**3GPP TSG-CT WG4 Meeting #111-eC4-224\_\_\_**

**E-Meeting, 18th – 26th August 2022 rev of C4-224598**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **29.272** | **CR** | **842** | **rev** | **2** | **Current version:** | **17.3.0** |  |
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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:*** | Update ULR flags in support of handover | | | | | | | | | |
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| ***Source to WG:*** | Vodafone | | | | | | | | | |
| ***Source to TSG:*** | CT4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI17 | | | | |  | ***Date:*** | | | 2202-08-25 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***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:*** | | After connected mode mobility (handover) into an MME (from either another MME or an AMF), the UE will initiate a Tracking Area Update with the MME. This will result in a Update Location Request from the MME towards the HSS.  If the UE is roaming on a non-preferred VPLMN (e.g. because the UE is in an area where there is no coverage of the preferred VPLMN) a 4G Steering of Roaming platform (e.g. as in GSMA PRD 73 section 6.1) may repeatedly block and/or reject the signalling. This can last for a long period (minutes) and lead to the release of the radio connection and any ongoing Voice over IMS call being dropped; and it may be impossible to establish a new call during this time. The 4G SoR platform may be implemented in a ‘roaming hub’ that has no ability to interact with platforms in the HPLMN.  Up to now, inter-MME mobility has frequently been a relatively rare event as MME-pool areas can be large and their boundaries can be located in low traffic areas of the PLMN. However, with the launch of 5G Core, many PLMNs can be expected to have much higher rates of AMF to MME mobility than inter-MME mobility (e.g. with EPS fallback, the whole of the PLMN is now an MME border area).  AMF to MME mobility can be caused by for example:   1. The use of EPS fallback to move the UE from NR-5GC to LTE-EPC for a normal voice call. EPS fallback requires NO UE movement. 2. VoNR to VoLTE handover. This can be the result of a small UE movement into poorer NR coverage, or, an operator policy to systematically handover voice calls from NR to LTE even without any UE movement.   For normal IMS calls using S8 Home Routeing, signalling flows back on the ‘user plane’ to the IMS servers in the HPLMN. However, it is not feasible for the SoR platform in e.g a roaming hub to interact with these IMS servers.  For IMS emergency calls, the IMS signalling is contained within the VPLMN and no IMS signalling is visible to the HPLMN or the roaming hub.  These AMF to MME mobility events can happen at any time (minutes or hours or days) after the last signalling between the VPLMN’s 5GC and the HPLMN. Hence the Update Location from the MME towards the HPLMN is highly likely to be a target for SoR.  The 4G SoR platforms can also cause problems at inter-PLMN handover- this would be highly undesirable at least for automotive use cases.  To prevent the loss of voice calls at AMF to MME mobility, and to allow inter-PLMN handovers to be successful, this CR proposes to add flags to the Update Location Request to inform any SoR platform that this ULR is related to connected mode mobility (c.f. handover) rather than idle mode mobility. The SoR platform may take this indication into account and avoid causing the handover to fail. Statistical/analytical mechanisms can be used to detect any abuse of the flags by the VPLMN.  Note: Normal CSFB does not involve any Location Update from the MSC to the HSS and hence the SoR platform does not impact 4G to 2G/3G CS FallBack.  Correcting typos. | | | | | | | | |
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| ***Summary of change:*** | | Means to avoid service interruption at inter-MME handover are added by providing more information to the non-3GPP standardised Steering of Roaming function (which otherwise may reject the Daimeter ULR. | | | | | | | | |
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| ***Consequences if not approved:*** | | If the HPLMN or intermediaries are using a Steering of Roaming function based on Rejecting Diameter ULR signalling then: a) Emergency calls may fail in the VPLMN.   1. Voice over IMS calls may fail in the VPLMN. 2. Inter-PLMN handovers may fail causing problems for automotive use cases. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 15.2.1.1.2, 15.2.1.1.3, 7.3.7 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | This CR introduces backward compatible changes. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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

##### 5.2.1.1.2 Detailed behaviour of the MME and the SGSN

The MME shall make use of this procedure to update the MME identity stored in the HSS (e.g. at initial attach, inter MME tracking area update or radio contact after HSS reset).

The SGSN shall make use of this procedure to update the SGSN identity stored in the HSS (e.g. at initial attach, inter SGSN routing area update or radio contact after HSS reset).

The MME shall make use of this procedure to request SMS data and to become registered for SMS.

The SGSN shall make use of this procedure to request to become registered for SMS.

A combined MME/SGSN which uses different Diameter Identities for the MME and SGSN parts shall not send a second ULR when in a first ULA the ULA-Flag "Separation Indication" was not set.

For UEs receiving emergency services, in which the UE was not successfully authenticated, the MME or SGSN shall not make use of the Update Location procedure.

If the Update Location request is to be sent due to an inter node (SGSN to MME) update and the previous SGSN is a Gn/Gp SGSN, the MME shall set the "Single-Registration-Indication" flag in the ULR-Flags information element in the request.

If the Update Location request is to be sent due to an initial attach, the MME or SGSN shall set the "Initial-Attach-Indicator" flag in the ULR-Flags information element in the request.

If the Update Location request is sent due to a Tracking Area Update following intra-PLMN inter-MME or AMF to MME handover, then the MME should set the Intra-PLMN-inter-MME handover flag in the ULR-Flags information element in the request.

