# 5G NR SA Signaling with 5GC Call flow traces

TP00005-V-1701 V0 - S04M03 Ed1

## Learning Objectives

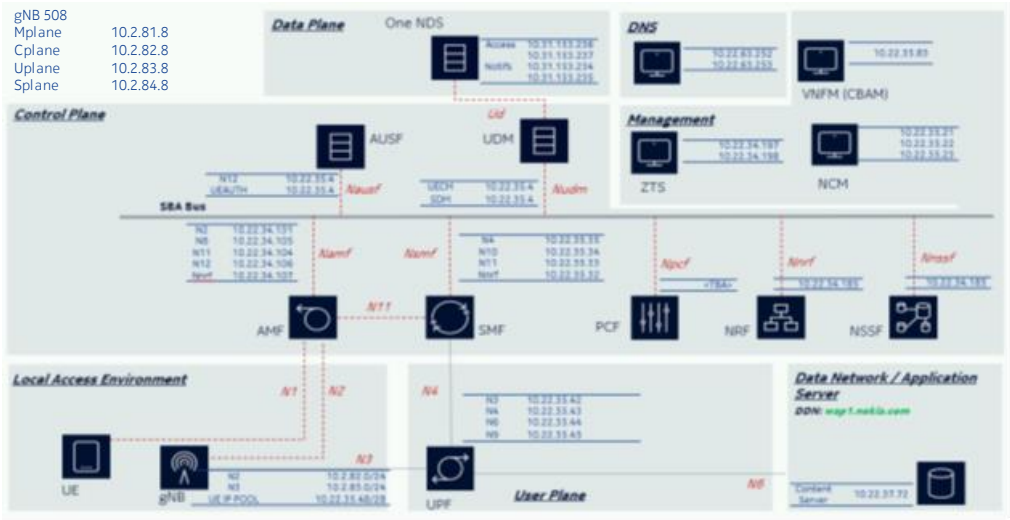
Upon completion of this module, you should be able to:

- Explain the 5G NR SA signaling with 5GC Traces Network Setup.
- Describe the 5G NR SA signaling with 5GC traces (pcap).
- Describe the 5G NR SA signaling with 5GC traces (html).

# Table of Contents

# 5G NR SA signaling with 5GC Traces Network Setup

# 5G NR SA signaling with 5GC Call flow traces
## gNB508 SA Setup



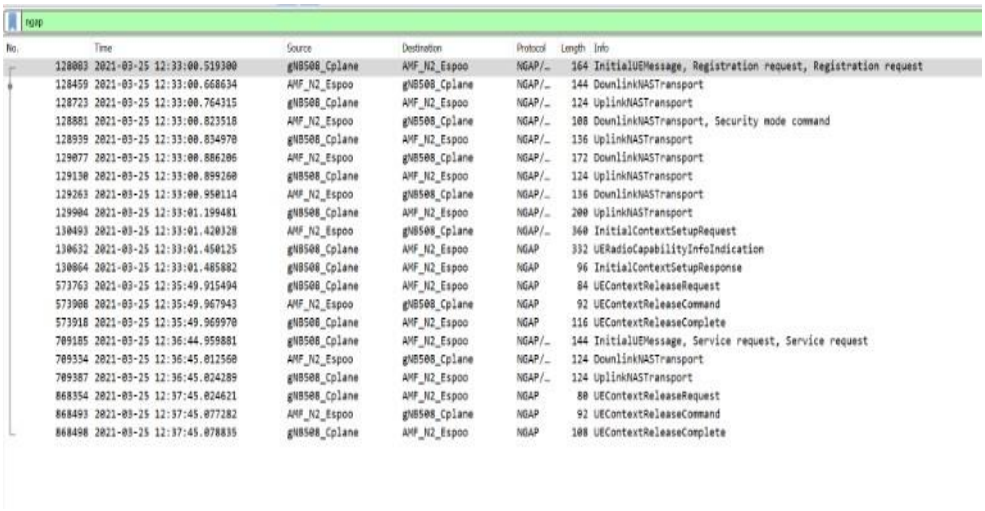





1. UE is in RRC Idle state in order to commence registration in the NR network.
2. A UE Context exists in the Old AMF from a previous registration.
3. Using the Zadoff-Chu sequence, the UE selects a Random-Access Preamble. Each preamble transmission is associated with an RA-RNTI, according to TS 38.123.
4. T300 timer is started for the RRC startup message from the 5G Network.
5. As a response to a PRACH transmission, a UE attempts to detect a DCI Format 1_0 with CRC scrambled by the RA-RNTI in the RACH transmission. The UE looks for message during a configured window of length ra-ResponseWindow.
6. The Temporary C-RNTI will be assigned to the UE via the Random-Access Response message.
7. According to TS 38.212, the RA-RNTI scrambled DCI message provides a reference for the frequency and time resources assigned, for the transmission of the Transport Block inside the Random-Access Response message. Frequency domain resource allocation, Time domain resource allocation and DL MCS.
8. The UE detects a DCI Format 1_0 with CRC scrambled by the RA-RNTI and receives a transport block in a corresponding PDSCH. The RAR carries the Timing-Advance (TA), uplink grant and the Temporary C-RNTI allocation. Temporary C-RNTI, Timing Advance command, UL Grant which contains Frequency hopping flag, Msg3 PUSCH frequency and time resource allocation, Uplink MCS, CSI request.
9. UE-identity for Content Resolution between 0 and 2^39 -1

# 5G NR SA signaling with 5GC traces (pcap)

# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 NGAP InitialUEMessage



ngap

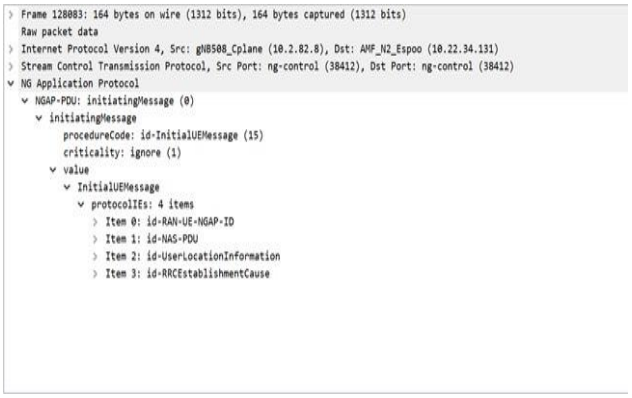
| No. | Time | Source | Destination | Protocol | Length | Info |
|---|---|---|---|---|---|---|
| 128083 | 2021-03-25 12:33:00.519300 | gNB508_Cplane | AMF_N2_Espoo | NGAP/... | 164 | InitialUEMessage, Registration request, Registration request |
| 128459 | 2021-03-25 12:33:00.668634 | AMF_N2_Espoo | gNB508_Cplane | NGAP/... | 144 | DownlinkNASTransport |
| 128723 | 2021-03-25 12:33:00.764315 | gNB508_Cplane | AMF_N2_Espoo | NGAP/... | 124 | UplinkNASTransport |
| 128881 | 2021-03-25 12:33:00.823518 | AMF_N2_Espoo | gNB508_Cplane | NGAP/... | 108 | DownlinkNASTransport, Security mode command |
| 128939 | 2021-03-25 12:33:00.834970 | gNB508_Cplane | AMF_N2_Espoo | NGAP/... | 136 | UplinkNASTransport |
| 129077 | 2021-03-25 12:33:00.886206 | AMF_N2_Espoo | gNB508_Cplane | NGAP/... | 172 | DownlinkNASTransport |
| 129130 | 2021-03-25 12:33:00.899260 | gNB508_Cplane | AMF_N2_Espoo | NGAP/... | 124 | UplinkNASTransport |
| 129263 | 2021-03-25 12:33:00.950114 | AMF_N2_Espoo | gNB508_Cplane | NGAP/... | 136 | DownlinkNASTransport |
| 129904 | 2021-03-25 12:33:01.199481 | gNB508_Cplane | AMF_N2_Espoo | NGAP/... | 200 | UplinkNASTransport |
| 130493 | 2021-03-25 12:33:01.420128 | AMF_N2_Espoo | gNB508_Cplane | NGAP/... | 360 | InitialContextSetupRequest |
| 130632 | 2021-03-25 12:33:01.450125 | gNB508_Cplane | AMF_N2_Espoo | NGAP | 332 | UERadioCapabilityInfoIndication |
| 130864 | 2021-03-25 12:33:01.485882 | gNB508_Cplane | AMF_N2_Espoo | NGAP | 96 | InitialContextSetupResponse |
| 573763 | 2021-03-25 12:35:49.915494 | gNB508_Cplane | AMF_N2_Espoo | NGAP | 84 | UEContextReleaseRequest |
| 573908 | 2021-03-25 12:35:49.967943 | AMF_N2_Espoo | gNB508_Cplane | NGAP | 92 | UEContextReleaseCommand |
| 573918 | 2021-03-25 12:35:49.969970 | gNB508_Cplane | AMF_N2_Espoo | NGAP | 116 | UEContextReleaseComplete |
| 709185 | 2021-03-25 12:36:44.959881 | gNB508_Cplane | AMF_N2_Espoo | NGAP/... | 144 | InitialUEMessage, Service request, Service request |
| 709334 | 2021-03-25 12:36:45.012560 | AMF_N2_Espoo | gNB508_Cplane | NGAP/... | 124 | DownlinkNASTransport |
| 709387 | 2021-03-25 12:36:45.024289 | gNB508_Cplane | AMF_N2_Espoo | NGAP/... | 124 | UplinkNASTransport |
| 868354 | 2021-03-25 12:37:45.024621 | gNB508_Cplane | AMF_N2_Espoo | NGAP | 80 | UEContextReleaseRequest |
| 868493 | 2021-03-25 12:37:45.077282 | AMF_N2_Espoo | gNB508_Cplane | NGAP | 92 | UEContextReleaseCommand |
| 868498 | 2021-03-25 12:37:45.078835 | gNB508_Cplane | AMF_N2_Espoo | NGAP | 108 | UEContextReleaseComplete |



This screenshot corresponds to the file named as IP Traffic Capture 508_20210325T172703 under the /gNB508_SA_Traces folder.

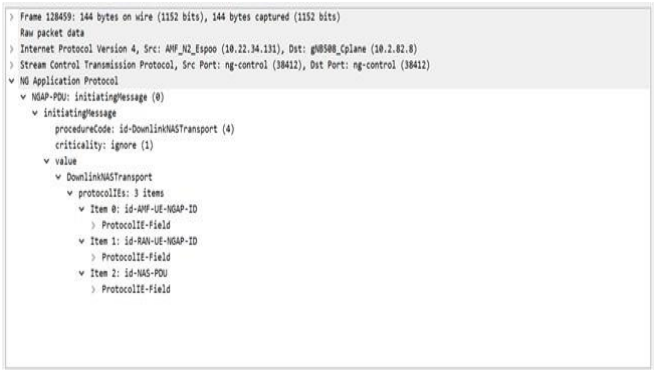
# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 NGAP InitialUEMessage

Trace indicates NGAP InitialUEMessage, Registration request.
Direction: from gNB508 to AMF.



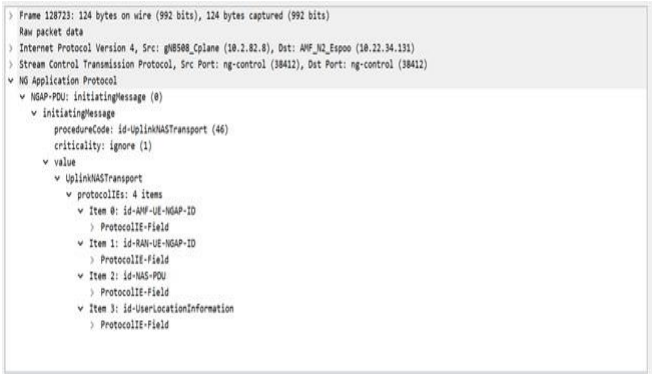
# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 NGAP DownlinkNASTransport

Trace indicates NGAP Downlink NAS Transport, Identity Request
Direction: from AMF to gNB508.



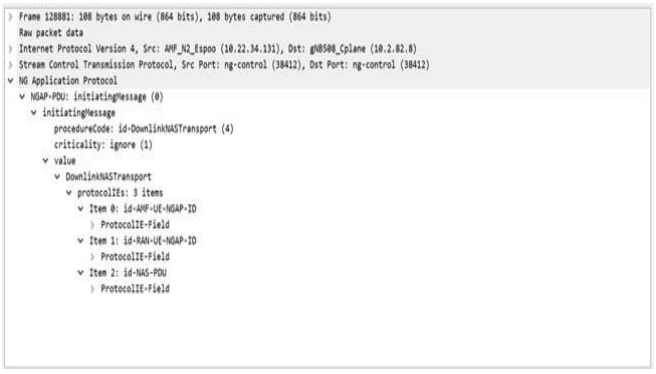
# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 NGAP UplinkNASTransport

Trace indicates NGAP Uplink NAS Transport, Identity Response.
Direction: from gNB508 to AMF.



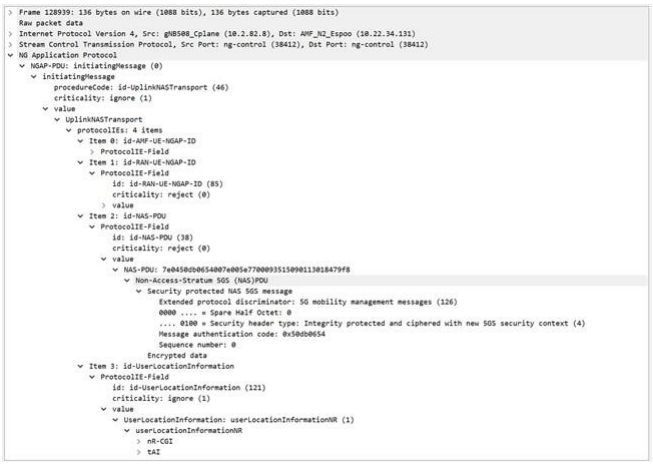
# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 NGAP DownlinkNASTransport, Security Mode Command

Trace indicates NGAP Downlink NAS Transport, Security Mode Command.
Direction: from AMF to gNB508



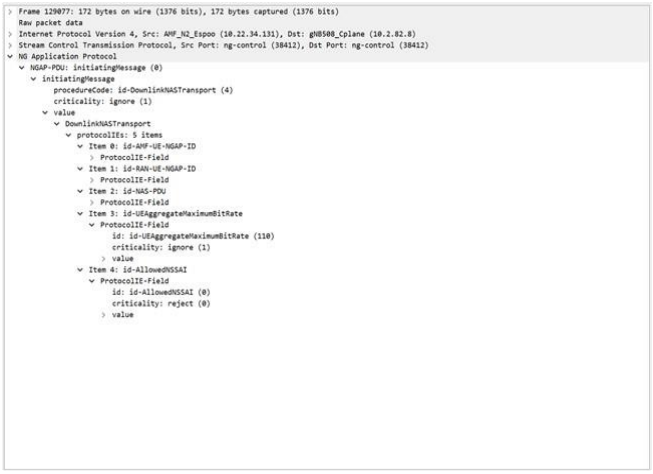
# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 NGAP UplinkNASTransport

Trace indicates NGAP Uplink NAS Transport, User Location Information
Direction: from gNB508 to AMF



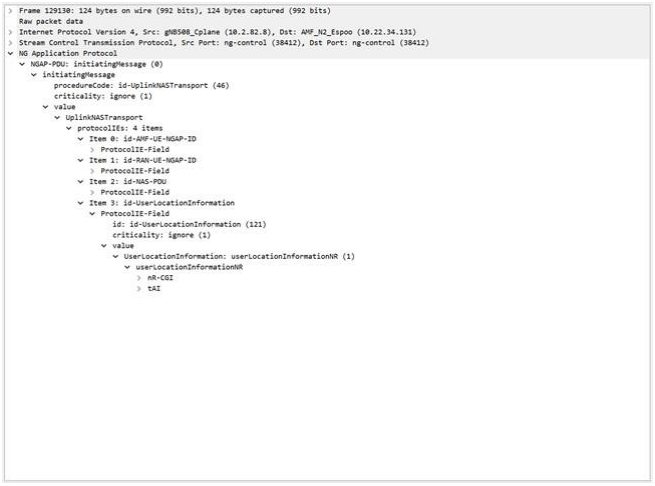
# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 NGAP DownlinkNASTransport

Trace indicates NGAP Downlink NAS Transport, UEAggregatedMaximumBitRate, AllowedNSSAI.
Direction: from AMF to gNB508



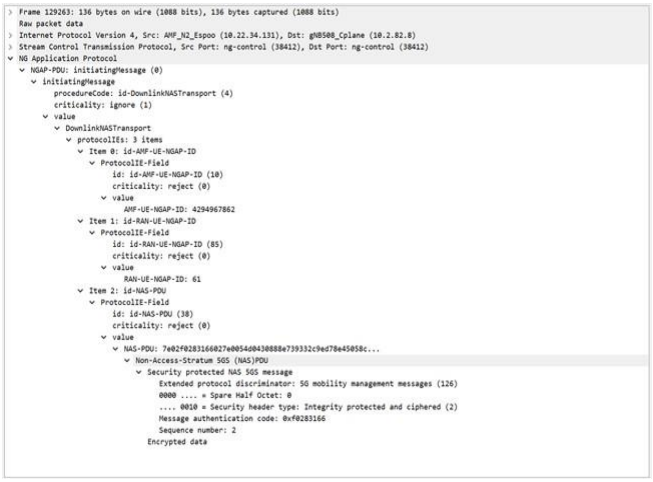
# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 NGAP UplinkNASTransport

Trace indicates NGAP Uplink NAS Transport,
userLocationInformationNR
Direction: from gNB508 to AMF



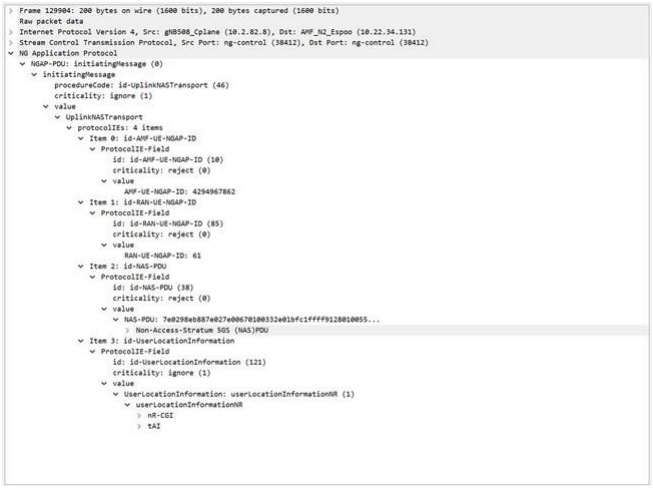
# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 NGAP DownlinkNASTransport

Trace indicates NGAP Downlink NAS Transport.
Direction: from AMF to gNB508



# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 NGAP UplinkNASTransport

Trace indicates NGAP Uplink NAS Transport, userLocationInformationNR
Direction: from gNB508 to AMF

