**3GPP TSG-SA5 Meeting #143-e *S5-223246***

e-meeting, 9 - 17 May 2022

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **32.422** | **CR** | **0394** | **rev** | **-** | **Current version:** | **17.6.1** |  |
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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:*** | Adding missing signalling and interface related to SMF for trace | | | | | | | | | |
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| ***Source to WG:*** | Huawei | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
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| ***Work item code:*** | 5GMDT | | | | |  | ***Date:*** | | | 2022-04-28 |
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| ***Category:*** | **A** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
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| ***Reason for change:*** | | Based on SA2 spec TS 23.501 clause 5.34.2.2, in the non-roaming case, N16a interface is used between SMF and I-SMF. This scenario is missing in the current TS 34.422 spec when tranfering Start triggering events. | | | | | | | | |
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| ***Summary of change:*** | | Adds the scenario for tranfering Start triggering events between SMF and I-SMF. | | | | | | | | |
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| ***Consequences if not approved:*** | | The secnario for using signalling between SMF and I-SMF for transfering Start triggering events is missing and not supported by the spec. | | | | | | | | |
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| ***Clauses affected:*** | | 5.1, 5.5 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | | **Y** |  | O&M Specifications | | | | TS/TR 32.423 CR 0130  TS/TR 28.623 | | |
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| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| **1st Change** |

# 5 Trace/UE measurement control and configuration parameters

5.1 Triggering Events (CM)

This conditional mandatory parameter defines when to start a Trace Recording Session and which message shall be recorded first, when to stop a Trace Recording Session and which message shall be recorded last respectively. The messages in the start triggering event tables indicate the transaction to be recorded first and the starting time of the Trace Recording Session within a Trace Session for the traced MS/subscriber in the given NE.

The messages in the stop triggering event tables indicate the transaction to be recorded last and the stopping time of the Trace Recording Session.

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| **MSC Server** | **Start triggering events** | **Stop triggering events** |
| Mobile Originated Call | Receipt of the CM SERVICE-REQUEST message with service type set to originating call establishment | Reception of CC-RELEASE COMPLETE or CM-SERVICE ABORT message |
| Mobile Terminated Call | Sending of PAGING REQUEST message | Reception of CC-RELEASE COMPLETE or CM-SERVICE ABORT message |
| Mobile Originated SMS | Receipt of the CM SERVICE-REQUEST message with service type set to Short Message service | Transmission of RP-ACK/RP-NACK message |
| Mobile Terminated SMS | Sending of PAGING REQUEST message | Reception of RP-ACK/RP-NACK message |
| IMSI Attach | Receipt of the MM-LOCATION UPDATING REQUEST message | Sending of MM-LOCATION-UPDATING ACCEPT or MM-LOCATION-UPDATING-REJECT message |
| Location Update | Receipt of the MM-LOCATION UPDATING REQUEST message | Sending of MM-LOCATION-UPDATING ACCEPT or MM-LOCATION-UPDATING-REJECT message |
| IMSI Detach | Receipt of the MM-IMSI DETACH INDICATION message | Reception of MM-IMSI DETACH INDICATION message |
| Handover | Receipt of the BSSMAP-HANDOVER-REQUIRED message in case of GSM or RANAP-RELOCATION-REQUIRED message in case of UMTS | Reception of BSSMAP-CLEAR COMPLETE message in case of GSM or RANAP-IU RELEASE COMPLETE message in case of UMTS or BSSMAP-HANDOVER FAILURE in case of GSM or RANAP-RELOCATION FAILURE in case of UMTS. |
| Supplementary Service | TBD | TBD |

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| **MGW** | **Start triggering events** | **Stop triggering events** |
| Context | Reception of H.248-ADD command, or reception of H.248 MODIFY command | Sending of H.248- SUBTRACT reply |