If the Update Location request is sent due to a Tracking Area Update following inter-PLMN inter-MME or AMF to MME handover, then the MME should set the Inter-PLMN-inter-MME handover flag in the ULR-Flags information element in the request.

NOTE 0: In order to avoid handovers failing (including the cases of emergency and non-emegency EPS fallback voice handovers), the Intra-PLMN-inter-MME handover flag and Inter-PLMN-inter-MME handover flags are required unless the VPLMN is certain that the Diameter signalling will reach the HSS without interventions by a Steering of Roaming function that interferes with the Diameter signalling procedures. Otherwise, these flags are left to configuration/deployment options.

When receiving and supporting Reset-ID AVPs in the response, the MME or SGSN shall delete all the stored Reset-IDs, if there are any, and then store all the received Reset-IDs.

A combined MME/SGSN shall set the "Skip Subscriber Data" flag in the ULR-Flags if subscriber data are already available due to a previous location update.

A combined MME/SGSN that has advertised its support for the combined MME/SGSN capability, by either including the SGSN Number within ULR sent over S6a or including the Coupled-Node-Diameter-ID within ULR sent over S6a/S6d or by using same Diameter identity over S6a and S6d interfaces, shall be prepared to receive a single subscription data update message (IDR or DSR) from the HSS when the subscription data is modified.

If the MME or SGSN knows about the homogeneity of the support of IMS Voice over PS Sessions in all TAs or RAs associated to that serving node (i.e., it is supported in all the TA/RAs or it is not supported in any of the TA/RAs) and for the serving subscriber taking into account roaming relationship for IMS Voice over PS Sessions, it shall include this indication to the HSS in the "Homogeneous Support of IMS Voice over PS Sessions" IE.

The MME or SGSN may include dynamic APN and PGW ID data in the list of Active-APN AVPs, in order to restore this information in the HSS after a Reset procedure.

The MME/SGSN may include an equivalent PLMN list to request the CSG Subscription data of the equivalent PLMNs.

A standalone MME shall not indicate its support for any SGSN specific features, and it shall not request explicitly the download of GPRS data (via the GPRS-Subscription-Data-Indicator flag; see clause 7.3.7). A standalone MME that does not support the "SMS in MME" feature shall not provide its MME Number for MT SMS, "SMS only" indication or SMS Registration Request and therefore not indicate its support for any SMS related features (such as ODB or barring services).

For an SGSN, if a DIAMETER\_ERROR\_CAMEL\_SUBSCRIPTION\_PRESENT is received, the SGSN shall initiate the update location procedure with MAP over Gr interface and use Gr for the subsequent mobility procedures.

For a standalone MME or SGSN, if EPS or GPRS subscription data is received, the standalone MME or SGSN shall replace all of the EPS or GPRS subscription data of the user in the MME or SGSN. Any optional EPS or GPRS data not received, but stored in the standalone MME or SGSN, shall be deleted.

For a combined MME/SGSN, if EPS subscription data of the user is received, it shall replace all of the EPS subscription data of the user. Any optional EPS data not received by the combined MME/SGSN, but stored in the MME/SGSN, shall be deleted.

For a combined MME/SGSN, if GPRS subscription data of the user is received, it shall replace all of the GPRS subscription data of the user. Any optional GPRS data not received by the combined MME/ SGSN, but stored in the MME/SGSN, shall be deleted.

When receiving an Update Location response from the HSS, the MME or SGSN shall check the result code. If it indicates success the MME or SGSN shall store the received subscription profile (if any), and it shall store the HSS identity as received in the Origin-Host AVP.

If an Additional MSISDN (A-MSISDN) is available in the subscription data and downloaded in the A-MSISDN AVP to the MME/SGSN in an Update Location and if the MME or SGSN supports the additional MSISDN feature, the MME or SGSN shall use the Additional MSISDN as C-MSISDN.

For UEs receiving emergency services (i.e. emergency attached UEs or normal attached UEs with a UE Requested PDN Connection for emergency services), and if the MME or SGSN supports emergency services for users in limited service state, the MME or SGSN shall proceed even if the Update Location procedure fails (e.g. authenticated users with roaming restrictions or RAT-Type restrictions in HSS).

When receiving GPRS-Subscription-Data AVP in the response, the SGSN or combined MME/SGSN shall delete all the stored PDP-Contexts, if there are any, and then store all the received PDP-Contexts.

When receiving the APN-Configuration-Profile AVP in a ULA, the MME or SGSN shall delete all the stored APN-Configurations, if there are any, and then store all the received APN-Configurations.

For each of the received APN-Configurations in the APN-Configuration-Profile, if both the MIP6-Agent-Info and the PDN-GW-Allocation-Type AVPs are absent in the APN-Configuration AVP and the MME or SGSN does not have any associated PGW information, the MME or SGSN shall perform the PGW selection (static or dynamic) according to the local configuration. If MIP6-Agent-Info is present, and PDN-GW-Allocation-Type is not present, this means that the PDN GW address included in MIP6-Agent-Info has been statically allocated. If the MIP6-Agent-Info contains an FQDN of the PDN GW, the MME shall retrieve the PGW PLMN ID from the MIP-Home-Agent-Host AVP within the MIP6-Agent-Info AVP.