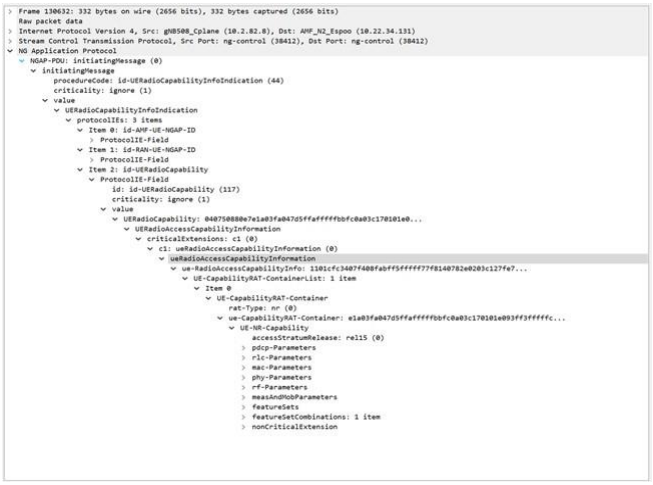


# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 InitialContextSetupRequest

Trace indicates InitialContextSetupRequest, UEAggregatedMaximumBitrate, GUAMI, PDUSessionResourceSetupList, AllowedNSSAI, UESecurityCapabilities, SecurityKey, MobilityRestrictionList.
Direction: from AMF to gNB508

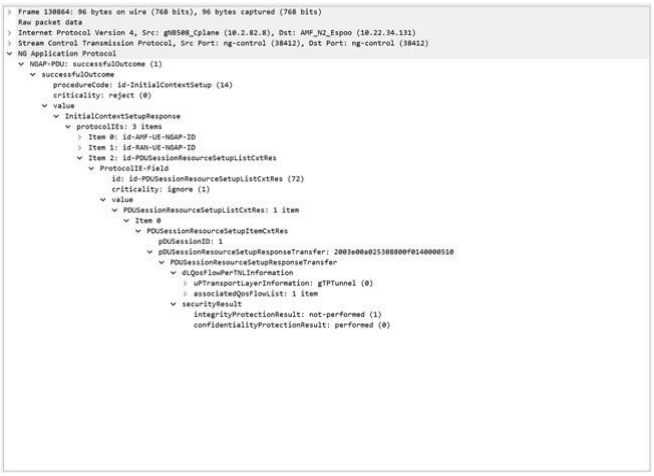
# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 UERadiocapabilityInfoIndication

Trace indicates UERadiocapabilityInfoIndication, ueRadioAccessCapabilityInformation.
Direction: from gNB to AMF



# 5G NR SA signaling with 5GC traces (pcap)
## gNB508 InitialContextSetupResponse

Trace indicates InitialContextSetupResponse, PDUSessionResourceSetupList.
Direction: from gNB to AMF



# 5G NR SA signaling with 5GC traces (html)

# 5G NR SA signaling with 5GC traces (html)

## gNB508 SA Setup





This screenshot corresponds to the file named gNB508_Cplane_1730_0 located under the folder /gNB508_SA_Traces/UPSherpa_traces_in_HTML_format folder

# 5G NR SA signaling with 5GC traces (html)
## gNB508 InitialUEMessage

```
NGAP-PDU : initiatingMessage : {
  procedureCode 15,
  criticality ignore,
  value InitialUEMessage : {
    protocolIEs {
      {
       id 85,
       criticality reject,
       value RAN-UE-NGAP-ID : 61
      },
      {
       id 38,
       criticality reject,
       value NAS-PDU : '7E 01 FA F2 A3 36 04 7E 00 41 09 00 0B F2 62 F0 66 01 00 41 C1 E0 00 2E 2E 02 F0 F0 71 00 29 7E 00 41 09 00 0B F2 62 F0 66 01 00
      },
      {
       id 121,
       criticality reject,
       value UserLocationInformation : userLocationInformationNR : {
          nR-CGI {
           pLMNIdentity '62 F0 66'H,
           nRCellIdentity '00000000 00000111 11110011 11111111 1111'B
          },
          tAI {
           pLMNIdentity '62 F0 66'H,
           tAC '00 02 4F'H
          }
         }
      },
      {
       id 90,
       criticality ignore,
       value RRCEstablishmentCause : mo-Signalling
      }
     }
    }
  }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 DownlinkNASTransport

```
NGAP-PDU : initiatingMessage : {
  procedureCode 4,
  criticality ignore,
  value DownlinkNASTransport : {
    protocolIEs {
     {
      id 10,
      criticality reject,
      value AMF-UE-NGAP-ID : 4294967862
     },
     {
      id 85,
      criticality reject,
      value RAN-UE-NGAP-ID : 61
     },
     {
      id 38,
      criticality reject,
      value NAS-PDU : '7E 02 70 AE 9E 2F 04 7E 00 56 01 02 00 00 21 58 8C 70 61 0F EF 9A 99 9E 7E 91 0D 9C E6 F4 0C 20 10 71 3E 5D 6F 48 54 80 00
     }
    }
   }
 }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 dlInformationTransfer

```
DL-DCCH-Message : {
 message c1 : dlInformationTransfer : {
    rrc-TransactionIdentifier 1,
    criticalExtensions dlInformationTransfer : {
      dedicatedNAS-Message '7E 02 70 AE 9E 2F 04 7E 00 56 01 02 00 00 21 58 8C 70 61 0F EF 9A 99 9E 7E 91 0D 9C E6 F4 0C 20 10 71 3E 5D 6F 48
     }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 dlRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 12,
  criticality ignore,
  value DLRRCMessageTransfer : {
    protocolIEs {
     {
      id 40,
      criticality reject,
      value GNB-CU-UE-F1AP-ID : 61
     },
     {
      id 41,
      criticality reject,
      value GNB-DU-UE-F1AP-ID : 62
     },
     {
      id 64,
      criticality reject,
      value SRBID : 1
     },
     {
      id 50,
      criticality reject,
      value RRCContainer : '00 00 2A 86 2F C0 4E 15 D3 C5 E0 8F C0 0A C0 20 40 00 04 2B 11 8E 0C 21 FD F3 53 33 CF D2 21 B3 9C DE 81 84 02 0E 27 CB AD E9
     }
    }
   }
 }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ulRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 13,
  criticality ignore,
  value ULRRCMessageTransfer : {
    protocolIEs {
      {
       id 40,
       criticality reject,
       value GNB-CU-UE-F1AP-ID : 61
      },
      {
       id 41,
       criticality reject,
       value GNB-DU-UE-F1AP-ID : 62
      },
      {
       id 64,
       criticality reject,
       value SRBID : 1
      },
      {
       id 50,
       criticality reject,
       value RRCContainer : '00 01 3A 0E 3F 01 56 C5 82 DD 82 BF 00 2B 96 88 0E 14 35 99 FD 2C 40 73 AB 7A 0A AA 81 2F 05 B6 80 00 00 00 00'H
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ulInformationTransfer

```
UL-DCCH-Message : {
 message c1 : ulInformationTransfer : {
    criticalExtensions ulInformationTransfer : {
      dedicatedNAS-Message '7E 02 AD 8B 05 BB 05 7E 00 57 2D 10 1C 28 6B 33 FA 58 80 E7 56 F4 15 55 02 5E 0B 6D'H
     }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 UplinkNASTransport

```
NGAP-PDU : initiatingMessage : {
  procedureCode 46,
  criticality ignore,
  value UplinkNASTransport : {
    protocolIEs {
      {
       id 10,
       criticality reject,
       value AMF-UE-NGAP-ID : 4294967862
      },
      {
       id 85,
       criticality reject,
       value RAN-UE-NGAP-ID : 61
      },
      {
       id 38,
       criticality reject,
       value NAS-PDU : '7E 02 AD 8B 05 BB 05 7E 00 57 2D 10 1C 28 6B 33 FA 58 80 E7 56 F4 15 55 02 5E 0B 6D'H
      },
      {
       id 121,
       criticality ignore,
       value UserLocationInformation : userLocationInformationNR : {
          nR-CGI {
           pLMNIdentity '62 F0 66'H,
           nRCellIdentity '00000000 00000111 11110011 11111111 1111'B
          },
          tAI {
           pLMNIdentity '62 F0 66'H,
           tAC '00 02 4F'H
          }
         }
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 DownlinkNASTransport

```
NGAP-PDU : initiatingMessage : {
  procedureCode 4,
  criticality ignore,
  value DownlinkNASTransport : {
    protocolIEs {
      {
       id 10,
       criticality reject,
       value AMF-UE-NGAP-ID : 4294967862
      },
      {
       id 85,
       criticality reject,
       value RAN-UE-NGAP-ID : 61
      },
      {
       id 38,
       criticality reject,
       value NAS-PDU : '7E 02 39 25 C4 7C 01 7E 00 42 01 01 77 00 0B F2 62 F0 66 01 00 41 C1 E0 00 2F 54 07 20 62 F0 66 00 02 4F 15 05 04 01 D1 43 A5 21
      },
      {
       id 110,
       criticality ignore,
       value UEAggregateMaximumBitRate : {
         uEAggregateMaximumBitRateDL 2000000000000,
         uEAggregateMaximumBitRateUL 2000000000000
       }
      },
      {
       id 0,
       criticality reject,
       value AllowedNSSAI : {
         {
          s-NSSAI {
           sST '01'H,
           sD 'D1 43 A5'H
          }
         }
       }
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 dlInformationTransfer

```
DL-DCCH-Message : {
 message c1 : dlInformationTransfer : {
    rrc-TransactionIdentifier 2,
    criticalExtensions dlInformationTransfer : {
      dedicatedNAS-Message '7E 03 A8 F2 9B F2 00 7E 00 5D 02 01 02 F0 F0 E1'H
     }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 dlRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 12,
  criticality ignore,
  value DLRRCMessageTransfer : {
    protocolIEs {
      {
       id 40,
       criticality reject,
       value GNB-CU-UE-F1AP-ID : 61
      },
      {
       id 41,
       criticality reject,
       value GNB-DU-UE-F1AP-ID : 62
      },
      {
       id 64,
       criticality reject,
       value SRBID : 1
      },
      {
       id 50,
       criticality reject,
       value RRCContainer : '00 01 2C 82 0F C0 75 1E 53 7E 40 0F C0 0B A0 40 20 5E 1E 1C 20 00 00 00 00'H
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ulRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 13,
  criticality ignore,
  value ULRRCMessageTransfer : {
    protocolIEs {
      {
       id 40,
       criticality reject,
       value GNB-CU-UE-F1AP-ID : 61
      },
      {
       id 41,
       criticality reject,
       value GNB-DU-UE-F1AP-ID : 62
      },
      {
       id 64,
       criticality reject,
       value SRBID : 1
      },
      {
       id 50,
       criticality reject,
       value RRCContainer : '00 02 3A 0B 3F 02 28 6D 83 2A 00 3F 00 2F 3B 80 04 9A 8A 84 80 89 80 C2 3C FC 00 00 00 00 00'H
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ulInformationTransfer

```
UL-DCCH-Message : {
 message c1 : ulInformationTransfer : {
    criticalExtensions ulInformationTransfer : {
      dedicatedNAS-Message '7E 04 50 DB 06 54 00 7E 00 5E 77 00 09 35 15 09 01 13 01 84 79 F8'H
     }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 UplinkNASTransport

```
NGAP-PDU : initiatingMessage : {
  procedureCode 46,
  criticality ignore,
  value UplinkNASTransport : {
    protocolIEs {
      {
       id 10,
       criticality reject,
       value AMF-UE-NGAP-ID : 4294967862
      },
      {
       id 85,
       criticality reject,
       value RAN-UE-NGAP-ID : 61
      },
      {
       id 38,
       criticality reject,
       value NAS-PDU : '7E 04 50 DB 06 54 00 7E 00 5E 77 00 09 35 15 09 01 13 01 84 79 F8'H
      },
      {
       id 121,
       criticality ignore,
       value UserLocationInformation : userLocationInformationNR : {
           nR-CGI {
            pLMNIdentity '62 F0 66'H,
            nRCellIdentity '00000000 00000111 11110011 11111111 1111'B
           },
           tAI {
            pLMNIdentity '62 F0 66'H,
            tAC '00 02 4F'H
           }
          }
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 DownlinkNASTransport

```
NGAP-PDU : initiatingMessage : {
  procedureCode 4,
  criticality ignore,
  value DownlinkNASTransport : {
    protocolIEs {
      {
       id 10,
       criticality reject,
       value AMF-UE-NGAP-ID : 4294967062
      },
      {
       id 85,
       criticality reject,
       value RAN-UE-NGAP-ID : 61
      },
      {
       id 38,
       criticality reject,
       value NAS-PDU : '7E 02 39 25 C4 7C 01 7E 00 42 01 01 77 00 0B F2 62 F0 66 01 00 41 C1 E0 00 2F 54 07 20 62 F0 66 00 0
      },
      {
       id 110,
       criticality ignore,
       value UEAggregateMaximumBitRate : {
         uEAggregateMaximumBitRateDL 2000000000000,
         uEAggregateMaximumBitRateUL 2000000000000
        }
      },
      {
       id 0,
       criticality reject,
       value AllowedNSSAI : {
          {
           s-NSSAI {
            sST '01'H,
            sD 'D1 43 A5'H
           }
          }
        }
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 dlInformationTransfer

```
DL-DCCH-Message : {
 message c1 : dlInformationTransfer : {
    rrc-TransactionIdentifier 3,
    criticalExtensions dlInformationTransfer : {
      dedicatedNAS-Message '7E 02 39 25 C4 7C 01 7E 00 42 01 01 77 00 0B F2 62 F0 66 01 00 41 C1 E0 00 2F 54 07 20 62 F0 66 00
     }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 dlRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 12,
  criticality ignore,
  value DLRRCMessageTransfer : {
    protocolIEs {
      {
       id 40,
       criticality reject,
       value GNB-CU-UE-F1AP-ID : 61
      },
      {
       id 41,
       criticality reject,
       value GNB-DU-UE-F1AP-ID : 62
      },
      {
       id 64,
       criticality reject,
       value SRBID : 1
      },
      {
       id 50,
       criticality reject,
       value RRCContainer : '00 02 2E 86 6F C0 47 24 B8 8F 80 2F C0 08 40 20 2E E0 01 7E 4C 5E 0C C0 20 08 38 3C 00 05 EA 80 E4 0C 5E
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ulRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 13,
  criticality ignore,
  value ULRRCMessageTransfer : {
    protocolIEs {
      {
       id 40,
       criticality reject,
       value GNB-CU-UE-F1AP-ID : 61
      },
      {
       id 41,
       criticality reject,
       value GNB-DU-UE-F1AP-ID : 62
      },
      {
       id 64,
       criticality reject,
       value SRBID : 1
      },
      {
       id 50,
       criticality reject,
       value RRCContainer : '00 03 3A 05 3F 01 1A 71 36 5E 00 BF 00 21 80 00 00 00 00'H
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ulInformationTransfer

```
UL-DCCH-Message : {
 message c1 : ulInformationTransfer : {
    criticalExtensions ulInformationTransfer : {
      dedicatedNAS-Message '7E 02 34 E2 6C BC 01 7E 00 43'H
     }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 UplinkNASTransport

```
NGAP-PDU : initiatingMessage : {
  procedureCode 46,
  criticality ignore,
  value UplinkNASTransport : {
    protocolIEs {
      {
       id 10,
       criticality reject,
       value AMF-UE-NGAP-ID : 4294967862
      },
      {
       id 85,
       criticality reject,
       value RAN-UE-NGAP-ID : 61
      },
      {
       id 38,
       criticality reject,
       value NAS-PDU : '7E 02 34 E2 6C BC 01 7E 00 43'H
      },
      {
       id 121,
       criticality ignore,
       value UserLocationInformation : userLocationInformationNR : {
           nR-CGI {
            pLMNIdentity '62 F0 66'H,
            nRCellIdentity '00000000 00000111 11110011 11111111 1111'B
           },
           tAI {
            pLMNIdentity '62 F0 66'H,
            tAC '00 02 4F'H
           }
          }
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 DownlinkNASTransport

```
NGAP-PDU : initiatingMessage : {
  procedureCode 4,
  criticality ignore,
  value DownlinkNASTransport : {
    protocolIEs {
     {
      id 10,
      criticality reject,
      value AMF-UE-NGAP-ID : 4294967862
     },
     {
      id 85,
      criticality reject,
      value RAN-UE-NGAP-ID : 61
     },
     {
      id 38,
      criticality reject,
      value NAS-PDU : '7E 02 F0 28 31 66 02 7E 00 54 D0 43 08 88 E7 39 33 2C 9E D7 8E 45 05 8C B5 E3 34 08 46 40 47 12 30 52 71 33
     }
    }
   }
 }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 dlInformationTransfer

```
DL-DCCH-Message : {
 message c1 : dlInformationTransfer : {
    rrc-TransactionIdentifier 0,
    criticalExtensions dlInformationTransfer : {
      dedicatedNAS-Message '7E 02 F0 28 31 66 02 7E 00 54 D0 43 08 80 E7 39 33 2C 9E D7 0E 45 05 0C B5 E3 34 08 46 40 47 12 30 52 71 33 00 40 49 01 00'H
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 dlRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 12,
  criticality ignore,
  value DLRRCMessageTransfer : {
    protocolIEs {
     {
      id 40,
      criticality reject,
      value GNB-CU-UE-F1AP-ID : 61
     },
     {
      id 41,
      criticality reject,
      value GNB-DU-UE-F1AP-ID : 62
     },
     {
      id 64,
      criticality reject,
      value SRBID : 1
     },
     {
      id 50,
      criticality reject,
      value RRCContainer : '00 03 28 85 2F C0 5E 05 06 2C C0 4F C0 0A 9A 08 61 11 1C E7 26 65 93 DA F1 C8 A0 B1 96 BC 66 81 08 C8 08 E2 46 0A 4E
     }
    }
   }
 }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ulRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 13,
  criticality ignore,
  value ULRRCMessageTransfer : {
    protocolIEs {
     {
      id 40,
      criticality reject,
      value GNB-CU-UE-F1AP-ID : 61
     },
     {
      id 41,
      criticality reject,
      value GNB-DU-UE-F1AP-ID : 62
     },
     {
      id 64,
      criticality reject,
      value SRBID : 1
     },
     {
      id 50,
      criticality reject,
      value RRCContainer : '00 04 3A 33 BF 01 4C 75 C4 3F 01 3F 00 33 80 80 19 97 00 DF E0 FF FF C8 94 00 80 2A 88 00 3D 80 11 C0 40 10 88 00 80 80
     }
    }
   }
 }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ulInformationTransfer