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| **SGSN** | **Start triggering events** | **Stop triggering events** |
| PDP Context | Reception of SM-ACTIVATE PDP CONTEXT REQUEST or sending SM-REQUEST PDP CONTEXT ACTIVATION or reception of SM- MODIFY PDP CONTEXT REQUEST | Reception or sending of SM- DEACTIVATE PDP CONTEXT REQUEST or sending SM-ACTIVATE PDP CONTEXT REJECT |
| Mobile Originated SMS | Receipt of RP-DATA message | Transmission of RP-ACK/RP-NACK message |
| Mobile Terminated SMS | Transmission of RP-DATA message | Reception of RP-ACK/RP-NACK message |
| GPRS Attach | Reception of MM-ATTACH-REQUEST | Sending MM-ATTACH-ACCEPT or MM-ATTACH-REJECT |
| Routing Area Update | Reception of MM-ROUTING AREA UPDATE REQUEST | Sending MM-ROUTING AREA UPDATE ACCEPT or MM-ROUTING AREA UPDATE REJECT |
| GPRS Detach | Reception MM-DETACH REQUEST | Reception of MM-DETACH ACCEPT |
| MBMS Context | Sending SM-Request MBMS Context Activation or reception of SM-Update MBMS Context Request | Sending of SM-Deactivate MBMS Context Request or sending of SM-Activate MBMS Context Reject |

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| **GGSN** | **Start triggering events** | **Stop triggering events** |
| PDP Context | Reception of GTP Create PDP context request or reception of GTP Update PDP context request | Sending of GTP Delete PDP context response |
| MBMS Context | Reception of GTP Create MBMS Context Request or reception of GTP Update MBMS Context Request | Sending of GTP Delete MBMS Context Response |

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| **IMS Network Element** | **Start triggering events** | **Stop triggering events** |
| SIP session or standalone transaction | Reception of an initial SIP request that matches the start trigger event configured by the Management System via the Trace IRP TS 32.442 [24] | Sending of a SIP final response to a SIP BYE or other request (originating or terminating), timer expiry or other event that matches the stop trigger event configured by the Management System via the Trace IRP TS 32.442 [24]. |

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| **BM-SC** | **Start triggering events** | **Stop triggering events** |
| MBMS Multicast service activation | Reception of MBMS Authorization Request | Reception of Deactivation Indication for user deactivation or sending of Session Stop Request for service deactivation |

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| **MME** | **Start triggering events** | **Stop triggering events** |
| Service request | Reception of NAS: Service Request message or S11: Downlink Data Notification  Note: The Service Request message shall not start a new Trace Recording Session when received after a Downlink Data Notification for the same service request instance. | Reception of S11: Modify Bearer Response or sending of NAS: SERVICE REJECT  Note: Modify Bearer Response shall stop the Trace Recording Session only if it has been sent as part of the Service Request procedure |
| UE initiated PDN connectivity | Reception of NAS: PDN connectivity Request message | Reception of NAS PDN Connectivity Complete |
| Initial Attach, Tracking area update, Detach | Initial Attach: Reception of the NAS: ATTACH REQUEST or of S6a Update Location Answer  Tracking Area Update: Reception of the NAS: TRACKING AREA UPDATE REQUEST  Detach: Reception of the NAS: DETACH REQUEST or S3 Detach Notification or S6a Cancel Location Request or sending of S11 Delete Session Request.  Note: Cancel location location shall not trigger new Trace Recording Session if it is sent as part of the tracking area update procedure.  Note: The Delete Session Request message shall trigger a new Trace Recording Session only if sent as part of a Detach procedure and only if a Detach Request has not been received for the same instance of the procedure.  Note: Update Location Answer shall be a start trigger for a Trace Recording Session only if sent as part of Attach procedure and if containing Trace Data. | Initial Attach: Reception of the NAS: ATTACH COMPLETE or sending of the NAS: ATTACH REJECT  Tracking Area Update: Sending of the NAS: TRACKING AREA UPDATE ACCEPT or sending of NAS: TRACKING AREA UPDATE REJECT  Detach: Sending of NAS: DETACH ACCEPT or S3 Detach Acknowledgement message or S6a Cancel Location Answer message or reception S11 Delete Session Response  Note: Cancel Location Answer shall not stop a Trace Recording Session if it is sent as part of the TAU procedure.  Note: The Delete Session Response message shall stop a Trace Recording Session only if sent as part of a Detach procedure and only if a Detach Request has not been received for the same instance of the procedure. |
| UE initiated PDN disconnection | Sending of the S11: Delete Session Request  Note: The S11 Delete Session Request message shall trigger a new Trace Recording Session only if it is sent as part of the UE initiated PDN disconnection procedure. | Reception of NAS Deactivate EPS Bearer Context Accept |
| Bearer Activation/Modification/Deactivation | Bearer Activation: Reception of S11: Create Bearer Request  Bearer Modification: Reception of S11: Update Bearer Request  Bearer Deactivation: Reception of S11 Delete Bearer Request  Note: Create Bearer Request shall not trigger a new trace recording session if it is sent due to Dedicated bearer activation in combination with the default bearer activation at Attach and UE requested PDN connectivity procedures | Bearer Activation: Sending of S11: Create Bearer Response  Bearer Modification: Sending of S11: Update Bearer Response  Bearer Deactivation: Sending of S11: Delete Bearer Response |
| Handover | Inter-eNB/Intra-MME: Reception of S1AP: Path Switch Request or S1AP Handover Required  Inter-eNB/Inter-MME - Inter RAT (source MME): Reception of S1AP: Handover Required  Inter-eNB/Inter-MME – Inter RAT (target MME): Reception of S10/S3: Forward Relocation Request | Inter-eNB/Intra-MME: Sending of S1AP: Path Switch Request Acknowledge or S1AP: Path Switch Request Failure, or S1AP: Handover Preparation Failure or S1AP: Handover Cancel Acknowledge or receiving Handover Notify  Inter eNB - Inter MME / Inter RAT (source MME): Reception of S10/S3 Forward Relocation Complete Notification or sending of S1AP Handover Cancel Acknowledge or S1AP Handover Preparation Failure  Inter eNB - Inter MME /Inter RAT (target MME): Sending of S10/S3 Forward Relocation Complete Notification or of S10/S3 Relocation Cancel Response or of S10/S3 Forward Relocation Response with reject cause value |