When receiving an Update Location response from the HSS in the TAU or RAU procedure, for each of the received APN-Configurations in the APN-Configuration-Profile, if both the MIP6-Agent-Info and the PDN-GW-Allocation-Type AVPs are absent in the APN-Configuration AVP and the MME or SGSN has associated PGW information and the UE-level access restriction "HO-To-Non-3GPP-Access Not Allowed" is not set, the MME or SGSN should send a Notify Request if HO to the WLAN is supported in the network, including the APN and PDN GW identity to the HSS in order to restore this information in the HSS e.g. after a Reset procedure.

If the MME/SGSN supports interworking with Gn/Gp-SGSNs, it shall ensure that the Context -Identifier sent over GTPv1 for each of the received APN-Configurations is within the range of 1 and 255.

NOTE 1: If the MME/SGSN receives from HSS a Context-Identifier value higher than 255, how this value is mapped to a value between 1 and 255 is implementation specific.

If the subscriber is not roaming and the SIPTO-Permission information for an APN is present, the MME or SGSN shall allow SIPTO above RAN for that APN only if the SIPTO-Permission information indicates so.

If the subscriber is not roaming and the SIPTO-Permission information for an APN is not present, the MME or SGSN may allow SIPTO above RAN for that APN.

If the subscriber is roaming and the SIPTO-Permission information for an APN is present, the MME or SGSN shall allow SIPTO above RAN for that APN only if the SIPTO-Permission information indicates so and the VPLMN Dynamic Address is allowed and the MME or SGSN selects a PDN GW in the VPLMN.

If the subscriber is roaming and the SIPTO-Permission information for an APN is not present, the MME or SGSN shall not allow SIPTO above RAN for that APN.

NOTE 2: Based on local configuration, the MME or SGSN can determine not to allow SIPTO above RAN for an APN, regardless if the SIPTO-Permission information is present.

If the subscriber is not roaming and the SIPTO-Local-Network-Permission information for an APN is present, the MME or SGSN shall allow SIPTO at the local network for that APN only if the SIPTO-Local-Network-Permission information indicates so.

If the subscriber is not roaming and the SIPTO-Local-Network-Permission information for an APN is not present, the MME or SGSN may allow SIPTO at the local network for that APN.

If the subscriber is roaming and the SIPTO-Local-Network-Permission information for an APN is present, the MME or SGSN shall allow SIPTO at the local network for that APN only if the SIPTO-Local-Network-Permission information indicates so and the VPLMN Dynamic Address is allowed and the MME or SGSN selects a L-GW in the VPLMN.

If the subscriber is roaming and the SIPTO-Local-Network-Permission information for an APN is not present, the MME or SGSN shall not allow SIPTO at the local network for that APN.

NOTE 3: Based on local configuration, the MME or SGSN can determine not to allow SIPTO at the local network for an APN, regardless if the SIPTO-Local-Network-Permission information is present.

If MPS-Priority AVP is present and the UE is subscribed to the eMLPP or 1x RTT priority service in the CS domain as indicated by the MPS-CS-Priority bit of the AVP, the MME shall allow the UE to initiate the RRC connection with higher priority than other normal UEs during CS Fallback procedure. If the MPS-Priority AVP is present and the UE is subscribed to MPS in the EPS domain as indicated by the MPS-EPS-Priority bit of the AVP, the MME shall allow the UE to initiate the RRC connection with higher priority than other normal UEs.

If the subscriber is not roaming, the MME or SGSN may allow or prohibit the UE to use LIPA as indicated by LIPA-Permission for a specific APN.

If the subscriber is roaming and the VPLMN-LIPA-Allowed AVP indicates that the UE is not allowed to use LIPA in the VPLMN where the UE is attached, the MME or SGSN shall not provide LIPA for the UE and shall not consider the LIPA-Permission AVP. If the VPLMN-LIPA-Allowed AVP indicates that the UE is allowed to use LIPA in the VPLMN, the MME or SGSN may allow or prohibit the UE to use LIPA as indicated by LIPA-Permission for a specific APN. The VPLMN-Dynamic-Address-Allowed AVP shall not be considered if it is received when the MME or SGSN establishes a PDN connection with LIPA.

If the LIPA-Permission information for an APN indicates LIPA only, the MME or SGSN shall only allow LIPA for that APN via the authorized CSGs according to the CSG Subscription Data. If the LIPA-Permission information for an APN indicates LIPA prohibited, the MME or SGSN shall not allow LIPA for that APN. If the LIPA-Permission information for an APN indicates LIPA conditional, the MME or SGSN shall allow non LIPA, and LIPA for that APN via the authorized CSGs according to the CSG Subscription Data. If the LIPA-Permission AVP is not present for a specific APN, the APN shall not be allowed to use LIPA.

The LIPA-Permission information for the Wildcard APN shall apply to any APN that is not explicitly present in the subscription data.

The SIPTO-Permission information for the Wildcard APN shall apply to any APN that is not explicitly present in the subscription data.

The SIPTO-Local-Network-Permission information for the Wildcard APN shall apply to any APN that is not explicitly present in the subscription data.

If the subscription data received for a certain APN indicates that the APN was authorized as a consequence of having the Wildcard APN in the user subscription in HSS, then the MME shall not store this APN data beyond the lifetime of the UE session and the MME shall delete them upon disconnection of the UE.

If the MME supports the Relay Node functionality (see 3GPP TS 36.300 [40]) and the subscription data indicates that the subscriber is not a relay, the MME shall reject the attach request from a device attempting to attach to EPS as a Relay Node. If a device requests to be attached to EPS as an UE, the MME shall proceed with the attach procedure regardless of the content of the Relay Node Indicator.