```
UL-DCCH-Message : {
 message c1 : ulInformationTransfer : {
    criticalExtensions ulInformationTransfer : {
      dedicatedNAS-Message '7E 02 98 EB 88 7E 02 7E 00 67 01 00 33 2E 01 BF C1 FF FF 91 28 01 00 55 10 00 7B 00 23 80 80 21 10 01
     }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 UplinkNASTransport

```
NGAP-PDU : initiatingMessage : {
  procedureCode 46,
  criticality ignore,
  value UplinkNASTransport : {
    protocolIEs {
     {
      id 10,
      criticality reject,
      value AMF-UE-NGAP-ID : 4294967862
     },
     {
      id 85,
      criticality reject,
      value RAN-UE-NGAP-ID : 61
     },
     {
      id 38,
      criticality reject,
      value NAS-PDU : '7E 02 98 EB 88 7E 02 7E 00 67 01 00 33 2E 01 BF C1 FF FF 91 28 01 00 55 10 00 7B 00 23 80 80 21 10 01 01 00 10 81 06 00 00 00 00 83 06
     },
     {
      id 121,
      criticality ignore,
      value UserLocationInformation : userLocationInformationNR : {
         nR-CGI {
          pLMNIdentity '62 F0 66'H,
          nRCellIdentity '00000000 00000111 11110011 11111111 1111'B
         },
         tAI {
          pLMNIdentity '62 F0 66'H,
          tAC '00 02 4F'H
         }
        }
     }
    }
   }
  }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 InitialContextSetupRequest



```
NGAP-PDU : initiatingMessage : {
  procedureCode 14,
  criticality reject,
  value InitialContextSetupRequest : {
   protocolIEs {
    {
     id 10,
     criticality reject,
     value AMF-UE-NGAP-ID : 4294967862
    },
    {
     id 85,
     criticality reject,
     value RAN-UE-NGAP-ID : 61
    },
    {
     id 110,
     criticality reject,
     value UEAggregateMaximumBitRate : {
      uEAggregateMaximumBitRateDL 2000000000000,
      uEAggregateMaximumBitRateUL 2000000000000
     }
    },
    {
     id 28,
     criticality reject,
     value GUAMI : {
      pLMNIdentity '62 F0 66'H,
      aMFRegionID '00000001'B,
      aMFSetID '0000000001'B,
      aMFPointer '000001'B
     }
    },
    {
     id 71,
     criticality reject,
     value PDUSessionResourceSetupListCxtReq : {
      {
       pDUSessionID 1,
       nAS-PDU '7E 02 C5 AA C3 B9 03 7E 00 68 01 00 59 2E 01 BF C2 11 00 09 01 00 06 31 31 01 01 FE 05 06 10 00 02 10 00 02 29 05 01 0A 16 23 33 22 04 01 D1 43 A5 79 00 06 05 20 41 01 01 09 7B 00 05 80 00 05 01 01 25 22 04 77 61 70 31 05 6E 6F 68 69 61 03 63 6F 6D 06 6D 6E 63 30 36 36 06 6D 63 63 32 36 30 04 67 70 72 73 12 01'H,
       s-NSSAI {
        sST '01'H,
        sD '01 43 A5'H
       },
       pDUSessionResourceSetupRequestTransfer {
        protocolIEs {
         {
          id 130,
          criticality reject,
          value PDUSessionAggregateMaximumBitRate : {
           pDUSessionAggregateMaximumBitRateDL 2000000000000,
           pDUSessionAggregateMaximumBitRateUL 2000000000000
          }
         },
         {
          id 139,
          criticality reject,
          value UPTransportLayerInformation : gTPTunnel : {
           transportLayerAddress '00001010000101100010001100101010'B,
           gTP-TEID '42 60 01 35'H
          }
         },
         {
          id 134,
          criticality reject,
          value PDUSessionType : ipv4
         },
         {
          id 138,
          criticality reject,
          value SecurityIndication : {
           integrityProtectionIndication preferred,
           confidentialityProtectionIndication required
          }
         },
         {
          id 136,
          criticality reject,
          value QosFlowSetupRequestList : {
           {
            qosFlowIdentifier 5,
            qosFlowLevelQosParameters {
            qosCharacteristics nonDynamic5QI : {
             fiveQI 9
            },
            allocationAndRetentionPriority {
             priorityLevelARP 9,
             pre-emptionCapability may-trigger-pre-emption,
             pre-emptionVulnerability pre-emptable
            }
           }
          }
         }
        }
       }
      }
     }
    },
    {
     id 0,
     criticality reject,
     value AllowedNSSAI : {
      {
       s-NSSAI {
        sST '01'H,
        sD '01 43 A5'H
```

```
        }
       }
      }
     },
     {
      id 119,
      criticality reject,
      value UESecurityCapabilities : {
       nRencryptionAlgorithms '11100000 00000000'B,
       nRintegrityProtectionAlgorithms '11100000 00000000'B,
       eUTRAencryptionAlgorithms '00000000 00000000'B,
       eUTRAintegrityProtectionAlgorithms '00000000 00000000'B
      }
     },
     {
      id 94,
      criticality reject,
      value SecurityKey : '01011111 01011000 10000010 01110010 01011110 00000111
11100111 11110101 01110001 01111010 11001000 11101111 10011011 00101011
10001001 00001001 01000100 00100011 11111100 11011100 00000110 11111110
10101001 01101010 11100011 11100011 01100100 00111110 00111000 00011110
11100100 00011010'B
     },
     {
      id 36,
      criticality ignore,
      value MobilityRestrictionList : {
       servingPLMN '62 F0 66'H
      }
     }
    }
   }
  }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 securityModeCommand

```
DL-DCCH-Message : {
 message c1 : securityModeCommand : {
    rrc-TransactionIdentifier 1,
    criticalExtensions securityModeCommand : {
      securityConfigSMC {
       securityAlgorithmConfig {
        cipheringAlgorithm nea2,
        integrityProtAlgorithm nia2
       }
      }
     }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ueCapabilityEnquiry

```
DL-DCCH-Message : {
 message c1 : ueCapabilityEnquiry : {
    rrc-TransactionIdentifier 2,
    criticalExtensions ueCapabilityEnquiry : {
      ue-CapabilityRAT-RequestList {
       {
        rat-Type nr,
        capabilityRequestFilter '80 04 02 80'H
       }
      }
     }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 dlRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 12,
  criticality ignore,
  value DLRRCMessageTransfer : {
    protocolIEs {
     {
      id 40,
      criticality reject,
      value GNB-CU-UE-F1AP-ID : 61
     },
     {
      id 41,
      criticality reject,
      value GNB-DU-UE-F1AP-ID : 62
     },
     {
      id 64,
      criticality reject,
      value SRBID : 1
     },
     {
      id 50,
      criticality reject,
      value RRCContainer : '00 04 22 09 10 FF 0D 73 52'H
     }
    }
   }
 }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 dlRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 12,
  criticality ignore,
  value DLRRCMessageTransfer : {
    protocolIEs {
      {
       id 40,
       criticality reject,
       value GNB-CU-UE-F1AP-ID : 61
      },
      {
       id 41,
       criticality reject,
       value GNB-DU-UE-F1AP-ID : 62
      },
      {
       id 64,
       criticality reject,
       value SRBID : 1
      },
      {
       id 50,
       criticality reject,
       value RRCContainer : '00 05 C6 3B 68 58 22 22 3D 00 B0 E5 C3 E8'H
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ulRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 13,
  criticality ignore,
  value ULRRCMessageTransfer : {
    protocolIEs {
      {
       id 40,
       criticality reject,
       value GNB-CU-UE-F1AP-ID : 61
      },
      {
       id 41,
       criticality reject,
       value GNB-DU-UE-F1AP-ID : 62
      },
      {
       id 64,
       criticality reject,
       value SRBID : 1
      },
      {
       id 50,
       criticality reject,
       value RRCContainer : '00 05 2A 00 EB 89 5F F6'H
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 securityModeComplete

```
UL-DCCH-Message : {
 message c1 : securityModeComplete : {
    rrc-TransactionIdentifier 1,
    criticalExtensions securityModeComplete : {
     }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ulRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 13,
  criticality ignore,
  value ULRRCMessageTransfer : {
    protocolIEs {
     {
      id 40,
      criticality reject,
      value GNB-CU-UE-F1AP-ID : 61
     },
     {
      id 41,
      criticality reject,
      value GNB-DU-UE-F1AP-ID : 62
     },
     {
      id 64,
      criticality reject,
      value SRBID : 1
     },
     {
      id 50,
      criticality reject,
      value RRCContainer : '00 06 42 C6 AD 5C 24 4C 2A 0B BF 86 81 FA D3 B0 90 7F F6 44 0A CD CE D6 04 E1 AE 84 57 23 4E 22 16 B8 87 EC 1B
     }
    }
   }
 }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ueCapabilityInformation

```
UL-DCCH-Message : {
 message c1 : ueCapabilityInformation : {
   rrc-TransactionIdentifier 2,
   criticalExtensions ueCapabilityInformation : {
     ue-CapabilityRAT-ContainerList {
       {
       rat-Type nr,
       ue-CapabilityRAT-Container '81 A0 3F A0 47 D5 FF AF FF FF BB FC 0A 03 C1 70 10 1E 09 3F F3 FF FF FC 00 10 20 3C ED C0 40 7E 38 04 57 70 1B FF 8B
           UE-NR-Capability : {
            accessStratumRelease rel15,
            pdcp-Parameters {
             supportedROHC-Profiles {
              profile0x0000 TRUE,
              profile0x0001 TRUE,
              profile0x0002 TRUE,
              profile0x0003 FALSE,
              profile0x0004 TRUE,
              profile0x0006 FALSE,
              profile0x0101 FALSE,
              profile0x0102 FALSE,
              profile0x0103 FALSE,
              profile0x0104 FALSE
             },
             maxNumberROHC-ContextSessions cs16,
             outOfOrderDelivery supported,
             shortSN supported,
             pdcp-DuplicationSRB supported,
             pdcp-DuplicationMCG-OrSCG-DRB supported
            },
            rlc-Parameters {
             am-WithShortSN supported,
             um-WithShortSN supported,
             um-WithLongSN supported
            },
            mac-Parameters {
             mac-ParametersCommon {
              lcp-Restriction supported,
              lch-ToSCellRestriction supported
             },
             mac-ParametersXDD-Diff {
              skipUplinkTxDynamic supported,
              logicalChannelSR-DelayTimer supported,
              longDRX-Cycle supported,
              shortDRX-Cycle supported,
              multipleSR-Configurations supported,
              multipleConfiguredGrants supported
             }
            }
```





---


```
ueCapabilityInformation

UL-DCCH-Message : {
 message c1 : ueCapabilityInformation : {
  rrc-TransactionIdentifier 2,
  criticalExtensions ueCapabilityInformation : {
   ue-CapabilityRAT-ContainerList {
    {
     rat-Type nr,
      ue-CapabilityRAT-Container '81 A0 3F A0 47 D5 FF AF FF FF BB FC 0A 03 C1 70 10 1E 09 3F F3 FF FF FC 00 10 20 3C ED C0 40 7E 38 04 57 70 1B FF BB C2 3B CB E0 82 1F F5 40 22 6F 65 37 48 91 89 3E B1 89 3E AC 41 E4 49 F0 91 46 5B E7 F8 AE E0 51 FF 17 84 77 97 C1 04 3F EA 80 44 DE CA 6E 91 23 12 7D 63 12 7D 58 83 C8 93 E1 22 BC B7 CF E9
5D C1 37 FE 2F 08 EF 2F 82 08 7F D5 00 89 80 94 DD 22 46 24 FA C6 24 FA B1 07 91 27 C2 45 19 6F 9F D0 11 03 85 00 00 00 01 00 10 0A 00 41 A0 18 11 B6 49 F0 3F FF E0 00 07 01 F0 01 40 E0 20 30 18 B1 C0 60 00 78 3E 00 99 20 00 00 0C 90 00 00 20 0F 0A 6F 2A 68 02 08 00 00 4B 2C A8 20 00 03 2C B2 A0 0E 85 55 D2 AA A0 21 80 01 F3 7E 03 80
E0 0F 37 E0 38 0E 00 00 00 00 C0 08 01 80 20 04 10'H
         UE-NR-Capability : {
          accessStratumRelease rel15,
          pdcp-Parameters {
           supportedROHC-Profiles {
            profile0x0000 TRUE,
            profile0x0001 TRUE,
            profile0x0003 TRUE,
            profile0x0003 FALSE,
            profile0x0004 TRUE,
            profile0x0006 FALSE,
            profile0x0101 FALSE,
            profile0x0102 FALSE,
            profile0x0103 FALSE,
            profile0x0104 FALSE
           },
           maxNumberROHC-ContextSessions cs16,
           outOfOrderDelivery supported,
           shortSN supported,
           pdcp-DuplicationSRB supported,
           pdcp-DuplicationMCG-OrSCG-DRB supported
          },
          rlc-Parameters {
           am-WithShortSN supported,
           um-WithShortSN supported,
           um-WithLongSN supported
          },
          mac-Parameters {
           mac-ParametersCommon {
            lcp-Restriction supported,
            lch-ToSCellRestriction supported
           },
           mac-ParametersXDD-Diff {
            skipUplinkTxDynamic supported,
            logicalChannelSR-DelayTimer supported,
            longDRX-Cycle supported,
            shortDRX-Cycle supported,
            multipleSR-Configurations supported,
            multipleConfiguredGrants supported
           }
          },
          phy-Parameters {
           phy-ParametersCommon {
            dynamicPRB-BundlingDL supported,
            sp-CSI-ReportPUCCH supported,
            sp-CSI-ReportPUSCH supported,
            nzp-CSI-RS-IntefMgmt supported,
            type2-SP-CSI-Feedback-LongPUCCH supported,
            precoderGranularityCORESET supported,
            dynamicHARQ-ACK-Codebook supported,
            semiStaticHARQ-ACK-Codebook supported,
            spatialBundlingHARQ-ACK supported,
            dynamicBetaOffsetInd-HARQ-ACK-CSI supported,
            pucch-Repetition-F1-3-4 supported,
            ra-Type0-PUSCH supported,
            dynamicSwitchRA-Type0-1-PDSCH supported,
            dynamicSwitchRA-Type0-1-PUSCH supported,
            pdsch-MappingTypeA supported,
            pdsch-MappingTypeB supported,
            interleavingVRB-ToPRB-PDSCH supported,
            interSlotFreqHopping-PUSCH supported,
            type1-PUSCH-RepetitionMultiSlots supported,
            type2-PUSCH-RepetitionMultiSlots supported,
            pusch-RepetitionMultiSlots supported,
            downlinkSPS supported,
            configuredUL-GrantType1 supported,
            configuredUL-GrantType2 supported,
            cbg-TransIndication-DL supported,
            cbg-TransIndication-UL supported,
            cbg-FlushIndication-DL supported,
            dynamicHARQ-ACK-CodeB-CBG-Retx-DL supported,
            rateMatchingResrcSetSemi-Static supported,
            rateMatchingResrcSetDynamic supported,
            bwp-SwitchingDelay type2,
            maxNumberSearchSpaces n10,
            rateMatchingCtrlResrcSetDynamic supported,
            maxLayersMIMO-Indication supported
           },
           phy-ParametersXDD-Diff {
            twoPUCCH-F0-2-ConsecSymbols supported,
            twoDifferentTPC-Loop-PUSCH supported,
            twoDifferentTPC-Loop-PUCCH supported,
            dl-SchedulingOffset-PDSCH-TypeA supported,
            dl-SchedulingOffset-PDSCH-TypeB supported,
            ul-SchedulingOffset supported
           },
           phy-ParametersFRX-Diff {
            twoFL-DMRS '11'B,
            supportedDMRS-TypeDL type1And2,
            supportedDMRS-TypeUL type1And2,
            semiOpenLoopCSI supported,
            csi-ReportWithoutPMI supported,
            csi-ReportWithoutCQI supported,
            onePortsPTRS '00'B,
            twoPUCCH-F0-2-ConsecSymbols supported,
            pucch-F2-WithFH supported,
```

```
 pucch-F3-WithFH supported,
 pucch-F4-WithFH supported,
 mux-SR-HARQ-ACK-CSI-PUCCH-MultiPerSlot supported,
 uci-CodeBlockSegmentation supported,
 onePUCCH-LongAndShortFormat supported,
 twoPUCCH-AnyOthersInSlot supported,
 intraSlotFreqHopping-PUSCH supported,
 pusch-LBRM supported,
 pdcch-BlindDetectionCA 4,
 tpc-PUSCH-RNTI supported,
 tpc-PUCCH-RNTI supported,
 tpc-SRS-RNTI supported,
 absoluteTPC-Command supported,
 twoDifferentTPC-Loop-PUSCH supported,
 twoDifferentTPC-Loop-PUCCH supported,
 pusch-HalfPi-BPSK supported,
 pucch-F3-4-HalfPi-BPSK supported,
 almostContiguousCP-OFDM-UL supported,
 sp-CSI-RS supported,
 sp-CSI-IM supported,
 tdd-MultiDL-UL-SwitchPerSlot supported,
 multipleCORESET supported,
 dl-SchedulingOffset-PDSCH-TypeA supported,
 dl-SchedulingOffset-PDSCH-TypeB supported,
 ul-SchedulingOffset supported,
 dl-64QAM-MCS-TableAlt supported,
 oneFL-DMRS-TwoAdditionalDMRS-UL supported,
 twoFL-DMRS-TwoAdditionalDMRS-UL supported,
 oneFL-DMRS-ThreeAdditionalDMRS-UL supported
},
phy-ParametersFR1 {
 pdcch-MonitoringSingleOccasion supported,
 pdsch-256QAM-FR1 supported,
 pdsch-RE-MappingFR1-PerSymbol n20,
 pdsch-RE-MappingFR1-PerSlot n256
}
},
rf-Parameters {
 supportedBandListNR {
  {
   bandNR 28,
   mimo-ParametersPerBand {
```

```
tci-StatePDSCH {
 maxNumberConfiguredTCIstatesPerCC n32,
 maxNumberActiveTCI-PerBWP n8
},
additionalActiveTCI-StatePDCCH supported,
pusch-TransCoherence nonCoherent,
beamCorrespondenceWithoutUL-BeamSweeping supported,
periodicBeamReport supported,
aperiodicBeamReport supported,
sp-BeamReportPUCCH supported,
sp-BeamReportPUSCH supported,
maxNumberNonGroupBeamReporting n4,
uplinkBeamManagement {
 maxNumberSRS-ResourcePerSet-BM n16,
 maxNumberSRS-ResourceSet 8
},
maxNumberCSI-RS-BFD 2,
maxNumberSSB-BFD 2,
maxNumberCSI-RS-SSB-CBD 16,
beamReportTiming {
 scs-15kHz sym8,
 scs-30kHz sym14,
 scs-60kHz sym28,
 scs-120kHz sym56
},
aperiodicTRS supported,
beamManagementSSB-CSI-RS {
 maxNumberSSB-CSI-RS-ResourceOneTx n16,
 maxNumberCSI-RS-Resource n16,
 maxNumberCSI-RS-ResourceTwoTx n16,
 supportedCSI-RS-Density oneAndThree,
 maxNumberAperiodicCSI-RS-Resource n16
},
beamSwitchTiming {
 scs-60kHz sym28
},
codebookParameters {
 type1 {
  singlePanel {
   supportedCSI-RS-ResourceList {
    {
     maxNumberTxPortsPerResource p32,
```

