**3GPP TSG-CT WG1 Meeting #125-eC1-205xxx**

**Electronic meeting, 20-28 August 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **23.041** | **CR** | **0220** | **rev** | **3** | **Current version:** | **16.4.0** |  |
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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:***  | Geo-fencing check for no stored "warning message" matched |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon, one2many |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | TEI17 |  | ***Date:*** | 2020-07-31 |
|  |  |  |  |  |
| ***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 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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | Geo-fencing of CMAS messages was introduced since R15 (by CR C1-191586 under TEI15). The geo-fencing was performed as following:"  *If the "warning message" is a geo-fencing trigger message (see subclause 9.4.1.2.2), the UE shall, for each "warning message" stored at the UE in the list of "warning messages" to be checked for geo-fencing:**- compare the Serial Number and Message Identifier combination of the stored "warning message" to the list of Serial Number and Message Identifier combinations included in the Warning Message Content IE (CB Data) of the geo-fencing trigger message and encoded as specified in ATIS-0700041 [47]; and**- if:**1) the Serial Number and Message Identifier combination of the stored "warning message" matches one of the Serial Number and Message Identifier combinations included in the geo-fencing trigger message; and**2) the UE:**a) is able to determine its location and determines it is inside the Warning Area Coordinates of the stored "warning message"; or**b) is unable to determine its location,* *indicate the contents of the stored "warning message" to the user and remove the "warning message" from the list of "warning messages" to be checked for geo-fencing.*"One can see it includes two steps involving different UE handling:Step 1 (yellow text): UE performs the matching between the SN+MID of stored "warning message" and the SN+MID of received geo-fencing trigger message;Step 2 (green text): UE performs the geo-fencing check, i.e. whether the UE is inside the geo-fencing or not.The above existing handling only covers the case that at least one of Serial Number and Message Identifier combination of the stored "warning message" matches one of the Serial Number and Message Identifier combinations included in the geo-fencing trigger message.However, it could happen that all Serial Number and Message Identifier combination of the stored "warning message" cannot match one of the Serial Number and Message Identifier combinations included in the geo-fencing trigger message. Typically this includes following two cases:1. There is no stored "warning message" at the UE for geo-fencing check, i.e. the list of "warning messages" to be checked for geo-fencing is empty.
2. The list of "warning messages" to be checked for geo-fencing is NOT empty but all them are not triggered by the geo-fencing trigger message.

In above case (1), actually the UE needs not to check any match and hence the received geo-fencing trigger message can be directly discarded. In above case (2), the UE needs to go through the whole stored list of "warning messages" for geo-fencing match. In this case, the received geo-fencing trigger message can be finally discarded as well. |
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| ***Summary of change:*** | It proposes that in case of the stored list of "warning messages" is empty or the stored list of "warning messages" is not empty but all Serial Number and Message Identifier combination of the stored "warning message" cannot match one of the Serial Number and Message Identifier combinations included in the geo-fencing trigger message, the received geo-fencing trigger message needs to be discarded. |
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| ***Consequences if not approved:*** | In case of the stored list of "warning messages" is empty or the stored list of "warning messages" is not empty but all Serial Number and Message Identifier combination of the stored "warning message" cannot match one of the Serial Number and Message Identifier combinations included in the geo-fencing trigger message, it is unclear for the UE to further handle the received geo-fencing trigger message. |
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| ***Clauses affected:*** | 9.1.3.4.2, 9.1.3.5.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Rev #1 was postponed in the last CT1#124e meeting.Rev #2 updated the UE handling and the cover page, e.g. changed to TEI17. |

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

##### 9.1.3.4.2 Warning Message Delivery Procedure

The warning message to be broadcast is delivered via MMEs to multiple eNodeBs. The eNodeB(s) are responsible for scheduling the broadcast of the new message and the repetitions in each cell.

The overall warning message delivery procedure is presented in figure 9.1.3.4.2-1:



Figure 9.1.3.4.2-1: Warning message delivery procedure in E-UTRAN

0. Network registration and security (e.g. mutual authentication) procedures are performed.

NOTE 1: This step is performed each time a UE is attached to a network (e.g. after each power on).

1. CBE (e.g. Information Source such as PSAP or Regulator) sends emergency information (e.g. "warning type", "warning message", "impacted area", "time period") to the CBC. The CBC shall authenticate this request.

NOTE 2: A warning message can include a language-independent content mapped to an event or a disaster that is compatible with texts used to describe user information contained in the content of a CBS-Message-Information-Page transparently passed from CBC to UEs if the ePWS language-independent content functionality (see subclause 8.3) is supported by CBE.

