**3GPP TSG-CT WG1 Meeting #133-eC1-21xxxx**

**E-meeting, 11-19 November 2021 (was C1-216752)**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **23.122** | **CR** | **0788** | **rev** | **3** | **Current version:** | **17.4.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:***  | Update of UE provisioning information for disaster roaming |
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| ***Source to WG:*** | Qualcomm Incorporated, Huawei, HiSilicon, Samsung |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | MINT |  | ***Date:*** | 2021-11-15 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)...Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | 1. At SA2#146-e, SA2 agreed CR 3019 to TS 23.501 (S2-2106659) and CR 2990 to TS 23.502 (S2-2106660) on MINT. The CRs were approved at SA Plenary #93-e. They contain the following difference with what CT1 agreed at CT1#131-e in CR 0742 to TS 23.122 (C1-215186, approved at CT Plenary #93-e):
* Per the SA2 agreements, the HPLMN provides a “list of PLMN(s) to be used in disaster condition” while the VPLMN provides a “list of PLMN(s) to be used in disaster condition in the roamed to country”, whereas in the text added in TS 23.122, there is only onw list
* Per the SA2 agreements, the “list of PLMN(s) to be used in disaster condition in the roamed to country” provided by a VPLMN shall not alter the list provided by HPLMN, whereas the text added in TS 23.122 only mentions one list which can be updated by either the HPLMN or the VPLMN
* Per the SA2 agreements, the “list of PLMN(s) to be used in disaster condition in the roamed to country” provided by a VPLMN is only used in the country of the VPLMN, whereas there is no such restriction in the text added in TS 23.122

TS 23.122 needs to be updated to align with the SA2 agreements.1. At CT1#131-e, it was initially proposed to have 2 wait ranges, one disaster roaming wait range (for registration on the PLMN offering disaster roaming) and one disaster return wait range (for registration on the PLMN previously with disaster condition). During the meeting, for simplicity it was decided to have only a single range applicable to both cases.

However, the number of UEs registering in both cases can be quite different: if for instance disaster inbound roamers are distributed into 3 PLMNs for disaster roaming, the number of UEs registering on each PLMN will be about 1/3 of the subscribers from the PLMN with disaster condition, whereas when the disaster condition ends, all UEs will return to the same PLMN, thus the wait time for the return should be longer.Therefore it can be benefical to have 2 ranges. It is thus proposed to revert to having 2 separate ranges. |
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| ***Summary of change:*** | 1. The text in TS 23.122 was aligned with the SA2 agreements
2. 2 separate wait ranges (disaster roaming wait range and disaster return wait range) were introduced rather than a single wait range
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| ***Consequences if not approved:*** | 1. TS 23.122 will remain misaligned with SA2’s agreements
2. The UEs registering on a PLMN for disaster roaming might wait longer than necessary before being allowed to register, thereby causing service interruption
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| ***Clauses affected:*** | 3.10, 4.4.3.1.1 |
|  |  |
|  | **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:*** |  |
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| ***This CR's revision history:*** | Revision 2 (CT1#133-e):* + Introduced possibility for VPLMN to provide “list of PLMN(s) to be used in disaster condition”
	+ Added requirement on the UE to store received “list of PLMN(s) to be used in disaster condition” along with the PLMN ID of the PLMN which provided it
	+ If a disaster condition occurs, the UE uses the “list of PLMN(s) to be used in disaster condition” provided by the RPLMN or the PLMN which the UE intended to select, if available, otherwise the UE uses the “list of PLMN(s) to be used in disaster condition” provided by the HLMN
	+ Disaster roaming is enabled/disabled via a flag sent to the UE via SOR by the HPLMN, not by providing an non-empty “list of PLMN(s) to be used in disaster condition”
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\*\*\* First change \*\*\*

## 3.10 Minimization of service interruption

The MS may support Minimization of service interruption (MINT).

MINT is not applicable in SNPNs.

If the MS supports MINT, the MS can be provisioned by the network with:

a) an indication of whether disaster roaming is enabled at the UE, provided by the HPLMN;

b) a "list of PLMN(s) to be used in disaster condition" provided by the HPLMN, consisting of zero or more entries, each containing a PLMN ID. The PLMNs are listed in order of decreasing priority, with the first PLMN being the highest priority PLMN;

c) one or more "lists of PLMN(s) to be used in disaster condition" provided by a VPLMN, consisting of zero or more entries, each containing a PLMN ID. The PLMNs are listed in order of decreasing priority, with the first PLMN being the highest priority PLMN;

d) a disaster roaming wait range consisting of a minimum wait time and a maximum wait time; and

e) a disaster return wait range consisting of a minimum wait time and a maximum wait time.