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| **SGW** | **Start triggering events** | **Stop triggering events** |
| PDN connection creation | Reception of the S11: Create Session Request | Sending of the S11: Create Session Response |
| PDN connection termination | Reception of the S11: Delete Session Request | Sending of the S11: Delete Session Response |
| Bearer Activation/Modification/Deactivation | Bearer Activation: Reception of the S5: Create Bearer Request or S11: Bearer Resource Command  Bearer Modification: Reception of the S11: Modify Bearer Request or S5: Update Bearer Request  Bearer Deletion: Reception of the S11: Deactivate Bearer Command or S5: Delete Bearer Request | Bearer Activation: Sending of the S5: Create Bearer Response  Bearer Modification: Sending of the S11: Modify Bearer Response or S5: Update Bearer Response  Bearer Deletion: Sending of S5: Delete Bearer Response |

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| **PGW** | **Start triggering events** | **Stop triggering events** |
| PDN connection creation | Reception of S5: Create Session Request (GTP) or Proxy Binding Update (PMIP)  Reception of S2b: Create Session Request (GTP) | Sending of S5: Create Session Response (GTP) or Proxy Binding Update Ack (PMIP)  Sending of S2b: Create Session Response (GTP) |
| PDN connection termination | Reception of the S5: Delete Session Request or Proxy Binding Update  Reception of the S2b: Delete Session Request | Sending of the S5: Delete Session Response (GTP) or Proxy Binding Update ACK (PMIP)  Sending of the S2b: Delete Session Response (GTP) |
| Bearer Activation/Modification/Deactivation  Note: this is applicable only to GTP based S5 interface. | Bearer Activation: Sending of the S5/S2b: Create Bearer Request  Bearer Modification: Reception of the S5: Modify Bearer Request or sending of the S5/S2b: Update Bearer Request  Bearer Deletion: Reception of the S5: Delete Bearer Command or sending of S5/S2b: Delete Bearer Request | Bearer Activation: Reception of the S5/S2b: Create Bearer Response  Bearer Modification: Sending of the S5: Modify Bearer Response or reception of the S5/S2b: Update Bearer Response  Bearer Deletion: Reception of the S5/S2b: Delete Bearer Response |