2. Using the "impacted area" information, the CBC identifies which MMEs need to be contacted and determines the information to be place into the Warning Area List Information Element. The CBC sends a Write-Replace Warning Request message containing the warning message to be broadcast and the delivery attributes (Message identifier, Serial Number, list of TAIs, Warning Area List, OMC ID, CWM Indicator, Send Write-Replace-Warning-Indication, Global eNB ID, Warning Area Coordinates) to MMEs.

 The warning messages use the coding scheme for CBS data specified in 3GPP TS 23.038 [3].

 The list of TAIs is only used by the MME. The MME uses it for selecting which eNodeBs to forward the Write-Replace Warning Request message to.

 If the Write-Replace Warning Request message is sent to reload cells served by an eNodeB, for which the CBC has previously received a Restart Indication (see subclause 15A.1 of TS 23.007 [38]), the CBC shall include the Global eNB ID IE with the identity of this eNodeB in the Write-Replace Warning Request message.

 The Warning Area List shall be a list of Cell IDs or a list of TAIs or one or more Emergency Area IDs. The Warning Area List is only used by the eNodeB. The eNodeB is configured with the TAI(s) and Cell ID(s) it serves and the Emergency Area ID(s) that it belongs to. The eNodeB checks for any match of the contents of the Warning Area List with these IDs to identify the cells where to distribute the warning message. The Warning Area List is an optional information element. If the Warning Area is absent, it shall be interpreted as "all cells on the eNodeB". The number of cell IDs will be limited by the message size on SBc and S1-MME. An Emergency Area ID is unique within the PLMN.

 The message may include an OMC ID. If present, it indicates the OMC to which the Trace record generated in step 9 is destined. Co-location of that OMC with the CBC is an operator option.

 CBC shall set the Concurrent Warning Message (CWM) indicator in all Write-Replace Warning Request messages, if the PLMN supports concurrent warning message broadcasts.

 The CBC shall not include the "digital signature" or "timestamp" information.

 CBC shall set the Send Write-Replace-Warning Indication element in case the MME is requested to forward the Broadcast Scheduled Area List in a Write-Replace Warning Indication for the warning message.

NOTE 3: Due to requirements in earlier versions of the specification, it is possible that "digital signature" and "timestamp" information are transmitted within the "warning message".

CBC includes the Warning Area Coordinates in the Write-Replace-Warning Request message based on operator policy.

3. The MME sends a Write-Replace Warning Confirm message that indicates to the CBC that the MME has started to distribute the warning message to eNodeBs.

 The Write-Replace Warning Confirm message may contain the *Unknown Tracking Area List* IE. The *Unknown Tracking Area List* IE identifies the Tracking Areas that are unknown to the MME and where the Request cannot be delivered.

 If this message is not received by the CBC within an appropriate time period, the CBC can attempt to deliver the warning message via another MME in the same pool area.

4. Upon reception of the Write-Replace Confirm messages from the MMEs, the CBC may confirm to the CBE that it has started to distribute the warning message.

5. The MME forwards Write-Replace Warning Message Request to eNodeBs. The MME shall use the list of TAIs to determine the eNodeBs in the delivery area. If the list of TAIs is not included and no Global eNB ID has been received from the CBC, the message is forwarded to all eNodeBs that are connected to the MME. If a Global eNB ID has been received from the CBC, the MME shall forward the message only to the eNodeB indicated by the Global eNB ID IE.

6. When S1-flex is used the eNodeB may receive same message from multiple MMEs. The eNodeB detects duplicate messages by checking the message identifier and serial number fields within the warning message. If any redundant messages are detected only the first one received will be broadcasted by the cells. The eNodeB shall use the Warning Area List information to determine the cell(s) in which the message is to be broadcast. The eNodeBs return a Distribute Warning Message Response to the MME, even if it was a duplicate.

 If there is a warning broadcast message already ongoing and the CWM Indicator is included in the Write-Replace Warning Message Request, the eNodeB does not stop existing broadcast message but start broadcasting the new message concurrently. Otherwise the eNodeB shall immediately replace the existing broadcast message with the newer one.

NOTE 4: If concurrent warning messages are not supported, this requires the CBE/CBC to take care that 'lower' priority warnings are not sent while a higher priority warning is still being sent.

 The eNodeB broadcasts the message frequently according to the attributes set by the CBC that originated the warning message distribution.

7. If the UE has been configured to receive warning messages, and the UE is configured to accept warnings on that PLMN (see 3GPP TS 31.102 [18]), then the UE proceeds as follows:

 The UE can use "warning type" values, 'earthquake', 'tsunami' or 'earthquake and tsunami', immediately to alert the user. When "warning type" is 'test', the UE silently discards the primary notification, but the UE specially designed for testing purposes may proceed with the following procedures.