```
    maxNumberResourcesPerBand 10,
    totalNumberTxPortsPerBand 64
   }
  },
  modes mode1andMode2,
  maxNumberCSI-RS-PerResourceSet 4
 },
 multiPanel {
  supportedCSI-RS-ResourceList {
   {
    maxNumberTxPortsPerResource p32,
    maxNumberResourcesPerBand 10,
    totalNumberTxPortsPerBand 64
   }
  },
  modes both,
  nrofPanels n4,
  maxNumberCSI-RS-PerResourceSet 4
 }
}
},
csi-RS-IM-ReceptionForFeedback {
 maxConfigNumberNZP-CSI-RS-PerCC 5,
 maxConfigNumberPortsAcrossNZP-CSI-RS-PerCC 32,
 maxConfigNumberCSI-IM-PerCC n4,
 maxNumberSimultaneousNZP-CSI-RS-PerCC 10,
 totalNumberPortsSimultaneousNZP-CSI-RS-PerCC 64
},
csi-ReportFramework {
 maxNumberPeriodicCSI-PerBWP-ForCSI-Report 1,
 maxNumberAperiodicCSI-PerBWP-ForCSI-Report 2,
 maxNumberSemiPersistentCSI-PerBWP-ForCSI-Report 1,
 maxNumberPeriodicCSI-PerBWP-ForBeamReport 1,
 maxNumberAperiodicCSI-PerBWP-ForBeamReport 2,
 maxNumberAperiodicCSI-triggeringStatePerCC n15,
 maxNumberSemiPersistentCSI-PerBWP-ForBeamReport 1,
 simultaneousCSI-ReportsPerCC 5
},
csi-RS-ForTracking {
 maxBurstLength 2,
 maxSimultaneousResourceSetsPerCC 4,
 maxConfiguredResourceSetsPerCC 32,
```

```
  maxConfiguredResourceSetsAllCC 64
 }
 },
 multipleTCI supported,
 bwp-SameNumerology upto4,
 bwp-DiffNumerology upto4,
 crossCarrierScheduling-SameSCS supported,
 pusch-256QAM supported,
 ue-PowerClass pc3,
 rateMatchingLTE-CRS supported
},
{
 bandNR 41,
 mimo-ParametersPerBand {
  tci-StatePDSCH {
   maxNumberConfiguredTCIstatesPerCC n32,
   maxNumberActiveTCI-PerBWP n8
  },
  additionalActiveTCI-StatePDCCH supported,
  pusch-TransCoherence nonCoherent,
  beamCorrespondenceWithoutUL-BeamSweeping supported,
  periodicBeamReport supported,
  aperiodicBeamReport supported,
  sp-BeamReportPUCCH supported,
  sp-BeamReportPUSCH supported,
  maxNumberNonGroupBeamReporting n4,
  uplinkBeamManagement {
   maxNumberSRS-ResourcePerSet-BM n16,
   maxNumberSRS-ResourceSet 8
  },
  maxNumberCSI-RS-BFD 2,
  maxNumberSSB-BFD 2,
  maxNumberCSI-RS-SSB-CBD 16,
  beamReportTiming {
   scs-15kHz sym8,
   scs-30kHz sym14,
   scs-60kHz sym28,
   scs-120kHz sym56
  },
  aperiodicTRS supported,
  beamManagementSSB-CSI-RS {
   maxNumberSSB-CSI-RS-ResourceOneTx n16,
```

```
 maxNumberCSI-RS-Resource n16,
 maxNumberCSI-RS-ResourceTwoTx n16,
 supportedCSI-RS-Density oneAndThree,
 maxNumberAperiodicCSI-RS-Resource n16
},
beamSwitchTiming {
 scs-60kHz sym28
},
codebookParameters {
 type1 {
  singlePanel {
   supportedCSI-RS-ResourceList {
    {
     maxNumberTxPortsPerResource p32,
     maxNumberResourcesPerBand 10,
     totalNumberTxPortsPerBand 64
    }
   },
   modes mode1andMode2,
   maxNumberCSI-RS-PerResourceSet 4
  },
  multiPanel {
   supportedCSI-RS-ResourceList {
    {
     maxNumberTxPortsPerResource p32,
     maxNumberResourcesPerBand 10,
     totalNumberTxPortsPerBand 64
    }
   },
   modes both,
   nrofPanels n4,
   maxNumberCSI-RS-PerResourceSet 4
  }
 }
},
csi-RS-IM-ReceptionForFeedback {
 maxConfigNumberNZP-CSI-RS-PerCC 5,
 maxConfigNumberPortsAcrossNZP-CSI-RS-PerCC 32,
 maxConfigNumberCSI-IM-PerCC n4,
 maxNumberSimultaneousNZP-CSI-RS-PerCC 10,
 totalNumberPortsSimultaneousNZP-CSI-RS-PerCC 64
},
```

```
 csi-ReportFramework {
  maxNumberPeriodicCSI-PerBWP-ForCSI-Report 1,
  maxNumberAperiodicCSI-PerBWP-ForCSI-Report 2,
  maxNumberSemiPersistentCSI-PerBWP-ForCSI-Report 1,
  maxNumberPeriodicCSI-PerBWP-ForBeamReport 1,
  maxNumberAperiodicCSI-PerBWP-ForBeamReport 2,
  maxNumberAperiodicCSI-triggeringStatePerCC n15,
  maxNumberSemiPersistentCSI-PerBWP-ForBeamReport 1,
  simultaneousCSI-ReportsPerCC 5
 },
 csi-RS-ForTracking {
  maxBurstLength 2,
  maxSimultaneousResourceSetsPerCC 4,
  maxConfiguredResourceSetsPerCC 32,
  maxConfiguredResourceSetsAllCC 64
 }
},
multipleTCI supported,
bwp-SameNumerology upto4,
bwp-DiffNumerology upto4,
crossCarrierScheduling-SameSCS supported,
pusch-256QAM supported,
ue-PowerClass pc2,
rateMatchingLTE-CRS supported
},
{
bandNR 78,
mimo-ParametersPerBand {
 tci-StatePDSCH {
  maxNumberConfiguredTCIstatesPerCC n32,
  maxNumberActiveTCI-PerBWP n8
 },
 additionalActiveTCI-StatePDCCH supported,
 pusch-TransCoherence nonCoherent,
 beamCorrespondenceWithoutUL-BeamSweeping supported,
 periodicBeamReport supported,
 aperiodicBeamReport supported,
 sp-BeamReportPUCCH supported,
 sp-BeamReportPUSCH supported,
 maxNumberNonGroupBeamReporting n4,
 uplinkBeamManagement {
  maxNumberSRS-ResourcePerSet-BM n16,
```

```
 maxNumberSRS-ResourceSet 8
},
maxNumberCSI-RS-BFD 2,
maxNumberSSB-BFD 2,
maxNumberCSI-RS-SSB-CBD 16,
beamReportTiming {
 scs-15kHz sym8,
 scs-30kHz sym14,
 scs-60kHz sym28,
 scs-120kHz sym56
},
aperiodicTRS supported,
beamManagementSSB-CSI-RS {
 maxNumberSSB-CSI-RS-ResourceOneTx n16,
 maxNumberCSI-RS-Resource n16,
 maxNumberCSI-RS-ResourceTwoTx n16,
 supportedCSI-RS-Density oneAndThree,
 maxNumberAperiodicCSI-RS-Resource n16
},
beamSwitchTiming {
 scs-60kHz sym28
},
codebookParameters {
 type1 {
  singlePanel {
   supportedCSI-RS-ResourceList {
    {
     maxNumberTxPortsPerResource p32,
     maxNumberResourcesPerBand 10,
     totalNumberTxPortsPerBand 64
    }
   },
   modes mode1andMode2,
   maxNumberCSI-RS-PerResourceSet 4
  },
  multiPanel {
   supportedCSI-RS-ResourceList {
    {
     maxNumberTxPortsPerResource p32,
     maxNumberResourcesPerBand 10,
     totalNumberTxPortsPerBand 64
    }
```

```
    },
    modes both,
    nrofPanels n4,
    maxNumberCSI-RS-PerResourceSet 4
   }
  }
 },
 csi-RS-IM-ReceptionForFeedback {
  maxConfigNumberNZP-CSI-RS-PerCC 5,
  maxConfigNumberPortsAcrossNZP-CSI-RS-PerCC 32,
  maxConfigNumberCSI-IM-PerCC n4,
  maxNumberSimultaneousNZP-CSI-RS-PerCC 10,
  totalNumberPortsSimultaneousNZP-CSI-RS-PerCC 64
 },
 csi-ReportFramework {
  maxNumberPeriodicCSI-PerBWP-ForCSI-Report 1,
  maxNumberAperiodicCSI-PerBWP-ForCSI-Report 2,
  maxNumberSemiPersistentCSI-PerBWP-ForCSI-Report 1,
  maxNumberPeriodicCSI-PerBWP-ForBeamReport 1,
  maxNumberAperiodicCSI-PerBWP-ForBeamReport 2,
  maxNumberAperiodicCSI-triggeringStatePerCC n15,
  maxNumberSemiPersistentCSI-PerBWP-ForBeamReport 1,
  simultaneousCSI-ReportsPerCC 5
 },
 csi-RS-ForTracking {
  maxBurstLength 2,
  maxSimultaneousResourceSetsPerCC 4,
  maxConfiguredResourceSetsPerCC 32,
  maxConfiguredResourceSetsAllCC 64
 }
},
multipleTCI supported,
bwp-SameNumerology upto4,
bwp-DiffNumerology upto4,
crossCarrierScheduling-SameSCS supported,
pusch-256QAM supported,
ue-PowerClass pc2,
rateMatchingLTE-CRS supported
}
},
supportedBandCombinationList {
 {
```

```
  bandList {
   nr : {
    bandNR 41,
    ca-BandwidthClassDL-NR a,
    ca-BandwidthClassUL-NR a
   }
  },
  featureSetCombination 0,
  supportedBandwidthCombinationSet '1'B
 }
},
appliedFreqBandListFilter {
 bandInformationNR : {
  bandNR 41
 }
},
supportedBandCombinationList-v1540 {
 {
  bandList-v1540 {
   {
    srs-TxSwitch {
     supportedSRS-TxPortSwitch t1r4-t2r4
    }
   }
  },
  ca-ParametersNR-v1540 {
   csi-RS-IM-ReceptionForFeedbackPerBandComb {
    maxNumberSimultaneousNZP-CSI-RS-ActBWP-AllCC 10,
    totalNumberPortsSimultaneousNZP-CSI-RS-ActBWP-AllCC 64
   },
   simultaneousCSI-ReportsAllCC 5
  }
 }
}
},
measAndMobParameters {
 measAndMobParametersCommon {
  supportedGapPattern '11111111 11000000 000000'B,
  ssb-RLM supported,
  ssb-AndCSI-RS-RLM supported,
  eventB-MeasAndReport supported,
  handoverFDD-TDD supported,
```

```
 eutra-CGI-Reporting supported,
 nr-CGI-Reporting supported,
 periodicEUTRA-MeasAndReport supported
},
measAndMobParametersXDD-Diff {
 intraAndInterF-MeasAndReport supported,
 eventA-MeasAndReport supported,
 handoverInterF supported
},
measAndMobParametersFRX-Diff {
 ss-SINR-Meas supported,
 csi-RS-RLM supported,
 handoverInterF supported,
 maxNumberResource-CSI-RS-RLM n8
}
},
featureSets {
 featureSetsDownlink {
 {
  featureSetListPerDownlinkCC {
   1
  },
  dummy8 supported,
  scellWithoutSSB supported,
  type1-3-CSS supported,
  ue-SpecificUL-DL-Assignment supported
 },
 {
  featureSetListPerDownlinkCC {
   2
  },
  dummy8 supported,
  scellWithoutSSB supported,
  type1-3-CSS supported,
  ue-SpecificUL-DL-Assignment supported
 }
},
featureSetsDownlinkPerCC {
 {
  supportedSubcarrierSpacingDL kHz15,
  supportedBandwidthDL fr1 : mhz100,
  channelBW-90mhz supported,
```

```
 maxNumberMIMO-LayersPDSCH fourLayers,
 supportedModulationOrderDL qam256
},
{
 supportedSubcarrierSpacingDL kHz30,
 supportedBandwidthDL fr1 : mhz100,
 channelBW-90mhz supported,
 maxNumberMIMO-LayersPDSCH fourLayers,
 supportedModulationOrderDL qam256
}
},
featureSetsUplink {
{
 featureSetListPerUplinkCC {
  1
 },
 supportedSRS-Resources {
  maxNumberAperiodicSRS-PerBWP n16,
  maxNumberAperiodicSRS-PerBWP-PerSlot 6,
  maxNumberPeriodicSRS-PerBWP n16,
  maxNumberPeriodicSRS-PerBWP-PerSlot 6,
  maxNumberSemiPersistentSRS-PerBWP n16,
  maxNumberSemiPersistentSRS-PerBWP-PerSlot 6,
  maxNumberSRS-Ports-PerResource n2
 }
},
{
 featureSetListPerUplinkCC {
  2
 },
 supportedSRS-Resources {
  maxNumberAperiodicSRS-PerBWP n16,
  maxNumberAperiodicSRS-PerBWP-PerSlot 6,
  maxNumberPeriodicSRS-PerBWP n16,
  maxNumberPeriodicSRS-PerBWP-PerSlot 6,
  maxNumberSemiPersistentSRS-PerBWP n16,
  maxNumberSemiPersistentSRS-PerBWP-PerSlot 6,
  maxNumberSRS-Ports-PerResource n2
 }
}
},
featureSetsUplinkPerCC {
```

```
{
 supportedSubcarrierSpacingUL kHz15,
 supportedBandwidthUL fr1 : mhz100,
 channelBW-90mhz supported,
 mimo-CB-PUSCH {
  maxNumberMIMO-LayersCB-PUSCH twoLayers,
  maxNumberSRS-ResourcePerSet 1
 },
 supportedModulationOrderUL qam256
},
{
 supportedSubcarrierSpacingUL kHz30,
 supportedBandwidthUL fr1 : mhz100,
 channelBW-90mhz supported,
 mimo-CB-PUSCH {
  maxNumberMIMO-LayersCB-PUSCH twoLayers,
  maxNumberSRS-ResourcePerSet 1
 },
 supportedModulationOrderUL qam256
}
},
featureSetsDownlink-v1540 {
{
 oneFL-DMRS-TwoAdditionalDMRS-DL supported,
 additionalDMRS-DL-Alt supported,
 twoFL-DMRS-TwoAdditionalDMRS-DL supported,
 oneFL-DMRS-ThreeAdditionalDMRS-DL supported,
 pdsch-ProcessingType2 {
  scs-15kHz {
   fallback cap1-only,
   differentTB-PerSlot {
    upto1 1
   }
  },
  scs-30kHz {
   fallback cap1-only,
   differentTB-PerSlot {
    upto1 1
   }
  },
  scs-60kHz {
   fallback cap1-only,
```

```
    differentTB-PerSlot {
     upto1 1
    }
   }
  },
  pdsch-ProcessingType2-Limited {
   differentTB-PerSlot-SCS-30kHz upto1
  }
 },
 {
  oneFL-DMRS-TwoAdditionalDMRS-DL supported,
  additionalDMRS-DL-Alt supported,
  twoFL-DMRS-TwoAdditionalDMRS-DL supported,
  oneFL-DMRS-ThreeAdditionalDMRS-DL supported,
  pdsch-ProcessingType2 {
   scs-15kHz {
    fallback cap1-only,
    differentTB-PerSlot {
     upto1 1
    }
   },
   scs-30kHz {
    fallback cap1-only,
    differentTB-PerSlot {
     upto1 1
    }
   },
   scs-60kHz {
    fallback cap1-only,
    differentTB-PerSlot {
     upto1 1
    }
   }
  },
  pdsch-ProcessingType2-Limited {
   differentTB-PerSlot-SCS-30kHz upto1
  }
 }
},
featureSetCombinations {
 {
```

```
                {
                 nr : {
                   downlinkSetNR 1,
                   uplinkSetNR 1
                  },
                 nr : {
                   downlinkSetNR 2,
                   uplinkSetNR 2
                  }
                }
               }
              },
              nonCriticalExtension {
               inactiveState supported
              }
             }
          }
         }
        }
       }
      }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ueRadioCapabilityIndication



UERadioCapabilityInfoIndication

```
NGAP-PDU : initiatingMessage: {
 procedureCode 44,
 criticality ignore,
 value UERadioCapabilityInfoIndication : {
  protocolIEs{
   {
    id 10,
    criticality reject,
    value AMF-UE-NGAP-ID : 4294967862
   },
   {
    id 85,
    criticality reject,
    value RAN-UE-NGAP-ID : 61
   },
   {
    id 117,
    criticality ignore,
    value UERadioCapability: '04 07 50 88 0E 7E 1A 03 FA 04 7D 5F FA FF FF FB BF C0 A0 3C 17 01 01 E0 93 FF 3F FF FF C0 01 02 03 CE DC 04 07 E3 80 45 77 01 BF F8 BC 23 BC BE 08 21 FF 54 02 26 F6 53 74 89 18 93 EB 18 93 EA C4 1E 44 9F 09 14 65 BE 7F 8A EE 05 1F F1 78 47 79 7C 10 43 FE A8 04 4D EC A6 E9 12 31 27 D6 31 27 D5 88 3C 89 3E 12 28 CB 7C FE 95 DC 13 7F E2 F0 BE F2 F8 20 87 FD 50 08 98 D9 4D D2 24 62 4F AC 62 4F AB 10 79 12 7C 24 51 96 F9 FD 01 10 38 50 00 00 00 10 01 00 A0 04 1A 01 81 1B 64 9F 03 FF FE 00 00 70 1F 00 14 0E 02 03 01 88 1C 06 00 07 83 E0 09 92 00 00 00 C9 00 00 02 00 F0 A6 F2 A6 80 20 80 00 04 B2 CA B2 00 00 32 CB 2A 00 E8 55 5D 2A AA 02 1B 00 1F 37 E0 38 0E 00 F3 7E 03 80 E0 00 00 0C 00 80 18 02 00 41 00'H
     UERadioAccessCapabilityInformation: {
      criticalExtensions c1 : ueRadioAccessCapabilityInformation : {
       ue-RadioAccessCapabilityInfo {
        {
         rat-Type nr,
         ue-CapabilityRAT-Container 'E1 A0 3F A0 47 D5 FF AF FF FF BB FC 0A 03 C1 70 10 1E 09 3F F3 FF FF FC 00 10 20 3C ED C0 40 7E 38 04 57 70 1B FF BB C2 3B CB E0 82 1F F5 40 22 6F 65 37 48 91 89 3E B1 89 3E AC 41 E4 49 F0 91 46 5B E7 F8 AE E0 51 FF 17 84 77 97 C1 04 3F EA 80 44 DE CA 6E 91 23 12 7D 63 12 7D 58 83 C8 93 E1 22 BC B7 CF E9 5D C1 37 FE 2F 08 EF 2F 82 08 7F D5 00 89 BD 94 DD 22 46 24 FA C6 24 FA B1 07 91 27 C2 45 19 6F 9F D0 11 03 85 00 00 00 01 00 10 0A 00 41 A0 18 11 BE 49 F0 3F FF E0 00 07 01 F0 01 40 E0 20 30 18 B1 C0 60 00 78 3E 00 99 20 00 00 0C 90 00 00 20 0F 0A 6F 2A 68 02 08 00 00 48 2C A8 20 00 03 2C B2 A0 0E 85 55 D2 AA A0 21 B0 01 F3 7E 03 80 E0 0F 37 E0 38 0E 00 00 00 00 C0 08 01 80 20 04 10'H
          UE-NR-Capability : {
           accessStratumRelease rel15,
           pdcp-Parameters {
            supportedROHC-Profiles {
             profile0x0000 TRUE,
             profile0x0001 TRUE,
             profile0x0003 TRUE,
             profile0x0003 FALSE,
             profile0x0004 TRUE,
             profile0x0006 FALSE,
             profile0x0101 FALSE,
             profile0x0102 FALSE,
             profile0x0103 FALSE,
             profile0x0104 FALSE
            },
            maxNumberROHC-ContextSessions cs16,
            outOfOrderDelivery supported,
            shortSN supported,
            pdcp-DuplicationSRB supported,
            pdcp-DuplicationMCG-OrSCG-DRB supported
           },
           rlc-Parameters {
            am-WithShortSN supported,
            um-WithShortSN supported,
            um-WithLongSN supported
           },
           mac-Parameters {
            mac-ParametersCommon {
             lcp-Restriction supported,
             lch-ToSCellRestriction supported
            },
            mac-ParametersXDD-Diff {
             skipUplinkTxDynamic supported,
             logicalChannelSR-DelayTimer supported,
             longDRX-Cycle supported,
             shortDRX-Cycle supported,
             multipleSR-Configurations supported,
             multipleConfiguredGrants supported
            }
           },
           phy-Parameters {
            phy-ParametersCommon {
             dynamicPRB-BundlingDL supported,
             sp-CSI-ReportPUCCH supported,
             sp-CSI-ReportPUSCH supported,
             nzp-CSI-RS-InterfMgmt supported,
             type2-SP-CSI-Feedback-LongPUCCH supported,
             precoderGranularityCORESET supported,
             dynamicHARQ-ACK-Codebook supported,
             semiStaticHARQ-ACK-Codebook supported,
             spatialBundlingHARQ-ACK supported,
             dynamicBetaOffsetInd-HARQ-ACK-CSI supported,
             pucch-Repetition-F1-3-4 supported,
             ra-Type0-PUSCH supported,
             dynamicSwitchRA-Type0-1-PDSCH supported,
             dynamicSwitchRA-Type0-1-PUSCH supported,
             pdsch-MappingTypeA supported,
             pdsch-MappingTypeB supported,
             interleavingVRB-ToPRB-PDSCH supported,
             interSlotFreqHopping-PUSCH supported,
             type1-PUSCH-RepetitionMultiSlots supported,
             type2-PUSCH-RepetitionMultiSlots supported,
             pusch-RepetitionMultiSlots supported,
             downlinkSPS supported,
             configuredUL-GrantType1 supported,
             configuredUL-GrantType2 supported,
             cbg-TransIndication-DL supported,
             cbg-TransIndication-UL supported,
             cbg-FlushIndication-DL supported,
             dynamicHARQ-ACK-CodeB-CBG-Retx-DL supported,
             rateMatchingResrcSetSemi-Static supported,
             rateMatchingResrcSetDynamic supported,
             bwp-SwitchingDelay type2,
             maxNumberSearchSpaces n10,
             rateMatchingCtrlResrcSetDynamic supported,
             maxLayersMIMO-Indication supported
            },
```