Editor's note (WI MINT, CR#0742): It is FFS whether the HPLMN can control whether the UE uses the "lists of PLMN(s) to be used in disaster condition" provided by VPLMNs.

The indication of whether disaster roaming is enabled at the UE, the disaster roaming wait range and the disaster return wait range provisioned by the network are stored in the non-volatile memory of the ME, as specified in 3GPP TS 24.501 [64] annex C.

In addition, the MS can also be pre-configured with an indication of whether disaster roaming is enabled at the UE, a disaster roaming wait range and a disaster return wait range stored in the USIM (see 3GPP TS 31.102 [40]).

Editor's note (WI MINT, CR#0742): The encoding of the indication of whether disaster roaming is enabled at the UE, of the disaster roaming wait range and of the disaster return wait range in the USIM needs to be specified by CT6.

3GPP TS 24.501 [64] annex C specifies the conditions under which the indication of whether disaster roaming is enabled at the UE, the one or more "lists of PLMN(s) to be used in disaster condition", the disaster roaming wait range and the disaster return wait range stored in the ME are deleted. Additionally:

a) when a USIM is inserted:

1) if:

i) no indication of whether disaster roaming is enabled at the UE is stored in the non-volatile memory of the ME; or

ii) the SUPI from the USIM does not match the SUPI stored together with the indication of whether disaster roaming is enabled at the UE in the non-volatile memory of the ME;

 and the MS has an indication of whether disaster roaming is enabled at the UE stored in the USIM (see 3GPP TS 31.102 [22]), the MS shall store the indication of whether disaster roaming is enabled at the UE from the USIM into the ME, as specified in 3GPP TS 24.501 [64] annex C;

2) if:

i) no disaster roaming wait range is stored in the non-volatile memory of the ME; or

ii) the SUPI from the USIM does not match the SUPI stored together with the disaster roaming wait range in the non-volatile memory of the ME;

 and the MS has a disaster roaming wait range stored in the USIM (see 3GPP TS 31.102 [22]), the MS shall store the disaster roaming wait range from the USIM into the ME, as specified in 3GPP TS 24.501 [64] annex C; and

3) if:

i) no disaster return wait range is stored in the non-volatile memory of the ME; or

ii) the SUPI from the USIM does not match the SUPI stored together with the disaster return wait range in the non-volatile memory of the ME;

 and the MS has a disaster return wait range stored in the USIM (see 3GPP TS 31.102 [22]), the MS shall store the disaster return wait range from the USIM into the ME, as specified in 3GPP TS 24.501 [64] annex C; and

b) when the ME receives a USAT REFRESH command indicating that:

1) the indication of whether disaster roaming is enabled at the UE stored in the USIM has been updated, the MS shall store the indication of whether disaster roaming is enabled at the UE from the USIM into the ME, as specified in 3GPP TS 24.501 [64] annex C;

2) the disaster roaming wait range stored in the USIM has been updated, the MS shall store the disaster roaming wait range from the USIM into the ME, as specified in 3GPP TS 24.501 [64] annex C; or

3) the disaster return wait range stored in the USIM has been updated, the MS shall store the disaster return wait range from the USIM into the ME, as specified in 3GPP TS 24.501 [64] annex C.

NOTE 1: The MS ignores the indication of whether disaster roaming is enabled at the UE stored in the USIM except when the USIM is inserted or when the ME receives a USAT REFRESH command indicating that the indication of whether disaster roaming is enabled at the UE stored in the USIM has been updated.

NOTE 2: The MS ignores the disaster roaming wait range stored in the USIM except when the USIM is inserted or when the ME receives a USAT REFRESH command indicating that the disaster roaming wait range stored in the USIM has been updated.

NOTE 3: The MS ignores the disaster return wait range stored in the USIM except when the USIM is inserted or when the ME receives a USAT REFRESH command indicating that the disaster return wait range stored in the USIM has been updated.

If the MS does not have an indication of whether disaster roaming is enabled at the UE stored in the ME, or the indication of whether disaster roaming is enabled at the UE stored in the ME is set to "Disaster roaming is disabled at the UE", disaster roaming is disabled at the MS. In this case, the MS shall not perform disaster roaming.

Upon selecting a PLMN for disaster roaming, if there is a disaster roaming wait range stored in the ME, the MS shall generate a random number within the disaster roaming wait range and start a timer set to the generated random number. While the timer is running, the MS shall not initiate registration. Upon expiration of the timer, the MS may initiate registration, if still camped on the selected PLMN.