 The UE activates reception of the broadcast messages containing the "warning message".

 If the Warning Area Coordinates are not present:

The UE indicates the contents of the "warning message" to the user.

 If the Warning Area Coordinates are present, and if the UE is unable to determine its location:

The UE indicates the contents of the "warning message" to the user.

 If the Warning Area Coordinates are present, and the UE determines it is inside the Warning Area Coordinates:

The UE indicates the contents of the "warning message" to the user.

 If the Warning Area Coordinates are present, and the UE determines it is outside the Warning Area Coordinates:

 The UE does not indicate the contents of the "warning message" to the user. The UE shall store the "warning message" in the list of "warning messages" to be checked for geo-fencing during a UE implementation specific time which shall not be greater than 24 hours. Upon expiration of the UE implementation specific time, the UE shall remove the stored "warning message" from the list of "warning messages" to be checked for geo-fencing.

 If the "warning message" is a geo-fencing trigger message (see subclause 9.4.1.2.2), the UE shall, for each "warning message" stored at the UE in the list of "warning messages" to be checked for geo-fencing:

- compare the Serial Number and Message Identifier combination of the stored "warning message" to the list of Serial Number and Message Identifier combinations included in the Warning Message Content IE (CB Data) of the geo-fencing trigger message and encoded as specified in ATIS-0700041 [47]; and

- if:

1) the Serial Number and Message Identifier combination of the stored "warning message" matches one of the Serial Number and Message Identifier combinations included in the geo-fencing trigger message; and

2) the UE:

a) is able to determine its location and determines it is inside the Warning Area Coordinates of the stored "warning message"; or

b) is unable to determine its location,

 indicate the contents of the stored "warning message" to the user, remove the "warning message" from the list of "warning messages" to be checked for geo-fencing and then discard the geo-fencing trigger message.

 If the "warning message" is a geo-fencing trigger message (see subclause 9.4.1.2.2) and

- there is no stored list of "warning messages" to be checked for geo-fencing; or

- none of Serial Number and Message Identifier combinations of the stored "warning message" matches any of the Serial Number and Message Identifier combinations included in the Warning Message Content IE (CB Data) of the geo-fencing trigger message,

 the UE shall discard the geo-fencing trigger message.

 If a language-independent content mapped to an event or a disaster (e.g. character such as Unicode based pictogram mapping to a disaster) is included as part of user information contained in the content of a CBS-Message-Information-Page transparently passed from CBC to UEs:

- UEs with user interface which support the ePWS language-independent content functionality (see subclause 8.3) and which are capable of displaying text-based warning messages should be capable of displaying the entire warning message that they receive.

Editor’s note [WI: ePWS, CR#203]: FFS on what character(s) such as Unicode based pictogram(s) are the language-independent content mapped to an event or a disaster.

8. If the Send Warning-Message-Indication parameter was present in the Write-Replace Warning Request and it is configured in the MME based on operator policy, the MME shall forward the Broadcast Scheduled Area Lists in a Write-Replace Warning Indication(s) to the CBC. The Broadcast Scheduled Area List shall contain the Broadcast Completed Area List the MME has received from the eNodeB. The MME may aggregate Broadcast Completed Area Lists it receives from eNodeBs.

NOTE 5: Support for sending of Write-Replace Warning Indication(s) to the CBC is optional in the MME.

9. From the Write-Replace Warning Response messages returned by eNodeB's the MME determines the success or failure of the delivery and creates a trace record. Any OMC ID received in step 2 is written to the trace record to permit the O&M system to deliver them to the desired destination.

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

9.1.3.5.2 Warning Message Delivery Procedure

The warning message to be broadcast is delivered via AMFs to multiple NG-RAN nodes. The NG-RAN node(s) are responsible for scheduling the broadcast of the new message and the repetitions in each cell.

The overall warning message delivery procedure is presented in figure 9.1.3.5.2-1:

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**Figure 9.1.3.5.2-1: Warning message delivery procedure in NG-RAN**

0. Network registration and security (e.g. mutual authentication) procedures are performed.

NOTE 1: This step is performed each time a UE is attached to a network (e.g. after each power on).

1. CBE (e.g. Information Source such as PSAP or Regulator) sends emergency information (e.g. "warning type", "warning message", "impacted area", "time period") to the CBC. The CBCF shall authenticate this request.