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| **AMF** | **Start triggering events** | **Stop triggering events** |
| UE initiated Registration Procedure | NAS Registration Request message from the UE | Sending of Registration Accept  Receipt of Registration Complete |
| UE initiated Service Request Procedure | NAS message from the UE | Optional Service Accept |
| N2 or Xn Handover | Reception of N2 Path Switch Request message from source NG-RAN | Sending of N2 Path Switch Request Ack message to target NG-RAN |
| UE initiated Deregistration Procedure | NAS Deregistration Request message from the UE | Sending of Deregistration Accept |
| Network initiated Deregistration Procedure | AMF timer or UDM request | Receipt of Deregistration Accept |
| UE mobility from EPC | Receipt of N26 Forward Relocation request | Sending of N26 Forward Relocation response |
| UE mobility to EPC | Receipt of N2 HO Request to E-UTRAN | Receipt of Nudm\_UECM\_DeregistrationNotification |

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| **AUSF** | **Start triggering events** | **Stop triggering events** |
| UE Authentication | Receipt of Nausf\_UEAuthentication\_authenticate request | Sending of Nausf\_UEAuthentication\_authenticate response |

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| **NEF** | **Start triggering events** | **Stop triggering events** |
| Event Exposure | Receipt of Nnef\_EventExposure\_Subscribe from AF  Receipt of Nnef\_EventExposure\_Unsubscribe from AF  Sending of Nnef\_EventExposure\_Notify to AF | Sending of Nnef\_EventExposure\_Subscribe result indication to AF  Sending of Nnef\_EventExposure\_Unsubscribe result indication to AF  Processing of Nnef\_EventExposure\_Notify |
| PFD Management | Receipt of Nnef\_PFDManagement\_Fetch request from SMF  Receipt of Nnef\_PFDmanagement\_Subscribe from SMF  Sending of Nnef\_PFDManagement\_Notify to SMF  Receipt of Nnef\_PFDManagement\_Unsubscribe from SMF | Sending of Nnef\_PFDManagement\_Fetch response to SMF  Processing of Nnef\_PFDmanagement\_Subscribe  Processing of Nnef\_PFDManagement\_Notify  Processing of Nnef\_PFDManagement\_Unsubscribe |
| Parameter Provision | Receipt of Nnef\_ParameterProvision\_Update from AF | Sending of Nnef\_ParameterProvision\_Update result indication to AF |
| Trigger | Receipt of Nnef\_Trigger\_Request from AF  Receipt of Nnef\_Trigger\_UpdateNotify from AF | Sending of Nnef\_Trigger\_Request operation result to AF  Sending of Nnef\_Trigger\_UpdateNotify delivery report |

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| **NRF** | **Start triggering events** | **Stop triggering events** |
| NF Management | Receipt of NFRegister/NFUpdate/NFDeregister request from NF | Sending of NFRegister/NFUpdate/NFDeregister response to NF |
| NF Discovery | Receipt of Nnrf\_NFDiscovery\_Request from NF | Sending of target NF information to the requestor |

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| **NSSF** | **Start triggering events** | **Stop triggering events** |
| NS Selection | Receipt of Nnssf\_NSSelection\_Get request from AMF, NSSF in different PLMN or NRF | Sending of Nnssf\_NSSelection\_Get response to AMF, NSSF in different PLMN or NRF |
| NSSAI Availability | Receipt of Nnssf\_NSSAIAvailability\_Update request from AMF  Sending of Nnssf\_NSSAIAvailability\_Notify to AMF | Sending of Nnssf\_NSSAIAvailability\_Update response to AMF  Processing of Nnssf\_NSSAIAvailability\_Notify |