phy-ParametersXDD-Diff {
twoPUCCH-F0-2-ConsecSymbols supported,
twoDifferentTPC-Loop-PUSCH supported,
twoDifferentTPC-Loop-PUCCH supported,
dl-SchedulingOffset-PDSCH-TypeA supported,
dl-SchedulingOffset-PDSCH-TypeB supported,
ul-SchedulingOffset supported
},
phy-ParametersFRX-Diff {
twoFL-DMRS '11'B,
supportedDMRS-TypeDL type1And2,
supportedDMRS-TypeUL type1And2,
semiOpenLoopCSI supported,
csi-ReportWithoutPMI supported,
csi-ReportWithoutCQI supported,
onePortsPTRS '00'B,
twoPUCCH-F0-2-ConsecSymbols supported,
pucch-F2-WithFH supported,
pucch-F3-WithFH supported,
pucch-F4-WithFH supported,
mux-SR-HARQ-ACK-CSI-PUCCH-MultiPerSlot supported,
uci-CodeBlockSegmentation supported,
onePUCCH-LongAndShortFormat supported,
twoPUCCH-AnyOthersInSlot supported,
intraSlotFreqHopping-PUSCH supported,
pusch-LBRM supported,
pdcch-BlindDetectionCA 4,
tpc-PUSCH-RNTI supported,
tpc-PUCCH-RNTI supported,
tpc-SRS-RNTI supported,
absoluteTPC-Command supported,
twoDifferentTPC-Loop-PUSCH supported,
twoDifferentTPC-Loop-PUCCH supported,
pusch-HalfPi-BPSK supported,
pucch-F3-4-HalfPi-BPSK supported,
almostContiguousCP-OFDM-UL supported,
sp-CSI-RS supported,
sp-CSI-IM supported,
tdd-MultiDL-UL-SwitchPerSlot supported,
multipleCORESET supported,
dl-SchedulingOffset-PDSCH-TypeA supported,
dl-SchedulingOffset-PDSCH-TypeB supported,

```
 ul-SchedulingOffset supported,
 dl-64QAM-MCS-TableAlt supported,
 oneFL-DMRS-TwoAdditionalDMRS-UL supported,
 twoFL-DMRS-TwoAdditionalDMRS-UL supported,
 oneFL-DMRS-ThreeAdditionalDMRS-UL supported
},
phy-ParametersFR1 {
 pdcch-MonitoringSingleOccasion supported,
 pdsch-256QAM-FR1 supported,
 pdsch-RE-MappingFR1-PerSymbol n20,
 pdsch-RE-MappingFR1-PerSlot n256
}
},
rf-Parameters {
supportedBandListNR {
 {
  bandNR 28,
  mimo-ParametersPerBand {
   tci-StatePDSCH {
    maxNumberConfiguredTCIstatesPerCC n32,
    maxNumberActiveTCI-PerBWP n8
   },
   additionalActiveTCI-StatePDCCH supported,
   pusch-TransCoherence nonCoherent,
   beamCorrespondenceWithoutUL-BeamSweeping supported,
   periodicBeamReport supported,
   aperiodicBeamReport supported,
   sp-BeamReportPUCCH supported,
   sp-BeamReportPUSCH supported,
   maxNumberNonGroupBeamReporting n4,
   uplinkBeamManagement {
    maxNumberSRS-ResourcePerSet-BM n16,
    maxNumberSRS-ResourceSet 8
   },
   maxNumberCSI-RS-BFD 2,
   maxNumberSSB-BFD 2,
   maxNumberCSI-RS-SSB-CBD 16,
   beamReportTiming {
    scs-15kHz sym8,
    scs-30kHz sym14,
    scs-60kHz sym28,
    scs-120kHz sym56
```

```
},
aperiodicTRS supported,
beamManagementSSB-CSI-RS {
 maxNumberSSB-CSI-RS-ResourceOneTx n16,
 maxNumberCSI-RS-Resource n16,
 maxNumberCSI-RS-ResourceTwoTx n16,
 supportedCSI-RS-Density oneAndThree,
 maxNumberAperiodicCSI-RS-Resource n16
},
beamSwitchTiming {
 scs-60kHz sym28
},
codebookParameters {
 type1 {
  singlePanel {
   supportedCSI-RS-ResourceList {
    {
     maxNumberTxPortsPerResource p32,
     maxNumberResourcesPerBand 10,
     totalNumberTxPortsPerBand 64
    }
   },
   modes mode1andMode2,
   maxNumberCSI-RS-PerResourceSet 4
  },
  multiPanel {
   supportedCSI-RS-ResourceList {
    {
     maxNumberTxPortsPerResource p32,
     maxNumberResourcesPerBand 10,
     totalNumberTxPortsPerBand 64
    }
   },
   modes both,
   nrofPanels n4,
   maxNumberCSI-RS-PerResourceSet 4
  }
 }
},
csi-RS-IM-ReceptionForFeedback {
 maxConfigNumberNZP-CSI-RS-PerCC 5,
 maxConfigNumberPortsAcrossNZP-CSI-RS-PerCC 32,
```

```
  maxConfigNumberCSI-IM-PerCC n4,
  maxNumberSimultaneousNZP-CSI-RS-PerCC 10,
  totalNumberPortsSimultaneousNZP-CSI-RS-PerCC 64
 },
 csi-ReportFramework {
  maxNumberPeriodicCSI-PerBWP-ForCSI-Report 1,
  maxNumberAperiodicCSI-PerBWP-ForCSI-Report 2,
  maxNumberSemiPersistentCSI-PerBWP-ForCSI-Report 1,
  maxNumberPeriodicCSI-PerBWP-ForBeamReport 1,
  maxNumberAperiodicCSI-PerBWP-ForBeamReport 2,
  maxNumberAperiodicCSI-triggeringStatePerCC n15,
  maxNumberSemiPersistentCSI-PerBWP-ForBeamReport 1,
  simultaneousCSI-ReportsPerCC 5
 },
 csi-RS-ForTracking {
  maxBurstLength 2,
  maxSimultaneousResourceSetsPerCC 4,
  maxConfiguredResourceSetsPerCC 32,
  maxConfiguredResourceSetsAllCC 64
 }
},
multipleTCI supported,
bwp-SameNumerology upto4,
bwp-DiffNumerology upto4,
crossCarrierScheduling-SameSCS supported,
pusch-256QAM supported,
ue-PowerClass pc3,
rateMatchingLTE-CRS supported
},
{
bandNR 41,
mimo-ParametersPerBand {
 tci-StatePDSCH {
  maxNumberConfiguredTCIstatesPerCC n32,
  maxNumberActiveTCI-PerBWP n8
 },
 additionalActiveTCI-StatePDCCH supported,
 pusch-TransCoherence nonCoherent,
 beamCorrespondenceWithoutUL-BeamSweeping supported,
 periodicBeamReport supported,
 aperiodicBeamReport supported,
 sp-BeamReportPUCCH supported,
```

```
sp-BeamReportPUSCH supported,
maxNumberNonGroupBeamReporting n4,
uplinkBeamManagement {
 maxNumberSRS-ResourcePerSet-BM n16,
 maxNumberSRS-ResourceSet 8
},
maxNumberCSI-RS-BFD 2,
maxNumberSSB-BFD 2,
maxNumberCSI-RS-SSB-CBD 16,
beamReportTiming {
 scs-15kHz sym8,
 scs-30kHz sym14,
 scs-60kHz sym28,
 scs-120kHz sym56
},
aperiodicTRS supported,
beamManagementSSB-CSI-RS {
 maxNumberSSB-CSI-RS-ResourceOneTx n16,
 maxNumberCSI-RS-Resource n16,
 maxNumberCSI-RS-ResourceTwoTx n16,
 supportedCSI-RS-Density oneAndThree,
 maxNumberAperiodicCSI-RS-Resource n16
},
beamSwitchTiming {
 scs-60kHz sym28
},
codebookParameters {
 type1 {
  singlePanel {
   supportedCSI-RS-ResourceList {
    {
     maxNumberTxPortsPerResource p32,
     maxNumberResourcesPerBand 10,
     totalNumberTxPortsPerBand 64
    }
   },
   modes mode1andMode2,
   maxNumberCSI-RS-PerResourceSet 4
  },
  multiPanel {
   supportedCSI-RS-ResourceList {
    {
```

```
    maxNumberTxPortsPerResource p32,
    maxNumberResourcesPerBand 10,
    totalNumberTxPortsPerBand 64
   }
  },
  modes both,
  nrofPanels n4,
  maxNumberCSI-RS-PerResourceSet 4
 }
}
},
csi-RS-IM-ReceptionForFeedback {
 maxConfigNumberNZP-CSI-RS-PerCC 5,
 maxConfigNumberPortsAcrossNZP-CSI-RS-PerCC 32,
 maxConfigNumberCSI-IM-PerCC n4,
 maxNumberSimultaneousNZP-CSI-RS-PerCC 10,
 totalNumberPortsSimultaneousNZP-CSI-RS-PerCC 64
},
csi-ReportFramework {
 maxNumberPeriodicCSI-PerBWP-ForCSI-Report 1,
 maxNumberAperiodicCSI-PerBWP-ForCSI-Report 2,
 maxNumberSemiPersistentCSI-PerBWP-ForCSI-Report 1,
 maxNumberPeriodicCSI-PerBWP-ForBeamReport 1,
 maxNumberAperiodicCSI-PerBWP-ForBeamReport 2,
 maxNumberAperiodicCSI-triggeringStatePerCC n15,
 maxNumberSemiPersistentCSI-PerBWP-ForBeamReport 1,
 simultaneousCSI-ReportsPerCC 5
},
csi-RS-ForTracking {
 maxBurstLength 2,
 maxSimultaneousResourceSetsPerCC 4,
 maxConfiguredResourceSetsPerCC 32,
 maxConfiguredResourceSetsAllCC 64
}
},
multipleTCI supported,
bwp-SameNumerology upto4,
bwp-DiffNumerology upto4,
crossCarrierScheduling-SameSCS supported,
pusch-256QAM supported,
ue-PowerClass pc2,
rateMatchingLTE-CRS supported
```

```
},
{
 bandNR 78,
 mimo-ParametersPerBand {
  tci-StatePDSCH {
   maxNumberConfiguredTCIstatesPerCC n32,
   maxNumberActiveTCI-PerBWP n8
  },
  additionalActiveTCI-StatePDCCH supported,
  pusch-TransCoherence nonCoherent,
  beamCorrespondenceWithoutUL-BeamSweeping supported,
  periodicBeamReport supported,
  aperiodicBeamReport supported,
  sp-BeamReportPUCCH supported,
  sp-BeamReportPUSCH supported,
  maxNumberNonGroupBeamReporting n4,
  uplinkBeamManagement {
   maxNumberSRS-ResourcePerSet-BM n16,
   maxNumberSRS-ResourceSet 8
  },
  maxNumberCSI-RS-BFD 2,
  maxNumberSSB-BFD 2,
  maxNumberCSI-RS-SSB-CBD 16,
  beamReportTiming {
   scs-15kHz sym8,
   scs-30kHz sym14,
   scs-60kHz sym28,
   scs-120kHz sym56
  },
  aperiodicTRS supported,
  beamManagementSSB-CSI-RS {
   maxNumberSSB-CSI-RS-ResourceOneTx n16,
   maxNumberCSI-RS-Resource n16,
   maxNumberCSI-RS-ResourceTwoTx n16,
   supportedCSI-RS-Density oneAndThree,
   maxNumberAperiodicCSI-RS-Resource n16
  },
  beamSwitchTiming {
   scs-60kHz sym28
  },
  codebookParameters {
   type1 {
```

```
 singlePanel {
  supportedCSI-RS-ResourceList {
   {
    maxNumberTxPortsPerResource p32,
    maxNumberResourcesPerBand 10,
    totalNumberTxPortsPerBand 64
   }
  },
  modes mode1andMode2,
  maxNumberCSI-RS-PerResourceSet 4
 },
 multiPanel {
  supportedCSI-RS-ResourceList {
   {
    maxNumberTxPortsPerResource p32,
    maxNumberResourcesPerBand 10,
    totalNumberTxPortsPerBand 64
   }
  },
  modes both,
  nrofPanels n4,
  maxNumberCSI-RS-PerResourceSet 4
 }
}
},
csi-RS-IM-ReceptionForFeedback {
 maxConfigNumberNZP-CSI-RS-PerCC 5,
 maxConfigNumberPortsAcrossNZP-CSI-RS-PerCC 32,
 maxConfigNumberCSI-IM-PerCC n4,
 maxNumberSimultaneousNZP-CSI-RS-PerCC 10,
 totalNumberPortsSimultaneousNZP-CSI-RS-PerCC 64
},
csi-ReportFramework {
 maxNumberPeriodicCSI-PerBWP-ForCSI-Report 1,
 maxNumberAperiodicCSI-PerBWP-ForCSI-Report 2,
 maxNumberSemiPersistentCSI-PerBWP-ForCSI-Report 1,
 maxNumberPeriodicCSI-PerBWP-ForBeamReport 1,
 maxNumberAperiodicCSI-PerBWP-ForBeamReport 2,
 maxNumberAperiodicCSI-triggeringStatePerCC n15,
 maxNumberSemiPersistentCSI-PerBWP-ForBeamReport 1,
 simultaneousCSI-ReportsPerCC 5
},
```

```
  csi-RS-ForTracking {
   maxBurstLength 2,
   maxSimultaneousResourceSetsPerCC 4,
   maxConfiguredResourceSetsPerCC 32,
   maxConfiguredResourceSetsAllCC 64
  }
 },
 multipleTCI supported,
 bwp-SameNumerology upto4,
 bwp-DiffNumerology upto4,
 crossCarrierScheduling-SameSCS supported,
 pusch-256QAM supported,
 ue-PowerClass pc2,
 rateMatchingLTE-CRS supported
}
},
supportedBandCombinationList {
{
 bandList {
  nr : {
   bandNR 41,
   ca-BandwidthClassDL-NR a,
   ca-BandwidthClassUL-NR a
  }
 },
 featureSetCombination 0,
 supportedBandwidthCombinationSet '1'B
}
},
appliedFreqBandListFilter {
 bandInformationNR : {
  bandNR 41
 }
},
supportedBandCombinationList-v1540 {
{
 bandList-v1540 {
  {
   srs-TxSwitch {
    supportedSRS-TxPortSwitch t1r4-t2r4
   }
  }
```

```
  },
  ca-ParametersNR-v1540 {
   csi-RS-IM-ReceptionForFeedbackPerBandComb {
    maxNumberSimultaneousNZP-CSI-RS-ActBWP-AllCC 10,
    totalNumberPortsSimultaneousNZP-CSI-RS-ActBWP-AllCC 64
   },
   simultaneousCSI-ReportsAllCC 5
  }
 }
},
measAndMobParameters {
 measAndMobParametersCommon {
  supportedGapPattern '11111111 11000000 000000'B,
  ssb-RLM supported,
  ssb-AndCSI-RS-RLM supported,
  eventB-MeasAndReport supported,
  handoverFDD-TDD supported,
  eutra-CGI-Reporting supported,
  nr-CGI-Reporting supported,
  periodicEUTRA-MeasAndReport supported
 },
 measAndMobParametersXDD-Diff {
  intraAndInterF-MeasAndReport supported,
  eventA-MeasAndReport supported,
  handoverInterF supported
 },
 measAndMobParametersFRX-Diff {
  ss-SINR-Meas supported,
  csi-RS-RLM supported,
  handoverInterF supported,
  maxNumberResource-CSI-RS-RLM n8
 }
},
featureSets {
 featureSetsDownlink {
  {
   featureSetListPerDownlinkCC {
    1
   },
   dummy8 supported,
   scellWithoutSSB supported,
```

```
 type1-3-CSS supported,
 ue-SpecificUL-DL-Assignment supported
},
{
 featureSetListPerDownlinkCC {
  2
 },
 dummy8 supported,
 scellWithoutSSB supported,
 type1-3-CSS supported,
 ue-SpecificUL-DL-Assignment supported
}
},
featureSetsDownlinkPerCC {
{
 supportedSubcarrierSpacingDL kHz15,
 supportedBandwidthDL fr1 : mhz100,
 channelBW-90mhz supported,
 maxNumberMIMO-LayersPDSCH fourLayers,
 supportedModulationOrderDL qam256
},
{
 supportedSubcarrierSpacingDL kHz30,
 supportedBandwidthDL fr1 : mhz100,
 channelBW-90mhz supported,
 maxNumberMIMO-LayersPDSCH fourLayers,
 supportedModulationOrderDL qam256
}
},
featureSetsUplink {
{
 featureSetListPerUplinkCC {
  1
 },
 supportedSRS-Resources {
  maxNumberAperiodicSRS-PerBWP n16,
  maxNumberAperiodicSRS-PerBWP-PerSlot 6,
  maxNumberPeriodicSRS-PerBWP n16,
  maxNumberPeriodicSRS-PerBWP-PerSlot 6,
  maxNumberSemiPersistentSRS-PerBWP n16,
  maxNumberSemiPersistentSRS-PerBWP-PerSlot 6,
  maxNumberSRS-Ports-PerResource n2
```

```
 }
},
{
 featureSetListPerUplinkCC {
  2
 },
 supportedSRS-Resources {
  maxNumberAperiodicSRS-PerBWP n16,
  maxNumberAperiodicSRS-PerBWP-PerSlot 6,
  maxNumberPeriodicSRS-PerBWP n16,
  maxNumberPeriodicSRS-PerBWP-PerSlot 6,
  maxNumberSemiPersistentSRS-PerBWP n16,
  maxNumberSemiPersistentSRS-PerBWP-PerSlot 6,
  maxNumberSRS-Ports-PerResource n2
 }
}
},
featureSetsUplinkPerCC {
{
 supportedSubcarrierSpacingUL kHz15,
 supportedBandwidthUL fr1 : mhz100,
 channelBW-90mhz supported,
 mimo-CB-PUSCH {
  maxNumberMIMO-LayersCB-PUSCH twoLayers,
  maxNumberSRS-ResourcePerSet 1
 },
 supportedModulationOrderUL qam256
},
{
 supportedSubcarrierSpacingUL kHz30,
 supportedBandwidthUL fr1 : mhz100,
 channelBW-90mhz supported,
 mimo-CB-PUSCH {
  maxNumberMIMO-LayersCB-PUSCH twoLayers,
  maxNumberSRS-ResourcePerSet 1
 },
 supportedModulationOrderUL qam256
}
},
featureSetsDownlink-v1540 {
{
 oneFL-DMRS-TwoAdditionalDMRS-DL supported,
```

```
additionalDMRS-DL-Alt supported,
twoFL-DMRS-TwoAdditionalDMRS-DL supported,
oneFL-DMRS-ThreeAdditionalDMRS-DL supported,
pdsch-ProcessingType2 {
 scs-15kHz {
  fallback cap1-only,
  differentTB-PerSlot {
   upto1 1
  }
 },
 scs-30kHz {
  fallback cap1-only,
  differentTB-PerSlot {
   upto1 1
  }
 },
 scs-60kHz {
  fallback cap1-only,
  differentTB-PerSlot {
   upto1 1
  }
 }
},
pdsch-ProcessingType2-Limited {
 differentTB-PerSlot-SCS-30kHz upto1
}
},
{
 oneFL-DMRS-TwoAdditionalDMRS-DL supported,
 additionalDMRS-DL-Alt supported,
 twoFL-DMRS-TwoAdditionalDMRS-DL supported,
 oneFL-DMRS-ThreeAdditionalDMRS-DL supported,
 pdsch-ProcessingType2 {
  scs-15kHz {
   fallback cap1-only,
   differentTB-PerSlot {
    upto1 1
   }
  },
  scs-30kHz {
   fallback cap1-only,
   differentTB-PerSlot {
```

```
                upto1 1
               }
              },
              scs-60kHz {
               fallback cap1-only,
               differentTB-PerSlot {
                upto1 1
               }
              }
             },
             pdsch-ProcessingType2-Limited {
              differentTB-PerSlot-SCS-30kHz upto1
             }
            }
           }
          },
          featureSetCombinations {
           {
            {
             nr : {
              downlinkSetNR 1,
              uplinkSetNR 1
             },
             nr : {
              downlinkSetNR 2,
              uplinkSetNR 2
             }
            }
           }
          },
          nonCriticalExtension {
           inactiveState supported
          }
         }
        }
       }
      }
    }
   }
  }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 BearerContextSetupRequest