Upon determining that a disaster condition has ended and selecting the PLMN previously with disaster condition, if there is a disaster return wait range stored in the ME, the MS shall generate a random number within the disaster return wait range and start a timer set to the generated random number. While the timer is running, the MS shall not initiate registration. Upon expiration of the timer, the MS may initiate registration, if still camped on the selected PLMN.

\*\*\* Next change \*\*\*

##### 4.4.3.1.1 Automatic Network Selection Mode Procedure

The MS selects and attempts registration on other PLMN/access technology combinations, if available and, for bullets i, ii, iii, iv, v, allowable, in the following order:

i) either the HPLMN (if the EHPLMN list is not present or is empty) or the highest priority EHPLMN that is available (if the EHPLMN list is present) ;

ii) each PLMN/access technology combination in the "User Controlled PLMN Selector with Access Technology" data file in the SIM (in priority order);

iii) each PLMN/access technology combination in the "Operator Controlled PLMN Selector with Access Technology" data file in the SIM (in priority order) or stored in the ME (in priority order);

iv) other PLMN/access technology combinations with received high quality signal in random order;

NOTE 1: High quality signal is defined in the appropriate AS specification.

v) other PLMN/access technology combinations in order of decreasing signal quality.

vi) PLMN/NG-RAN combinations for any forbidden PLMNs match the below conditions:

- each PLMN in the "list of PLMN(s) to be used in disaster condition" stored in the UE which is associated with the PLMN ID of the determined PLMN with disaster condition, if any, ordered based on the "list of PLMN(s) to be used in disaster condition" associated with the PLMN ID of the determined PLMN with disaster condition; otherwise

- if the UE does not have a stored "list of PLMN(s) to be used in disaster condition" associated with the PLMN ID of the determined PLMN with disaster condition, any PLMN in the "list of PLMN(s) to be used in disaster condition" stored in the ME which is associated with the PLMN ID of the HPLMN, if any, ordered based on the "list of PLMN(s) to be used in disaster condition" associated with the PLMN ID of HPLMN stored in the ME.

vii) PLMN/NG-RAN combinations for other forbidden PLMNs, in random order.

When following the above procedure the following requirements apply:

a) An MS with voice capability shall ignore PLMNs for which the MS has identified at least one GSM COMPACT.

b) In A/Gb mode or GSM COMPACT, an MS with voice capability, or an MS not supporting packet services shall not search for CPBCCH carriers.

c) In ii and iii, the MS should limit its search for the PLMN to the access technology or access technologies associated with the PLMN in the appropriate PLMN Selector with Access Technology list (User Controlled or Operator Controlled selector list).

 An MS using a SIM without access technology information storage (i.e. the "User Controlled PLMN Selector with Access Technology" and the "Operator Controlled PLMN Selector with Access Technology" data files are not present) shall instead use the "PLMN Selector" data file, for each PLMN in the "PLMN Selector" data file, the MS shall search for all access technologies it is capable of. The priority ordering amongst the access technologies is implementation dependent.

d) In iv, v, vi and vii, the MS shall search for all access technologies it is capable of, before deciding which PLMN to select.

e) In ii, and iii, a packet only MS which supports GSM COMPACT, but using a SIM without access technology information storage (i.e. the "User Controlled PLMN Selector with Access Technology" and the "Operator Controlled PLMN Selector with Access Technology" data files are not present) shall instead use the "PLMN Selector" data file, for each PLMN in the "PLMN Selector" data file, the MS shall search for all access technologies it is capable of and shall assume GSM COMPACT access technology as the lowest priority radio access technology.

f) In i, the MS shall search for all access technologies it is capable of. No priority is defined for the preferred access technology and the priority is an implementation issue, but "HPLMN Selector with Access Technology" data file on the SIM may be used to optimise the procedure.

g) In i, an MS using a SIM without access technology information storage (i.e. the "HPLMN Selector with Access Technology" data file is not present) shall search for all access technologies it is capable of. The priority ordering amongst the access technologies is implementation dependent. A packet only MS which supports GSM COMPACT using a SIM without access technology information storage shall also assume GSM COMPACT access technology as the lowest priority radio access technology.

NOTE 2: For f) and g), the MS in automatic network selection mode can end the PLMN search procedure once the HPLMN or the highest priority EHPLMN is found on an access technology.