If trace data are received in the subscriber data, the MME or SGSN shall start a Trace Session. For details, see 3GPP TS 32.422 [23].

If the Ext-PDP-Type AVP is present in the PDP-Context AVP, the SGSN or combined MME/SGSN shall ignore the value of the PDP-Type AVP.

If the subscriber is not roaming and the Subscribed-Periodic-RAU-TAU-Timer information is present, the MME or SGSN shall allocate the subscribed value to the UE as periodic RAU or TAU timer. If the subscriber is roaming and the Subscribed-Periodic-RAU-TAU-Timer information is present, the MME or SGSN may use the subscribed periodic RAU/TAU timer value as an indication to decide for allocating a locally configured periodic RAU/TAU timer value to the UE.

For a combined MME/SGSN, the node may include the Coupled-Node-Diameter-ID AVP to allow the HSS to determine if the UE is served by the MME and SGSN parts of the same combined MME/SGSN. When the message is sent over S6a interface and if this AVP is included, the MME shall include the Diameter identity of the coupled SGSN which is used by the SGSN over S6d interface. When the message is sent over S6d interface and if this AVP is included, the SGSN shall include the Diameter identity of the coupled MME which is used by the MME over S6a interface.

NOTE 4: The Coupled-Node-Diameter-ID AVP allows the HSS to determine if the UE is served by the MME and SGSN parts of the same combined MME/SGSN, when the SGSN number is not available and when Diameter identity of S6a and S6d interfaces of the combined MME/SGSN are not the same.

If the MME supports the "SMS in MME" feature and the UE has requested a combined EPS/IMSI attach or Combined TA/LA Update (see 3GPP TS 23.272 [44]) and the MME is not currently registered for SMS, the MME requests to be registered for SMS by indicating its MME Number for MT SMS in the request, including the SMS-Register-Request AVP and the SMS-Only-Indication flag set in the ULR-Flags AVP if UE indicates "SMS only".

If the MME supports the "SMS in MME" feature, when receving an EPS attach or a TAU from a UE accessing NB-IoT which requests SMS by indicating "SMS transfer without Combined Attach" (see 3GPP TS 23.401 [2]), and if the MME is not currently registered for SMS, the MME requests to be registered for SMS by indicating its MME Number for MT SMS in the request, including the SMS-Register-Request AVP.

If the HSS provides the MME with SMS data in the ULA and the ULA-Flags is received with "MME Registered for SMS" flag set, the MME shall store this data for providing SMS in MME service and consider itself registered for SMS.

If the SGSN supports the "SMS in SGSN" feature as specified in 3GPP TS 23.060 [12], clause 5.3.18, and wishes to provide SMS via SGSN it shall set the "SMS in SGSN" flag in the Feature-List AVP, and include SMS-Register-Request AVP. If the SGSN supports the Diameter based Gdd interface for SMS in SGSN, it shall set the "Gdd-in-SGSN" flag in the Feature-List AVP. If the UE has indicated "SMS-Only" this shall be indicated to the HSS setting the SMS-Only–Indication flag in the ULR-Flags AVP.

NOTE 5: the setting of the "SMS in SGSN" feature bit reflects the "SMS in SGSN Offered" as described in stage 2 above.

If the SMS-In-SGSN-Allowed-Indication flag is set in the received Subscription-Data-Flags AVP, the SGSN shall store the subscription data for providing SMS in SGSN service.

If the subscriber is not roaming and the Restoration-Priority information for a certain APN is present, the MME or SGSN shall consider the subscribed value as the relative priority of the user's PDN connection among PDN connections to the same APN when restoring PDN connections affected by an SGW or PGW failure/restart (see 3GPP TS 23.007 [43]). If the subscriber is roaming and the Restoration-Priority information for a certain APN is present, the MME or SGSN may use the subscribed value as an indication of the relative priority of the user's PDN connection among PDN connections to the same APN based on service level agreements. The MME/SGSN may use a locally configured value as default restoration priority if the Restoration-Priority AVP for a certain APN is not present, or if it is not permitted by service level agreements for an in-bound roamer.

If the subscription data received for a certain APN includes WLAN-offloadability AVP, then the MME or SGSN shall determine the offloadability of the UE's PDN Connection(s) to that APN based on subscription data and locally configured policy (e.g. for roaming users or when the subscription data does not include any offloadability indication).

NOTE 6: As indicated in clause 7.3.31, if the UE-level access restriction "HO-To-Non-3GPP-Access Not Allowed" is set, the offload of PDN Connections to WLAN is not allowed for any APN.

If the subscription data received for the user includes the DL-Buffering-Suggested-Packet-Count AVP, then the MME or SGSN should take into account the subscription data, in addition to local policies, to determine whether to invoke extended buffering of downlink packets at the SGW for High Latency Communication. Otherwise, the MME or SGSN shall make this determination based on local policies only.

When receiving IMSI-Group-Id AVP(s) within the Subscription-Data AVP, the MME or SGSN shall replace stored IMSI-Group Ids (if any) with the received information rather than add the received information to the stored information.