```
E1AP-PDU : initiatingMessage : {
  procedureCode 8,
  criticality reject,
  value BearerContextSetupRequest : {
    protocolIEs {
     {
      id 2,
      criticality reject,
      value GNB-CU-CP-UE-E1AP-ID : 61
     },
     {
      id 13,
      criticality reject,
      value SecurityInformation : {
        securityAlgorithm {
         cipheringAlgorithm c-128-NEA2
        },
        uPSecuritykey {
         encryptionKey '4E DB 23 3B 43 E6 7C A8 29 A4 5B 19 52 D6 07 51'H
        }
      }
     },
     {
      id 14,
      criticality reject,
      value BitRate : 2000000000000
     },
     {
      id 58,
      criticality ignore,
      value PLMN-Identity : '62 F0 66'H
     },
     {
      id 23,
      criticality reject,
      value ActivityNotificationLevel : ue
     },
     {
      id 59,
      criticality reject,
      value Inactivity-Timer : 10
     },
     {
```



```
E1AP-PDU : initiatingMessage : {
 procedureCode 8,
 criticality reject,
 value BearerContextSetupRequest : {
  protocolIEs {
   {
    id 2,
    criticality reject,
    value GNB-CU-CP-UE-E1AP-ID : 61
   },
   {
    id 13,
    criticality reject,
    value SecurityInformation : {
     securityAlgorithm {
      cipheringAlgorithm c-128-NEA2
     },
     uPSecuritykey {
      encryptionKey '4E DB 23 3B 43 E6 7C A8 29 A4 5B 19 52 D6 07 51'H
     }
    }
   },
   {
    id 14,
    criticality reject,
    value BitRate : 2000000000000
   },
   {
    id 58,
    criticality ignore,
    value PLMN-Identity : '62 F0 66'H
   },
   {
    id 23,
    criticality reject,
    value ActivityNotificationLevel : ue
   },
   {
    id 59,
    criticality reject,
    value Inactivity-Timer : 10
   },
   {
    id 15,
    criticality reject,
    value System-BearerContextSetupRequest : nG-RAN-BearerContextSetupRequest : {
     {
      id 42,
      criticality reject,
      value PDU-Session-Resource-To-Setup-List : {
       {
        pDU-Session-ID 1,
        pDU-Session-Type ipv4,
        sNSSAI {
         sST '01'H,
         sD '01 43 A5'H
        },
        securityIndication {
         integrityProtectionIndication not-needed,
         confidentialityProtectionIndication required
        },
        pDU-Session-Resource-DL-AMBR 2000000000000,
        nG-UL-UP-TNL-Information gTPTunnel : {
         transportLayerAddress '00001010000101100010001100101010'B,
         gTP-TEID '42 60 01 35'H
        },
        dRB-To-Setup-List-NG-RAN {
         {
          dRB-ID 4,
          sDAP-Configuration {
           defaultDRB true,
           sDAP-Header-UL present,
           sDAP-Header-DL absent
          },
          pDCP-Configuration {
           pDCP-SN-Size-UL s-18,
           pDCP-SN-Size-DL s-18,
           rLC-Mode rlc-am,
           t-ReorderingTimer {
            t-Reordering ms100
           },
           discardTimer infinity
          },
          cell-Group-Information {
           {
            cell-Group-ID 0
           }
          },
          qos-flow-Information-To-Be-Setup {
           {
            qoS-Flow-Identifier 5,
            qoSFlowLevelQoSParameters {
             qoS-Characteristics non-Dynamic-5QI : {
              fiveQI 9
             },
             nGRANallocationRetentionPriority {
              priorityLevel 9,
              pre-emptionCapability may-trigger-pre-emption,
              pre-emptionVulnerability pre-emptable
             }
            }
           }
          }
         }
        }
       }
      }
     }
    }
```

```
        }
      }
    }
   }
  }
 }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 BearerContextSetupResponse




```
E1AP-PDU : successfulOutcome : {
 procedureCode 8,
 criticality reject,
 value BearerContextSetupResponse : {
  protocolIEs {
   {
    id 2,
    criticality reject,
    value GNB-CU-CP-UE-E1AP-ID : 61
   },
   {
    id 3,
    criticality reject,
    value GNB-CU-UP-UE-E1AP-ID : 15
   },
   {
    id 16,
    criticality ignore,
    value System-BearerContextSetupResponse : nG-RAN-BearerContextSetupResponse : {
     {
      id 46,
      criticality ignore,
      value PDU-Session-Resource-Setup-List : {
       {
        pDU-Session-ID 1,
        securityResult {
         integrityProtectionResult not-performed,
         confidentialityProtectionResult performed
        },
        nG-DL-UP-TNL-Information gTPTunnel : {
         transportLayerAddress '00001010 00000010 01010011 00001000'B,
         gTP-TEID '80 0F 01 40'H
        },
        dRB-Setup-List-NG-RAN {
         {
          dRB-ID 4,
          uL-UP-Transport-Parameters {
           {
            uP-TNL-Information gTPTunnel : {
             transportLayerAddress '00000000 00001111 00000000 00000011 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000'B,
             gTP-TEID '20 0F 01 48'H
            },
            cell-Group-ID 0
           }
          },
          flow-Setup-List {
           {
            qoS-Flow-Identifier 5
           }
          }
         }
        }
       }
      }
     }
    }
   }
  }
 }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 BearerContextModificationRequest

```
E1AP-PDU : initiatingMessage : {
  procedureCode 9,
  criticality reject,
  value BearerContextModificationRequest : {
    protocolIEs {
     {
      id 2,
      criticality reject,
      value GNB-CU-CP-UE-E1AP-ID : 61
     },
     {
      id 3,
      criticality reject,
      value GNB-CU-UP-UE-E1AP-ID : 15
     },
     {
      id 18,
      criticality reject,
      value System-BearerContextModificationRequest : nG-RAN-BearerContextModificationRequest : {
         {
          id 43,
          criticality reject,
          value PDU-Session-Resource-To-Modify-List : {
            {
             pDU-Session-ID 1,
             dRB-To-Modify-List-NG-RAN {
              {
               dRB-ID 4,
               dL-UP-Parameters {
                {
                 uP-TNL-Information gTPTunnel : {
                   transportLayerAddress '00000000 00000000 00000000 00000000'B,
                   gTP-TEID '20 0F 01 4E'H
                 },
                 cell-Group-ID 0
```



```
E1AP-PDU : initiatingMessage : {
 procedureCode 9,
 criticality reject,
 value BearerContextModificationRequest : {
  protocolIEs {
   {
    id 2,
    criticality reject,
    value GNB-CU-CP-UE-E1AP-ID : 61
   },
   {
    id 3,
    criticality reject,
    value GNB-CU-UP-UE-E1AP-ID : 15
   },
   {
    id 18,
    criticality reject,
    value System-BearerContextModificationRequest : nG-RAN-BearerContextModificationRequest : {
     {
      id 43,
      criticality reject,
      value PDU-Session-Resource-To-Modify-List : {
       {
        pDU-Session-ID 1,
        dRB-To-Modify-List-NG-RAN {
         {
          dRB-ID 4,
          dL-UP-Parameters {
           {
            uP-TNL-Information gTPTunnel : {
             transportLayerAddress '00000000 00000000 00000000 00000000'B,
             gTP-TEID '20 0F 01 4E'H
            },
            cell-Group-ID 0
           }
          }
         }
        }
       }
      }
     }
    }
   }
  }
 }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 BearerContextModificationResponse

```
E1AP-PDU : successfulOutcome : {
  procedureCode 9,
  criticality reject,
  value BearerContextModificationResponse : {
    protocolIEs {
     {
      id 2,
      criticality reject,
      value GNB-CU-CP-UE-E1AP-ID : 61
     },
     {
      id 3,
      criticality reject,
      value GNB-CU-UP-UE-E1AP-ID : 15
     },
     {
      id 19,
      criticality ignore,
      value System-BearerContextModificationResponse : nG-RAN-BearerContextModificationResponse : {
          {
           id 48,
           criticality reject,
           value PDU-Session-Resource-Modified-List : {
             {
              pDU-Session-ID 1,
              dRB-Modified-List-NG-RAN {
               {
                dRB-ID 4
               }
              }
             }
            }
          }
         }
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 rrcReconfiguration

```
DL-DCCH-Message : {
 message c1 : rrcReconfiguration : {
   rrc-TransactionIdentifier 3,
   criticalExtensions rrcReconfiguration : {
     radioBearerConfig {
       srb-ToAddModList {
         {
          srb-Identity 2
         }
       },
       drb-ToAddModList {
         {
          cnAssociation sdap-Config : {
            pdu-Session 1,
            sdap-HeaderDL absent,
            sdap-HeaderUL present,
            defaultDRB TRUE,
            mappedQoS-FlowsToAdd {
              5
            }
          },
          drb-Identity 4,
          pdcp-Config {
            drb {
              discardTimer infinity,
              pdcp-SN-SizeUL len18bits,
              pdcp-SN-SizeDL len18bits,
              headerCompression notUsed : NULL
            },
            t-Reordering ms100
          }
         }
       },
       securityConfig {
         securityAlgorithmConfig {
          cipheringAlgorithm nea2,
          integrityProtAlgorithm nia2
         }
       }
     },
     measConfig {
       measObjectToAddModList {
         {
          measObjectId 1,
          measObject measObjectNR : {
            ssbFrequency 509790,
            ssbSubcarrierSpacing kHz30,
            smtc1 {
              periodicityAndOffset sf20 : 0,
```



```
rrcReconfiguration

DL-DCCH-Message : {
 message c1 : rrcReconfiguration : {
  rrc-TransactionIdentifier 3,
  criticalExtensions rrcReconfiguration : {
   radioBearerConfig {
    srb-ToAddModList {
     {
      srb-Identity 2
     }
    },
    drb-ToAddModList {
     {
      cnAssociation sdap-Config : {
       pdu-Session 1,
       sdap-HeaderDL absent,
       sdap-HeaderUL present,
       defaultDRB TRUE,
       mappedQoS-FlowsToAdd {
        5
       }
      },
      drb-Identity 4,
      pdcp-Config {
       drb {
        discardTimer infinity,
        pdcp-SN-SizeUL len18bits,
        pdcp-SN-SizeDL len18bits,
        headerCompression notUsed : NULL
       },
       t-Reordering ms100
      }
     }
    },
    securityConfig {
     securityAlgorithmConfig {
      cipheringAlgorithm nea2,
      integrityProtAlgorithm nia2
     }
    }
   },
   measConfig {
    measObjectToAddModList {
     {
      measObjectId 1,
      measObject measObjectNR : {
       ssbFrequency 509790,
       ssbSubcarrierSpacing kHz30,
       smtc1 {
        periodicityAndOffset sf20 : 0,
        duration sf5
       },
       referenceSignalConfig {
        ssb-ConfigMobility {
         deriveSSB-IndexFromCell TRUE
        }
       },
       absThreshSS-BlocksConsolidation {
        thresholdRSRP 0,
        thresholdRSRQ 3
       },
       quantityConfigIndex 1,
       offsetMO {
        rsrpOffsetSSB dB0,
        rsrqOffsetSSB dB0,
        sinrOffsetSSB dB0,
        rsrpOffsetCSI-RS dB0,
        rsrqOffsetCSI-RS dB0,
        sinrOffsetCSI-RS dB0
       },
       freqBandIndicatorNR 41
      }
     }
    },
    reportConfigToAddModList {
     {
      reportConfigId 1,
      reportConfig reportConfigNR : {
       reportType eventTriggered : {
        eventId eventA3 : {
         a3-Offset rsrp : 3,
         reportOnLeave FALSE,
         hysteresis 3,
         timeToTrigger ms320,
         useWhiteCellList FALSE
        },
        rsType ssb,
        reportInterval ms120,
        reportAmount r4,
        reportQuantityCell {
         rsrp TRUE,
         rsrq TRUE,
         sinr TRUE
        },
        maxReportCells 8,
        reportQuantityRS-Indexes {
         rsrp TRUE,
         rsrq TRUE,
         sinr TRUE
        },
        maxNrofRS-IndexesToReport 8,
        includeBeamMeasurements TRUE
       }
      }
     },
```

```
measIdToAddModList {
 {
  measId 1,
  measObjectId 1,
  reportConfigId 1
 }
},
s-MeasureConfig ssb-RSRP : 127,
quantityConfig {
 quantityConfigNR-List {
  {
   quantityConfigCell {
    ssb-FilterConfig {
     filterCoefficientRSRP fc4,
     filterCoefficientRSRQ fc4,
     filterCoefficientRS-SINR fc4
    },
    csi-RS-FilterConfig {
     filterCoefficientRSRP fc4,
     filterCoefficientRSRQ fc4,
     filterCoefficientRS-SINR fc4
    }
   },
   quantityConfigRS-Index {
    ssb-FilterConfig {
     filterCoefficientRSRP fc4,
     filterCoefficientRSRQ fc4,
     filterCoefficientRS-SINR fc4
    },
    csi-RS-FilterConfig {
     filterCoefficientRSRP fc4,
     filterCoefficientRSRQ fc4,
     filterCoefficientRS-SINR fc4
    }
   }
  }
 }
},
nonCriticalExtension {
 masterCellGroup {
  cellGroupId 0,
```

```
rlc-BearerToAddModList {
 {
  logicalChannelIdentity 4,
  servedRadioBearer drb-Identity : 4,
  rlc-Config am : {
    ul-AM-RLC {
     sn-FieldLength size18,
     t-PollRetransmit ms45,
     pollPDU p64,
     pollByte kB500,
     maxRetxThreshold t32
    },
    dl-AM-RLC {
     sn-FieldLength size18,
     t-Reassembly ms15,
     t-StatusProhibit ms15
    }
  },
  mac-LogicalChannelConfig {
   ul-SpecificParameters {
    priority 12,
    prioritisedBitRate infinity,
    bucketSizeDuration ms50,
    logicalChannelGroup 1,
    schedulingRequestID 0,
    logicalChannelSR-Mask FALSE,
    logicalChannelSR-DelayTimerApplied FALSE
   }
  }
 },
 {
  logicalChannelIdentity 2,
  servedRadioBearer srb-Identity : 2,
  rlc-Config am : {
    ul-AM-RLC {
     sn-FieldLength size12,
     t-PollRetransmit ms45,
     pollPDU infinity,
     pollByte infinity,
     maxRetxThreshold t8
    },
    dl-AM-RLC {
```

```
    sn-FieldLength size12,
    t-Reassembly ms35,
    t-StatusProhibit ms0
   }
  },
  mac-LogicalChannelConfig {
   ul-SpecificParameters {
    priority 3,
    prioritisedBitRate infinity,
    bucketSizeDuration ms50,
    logicalChannelGroup 0,
    schedulingRequestID 0,
    logicalChannelSR-Mask FALSE,
    logicalChannelSR-DelayTimerApplied FALSE
   }
  }
 }
},
spCellConfig {
 servCellIndex 0,
 spCellConfigDedicated {
  downlinkBWP-ToAddModList {
   {
    bwp-Id 1,
    bwp-Dedicated {
     pdsch-Config setup : {
      dmrs-DownlinkForPDSCH-MappingTypeA setup : {
       dmrs-AdditionalPosition pos1,
       scramblingID0 101
      },
      tci-StatesToAddModList {
       {
        tci-StateId 0,
        qcl-Type1 {
         bwp-Id 1,
         referenceSignal csi-rs : 30,
         qcl-Type typeA
        }
       },
       {
        tci-StateId 1,
        qcl-Type1 {
```