NOTE 2: A warning message can include a language-independent content mapped to an event or a disaster that is compatible with texts used to describe user information contained in the content of a CBS-Message-Information-Page transparently passed from CBC to UEs if the ePWS language-independent content functionality (see subclause 8.3) is supported by CBE.

2. Using the "impacted area" information, the CBCF identifies which AMFs need to be contacted and determines the information to be placed into the Warning Area List NG-RAN Information Element. The CBCF sends a Write-Replace Warning Request NG-RAN message containing the warning message to be broadcast and the delivery attributes (Message Identifier, Serial Number, list of NG-RAN TAIs, Warning Area List NG-RAN, OMC ID, CWM Indicator, Send Write-Replace-Warning-Indication, Global RAN Node ID, Warning Area Coordinates) to AMFs.

 The warning messages use the coding scheme for CBS data specified in 3GPP TS 23.038 [3].

 The list of NG-RAN TAIs is only used by the AMF. The AMF uses it for selecting which NG-RAN node(s) to forward the Write-Replace Warning Request NG-RAN message to.

 If the Write-Replace Warning Request NG-RAN message is sent to reload cells served by a NG-RAN node, for which the CBCF has previously received a Restart Indication (see subclause 15A.1 of TS 23.007 [38]), the CBCF shall include the Global RAN Node ID IE with the identity of this NG-RAN node in the Write-Replace Warning Request NG-RAN message.

 The Warning Area List NG-RAN shall be a list of Cell IDs or a list of NG-RAN TAIs or one or more Emergency Area IDs. The Warning Area List NG-RAN is only used by the NG-RAN node. The NG-RAN node is configured with the NG-RAN TAI(s) and Cell ID(s) it serves and the Emergency Area ID(s) that it belongs to. The NG-RAN node checks for any match of the contents of the Warning Area List NG-RAN with these IDs to identify the cells where to distribute the warning message. The Warning Area List NG-RAN is an optional information element. If the Warning Area List NG-RAN is absent, it shall be interpreted as "all cells on the NG-RAN node". The number of cell IDs will be limited by the message size on N50 and N2. An Emergency Area ID is unique within the PLMN.

 The message may include an OMC ID. If present, it indicates the OMC to which the Trace record generated in step 9 is destined. Co-location of that OMC with the CBCF is an operator option.

 The CBCF shall set the Concurrent Warning Message (CWM) indicator in all Write-Replace Warning Request NG-RAN messages, if the PLMN supports concurrent warning message broadcasts.

 The CBCF shall not include the "digital signature" or "timestamp" information.

 The CBCF shall set the Send Write-Replace-Warning Indication element in case the AMF is requested to forward the Broadcast Scheduled Area List in a Write-Replace Warning Indication NG-RAN for the warning message.

 The CBCF includes the Warning Area Coordinates in the Write-Replace-Warning-Request-NG-RAN message based on operator policy.

3. The AMF sends a Write-Replace Warning Confirm NG-RAN message that indicates to the CBCF that the AMF has started to distribute the warning message to NG-RAN nodes.

 The Write-Replace Warning Confirm NG-RAN message may contain the *Unknown Tracking Area List* IE. The *Unknown Tracking Area List* IE identifies the Tracking Areas that are unknown to the AMF and where the Request cannot be delivered.

 If this message is not received by the CBCF within an appropriate time period, the CBCF can attempt to deliver the warning message via another AMF in the same AMF region.

4. Upon reception of the Write-Replace Confirm NG-RAN messages from the AMFs, the CBCF may confirm to the CBE that it has started to distribute the warning message.

5. The AMF forwards Write-Replace Warning Message Request NG-RAN to NG-RAN nodes. The AMF shall use the list of NG-RAN TAIs to determine the NG-RAN nodes in the delivery area. If the list of NG-RAN TAIs is not included and no Global RAN Node ID has been received from the CBCF, the message is forwarded to all NG-RAN nodes that are connected to the AMF, subject to the RAT Selector NG-RAN. If a Global RAN Node ID has been received from the CBCF, the AMF shall forward the message only to the NG-RAN node indicated by the Global RAN Node ID IE.

6. When the CBCF sends warning messages to multiple AMFs for the same warning area, the NG-RAN node may receive the same message from multiple AMFs. The NG-RAN node detects duplicate messages by checking the message identifier and serial number fields within the warning message. If any redundant messages are detected only the first one received will be broadcasted by the cells. The NG-RAN node shall use the Warning Area List NG-RAN information to determine the cell(s) in which the message is to be broadcast. The NG-RAN nodes return a Write Replace Warning Message Response to the AMF, even if it was a duplicate.