NOTE 3: For i, ii and iii, the MS can use location information to determine which PLMNs can be available in its present location.

h) In v, the MS shall order the PLMN/access technology combinations in order of decreasing signal quality within each access technology. The order between PLMN/access technology combinations with different access technologies is an MS implementation issue.

NOTE 4: Requirements a) and b) apply also to requirement d), so a GSM voice capable MS should not search for GSM COMPACT PLMNs, even if capable of GSM COMPACT.

NOTE 5: Requirements a) and b) apply also to requirement f), so a GSM voice capable MS should not search for GSM COMPACT PLMNs, even if this is the only access technology on the "HPLMN Selector with Access Technology" data file on the SIM.

i) In i to vii, the MS shall not consider PLMNs where voice service was not possible as PLMN selection candidate, unless such PLMN is available in GERAN or UTRAN or no other allowed PLMN is available.

j) In i to v, if the MS only supports EMM-REGISTERED without PDN connection (see 3GPP TS 24.301 [23A]), the MS shall not consider PLMNs which do not advertise support of EMM-REGISTERED without PDN connection.

k) In i to v, if the MS only supports control plane CIoT EPS optimization (see 3GPP TS 24.301 [23A]) and the MS camps on a E-UTRA cell which is not NB-IoT cell (see 3GPP TS 36.304 [43], 3GPP TS 36.331 [42]), the MS shall not consider PLMNs which do not advertise support of EPS services with control plane CIoT EPS optimization.

l) In i to vii, if the MS is in eCall only mode, the MS shall not consider PLMNs which do not advertise support for eCall over IMS, unless such PLMNs are available in GERAN or UTRAN.

NOTE 6: As an implementation option, an MS in eCall only mode that was not able to select any PLMN according to l) can perform a second iteration of i to v with no restriction.

m) In i to vii, if the MS supports CAG and:

1) is provisioned with a non-empty "CAG information list", the MS shall consider a PLMN indicated by an NG-RAN cell only if:

A) the cell is a CAG cell and broadcasts a CAG-ID for the PLMN such that there exists an entry with the PLMN ID of the PLMN in the "CAG information list" and the CAG-ID is included in the "Allowed CAG list" of the entry; or

B) the cell is not a CAG cell and:

- there is no entry with the PLMN ID of the PLMN in the "CAG information list"; or

- there exists an entry with the PLMN ID of the PLMN in the "CAG information list" but the "indication that the MS is only allowed to access 5GS via CAG cells" is not included in the entry; or

2) is provisioned with an empty "CAG information list" or is not provisioned with a "CAG information list", the MS shall consider a PLMN indicated by an NG-RAN cell only if the cell is not a CAG cell.

n) In i to vii, if the MS only supports control plane CIoT 5GS optimization (see 3GPP TS 23.501 [62]) and the MS camps on an E-UTRA cell connected to 5GCN, which is not NB-IoT cell (see 3GPP TS 36.304 [43], 3GPP TS 36.331 [42]), the MS shall not consider PLMNs which do not advertise support of 5GS services with control plane CIoT 5GS optimization.

o) In i to vii, if the MS supports CIoT 5GS optimizations, the MS shall not consider the PLMN/access technology combinations for which the MS preferred CIoT network behaviour is not advertised as supported by the PLMN/access technology combination (see 3GPP TS 24.501 [64]).

NOTE 7: As an implementation option, the MS supporting CIoT 5GS optimizations that was not able to select any PLMN according to o) can perform a second iteration of i to v with no restriction.

p) In iii, the MS shall use the PLMN/access technology combination in the "Operator Controlled PLMN Selector with Access Technology" stored in the ME, if the last received steering of roaming information contains the "list of preferred PLMN/access technology combinations"(see annex C) and is stored in the ME. Otherwise, the MS shall use the "Operator Controlled PLMN Selector with Access Technology" list retrieved from the SIM.

q) for vi and vii, the UE shall determine the PLMN with disaster condition as follows:

i) if the MS's RPLMN is included in any "list of one or more PLMN(s) with disaster condition for which disaster roaming is offered by the available PLMN" broadcast by any NG-RAN cell, the MS shall consider that the MS's RPLMN is the PLMN with disaster condition; or

ii) if the MS's RPLMN is not included in any "list of one or more PLMN(s) with disaster condition for which disaster roaming is offered by the available PLMN" broadcast by any NG-RAN cell, the MS shall determine the PLMN with disaster condition from PLMNs:

- in the "list of one or more PLMN(s) with disaster condition for which disaster roaming is offered by the available PLMN" broadcast by any NG-RAN cell; and

- which are allowable;

 in the following order:

- either the HPLMN (if the EHPLMN list is not present or is empty) or the highest priority EHPLMN that is available (if the EHPLMN list is present);

- each PLMN in the "User Controlled PLMN Selector with Access Technology" data file in the SIM (in priority order);

- each PLMN in the "Operator Controlled PLMN Selector with Access Technology" data file in the SIM (in priority order) or stored in the ME (in priority order); and

- other PLMNs.

r) The MS shall perform vi and vii to select a PLMN for disaster roaming only if:

1) the MS supports MINT;

2) the indication of whether disaster roaming is enabled at the UE stored in the ME is set to "Disaster roaming is enabled at the UE";

3) there is no available PLMN which is allowable;

4) the MS is not registered via non-3GPP access connected to 5GCN; and

5) an NG-RAN cell of the PLMN:

A) broadcasts the disaster related indication; or

The MS determines PLMN with disaster condition as follows:

i) In vi, the UE shall determine the PLMN with disaster condition in the order of RPLMN followed by the PLMNs in the bullet i, ii, iii, iv and v. In vi, if forbidden PLMN/NG-RAN combination is available and is part of "list of PLMN(s) to be used in disaster condition" stored in the UE which is associated with the PLMN ID of the determined PLMN with disaster condition, then the PLMN with disaster condition is determined PLMN with disaster condition;

Editor's note: (WI:MINT, CR#0788) For vii, how does the UE determine PLMN with disaster condition is FFS.

Editor's note: (WI:MINT, CR#0734) it is FFS whether the disaster related indication indicates (a) solely that the available PLMN is accessible for disaster inbound roamers or (b) that the available PLMN is accessible for disaster inbound roamers and all other PLMNs have disaster condition.

B) broadcasts a "list of one or more PLMN(s) with disaster condition for which disaster roaming is offered by the available PLMN" including the determined PLMN with disaster condition

If successful registration is achieved, the MS indicates the selected PLMN.

If registration cannot be achieved because no PLMNs are available and allowable, and the MS does not support access to RLOS, the MS indicates "no service" to the user, waits until a new PLMN is available and allowable and then repeats the procedure.

If there were one or more PLMNs which were available and allowable, but an LR failure made registration on those PLMNs unsuccessful or an entry in any of the lists "forbidden location areas for roaming", "forbidden tracking areas for roaming", "5GS forbidden tracking areas for roaming", "forbidden location areas for regional provision of service", "forbidden tracking areas for regional provision of service", "5GS forbidden tracking areas for regional provision of service", or "CAG information list" prevented a registration attempt, the MS selects the first such PLMN again and enters a limited service state.

If:

- the MS supports access to RLOS;

- either the UICC containing the USIM is not present in the MS, or the UICC containing the USIM is present in the MS and the MCC part of the IMSI in the USIM is present in the RLOS allowed MCC list configured in the USIM (see 3GPP TS 31.102 [40]) or in the ME (see 3GPP TS 24.368 [50]);

- one or more PLMNs offering access to RLOS has been found;

- registration cannot be achieved on any PLMN; and

- the MS is in limited service state,

the MS shall select a PLMN offering access to RLOS as follows:

a) if at least one preferred PLMN exists based on the RLOS preferred PLMN list configured in the USIM (see 3GPP TS 31.102 [40]) or in the ME (see 3GPP TS 24.368 [50]) and the MCC part of the preferred PLMN ID is present in the RLOS allowed MCC list configured in the USIM (see 3GPP TS 31.102 [40]) or in the ME (see 3GPP TS 24.368 [50]), the MS shall select the preferred PLMN offering access to RLOS and indicate the selected preferred PLMN for access to RLOS; and

b) if none of the preferred PLMNs for access to RLOS is available, the MS shall evaluate the remaining PLMNs offering access to RLOS that are not in the RLOS preferred PLMN list. If the MCC part of a PLMN ID is present in the RLOS allowed MCC list configured in the USIM (see 3GPP TS 31.102 [40]) or in the ME (see 3GPP TS 24.368 [50]), the MS shall select this PLMN and indicate the selected PLMN for access to RLOS.

If registration cannot be achieved because no PLMNs are available and allowable, and if no PLMN offering access to RLOS has been found, or none of the PLMNs offering access to RLOS is allowed to be accessed according to the RLOS allowed MCC list configured in the USIM (see 3GPP TS 31.102 [40]) or in the ME (see 3GPP TS 24.368 [50]), or the MS does not support access to RLOS, the MS indicates "no service" to the user, waits until a new PLMN is available and then repeats the procedure.

\*\*\* End of changes \*\*\*