```
      bwp-Id 1,
      referenceSignal ssb : 0,
      qcl-Type typeC
     }
    }
   },
   resourceAllocation resourceAllocationType0,
   rbg-Size config1,
   mcs-Table qam256,
   prb-BundlingType staticBundling : {
    bundleSize wideband
   }
  }
 }
},
uplinkConfig {
 uplinkBWP-ToAddModList {
  {
   bwp-Id 1,
   bwp-Dedicated {
    pucch-Config setup : {
     resourceSetToAddModList {
      {
       pucch-ResourceSetId 0,
       resourceList {
        0,
        1,
        2,
        3,
        4,
        5,
        6,
        7
       }
      },
      {
       pucch-ResourceSetId 1,
       resourceList {
        23,
        24,
        25,
```

```
  26,
  27,
  28,
  29,
  30
 }
 }
},
resourceToAddModList {
 {
  pucch-ResourceId 0,
  startingPRB 0,
  format format0 : {
   initialCyclicShift 0,
   nrofSymbols 1,
   startingSymbolIndex 12
  }
 },
 {
  pucch-ResourceId 1,
  startingPRB 16,
  format format0 : {
   initialCyclicShift 0,
   nrofSymbols 1,
   startingSymbolIndex 12
  }
 },
 {
  pucch-ResourceId 2,
  startingPRB 32,
  format format0 : {
   initialCyclicShift 0,
   nrofSymbols 1,
   startingSymbolIndex 12
  }
 },
 {
  pucch-ResourceId 3,
  startingPRB 48,
  format format0 : {
   initialCyclicShift 0,
   nrofSymbols 1,
```

```
  startingSymbolIndex 12
 }
},
{
 pucch-ResourceId 4,
 startingPRB 0,
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 5,
 startingPRB 16,
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 6,
 startingPRB 32,
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 7,
 startingPRB 48,
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 8,
 startingPRB 100,
```

```
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 21,
 startingPRB 101,
 format format2 : {
  nrofPRBs 4,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 23,
 startingPRB 0,
 format format2 : {
  nrofPRBs 16,
  nrofSymbols 1,
  startingSymbolIndex 12
 }
},
{
 pucch-ResourceId 24,
 startingPRB 16,
 format format2 : {
  nrofPRBs 16,
  nrofSymbols 1,
  startingSymbolIndex 12
 }
},
{
 pucch-ResourceId 25,
 startingPRB 32,
 format format2 : {
  nrofPRBs 16,
  nrofSymbols 1,
  startingSymbolIndex 12
 }
},
```

```
{
 pucch-ResourceId 26,
 startingPRB 48,
 format format2 : {
  nrofPRBs 16,
  nrofSymbols 1,
  startingSymbolIndex 12
 }
},
{
 pucch-ResourceId 27,
 startingPRB 0,
 format format2 : {
  nrofPRBs 16,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 28,
 startingPRB 16,
 format format2 : {
  nrofPRBs 16,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 29,
 startingPRB 32,
 format format2 : {
  nrofPRBs 16,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 30,
 startingPRB 48,
 format format2 : {
  nrofPRBs 16,
  nrofSymbols 1,
```

```
    startingSymbolIndex 13
   }
  }
 },
 format2 setup : {
  maxCodeRate zeroDot15
 },
 schedulingRequestResourceToAddModList {
  {
   schedulingRequestResourceId 1,
   schedulingRequestID 0,
   periodicityAndOffset sl160 : 134,
   resource 8
  }
 },
 dl-DataToUL-ACK {
  3,
  4,
  5,
  6,
  7,
  11,
  0,
  0
 },
 pucch-PowerControl {
  deltaF-PUCCH-f0 0,
  deltaF-PUCCH-f2 0,
  p0-Set {
   {
    p0-PUCCH-Id 1,
    p0-PUCCH-Value 0
   }
  },
  pathlossReferenceRSs {
   {
    pucch-PathlossReferenceRS-Id 0,
    referenceSignal csi-RS-Index : 0
   }
  }
 },
```

```
 pusch-Config setup : {
  txConfig codebook,
  dmrs-UplinkForPUSCH-MappingTypeB setup : {
   dmrs-AdditionalPosition pos1
  },
  resourceAllocation resourceAllocationType1,
  codebookSubset nonCoherent,
  maxRank 2
 },
 srs-Config setup : {
  srs-ResourceToAddModList {
   {
    srs-ResourceId 0,
    nrofSRS-Ports ports2,
    transmissionComb n2 : {
     combOffset-n2 0,
     cyclicShift-n2 0
    },
    resourceMapping {
     startPosition 2,
     nrofSymbols n1,
     repetitionFactor n1
    },
    freqDomainPosition 0,
    freqDomainShift 0,
    freqHopping {
     c-SRS 61,
     b-SRS 0,
     b-hop 0
    },
    groupOrSequenceHopping neither,
    resourceType aperiodic : {
     },
    sequenceId 101,
    spatialRelationInfo {
     referenceSignal csi-RS-Index : 0
    }
   }
  }
 }
}
```

```
 },
 pusch-ServingCellConfig setup : {
  maxMIMO-Layers 2
 }
},
pdsch-ServingCellConfig setup : {
 maxMIMO-Layers 4
},
csi-MeasConfig setup : {
 csi-ReportConfigToAddModList {
  {
   reportConfigId 0,
   resourcesForChannelMeasurement 0,
   csi-IM-ResourcesForInterference 11,
   reportConfigType periodic : {
    reportSlotConfig slots320 : 294,
    pucch-CSI-ResourceList {
     {
      uplinkBandwidthPartId 1,
      pucch-Resource 21
     }
    }
   },
   reportQuantity cri-RI-PMI-CQI : NULL,
   reportFreqConfiguration {
    cqi-FormatIndicator widebandCQI,
    pmi-FormatIndicator widebandPMI,
    csi-ReportingBand subbands18 : '11111111 11111111 11'B
   },
   timeRestrictionForChannelMeasurements configured,
   timeRestrictionForInterferenceMeasurements configured,
   codebookConfig {
    codebookType type1 : {
     subType typeI-SinglePanel : {
      nrOfAntennaPorts two : {
       twoTX-CodebookSubsetRestriction '111111'B
      },
      typeI-SinglePanel-ri-Restriction '00000011'B
     },
     codebookMode 1
    }
   },
```

```
            groupBasedBeamReporting disabled : {
             },
            cqi-Table table2,
            subbandSize value1
           }
          }
         },
         tag-Id 0,
         servingCellMO 1
        }
       }
      },
      dedicatedNAS-MessageList {
       '7E 02 C5 AA C3 B9 03 7E 00 68 01 00 59 2E 01 BF C2 11 00 09 01 00 06 31 31 01 01
FE 05 06 10 00 02 10 00 02 29 05 01 0A 16 23 33 22 04 01 D1 43 A5 79 00 06 05 20 41 01
01 09 7B 00 05 80 00 05 01 01 25 22 04 77 61 70 31 05 6E 6F 6B 69 61 03 63 6F 6D 06 6D
6E 63 30 36 36 06 6D 63 63 32 36 30 04 67 70 72 73 12 01'H
      }
     }
    }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 dlRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 12,
  criticality ignore,
  value DLRRCMessageTransfer : {
    protocolIEs {
      {
       id 40,
       criticality reject,
       value GNB-CU-UE-F1AP-ID : 61
      },
      {
       id 41,
       criticality reject,
       value GNB-DU-UE-F1AP-ID : 62
      },
      {
       id 64,
       criticality reject,
       value SRBID : 1
      },
      {
       id 50,
       criticality reject,
       value RRCContainer : '00 06 DA 2F E9 D4 B1 5C E4 77 C5 C9 60 D8 DC 84 A0 34 63 7E F1 72 42 61 BB 9D 15 15 CB 2E 66
      }
    }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ulRRCMessageTransfer

```
F1AP-PDU : initiatingMessage : {
  procedureCode 13,
  criticality ignore,
  value ULRRCMessageTransfer : {
    protocolIEs {
     {
      id 40,
      criticality reject,
      value GNB-CU-UE-F1AP-ID : 61
     },
     {
      id 41,
      criticality reject,
      value GNB-DU-UE-F1AP-ID : 62
     },
     {
      id 64,
      criticality reject,
      value SRBID : 1
     },
     {
      id 50,
      criticality reject,
      value RRCContainer : '00 07 68 EA BB BC 13 28'H
     }
    }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 rrcReconfigurationComplete

```
UL-DCCH-Message : {
 message c1 : rrcReconfigurationComplete : {
    rrc-TransactionIdentifier 3,
    criticalExtensions rrcReconfigurationComplete : {
     }
   }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ueContextModificationRequest

```
F1AP-PDU : initiatingMessage : {
  procedureCode 7,
  criticality reject,
  value UEContextModificationRequest : {
    protocolIEs {
     {
      id 40,
      criticality reject,
      value GNB-CU-UE-F1AP-ID : 61
     },
     {
      id 41,
      criticality reject,
      value GNB-DU-UE-F1AP-ID : 62
     },
     {
      id 87,
      criticality ignore,
      value RRCReconfigurationCompleteIndicator : true
     }
    }
   }
 }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ueContextModificationResponse

```
F1AP-PDU : successfulOutcome : {
  procedureCode 7,
  criticality reject,
  value UEContextModificationResponse : {
   protocolIEs {
    {
     id 40,
     criticality reject,
     value GNB-CU-UE-F1AP-ID : 61
    },
    {
     id 41,
     criticality reject,
     value GNB-DU-UE-F1AP-ID : 62
    },
    {
     id 39,
     criticality reject,
     value DUtoCURRCInformation : {
      cellGroupConfig '5C 04 B0 01 11 7A EC 70 10 61 E6 00 B1 C6 32 08 6F C6 1A 0E FC C8 16 12 22 2F 5D 8E 02 0C BC C0 0F 80 40 8D
          CellGroupConfig : {
           cellGroupId 0,
           rlc-BearerToAddModList {
            {
             logicalChannelIdentity 1,
             servedRadioBearer srb-Identity : 1,
             rlc-Config am : {
              ul-AM-RLC {
               sn-FieldLength size12,
               t-PollRetransmit ms45,
               pollPDU infinity,
               pollByte infinity,
               maxRetxThreshold t8
              },
              dl-AM-RLC {
               sn-FieldLength size12,
               t-Reassembly ms35,
               t-StatusProhibit ms0
              }
             },
             mac-LogicalChannelConfig {
              ul-SpecificParameters {
               priority 5,
               prioritisedBitRate infinity,
               bucketSizeDuration ms50,
               logicalChannelGroup 0,
               schedulingRequestID 0,
               logicalChannelSR-Mask FALSE,
```



---

```
UEContextModificationResponse

F1AP-PDU : successfulOutcome : {
 procedureCode 7,
 criticality reject,
 value UEContextModificationResponse :{
  protocolIEs{
   {
    id 40,
    criticality reject,
    value GNB-CU-UE-F1AP-ID : 61
   },
   {
    id 41,
    criticality reject,
    value GNB-DU-UE-F1AP-ID : 62
   },
   {
    id 39,
    criticality reject,
    value DUtoCURRCInformation : {
     cellGroupConfig '5C 04 B0 01 11 7A EC 70 10 61 E6 00 B1 C6 32 08 6F C6 1A 0E FC C8 16 12 22 2F 5D 8E 02 0C BC C0 0F 80 40 8D 07 88 40 00 82 19 30 0C B0 22 59 C7 EF C4 05 40 07 80 00 08 8A 0D C5 00 C0 00 04 02 0F C6 05 40 07 80 00 08 8A 00 04 18 50 10 3B 00 00 0A 70 0A 20 1B 40 35 80 86 CA 80 40 FF FF F8 00 00 00 80 00 3B 8E 01 80
00 08 04 1B 90 21 B0 00 14 08 29 02 02 51 00 65 02 00 2A 3C 00 49 81 17 14 0D 86 A4 31 C8 B0 56 1E 19 1C 32 E0 44 83 2A 4F 07 3F 62 66 BF E4 E0 04 9E 21 5B C2 C5 87 6F 12 DE 2D BC 9B 79 56 F2 ED E6 58 A7 A9 83 2C 23 55 24 94 1C 00 10 40 C2 05 0C 1C 9C B9 83 26 8D 9C 3A 78 B8 00 00 01 80 10 80 06 00 84 00 18 02 18 00 60 10 00 01 40 50
80 06 81 84 00 1A 07 18 00 68 20 C8 01 A1 53 2A 36 85 C0 DB D8 18 08 2F 60 64 40 BD 81 A1 82 F6 06 C0 DB DA 1C 08 2F 68 74 40 BD A1 E1 82 F6 C8 23 03 21 84 73 45 67 B0 05 3A 20 04 02 01 2C 0E 12 08 C0 0C 10 E1 00 71 28 1C 00 00 20 9E F4 01 01 02 00 00 0F 40 03 29 00 38 01 01 90 C0 04 06 02 AA 28 02 10 01 82 49 40 0F C2 8C B7 2F 71 E0
10 C4 00 7E 15 19 68 00 08 8F 80 8A 20 03 F0 A8 CB 40 00 5C B0 04 31 00 1F 85 46 5A 01 02 E4 20 22 88 00 FC 2A 32 D0 08 10 40 00 00 14 30 C7 87 C8 08 60 70 52 00 3F 2E 5E 00 00 00 40 08 00 30 5C 00 32 12 00 CC 01 68 00 02 C9 93 04 A9 E3 FF FF F0 7E 06 90'H
      CellGroupConfig : {
       cellGroupId 0,
       rlc-BearerToAddModList {
        {
         logicalChannelIdentity 1,
         servedRadioBearer srb-Identity : 1,
         rlc-Config am : {
          ul-AM-RLC {
           sn-FieldLength size12,
           t-PollRetransmit ms45,
           pollPDU infinity,
           pollByte infinity,
           maxRetxThreshold t8
          },
          dl-AM-RLC {
           sn-FieldLength size12,
           t-Reassembly ms35,
           t-StatusProhibit ms0
          }
         },
         mac-LogicalChannelConfig {
          ul-SpecificParameters {
           priority 1,
           prioritisedBitRate infinity,
           bucketSizeDuration ms50,
           logicalChannelGroup 0,
           schedulingRequestID 0,
           logicalChannelSR-Mask FALSE,
           logicalChannelSR-DelayTimerApplied FALSE
          }
         }
        },
        {
         logicalChannelIdentity 4,
         servedRadioBearer drb-Identity : 4,
         rlc-Config am : {
          ul-AM-RLC {
           sn-FieldLength size18,
           t-PollRetransmit ms45,
           pollPDU p64,
           pollByte kB500,
           maxRetxThreshold t32
          },
          dl-AM-RLC {
           sn-FieldLength size18,
           t-Reassembly ms15,
           t-StatusProhibit ms15
          }
         },
         mac-LogicalChannelConfig {
          ul-SpecificParameters {
           priority 12,
           prioritisedBitRate infinity,
           bucketSizeDuration ms50,
           logicalChannelGroup 1,
           schedulingRequestID 0,
           logicalChannelSR-Mask FALSE,
           logicalChannelSR-DelayTimerApplied FALSE
          }
         }
        },
        {
         logicalChannelIdentity 2,
         servedRadioBearer srb-Identity : 2,
         rlc-Config am : {
          ul-AM-RLC {
           sn-FieldLength size12,
           t-PollRetransmit ms45,
           pollPDU infinity,
           pollByte infinity,
           maxRetxThreshold t8
          },
          dl-AM-RLC {
           sn-FieldLength size12,
           t-Reassembly ms35,
           t-StatusProhibit ms0
          }
         },
         mac-LogicalChannelConfig {
          ul-SpecificParameters {
           priority 3,
           prioritisedBitRate infinity,
           bucketSizeDuration ms50,
```

```
    logicalChannelGroup 0,
    schedulingRequestID 0,
    logicalChannelSR-Mask FALSE,
    logicalChannelSR-DelayTimerApplied FALSE
   }
  }
 }
},
mac-CellGroupConfig {
 schedulingRequestConfig {
  schedulingRequestToAddModList {
   {
    schedulingRequestId 0,
    sr-TransMax n64
   }
  }
 },
 bsr-Config {
  periodicBSR-Timer sf10,
  retxBSR-Timer sf80
 },
 tag-Config {
  tag-ToAddModList {
   {
    tag-Id 0,
    timeAlignmentTimer infinity
   }
  }
 },
 phr-Config setup : {
   phr-PeriodicTimer sf20,
   phr-ProhibitTimer sf0,
   phr-Tx-PowerFactorChange dB3,
   multiplePHR FALSE,
   dummy FALSE,
   phr-Type2OtherCell FALSE,
   phr-ModeOtherCG real
  },
 skipUplinkTxDynamic FALSE
},
physicalCellGroupConfig {
 pdsch-HARQ-ACK-Codebook dynamic
```

```
},
spCellConfig {
 spCellConfigDedicated {
  downlinkBWP-ToAddModList {
   {
    bwp-Id 1,
    bwp-Common {
     genericParameters {
      locationAndBandwidth 1099,
      subcarrierSpacing kHz30
     },
     pdcch-ConfigCommon setup : {
       commonSearchSpaceList {
        {
         searchSpaceId 4,
         controlResourceSetId 0,
         monitoringSlotPperiodicityAndOffset sl10 : 4,
         duration 9,
         monitoringSymbolsWithinSlot '10000000 000000'B,
         nrofCandidates {
          aggregationLevel1 n0,
          aggregationLevel2 n0,
          aggregationLevel4 n4,
          aggregationLevel8 n2,
          aggregationLevel16 n1
         },
         searchSpaceType common : {
           dci-Format0-0-AndFormat1-0 {
           }
          }
        },
        {
         searchSpaceId 5,
         controlResourceSetId 0,
         monitoringSlotPeriodicityAndOffset sl1 : NULL,
         monitoringSymbolsWithinSlot '11000000 000000'B,
         nrofCandidates {
          aggregationLevel1 n0,
          aggregationLevel2 n0,
          aggregationLevel4 n2,
          aggregationLevel8 n0,
          aggregationLevel16 n0
```

```
      },
      searchSpaceType common : {
       dci-Format0-0-AndFormat1-0 {
       }
      }
     },
     {
      searchSpaceId 6,
      controlResourceSetId 0,
      monitoringSlotPeriodicityAndOffset sl10 : 4,
      duration 9,
      monitoringSymbolsWithinSlot '10000000 000000'B,
      nrofCandidates {
       aggregationLevel1 n0,
       aggregationLevel2 n0,
       aggregationLevel4 n4,
       aggregationLevel8 n2,
       aggregationLevel16 n1
      },
      searchSpaceType common : {
       dci-Format0-0-AndFormat1-0 {
       }
      }
     },
     searchSpaceSIB1 0,
     searchSpaceOtherSystemInformation 4,
     pagingSearchSpace 6,
     ra-SearchSpace 5,
     firstPDCCH-MonitoringOccasionOfPO sCS120KHZoneT-SCS60KHZhalfT-
SCS30KHZquarterT-SCS15KHZoneEighthT : {
      0
     }
    },
    pdsch-ConfigCommon setup : {
     pdsch-TimeDomainAllocationList {
     {
      k0 0,
      mappingType typeA,
      startSymbolAndLength 40
     },
     {
      k0 0,
```