 If there is a warning broadcast message already ongoing and the CWM Indicator is included in the Write-Replace Warning Request NG-RAN message, the NG-RAN node does not stop the existing broadcast message but starts broadcasting the new message concurrently. Otherwise the NG-RAN node shall immediately replace the existing broadcast message with the newer one.

NOTE 3: If concurrent warning messages are not supported, this requires the CBE/CBCF to take care that 'lower' priority warnings are not sent while a higher priority warning is still being sent.

 The NG-RAN node broadcasts the message frequently according to the attributes set by the CBCF that originated the warning message distribution.

7. If the UE has been configured to receive warning messages, and the UE is configured to accept warnings on that PLMN (see 3GPP TS 31.102 [18]), then the UE proceeds as follows:

 The UE can use "warning type" values, 'earthquake', 'tsunami' or 'earthquake and tsunami', immediately to alert the user. When "warning type" is 'test', the UE silently discards the primary notification, but the UE specially designed for testing purposes may proceed with the following procedures.

 The UE activates reception of the broadcast messages containing the "warning message".

 If the Warning Area Coordinates are not present:

The UE indicates the contents of the "warning message" to the user.

 If the Warning Area Coordinates are present, and if the UE is unable to determine its location:

The UE indicates the contents of the "warning message" to the user.

 If the Warning Area Coordinates are present, and the UE determines it is inside the Warning Area Coordinates:

The UE indicates the contents of the "warning message" to the user.

 If the Warning Area Coordinates are present, and the UE determines it is outside the Warning Area Coordinates:

 The UE does not indicate the contents of the "warning message" to the user. The UE shall store the "warning message" in the list of "warning messages" to be checked for geo-fencing during a UE implementation specific time which shall not be greater than 24 hours. Upon expiration of the UE implementation specific time, the UE shall remove the stored "warning message" from the list of "warning messages" to be checked for geo-fencing.

 If the "warning message" is a geo-fencing trigger message (see subclause 9.4.1.2.2), the UE shall, for each "warning message" stored at the UE in the list of "warning messages" to be checked for geo-fencing:

- compare the Serial Number and Message Identifier combination of the stored "warning message" to the list of Serial Number and Message Identifier combinations included in the Warning Message Content IE (CB Data) of the geo-fencing trigger message and encoded as specified in ATIS-0700041 [47]; and

- if:

1) the Serial Number and Message Identifier combination of the stored "warning message" matches one of the Serial Number and Message Identifier combinations included in the geo-fencing trigger message; and

2) the UE:

a) is able to determine its location and determines it is inside the Warning Area Coordinates of the stored "warning message"; or

b) is unable to determine its location,

 indicate the contents of the stored "warning message" to the user, remove the "warning message" from the list of "warning messages" to be checked for geo-fencing and then discard the geo-fencing trigger message.

 If the "warning message" is a geo-fencing trigger message (see subclause 9.4.1.2.2) and

- there is no stored list of "warning messages" to be checked for geo-fencing; or

- none of Serial Number and Message Identifier combinations of the stored "warning message" matches any of the Serial Number and Message Identifier combinations included in the Warning Message Content IE (CB Data) of the geo-fencing trigger message,

 the UE shall discard the geo-fencing trigger message.

 If a language-independent content mapped to an event or a disaster (e.g. character such as Unicode based pictogram mapping to a disaster) is included as part of user information contained in the content of a CBS-Message-Information-Page transparently passed from CBC to UEs:

- UEs with user interface which support the ePWS language-independent content functionality (see subclause 8.3) and which are capable of displaying text-based warning messages should be capable of displaying the entire warning message that they receive.

Editor’s note [WI: ePWS, CR#203]: FFS on what character(s) such as Unicode based pictogram(s) are the language-independent content mapped to an event or a disaster.

8. If the Send Warning-Message-Indication parameter was present in the Write-Replace Warning Request NG‑RAN and it is configured in the AMF based on operator policy, the AMF shall forward the Broadcast Scheduled Area Lists in a Write-Replace Warning Indication(s) NG-RAN to the CBCF. The Broadcast Scheduled Area List shall contain the Broadcast Completed Area List the AMF has received from the NG-RAN node. The MME may aggregate Broadcast Completed Area Lists it receives from NG-RAN nodes.

NOTE 4: Support for sending of Write-Replace Warning Indication(s) NG-RAN to the CBCF is optional in the AMF.

9. From the Write-Replace Warning Response messages returned by NG-RAN nodes the AMF determines the success or failure of the delivery and creates a trace record. Any OMC ID received in step 2 is written to the trace record to permit the O&M system to deliver them to the desired destination.

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