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| **PCF** | **Start triggering events** | **Stop triggering events** |
| AM Policy Control | Receipt of Npcf\_AMPolicyControl\_Get request from AMF  Receipt of Npcf\_AMPolicyControl\_Delete request from AMF  Sending of Npcf\_AMPolicyControl\_UpdateNotify to AMF | Sending of Npcf\_AMPolicyControl\_Get response to AMF  Sending of Npcf\_AMPolicyControl\_Delete response to AMF  Receipt of Npcf\_AMPolicyControl\_UpdateNotify result from AMF |
| SM Policy Control | Receipt of Npcf\_SMPolicyControl\_Get request from SMF  Receipt of Npcf\_SMPolicyControl\_Delete request from SMF  Sending of Npcf\_SMPolicyControl\_UpdateNotify to SMF | Sending of Npcf\_SMPolicyControl\_Get response to SMF  Sending of Npcf\_SMPolicyControl\_Delete response to SMF  Receipt of Npcf\_SMPolicyControl\_UpdateNotify result from SMF |
| Policy Authorization | Receipt of Npcf\_PolicyAuthorization\_Create request from AF or NEF  Receipt of Npcf\_PolicyAuthorization\_Update request from AF or NEF  Receipt of Npcf\_PolicyAuthorization\_Delete request from AF or NEF  Sending of Npcf\_PolicyAuthorization\_Notify to AF or NEF  Receipt of Npcf\_PolicyAuthorization\_Subscribe request from AF or NEF  Receipt of Npcf\_PolicyAuthorization\_Unsubscribe request from AF or NEF | Sending of Npcf\_PolicyAuthorization\_Create response to AF or NEF  Sending of Npcf\_PolicyAuthorization\_Update response to AF or NEF  Sendng of Npcf\_PolicyAuthorization\_Delete response to AF or NEF  Processing of Npcf\_PolicyAuthorization\_Notify  Sendng of Npcf\_PolicyAuthorization\_Subscribe response to AF or NEF  Sendng of Npcf\_PolicyAuthorization\_Unsubscribe response to AF or NEF |
| Background data transfer policy | Receipt of Npcf\_BDTPolicyControl\_Update request from NEF  Receipt of Npcf\_BDTPolicyControl\_Get request from NEF | Sending of Npcf\_BDTPolicyControl\_Update response to NEF  Sending of Npcf\_BDTPolicyControl\_Get response to NEF |

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| **SMF** | **Start triggering events** | **Stop triggering events** |
| UE initiated PDU Session Establishment procedure | NAS signalling from the UE, N16 signalling from VSMF  Receipt of Nsmf\_PDUSession\_CreateSMContext request from AMF  NAS signalling from the UE, N16a signalling from I-SMF | Sending of Nsmf\_PDUSession\_CreateSMContext response |
| UE initiated PDU Session Modification procedure | NAS signalling from the UE, N16 signalling from VSMF  Receipt of Nsmf\_PDUSession\_UpdateSMContext request from AMF  NAS signalling from the UE, N16a signalling from I-SMF | Sending of Nsmf\_PDUSession\_UpdateSMContext response |
| UE initiated PDU Session Release procedure | NAS signalling from the UE, N16 signalling from VSMF  Receipt of Nsmf\_PDUSession\_ReleaseSMContext request from AMF  NAS signalling from the UE, N16a signalling from I-SMF | Sending of Nsmf\_PDUSession\_ReleaseSMContext response |
| UE initiated PDU Session UP activation / deactivation | N11 request from AMF (may come from a NAS SR or Registration) | Sending of N11 response to AMF |
| Mobility of a PDU Session between 3GPP and N3GPP access to 5GC | NAS signalling from the UE (Request Type = "Existing PDU Session") | Sending of NAS signalling to UE |
| Mobility of a PDU Session from EPC | N11 request from AMF (comes from a N26 forward relocation request) | Sending of Nsmf\_PDUSession\_UpdateSMContext response |

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| **SMSF** | **Start triggering events** | **Stop triggering events** |
| SMService | Receipt of Nsmsf\_SMService\_Activate from AMF | Receipt of Nsmsf\_SMService\_Deactivate from AMF |