When receiving one or more Monitoring-Event-Configuration AVP(s) in the ULA, the MME or SGSN shall start the detection of the Monitoring events indicated in those AVP(s), if not already started, and shall stop the detection and delete the previous monitoring events (if any) which are not indicated in those AVP(s). If there is a failure when starting the detection (e.g. maximum resources exceeded), the MME or SGSN shall not store the failed configuration(s) and shall send a notification of those events whose configuration have failed, as described in clause 5.2.5.1.2 (NOR/NOA commands). If the Subscription-Data AVP is received in the ULA but it does not contain any Monitoring-Event-Configuration AVP(s), the MME or SGSN shall stop the detection and delete all stored monitoring event configurations (if any).

If the MME/SGSN supports Monitoring, the MME/SGSN shall include the Supported-Services AVP with Supported-Monitoring-Events included in the ULR command.

If the MME and the UE support Attach without PDN connection (i.e. EMM-REGISTERED without PDN connection) and the PDN-Connection-Restricted flag is set in the received Subscription-Data-Flags AVP, the MME shall not establish any non-emergency PDN connectionand shall tear down any existing non-emergency PDN connection for this user.

If the subscription data received for the user includes the Preferred-Data-Mode AVP, for an IP APN configuration or for a non-IP APN configuration with SGi based delivery, then the MME should (if the subscriber is not roaming) or may (if the subscriber is roaming) take into account the subscription data, in addition to local policies and the UE's Preferred Network Behaviour, to determine whether to transmit the traffic associated with this APN over the User Plane and/or over the Control Plane.Otherwise, the MME shall make this determination based on local policies and the UE's Preferred Network Behaviour only.

If the MME receives from the HSS an Update Location response containing the Emergency-Info AVP in the Subscription-Data, the MME shall use the PDN-GW identity included in Emergency-Info as the PDN-GW used to establish emergency PDN connections with the emergency APN, for non-roaming authenticated UEs requesting the handover of an emergency PDN connection if the MME is configured to use a dynamic PDN-GW for emergency services for such user.

When receiving V2X-Subscription-Data in the ULA, the MME shall determine whether the UE is authorized to use V2X communication over PC5 according to V2X subscription data and UE provided network capability. If the UE is authorized to use V2X communication over PC5, the MME shall store the "V2X service authorized" indication together with the UE AMBR used for PC5 interface (i.e. UE-PC5-AMBR), and provide such information to the eNodeB when needed.

If the MME/SGSN receives from the HSS an Update Location response without the bit set for "NR as Secondary RAT" in the Feature-List AVP, the MME/SGSN, based on local policy, may restrict access for NR as secondary RAT when all relevant entities except HSS supports it.

If the MME receives from the HSS an Update Location response containing in the subscription data the Core-Network-Restrictions AVP with the bit "5GC not allowed" set, the MME shall restrict mobility towards 5GC.

##### 5.2.1.1.3 Detailed behaviour of the HSS

When receiving an Update Location request the HSS shall check whether subscription data exists for the IMSI.

If the HSS determines that there is not any type of subscription for the IMSI (including EPS, GPRS and CS subscription data), a Result Code of DIAMETER\_ERROR\_USER\_UNKNOWN shall be returned.

If the Update Location Request is received over the S6a interface, and the subscriber has not any APN configuration, the HSS shall return a Result Code of DIAMETER\_ERROR\_UNKNOWN\_EPS\_SUBSCRIPTION.

If the Update Location Request is received over S6a, from an MME that does not support the "Non-IP PDN Type APNs" feature, and the user's subscripton profile contains only APN configurations of type "Non-IP", the HSS shall return a Result Code of DIAMETER\_ERROR\_UNKNOWN\_EPS\_SUBSCRIPTION.

If the Update Location Request is received over the S6d interface, and the subscriber has neither an APN configuration profile nor GPRS subscription data, the HSS shall return a Result Code of DIAMETER\_ERROR\_UNKNOWN\_EPS\_SUBSCRIPTION.

When sending DIAMETER\_ERROR\_UNKNOWN\_EPS\_SUBSCRIPTION, an Error Diagnostic information may be added to indicate whether or not GPRS subscription data are subscribed (i.e. whether or not Network Access Mode stored in the HSS indicates that only CS service is allowed).

The HSS shall check whether the RAT type the UE is using is allowed for the subscriber in the serving PLMN. If it is not, a Result Code of DIAMETER\_ERROR\_RAT\_NOT\_ALLOWED shall be returned.

The HSS shall check whether access to EPC is allowed, based on the active Core Network Restrictions of the subscriber. If access to EPC is restricted, a Result Code of DIAMETER\_ERROR\_UNKNOWN\_EPS\_SUBSCRIPTION shall be returned.

The HSS shall check whether roaming is not allowed in the VPLMN due to ODB. If so a Result Code of DIAMETER\_ERROR\_ROAMING\_NOT\_ALLOWED shall be returned. When this error is sent due to the MME or SGSN not supporting a certain ODB category, an Error Diagnostic information element may be added to indicate the type of ODB; if this error is sent due to the ODB indicating "Barring of Roaming", Error Diagnostic shall not be included.

If the Update Location Request is received over the S6d interface and the HSS supports the "SGSN CAMEL Capability" feature, and the SGSN indicates support of SGSN CAMEL capability, the HSS shall check if the subscriber has SGSN CAMEL Subscription data. If the subscriber has SGSN CAMEL Subscription data, the HSS shall return a Result Code of DIAMETER\_ERROR\_CAMEL\_SUBSCRIPTION\_PRESENT.