```
                mappingType typeA,
                startSymbolAndLength 54
               },
               {
                k0 0,
                mappingType typeA,
                startSymbolAndLength 53
               },
               {
                k0 0,
                mappingType typeA,
                startSymbolAndLength 67
               }
              }
             }
            },
            bwp-Dedicated {
             pdcch-Config setup : {
              controlResourceSetToAddModList {
               {
                controlResourceSetId 1,
                frequencyDomainResources '11111111 11111111 11110000 00000000
00000000 00000'B,
                duration 1,
                cce-REG-MappingType nonInterleaved : NULL,
                precoderGranularity sameAsREG-bundle,
                tci-StatesPDCCH-ToAddList {
                 0
                }
               }
              },
              searchSpacesToAddModList {
               {
                searchSpaceId 7,
                controlResourceSetId 0,
                monitoringSlotPeriodicityAndOffset sl1 : NULL,
                monitoringSymbolsWithinSlot '11000000 000000'B,
                nrofCandidates {
                 aggregationLevel1 n0,
                 aggregationLevel2 n0,
                 aggregationLevel4 n2,
                 aggregationLevel8 n0,
                 aggregationLevel16 n0
```

```
    },
    searchSpaceType common : {
      dci-Format0-0-AndFormat1-0 {
      }
    }
   },
   {
    searchSpaceId 8,
    controlResourceSetId 1,
    monitoringSlotPeriodicityAndOffset sl1 : NULL,
    monitoringSymbolsWithinSlot '11000000 000000'B,
    nrofCandidates {
     aggregationLevel1 n0,
     aggregationLevel2 n0,
     aggregationLevel4 n5,
     aggregationLevel8 n0,
     aggregationLevel16 n0
    },
    searchSpaceType ue-Specific : {
      dci-Formats formats0-1-And-1-1
     }
    }
   }
  },
 pdsch-Config setup : {
  dmrs-DownlinkForPDSCH-MappingTypeA setup : {
    dmrs-AdditionalPosition pos1,
    scramblingID0 101
   },
  tci-StatesToAddModList {
   {
    tci-StateId 0,
    qcl-Type1 {
     bwp-Id 1,
     referenceSignal csi-rs : 30,
     qcl-Type typeA
    }
   },
   {
    tci-StateId 1,
    qcl-Type1 {
     bwp-Id 1,
```

```
  referenceSignal ssb : 0,
  qcl-Type typeC
 }
 }
},
resourceAllocation resourceAllocationType0,
pdsch-TimeDomainAllocationList setup : {
 {
  mappingType typeA,
  startSymbolAndLength 40
 },
 {
  mappingType typeA,
  startSymbolAndLength 54
 },
 {
  mappingType typeA,
  startSymbolAndLength 53
 },
 {
  mappingType typeA,
  startSymbolAndLength 67
 },
 {
  mappingType typeA,
  startSymbolAndLength 57
 },
 {
  mappingType typeA,
  startSymbolAndLength 44
 },
 {
  mappingType typeA,
  startSymbolAndLength 43
 },
 {
  mappingType typeA,
  startSymbolAndLength 30
 }
},
rbg-Size config1,
maxNrofCodeWordsScheduledByDCI n1,
```

```
    prb-BundlingType staticBundling : {
     bundleSize wideband
    }
   }
  }
 }
},
firstActiveDownlinkBWP-Id 1,
uplinkConfig {
 uplinkBWP-ToAddModList {
  {
   bwp-Id 1,
   bwp-Common {
    genericParameters {
     locationAndBandwidth 1099,
     subcarrierSpacing kHz30
    },
    rach-ConfigCommon setup : {
     rach-ConfigGeneric {
      prach-ConfigurationIndex 158,
      msg1-FDM one,
      msg1-FrequencyStart 115,
      zeroCorrelationZoneConfig 15,
      preambleReceivedTargetPower -104,
      preambleTransMax n10,
      powerRampingStep dB2,
      ra-ResponseWindow sl20
     },
     ssb-perRACH-OccasionAndCB-PreamblesPerSSB one : n64,
     ra-ContentionResolutionTimer sf64,
     rsrp-ThresholdSSB 19,
     prach-RootSequenceIndex l139 : 0,
     msg1-SubcarrierSpacing kHz30,
     restrictedSetConfig unrestrictedSet
    },
    pusch-ConfigCommon setup : {
     pusch-TimeDomainAllocationList {
      {
       k2 2,
       mappingType typeB,
       startSymbolAndLength 55
      },
```

```
{
 k2 2,
 mappingType typeB,
 startSymbolAndLength 69
},
{
 k2 3,
 mappingType typeB,
 startSymbolAndLength 55
},
{
 k2 4,
 mappingType typeB,
 startSymbolAndLength 55
},
{
 k2 5,
 mappingType typeB,
 startSymbolAndLength 55
},
{
 k2 9,
 mappingType typeB,
 startSymbolAndLength 55
},
{
 k2 10,
 mappingType typeB,
 startSymbolAndLength 55
},
{
 k2 11,
 mappingType typeB,
 startSymbolAndLength 55
},
{
 k2 12,
 mappingType typeB,
 startSymbolAndLength 55
}
},
msg3-DeltaPreamble 1,
```

```
  p0-NominalWithGrant -80
 },
 pucch-ConfigCommon setup : {
  pucch-GroupHopping neither,
  hoppingId 101,
  p0-nominal -70
 }
},
bwp-Dedicated {
 pucch-Config setup : {
  resourceSetToAddModList {
   {
    pucch-ResourceSetId 0,
    resourceList {
     0,
     1,
     2,
     3,
     4,
     5,
     6,
     7
    }
   },
   {
    pucch-ResourceSetId 1,
    resourceList {
     23,
     24,
     25,
     26,
     27,
     28,
     29,
     30
    }
   }
  },
  resourceToAddModList {
   {
    pucch-ResourceId 0,
    startingPRB 0,
```

```
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 12
 }
},
{
 pucch-ResourceId 1,
 startingPRB 16,
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 12
 }
},
{
 pucch-ResourceId 2,
 startingPRB 32,
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 12
 }
},
{
 pucch-ResourceId 3,
 startingPRB 48,
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 12
 }
},
{
 pucch-ResourceId 4,
 startingPRB 0,
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
```

```
{
 pucch-ResourceId 5,
 startingPRB 16,
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 6,
 startingPRB 32,
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 7,
 startingPRB 48,
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 8,
 startingPRB 100,
 format format0 : {
  initialCyclicShift 0,
  nrofSymbols 1,
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 21,
 startingPRB 101,
 format format2 : {
  nrofPRBs 4,
  nrofSymbols 1,
```

```
  startingSymbolIndex 13
 }
},
{
 pucch-ResourceId 23,
 startingPRB 0,
 format format2 : {
  nrofPRBs 16,
  nrofSymbols 1,
  startingSymbolIndex 12
 }
},
{
 pucch-ResourceId 24,
 startingPRB 16,
 format format2 : {
  nrofPRBs 16,
  nrofSymbols 1,
  startingSymbolIndex 12
 }
},
{
 pucch-ResourceId 25,
 startingPRB 32,
 format format2 : {
  nrofPRBs 16,
  nrofSymbols 1,
  startingSymbolIndex 12
 }
},
{
 pucch-ResourceId 26,
 startingPRB 48,
 format format2 : {
  nrofPRBs 16,
  nrofSymbols 1,
  startingSymbolIndex 12
 }
},
{
 pucch-ResourceId 27,
 startingPRB 0,
```

```
  format format2 : {
   nrofPRBs 16,
   nrofSymbols 1,
   startingSymbolIndex 13
  }
 },
 {
  pucch-ResourceId 28,
  startingPRB 16,
  format format2 : {
   nrofPRBs 16,
   nrofSymbols 1,
   startingSymbolIndex 13
  }
 },
 {
  pucch-ResourceId 29,
  startingPRB 32,
  format format2 : {
   nrofPRBs 16,
   nrofSymbols 1,
   startingSymbolIndex 13
  }
 },
 {
  pucch-ResourceId 30,
  startingPRB 48,
  format format2 : {
   nrofPRBs 16,
   nrofSymbols 1,
   startingSymbolIndex 13
  }
 }
},
format2 setup : {
 maxCodeRate zeroDot15
},
schedulingRequestResourceToAddModList {
 {
  schedulingRequestResourceId 1,
  schedulingRequestID 0,
  periodicityAndOffset sl160 : 134,
```

```
  resource 8
 }
},
dl-DataToUL-ACK {
 3,
 4,
 5,
 6,
 7,
 11,
 0,
 0
},
pucch-PowerControl {
 deltaF-PUCCH-f0 0,
 deltaF-PUCCH-f2 0,
 p0-Set {
  {
   p0-PUCCH-Id 1,
   p0-PUCCH-Value 0
  }
 },
 pathlossReferenceRSs {
  {
   pucch-PathlossReferenceRS-Id 0,
   referenceSignal csi-RS-Index : 0
  }
 }
}
},
pusch-Config setup : {
 txConfig codebook,
 dmrs-UplinkForPUSCH-MappingTypeB setup : {
  dmrs-AdditionalPosition pos1
 },
 pusch-PowerControl {
  p0-AlphaSets {
   {
    p0-PUSCH-AlphaSetId 0,
    p0 0,
    alpha alpha1
   }
```

```
  },
  pathlossReferenceRSToAddModList {
   {
    pusch-PathlossReferenceRS-Id 0,
    referenceSignal csi-RS-Index : 0
   }
  }
 },
 resourceAllocation resourceAllocationType1,
 transformPrecoder disabled,
 codebookSubset nonCoherent,
 maxRank 1
},
srs-Config setup : {
 srs-ResourceSetToAddModList {
  {
   srs-ResourceSetId 0,
   srs-ResourceIdList {
    0
   },
   resourceType aperiodic : {
    aperiodicSRS-ResourceTrigger 1,
    slotOffset 2
   },
   usage codebook,
   alpha alpha1,
   p0 -80
  }
 },
 srs-ResourceToAddModList {
  {
   srs-ResourceId 0,
   nrofSRS-Ports ports2,
   transmissionComb n2 : {
    combOffset-n2 0,
    cyclicShift-n2 0
   },
   resourceMapping {
    startPosition 2,
    nrofSymbols n1,
    repetitionFactor n1
   },
```

```
        freqDomainPosition 0,
        freqDomainShift 0,
        freqHopping {
         c-SRS 61,
         b-SRS 0,
         b-hop 0
        },
        groupOrSequenceHopping neither,
        resourceType aperiodic : {
         },
        sequenceId 101,
        spatialRelationInfo {
         referenceSignal csi-RS-Index : 0
        }
       }
      }
     }
    }
   }
  },
  firstActiveUplinkBWP-Id 1,
  pusch-ServingCellConfig setup : {
   maxMIMO-Layers 2
  }
 },
 pdsch-ServingCellConfig setup : {
  maxMIMO-Layers 1
 },
 csi-MeasConfig setup : {
  nzp-CSI-RS-ResourceToAddModList {
   {
    nzp-CSI-RS-ResourceId 0,
    resourceMapping {
     frequencyDomainAllocation other : '000001'B,
     nrofPorts p2,
     firstOFDMSymbolInTimeDomain 2,
     cdm-Type fd-CDM2,
     density one : NULL,
     freqBand {
      startingRB 0,
      nrofRBs 276
     }
```

```
 },
 powerControlOffset -3,
 scramblingID 101,
 periodicityAndOffset slots320 : 303
},
{
 nzp-CSI-RS-ResourceId 30,
 resourceMapping {
  frequencyDomainAllocation row1 : '0001'B,
  nrofPorts p1,
  firstOFDMSymbolInTimeDomain 6,
  cdm-Type noCDM,
  density three : NULL,
  freqBand {
   startingRB 0,
   nrofRBs 276
  }
 },
 powerControlOffset -3,
 powerControlOffsetSS db0,
 scramblingID 101,
 periodicityAndOffset slots160 : 0,
 qcl-InfoPeriodicCSI-RS 1
},
{
 nzp-CSI-RS-ResourceId 31,
 resourceMapping {
  frequencyDomainAllocation row1 : '0001'B,
  nrofPorts p1,
  firstOFDMSymbolInTimeDomain 10,
  cdm-Type noCDM,
  density three : NULL,
  freqBand {
   startingRB 0,
   nrofRBs 276
  }
 },
 powerControlOffset -3,
 powerControlOffsetSS db0,
 scramblingID 101,
 periodicityAndOffset slots160 : 0,
 qcl-InfoPeriodicCSI-RS 1
```

```
},
{
 nzp-CSI-RS-ResourceId 32,
 resourceMapping {
  frequencyDomainAllocation row1 : '0001'B,
  nrofPorts p1,
  firstOFDMSymbolInTimeDomain 6,
  cdm-Type noCDM,
  density three : NULL,
  freqBand {
   startingRB 0,
   nrofRBs 276
  }
 },
 powerControlOffset -3,
 powerControlOffsetSS db0,
 scramblingID 101,
 periodicityAndOffset slots160 : 1,
 qcl-InfoPeriodicCSI-RS 1
},
{
 nzp-CSI-RS-ResourceId 33,
 resourceMapping {
  frequencyDomainAllocation row1 : '0001'B,
  nrofPorts p1,
  firstOFDMSymbolInTimeDomain 10,
  cdm-Type noCDM,
  density three : NULL,
  freqBand {
   startingRB 0,
   nrofRBs 276
  }
 },
 powerControlOffset -3,
 powerControlOffsetSS db0,
 scramblingID 101,
 periodicityAndOffset slots160 : 1,
 qcl-InfoPeriodicCSI-RS 1
}
},
nzp-CSI-RS-ResourceSetToAddModList {
 {
```

```
  nzp-CSI-ResourceSetId 0,
  nzp-CSI-RS-Resources {
   0
  }
 },
 {
  nzp-CSI-ResourceSetId 3,
  nzp-CSI-RS-Resources {
   30,
   31,
   32,
   33
  },
  repetition off,
  trs-Info true
 }
},
csi-IM-ResourceToAddModList {
 {
  csi-IM-ResourceId 0,
  csi-IM-ResourceElementPattern pattern1 : {
   subcarrierLocation-p1 s4,
   symbolLocation-p1 2
  },
  freqBand {
   startingRB 0,
   nrofRBs 276
  },
  periodicityAndOffset slots320 : 303
 }
},
csi-IM-ResourceSetToAddModList {
 {
  csi-IM-ResourceSetId 0,
  csi-IM-Resources {
   0
  }
 }
},
csi-ResourceConfigToAddModList {
 {
  csi-ResourceConfigId 0,
```

```
 csi-RS-ResourceSetList nzp-CSI-RS-SSB : {
  nzp-CSI-RS-ResourceSetList {
   0
  }
 },
 bwp-Id 1,
 resourceType periodic
},
{
 csi-ResourceConfigId 11,
 csi-RS-ResourceSetList csi-IM-ResourceSetList : {
  0
 },
 bwp-Id 1,
 resourceType periodic
},
{
 csi-ResourceConfigId 2,
 csi-RS-ResourceSetList nzp-CSI-RS-SSB : {
  nzp-CSI-RS-ResourceSetList {
   3
  }
 },
 bwp-Id 1,
 resourceType periodic
}
},
csi-ReportConfigToAddModList {
{
 reportConfigId 0,
 resourcesForChannelMeasurement 0,
 csi-IM-ResourcesForInterference 11,
 reportConfigType periodic : {
  reportSlotConfig slots320 : 294,
  pucch-CSI-ResourceList {
   {
    uplinkBandwidthPartId 1,
    pucch-Resource 21
   }
  }
 },
 reportQuantity cri-RI-PMI-CQI : NULL,
```

```
            reportFreqConfiguration {
             cqi-FormatIndicator widebandCQI,
             pmi-FormatIndicator widebandPMI,
             csi-ReportingBand subbands18 : '11111111 11111111 11'B
            },
            timeRestrictionForChannelMeasurements configured,
            timeRestrictionForInterferenceMeasurements configured,
            codebookConfig {
             codebookType type1 : {
              subType typeI-SinglePanel : {
               nrOfAntennaPorts two : {
                twoTX-CodebookSubsetRestriction '111111'B
               },
               typeI-SinglePanel-ri-Restriction '00000011'B
              },
              codebookMode 1
             }
            },
            groupBasedBeamReporting disabled : {
             },
            cqi-Table table2,
            subbandSize value1
           }
          }
         },
        tag-Id 0
       }
      }
     },
  iE-Extensions {
   {
    id 193,
    criticality ignore,
    extensionValue SelectedBandCombinationIndex : '00 00'H
   },
   {
    id 194,
    criticality ignore,
    extensionValue SelectedFeatureSetEntryIndex : '02'H
   }
  }
}
```

```
    },
    {
     id 95,
     criticality ignore,
     value C-RNTI : 4797
    }
   }
  }
}
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 ueContextModificationRequest

```
F1AP-PDU : initiatingMessage : {
  procedureCode 7,
  criticality reject,
  value UEContextModificationRequest : {
    protocolIEs {
     {
      id 40,
      criticality reject,
      value GNB-CU-UE-F1AP-ID : 61
     },
     {
      id 41,
      criticality reject,
      value GNB-DU-UE-F1AP-ID : 62
     },
     {
      id 162,
      criticality reject,
      value GNB-DUConfigurationQuery : true
     }
    }
   }
 }
```

# 5G NR SA signaling with 5GC traces (html)
## gNB508 initialContextSetupResponse

```
NGAP-PDU : successfulOutcome : {
  procedureCode 14,
  criticality reject,
  value InitialContextSetupResponse : {
    protocolIEs {
     {
      id 10,
      criticality ignore,
      value AMF-UE-NGAP-ID : 4294967862
     },
     {
      id 85,
      criticality ignore,
      value RAN-UE-NGAP-ID : 61
     },
     {
      id 72,
      criticality ignore,
      value PDUSessionResourceSetupListCxtRes : {
        {
         pDUSessionID 1,
         pDUSessionResourceSetupResponseTransfer {
          dLQosFlowPerTNLInformation {
           uPTransportLayerInformation gTPTunnel : {
             transportLayerAddress '00001010 00000010 01010011 00001000'B,
             gTP-TEID '80 0F 01 40'H
           },
          associatedQosFlowList {
           {
            qosFlowIdentifier 5
           }
          }
         },
         securityResult {
          integrityProtectionResult not-performed,
          confidentialityProtectionResult performed
         }
        }
       }
```

## Wrap-up

In this module we have covered the following items:

- Explain the 5G NR SA signaling with 5GC Traces Network Setup.
- Describe the 5G NR SA signaling with 5GC traces (pcap).
- Describe the 5G NR SA signaling with 5GC traces (html).