMF is performed from an AS that interacts with the UCMF either directly or via the SCEF (or via Network Management) (see TS 23.682 [74] for further information). A UCMF that serves both EPS and 5GS shall require provisioning the UE Radio Capability ID with the TS 38.331 [89] format or the TS 36.331 [37] format or both the formats of the UE radio capabilities.

For PLMN-assigned UE Radio Capability ID the UCMF also is the entity that assigns the UE Radio Capability ID values.



Figure 4.4.13-1: UCMF connected to MME

Each PLMN-assigned UE Radio Capability ID is also associated to the IMEI/TAC of the UE model(s) that it is related to. When an MME requests the UCMF to assign a UE Radio Capability ID for a set of UE radio capabilities, it indicates the IMEI/TAC of the UE that the UE Radio Capability information is related to.

The UCMF may be provisioned with a dictionary of UE manufacturer-assigned UE Radio Capability IDs which include a "Vendor ID" that applies to the Manufacturers of these UE, and a list of IMEI/TACs for which the PLMN has obtained UE manufacturer-assigned UE Radio Capability IDs.

A PLMN-assigned UE Radio Capability IDs is kept in the UCMF storage as long as it is associated with at least a IMEI/TAC value. When a IMEI/TAC value is related to a UE model that is earmarked for operation based on UE manufacturer-assigned UE Radio Capability IDs, this IMEI/TAC value is disassociated in the UCMF from any PLMN assigned UE Radio Capability IDs.

For the case the PLMN is configured to store PLMN assigned IDs in the UE manufacturer-assigned operation requested list defined in clause 5.11.3a, the UCMF does not remove from UE manufacturer-assigned operation requested list any PLMN assigned UE Radio Capability ID no longer used, and rather quarantines it to avoid any future reassignment.

The UCMF stores a Version ID value for the PLMN assigned UE Radio Capability IDs so it is included in the PLMN assigned UE Radio Capability IDs it assigns. This shall be configured in the UCMF.

A UCMF dictionary entry shall include also the related UE Radio Capability for Paging for each RAT.

End of CHANGEs