If the Update Location Request is received over the S6a interface, the HSS shall send a Cancel Location Request with a Cancellation-Type of MME\_UPDATE\_PROCEDURE (CLR; see clause 7.2.7) to the previous MME (if any) and replace the stored MME-Identity with the received value (the MME-Identity is received within the Origin-Host AVP). The HSS shall reset the "UE purged in MME" flag and delete any stored last known MME location information of the (no longer) purged UE. If the "Single-Registration-Indication" flag was set in the received request, the HSS shall send a Cancel Location Request with a Cancellation-Type of SGSN\_UPDATE\_PROCEDURE to the SGSN (MAP Cancel Location), and delete the stored SGSN address and SGSN number. If the "Initial-Attach-Indicator" flag was set in the received request, and the "Single-Registration-Indication" flag was not set, the HSS shall send a Cancel Location Request with a Cancellation-Type of INITIAL\_ATTACH\_PROCEDURE (CLR; see clause 7.2.7, or MAP Cancel Location) to the SGSN if there is an SGSN registration.

If the Update Location Request is received over the S6d interface, the HSS shall send a Cancel Location Request with a Cancellation-Type of SGSN\_UPDATE\_PROCEDURE (CLR; see clause 7.2.7, or MAP Cancel Location) to the previous SGSN (if any) and replace the stored SGSN-Identity with the received value (the SGSN-Identity is received within the Origin-Host AVP). The HSS shall reset the "UE purged in SGSN" flag and delete any stored last known SGSN location information of the (no longer) purged UE. If the "Initial-Attach-Indicator" flag was set in the received request, the HSS shall send a Cancel Location Request with a Cancellation-Type of INITIAL\_ATTACH\_PROCEDURE (CLR; see clause 7.2.7) to the MME if there is an MME registration.

When the HSS receives the Update Location Request, if a 15th digit of the IMEI AVP is received, the HSS may discard the digit.

If the Update Location Request includes either the ULR-flag Inter-PLMN-inter-MME or the ULR-flag intra-PLMN-inter-MME, then the HSS may ignore this information.

NOTE 1: These flags are intended for use by Steering of Roaming functions that are not standardised by 3GPP and which operate by interfering with the Diameter procedures.

If the Update Location Request includes the list of active APNs, the HSS shall delete all the stored dynamic PDN GW information, if there are any, and then replace them by the PDN GW information received in the list of Active-APN AVPs.

If the Update Location Request includes an equivalent PLMN list, the HSS shall return the CSG list (if any) for each equivalent PLMN to the MME with the subscription data, and Visited-PLMN-Id AVP shall be present in the CSG-Subscription-Data AVP to indicate the corresponding PLMN. If there is no equivalent PLMN list received, the HSS may not include Visited-PLMN-Id AVP in the CSG-Subscription-Data AVP, and the CSG-Subscription-Data AVP shall contain the CSG subscription data of the registered PLMN of the MME or the SGSN.

If the Update Location Request is received over the S6a interface for a user for which the URRP-MME parameter is set in the HSS, the HSS shall clear the URRP-MME parameter and send an indication to the corresponding Service Related Entities.

If the Update Location Request is received over the S6d interface for a user for which the URRP-SGSN parameter is set in the HSS, the HSS shall clear the URRP-SGSN parameter and send an indication to the corresponding Service Related Entities.

If no result code has been sent to the MME or SGSN so far, the HSS shall include the subscription data in the ULA command according to the ULR-Flags and the supported/unsupported features of the MME or SGSN, unless an explicit "skip subscriber data" indication has been received in the request, and shall return a Result Code of DIAMETER\_SUCCESS.

When the APN-Configuration-Profile AVP is present in the Subscription-Data AVP sent within a ULA, the AVP shall contain at least the default APN Configuration and a Context-Identifier AVP that identifies the per subscriber's default APN configuration. The default APN Configuration shall not contain the Wildcard APN (see 3GPP TS 23.003 [3], clause 9.2); the default APN shall always contain an explicit APN.

The GPRS Subscription data (if available in the HSS) shall only be present in the ULA command if it was indicated by the serving node in the ULR-Flags AVP (see clause 7.3.7), or when the subscription data is returned by a Pre-Rel-8 HSS (via an IWF) or when the Update Location Request is received over the S6d interface and there is no APN configuration profile stored for the subscriber.

The HSS shall use the indication received in the GPRS-Subscription-Data-Indicator for future use in the subscriber data update procedures.

The HSS shall store the new terminal information and/or the new UE SRVCC capability, if they are present in the request. If the UE SRVCC capability is not present, the HSS shall store that it has no knowledge of the UE SRVCC capability.

If the MME/SGSN indicates support of the Additional-MSISDN feature and an additional MSISDN (A-MSISDN) is available in the subscription data, the HSS shall send the provisioned additional MSISDN together with the MSISDN.

If the MME/SGSN does not support the Additional-MSISDN feature, the HSS shall populate the MSISDN AVP either with the subscribed MSISDN or the subscribed additional MSISDN based on operator policy and availability.

NOTE 2: When the MME/SGSN does not support the Additional-MSISDN feature, the MME/SGSN will use the MSISDN from the MSISDN AVP as C-MSISDN.

LCS-Info, Teleservice-List and Call-Barring-Info data shall be included according to the list of supported features indicated by the serving node (see clause 7.3.10).