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| **UDM** | **Start triggering events** | **Stop triggering events** |
| UE Context Management | Receipt of Nudm\_UECM\_Registration request from AMF, SMF or SMSF  Sending of Nudm\_UECM\_DeregistrationNotification to AMF, SMF or SMSF  Receipt of Nudm\_UECM\_Deregistration request from AMF, SMF or SMSF  Receipt of Nudm\_UECM\_Get request from AMF, SMF or SMSF | Sending of Nudm\_UECM\_Registration response to AMF, SMF or SMSF  Processing of Nudm\_UECM\_DeregistrationNotification  Sending of Nudm\_UECM\_Deregistration result indication to AMF, SMF or SMSF  Sending of Nudm\_UECM\_Get response to AMF, SMF or SMSF |
| Subscriber Data Management | Receipt of Nudm\_SDM\_Get request from AMF, SMF or SMSF  Sending of Nudm\_SDM\_Notification to AMF, SMF or SMSF  Receipt of Nudm\_SDM\_Subscribe from AMF, SMF or SMSF  Receipt of Nudm\_SDM\_Unsubscribe from AMF, SMF or SMSF | Sending of Nudm\_SDM\_Get response to AMF, SMF or SMSF  Processing of Nudm\_SDM\_Notification  Processing of Nudm\_SDM\_Subscribe  Processing of Nudm\_SDM\_Unsubscribe |
| UE Authentication | Receipt of Nudm\_UEAuthentication\_Get request from AUSF | Sending Nudm\_UEAuthentication\_Get response to AUSF |
| Event Exposure | Receipt of Nudm\_EventExposure\_Subscribe request from NEF | Receipt of Nudm\_EventExposure\_Unsubscribe from NEF |

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| **UPF** | **Start triggering events** | **Stop triggering events** |
| N4 Session | Receipt of N4 Session Establishment from SMF  Receipt of N4 Session Modification from SMF | Receipt of N4 Session Termination from SMF |

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| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| MSC Server | | | | | | | |
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| MGW | | | | | | | |
| SGSN | | | | | | | |
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| GGSN | | | | | | | |
| BM-SC | | | | | | | |
| MME | | | | | | | |
| PGW | | | | SGW | | | |
| AMF | | | | | | | |
| SMF | | | | | | | |
| PCF | | | | UPF | | | |
| AUSF | | | | NEF | | | |
| NRF | | | | NSSF | | | |
| SMSF | | | | UDM | | | |

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| **MSC Server** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | | spare | SS | Handover | LU, IMSI attach, IMSI detach | MO and MT SMS | MO and MT calls |
| spare | | | | | | | |

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| **MGW** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | | | | | | spare | Context |

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| **SGSN** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | | | | MBMS Context | RAU, GPRS attach, GPRS detach | MO and MT SMS | PDP context |
| Reserved | | | | | | | |

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| **GGSN** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | | | | | | MBMS Context | PDP Context |

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| **BM-SC** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | | | | | | Spare | MBMS activation |

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| **MME** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | Spare | Handover | Bearer  Activation  Modification  Deletion | UE initiated PDN disconnection | Initial Attach, Tracking area update, Detach | Service requests | UE initiated PDN connectivity request |

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| **PGW** | | | | **SGW** | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | Bearer  Activation  Modification  Deletion | PDN connection termination | PDN connection creation | Spare | Bearer  Activation  Modification  Deletion | PDN connection termination | PDN Connection creation |

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| **AMF** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| Spare | UE Mobility to EPC | UE Mobility from EPC | Network Deregistration | UE Deregistration | Handover | Service  Request | Registration |

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| **SMF** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| Spare | Spare | Mobility from EPC | Mobility between 3GPP and N3GPP to 5GC | PDU Session UP activation / deactivation | PDU Session Release | PDU Session Modification | PDU Session Establishment |

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| **PCF** | | | |
| **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| BDT policy | Authorization | SM Policy | AM Policy |

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| **UPF** | | | |
| **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| Spare | Spare | Spare | N4 Session |

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| **AUSF** | | | | **NEF** | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | spare | spare | UE Authentication | Trigger | Parameter Provision | PFD Management | Event Exposure |

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| **NRF** | | | | **NSSF** | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | spare | NF Discovery | NF Management | spare | spare | NSSAI | NS Selection |

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| **SMSF** | | | | **UDM** | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | spare | spare | SM Service | Event Exposure | UE Authentication | Subscriber data | UE Context |

If a bit is set to 1 the given event shall be traced, i.e. a Trace Recording Session shall be started for that event.

If a bit is set to 0 the given event should not be traced, i.e. Trace Recording Session should not be started.

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| **2nd change** |

5.5 List of Interfaces (CO)

This is an optional parameter, which defines the interfaces to be recorded in the Network Element.