If the HSS supports the "SMS in MME" feature and receives the indication that the MME supports the "SMS in MME" feature and requests to be registered for SMS by including the MME Number for MT SMS, SMS-Register-Request AVP and/or setting the SMS-Only-Indication flag in the ULR-Flags AVP if indicated from the UE, the HSS shall determine if SMS can be provided via the MME as described in 3GPP TS 23.272 [44]. If SMS in MME is accepted the HSS shall register the MME for SMS, store the "MME number for MT SMS" as the corresponding MSC number to be used for MT SMS and return an indication of MME registered for SMS in ULA-Flags AVP.

If the MME is successfully registered for SMS the HSS shall download the available SMS related subscription data that may comprise SMS teleservice, MSISDN, ODB and barring services for SMS according to supported features. Also, if the user is considered as not reachable (i.e., MNRF flag is set in HSS for that user), and the UE is considered to have free available memory (i.e., MCEF flag is not set in HSS for that user), the HSS shall send a MAP-Alert-Service-Centre message or S6c-Alert-Service-Centre-Request to the SMS-IWMSC (see 3GPP TS 29.338 [48]).

If the HSS supports the "SMS in SGSN" feature as described in 3GPP TS 23.060 [12], clause 5.3.18 and receives the indication from the SGSN that it supports "SMS in SGSN" feature, and SMS-Register-Request AVP and/or the SMS-Only-Indication flag in the ULR-Flags AVP if indicated from the UE, and the PS subscriber data allow for SMS services (e.g. the subscription information indicates "PS and SMS-Only"), the HSS shall determine if SMS can be provided via the SGSN as described in 3GPP TS 23.060 [12]. If "SMS in SGSN" is accepted the HSS shall indicate in the ULA that "SMS in SGSN" is allowed to the SGSN and shall handle MT SMS as described in 3GPP TS 23.060 [12], clause 5.3.18. If the HSS supports the "Gdd-in-SGSN" feature and receives the indication from the SGSN that it supports the "Gdd-in-SGSN" feature, the HSS shall store the information that the SGSN supports the Gdd interface. Also, if the user is considered as not reachable (i.e., MNRG flag is set in HSS for that user), and the UE is considered to have free available memory (i.e., MCEF flag is not set in HSS for that user), the HSS shall send a MAP-Alert-Service-Centre message or S6c-Alert-Service-Centre-Request to the SMS-IWMSC (see 3GPP TS 29.338 [48]).

The HSS may use the indication received in the Node-Type-Indicator for future use in the subscriber data update procedures.

Subscriber-Status AVP shall be present in the Subscription-Data AVP when sent within a ULA. If the value "OPERATOR\_DETERMINED\_BARRING" is sent, the Operator-Determined-Barring AVP or HPLMN-ODB AVP shall also be present in the Subscription-Data AVP, or vice versa.

Access-Restriction-Data AVP shall be present within the Subscription-Data AVP sent within a ULA if at least one of the defined restrictions applies.

The AMBR AVP shall be present in the Subscription-Data AVP when the APN-Configuration-Profile AVP is sent within a ULA (as part of the Subscription-Data AVP) and may be present in the Subscription-Data AVP when the GPRS-Subscription-Data AVP is present.

The EPS-Subscribed-QoS-Profile AVP and the AMBR AVP shall be present in the APN-Configuration AVP when the APN-Configuration AVP is sent in the APN-Configuration-Profile AVP and when the APN-Configuration-Profile AVP is sent within a ULA (as part of the Subscription-Data AVP).

For those APNs that have been authorized as a consequence of having the Wildcard APN in the user subscription, the HSS shall include the specific APN name and associated PDN-GW identity inside the APN context of the Wildcard APN. This indicates to the MME that the particular APN shall not be cached in the MME and it shall be deleted when the UE session is terminated.

If a Result Code of DIAMETER\_SUCCESS is returned, the HSS shall set the Separation Indication in the response.

If the HSS receives an indication in the ULR command about the homogeneous support of IMS Voice over PS Sessions in all TA/RAs associated to a serving node, it may use this information in the future in order to skip the T-ADS data retrieval, as described in clause 5.2.2.1 (IDR/IDA commands).

Subscribed-VSRVCC AVP shall be present within the Subscription-Data AVP sent within a ULA only if the user is subscribed to the SRVCC and vSRVCC.

If the UE is allowed to use Proximity-based Services in the visited PLMN, the HSS shall include ProSe-Subscription-Data AVP within the Subscription-Data AVP sent within a ULA.

If the HSS receives the SGs MME identity and if the HSS supports this information element, the HSS shall store it for use with VLR restoration.

If the HSS receives Update Location Request over both the S6a and S6d interfaces, then based on the following conditions the HSS concludes if the UE is served by the MME and SGSN parts of the same combined MME/SGSN:

- if both the messages contain the same SGSN number; or

- if the Diameter identity received over S6a matches with the Diameter identity received over S6d; or

- if the Coupled-Node-Diameter-ID AVP received over S6a interface matches with the Diameter identity received within Origin-Host AVP over S6d interface OR if the Coupled-Node-Diameter-ID AVP received over S6d interface matches with the Diameter identity received within Origin-Host AVP over S6a interface.

If the HSS supports the handling of access restrictions for adjacent PLMNs, and it receives a list of adjacent PLMNs from the MME/SGSN, the HSS may send the associated Access Restriction Data, according to local operator policies, in the Adjacent-Access-Restriction-Data AVP, so the MME/SGSN can use this information to allow, or prevent, inter-RAT inter-PLMN handovers towards any of the PLMNs indicated by the HSS. The HSS shall not include in the list of Adjacent-Access-Restriction-Data the PLMN-ID, and its access restrictions, of the current PLMN where the MME/SGSN is located, since this information is already conveyed in the Access-Restriction-Data AVP inside the Subscription-Data AVP.

If the HSS supports Monitoring events and receives a Supported-Services AVP it shall only trigger those services which are supported by the MME/SGSN.

If the HSS has previously received over SWx (see 3GPP TS 29.273 [59]) the identity of the PDN-GW to be used for the establishment of emergency PDN connections, it shall include it as part of the Subscription-Data AVP (in the Emergeny-Info AVP), in the Update Location response to the MME.

If the UE is allowed to use V2X service in the visited PLMN and the MME supports V2X service, the HSS shall include V2X-Subscription-Data AVP into Subscription-Data AVP within the ULA command.

If the MME/SGSN supports the "External-Identifier" feature, the HSS shall include the External-Identifier associated with Monitoring Event Configuration in the External-Identifier AVP if populated in the subscription. When multiple External Identifiers are defined for a same subscription, the HSS shall send a default External Identifier in the External-Identifier AVP of the Subscription-Data AVP and shall include a specific External Identifier (if different from the default External Identifier) associated to each Monitoring Event Configuration in the External-Identifier AVP of each Monitoring-Event-Configuration AVP occurrence inside the Subscription-Data AVP.

The Aerial-UE-Subscription-Information AVP shall be present within the Subscription-Data AVP sent within a ULA only if the user has Aerial UE subscription information.

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

### 7.3.7 ULR-Flags

The ULR-Flags AVP is of type Unsigned32 and it shall contain a bit mask. The meaning of the bits shall be as defined in table 7.3.7/1:

Table 7.3.7/1: ULR-Flags

|  |  |  |
| --- | --- | --- |
| Bit | Name | Description |
| 0 | Single-Registration-Indication | This bit, when set, indicates that the HSS shall send Cancel Location to the SGSN. An SGSN shall not set this bit when sending ULR. |
| 1 | S6a/S6d-Indicator | This bit, when set, indicates that the ULR message is sent on the S6a interface, i.e. the source node is an MME (or a combined MME/SGSN to which the UE is attached via E-UTRAN).  This bit, when cleared, indicates that the ULR message is sent on the S6d interface, i.e. the source node is an SGSN (or a combined MME/SGSN to which the UE is attached via UTRAN or GERAN). |
| 2 | Skip Subscriber Data | This bit, when set, indicates that the HSS may skip subscription data in ULA. If the subscription data has changed in the HSS after the last successful update of the MME/SGSN, the HSS shall ignore this bit and send the updated subscription data. If the HSS effectively skips the sending of subscription data, the GPRS-Subscription-Data-Indicator flag can be ignored. |
| 3 | GPRS-Subscription-Data-Indicator | This bit, when set, indicates that the HSS shall include in the ULA command the GPRS subscription data, if available in the HSS; it shall be included in the GPRS-Subscription-Data AVP inside the Subscription-Data AVP (see 7.3.2).  Otherwise, the HSS shall not include the GPRS-Subscription-Data AVP in the response, unless the Update Location Request is received over the S6d interface and there is no APN configuration profile stored for the subscriber, or when the subscription data is returned by a Pre-Rel-8 HSS (via an IWF).  A standalone MME shall not set this bit when sending a ULR. |
| 4 | Node-Type-Indicator | This bit, when set, indicates that the requesting node is a combined MME/SGSN.  This bit, when cleared, indicates that the requesting node is a single MME or SGSN; in this case, if the S6a/S6d-Indicator is set, the HSS may skip the check of those supported features only applicable to the SGSN, and if, in addition the MME does not request to be registered for SMS, the HSS may consequently skip the download of the SMS related subscription data to a standalone MME. NOTE2 |
| 5 | Initial-Attach-Indicator | This bit, when set, indicates that the HSS shall send Cancel Location to the MME or SGSN if there is the MME or SGSN registration. |
| 6 | PS-LCS-Not-Supported-By-UE | This bit, when set, indicates to the HSS that the UE does not support neither UE Based nor UE Assisted positioning methods for Packet Switched Location Services. The MME shall set this bit on the basis of the UE capability information. The SGSN shall set this bit on the basis of the UE capability information and the access technology supported by the SGSN. |
| 7 | SMS-Only-Indication | This bit, when set, indicates that the UE indicated "SMS only" when requesting a combined IMSI attach or combined RA/LU. |
| 8 | Dual-Registration-5G-Indicator | This bit, when set by an MME over S6a interface, indicates that the HSS+UDM shall not send Nudm\_UECM\_DeregistrationNotification to the registered AMF (if any); when not set by an MME over S6a interface, it indicates that the HSS+UDM shall send Nudm\_UECM\_DeregistrationNotification to the registered AMF (if any). See 3GPP TS 29.503 [66].  An SGSN shall not set this bit when sending ULR over S6d interface. |
| X | Inter-PLMN-inter-MME handover | This bit, when set by an MME over S6a interface, indicates that an inter PLMN inter MME (or AMF to MME) handover is ongoing. |
| Y | Intra-PLMN-inter-MME handover | This bit, when set by an MME over S6a interface, indicates that an intra PLMN inter MME (or AMF to MME) handover is ongoing. |

\* \* \* End of Changes \* \* \* \*