The following list contains the list of interfaces in each Network Element:

- MSC Server: A, Iu-CS, Mc and MAP (G, B, E, F, D, C) interfaces, CAP.

- MGW: Mc, Nb-UP, Iu-UP.

- RNC: Iu-CS, Iu-PS, Iur, Iub and Uu interfaces.

- SGSN: Gb, Iu-PS, Gn, MAP (Gr, Gd, Gf), CAP (Ge), Gs, S6d, S4, S3, S13' interfaces.

- GGSN: Gn, Gi and Gmb interfaces.

- S-CSCF: Mw, Mg, Mr and Mi interfaces.

- P-CSCF: Gm and Mw interfaces.

- I-CSCF: Cx, Dx, Mg, Mw.

- MRFC: Mp, Mr.

- MGCF: Mg, Mj, Mn.

- IBCF: Ix, Mx.

- E-CSCF: Mw, Ml, Mm, Mi/Mg.

- BGCF: Mi, Mj, Mk.

- AS: Dh, Sh, ISC, Ut.

- HSS: MAP (C, D, Gc, Gr), Cx, S6d, S6a, Sh, N70, N71 and NU1 interfaces and location and subscription information.

- EIR: MAP (F), S13, S13’, MAP (Gf)

- BM-SC: Gmb interface.

- MME: S1-MME, S3, S6a, S10, S11, S13

- SGW: S4, S5, S8, S11, Gxc

- PDN GW: S2a, S2b, S2c, S5, S6b, Gx, S8, SGi

- eNB/en-gNB: S1-MME, X2, Uu, F1-C, E1

- AMF: N1, N2, N8, N11, N12, N14, N15, N20, N22, N26

- AUSF: N12, N13

- NEF: N29, N30, N33

- NRF: N27

- NSSF: N22, N31

- PCF: N5, N7, N15

- SMF: N4, N7, N10, N11, S5-C, N16, N16a

- SMSF: N20, N21

- UDM: N8, N10, N13, N21, NU1

- UPF: N4

- ng-eNB: NG-C, Xn-C, Uu

- gNB-CU-CP: NG-C, Xn-C, Uu, F1-C, E1, X2-C

- gNB-CU-UP: E1

- gNB-DU: F1-C

NOTE 1: For IMS Network Elements other than P-CSCF and S-CSCF the interfaces included in the Trace Job for a particular type of IMS session are configured in the Management System via the Trace IRP (3GPP TS 32.442 [24]).

NOTE 2: The logical RAN node.gNB and en-gNB are defined in 3GPP TS 38.401 [44] clause 3.1. Both of these logical nodes are comprised of the following 3 Network Elements or Managed Functions (MFs): gNB-CU-CP, gNB-CU-UP & gNB-DU in either a 3-split, 2-split or non-split deployment scenario, as described in 3GPP TS 28.541 [46] clause 4.2.1 (and 4.3.2.1).

- The "List of interfaces" for these 4 Network Element types are combined into a single bitmap parameter below for the logical NG-RAN node, to be consumed and interpreted by each of these Network Elements irrespective of NR SA deployment scenario i.e.

(Logical NG-RAN node) ng-eNB/gNB-CU-CP/gNB-CU-UP/gNB-DU: NG-C, Xn-C, Uu, F1-C, E1

- The "List of interfaces" for these 3 Network Element types are combined with the existing eNB Network Element bitmap into a single bitmap parameter below for both eNB & en-gNB node, to be consumed and interpreted by each of these Network Elements irrespective of NR NSA deployment scenario i.e.

(Logical eNB/en-gNB) eNB/gNB-CU-CP/gNB-CU-UP/gNB-DU: S1-MME, X2, Uu, F1-C, E1

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| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| MSC Server | | | | | | | |
|  | | | | | | | |
| MGW | | | | | | | |
| SGSN | | | | | | | |
|  | | | | | | | |
| GGSN | | | | | | | |
| RNC | | | | | | | |
| BM-SC | | | | | | | |
| MME | | | | | | | |
| SGW | | | | | | | |
| PDN GW | | | | | | | |
| (Logical eNB/en-gNB) eNB/gNB-CU-CP/gNB-CU-UP/gNB-DU | | | | | | | |
| HSS | | | | | | | |
|  | | | | | | | |
| EIR | | | | | | | |
| AMF | | | | | | | |
|  | | | | | | | |
| PCF | | | | | | | |
| SMF | | | | | | | |
| UPF | | | | | | | |
| (Logical NG-RAN node) ng-eNB/gNB-CU-CP/gNB-CU-UP/gNB-DU | | | | | | | |
| UDM | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **MSC Server** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| CAP | MAP-F | MAP-E | MAP-B | MAP-G | Mc | Iu | A |
| spare | | | | | | MAP-C | MAP-D |

|  |  |  |  |  |  |  |  |
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| **SGSN** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| Ge | Gs | MAP-Gf | MAP-Gd | MAP-Gr | Gn | Iu | Gb |
| spare | | | | S13' | S3 | S4 | S6d |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **MGW** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| Spare | | | | | Iu-UP | Nb-UP | Mc |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **GGSN** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | | | | | Gmb | Gi | Gn |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **RNC** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| Spare | | | | Uu | Iub | Iur | Iu |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **BM-SC** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | | | | | | | Gmb |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **MME** | | | | | | | | |
| **Bit 8** | **Bit 7** | | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| Spare | | S13 | | S11 | S10 | S6a | S3 | S1-MME |

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| **SGW** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| Spare | | | Gxc | S11 | S8b | S5 | S4 |

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| **PDN GW** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| SGi | S8b | Gx | S6b | S5 | S2c | S2b | S2a |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **(eNB/en-gNB) eNB(Management Based Activation and Signaling Based Activation)/gNB-CU-CP/gNB-CU-UP/gNB-DU (Signaling Based Activation only)** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| **Spare** | **Spare** | **Spare** | **E1** | **F1-C** | **Uu** | **X2** | **S1-MME** |

NOTE 3: For NR NSA, the existing 1 bitmaskis extended to representation for eNB to additionally include all 3 NEs of the logical en-gNB (relevant interfaces only). The receiving MF entity interprets only the bits that are valid for its interface.

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| **HSS** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| Sh | S6a | S6d | Cx | MAP-Gr | MAP-Gc | MAP-D | MAP-C |
| spare | spare | spare | spare | spare | NU1 | N71 | N70 |

|  |  |  |  |  |  |  |  |
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| **EIR** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| Spare | | | | MAP-Gf | S13’ | S13 | MAP-F |

|  |  |  |  |  |  |  |  |
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| **AMF** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| N20 | N15 | N14 | N12 | N11 | N8 | N2 | N1 |
| spare | | | | | | N26 | N22 |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **PCF** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | spare | spare | spare | spare | N15 | N7 | N5 |

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| **SMF** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | N16a | N16 | S5-C | N11 | N10 | N7 | N4 |

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| **UPF** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | spare | spare | spare | spare | spare | spare | N4 |

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| **(NG-RAN node) ng-eNB/gNB-CU-CP/gNB-CU-UP/gNB-DU (Management Based Activation and Signaling Based Activation),**  **(en-gNB) gNB-CU-CP/gNB-CU-UP/gNB-DU (Management Based Activation only)** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | spare | spare | E1-C | F1-C | Uu | Xn-C/X2 | NG-C |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **UDM** | | | | | | | |
| **Bit 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** |
| spare | spare | spare | NU1 | N21 | N13 | N10 | N8 |

NOTE 4: For Management Based Activation, only this one NG-RAN bitmask above needs to be used for cell traffic trace functionality (not 2 different bitmasks).  
As the gNB-CU-CP can be either logical gNB role or logical en-gNB role, then Bits 1 and 2 can be interpreted differently depending on the role and whether it is an NSA user or SA user.  
SA User.  
 - Bit 1 = NG-C  
 - Bit 2 = Xn-C  
NSA User  
 - Bit 1 = N/A  
 - Bit 2 = X2

If a bit is set to 1, the interface should be traced in the given Network Element.

If a bit is set to 0, that interface should not be traced in the given Network Element.

# NOTE 5: The bit significance of the bitmaps defined above for the OAM interface can be different from the bit significance of the corresponding bitmaps in the signall

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| **End of change** |