Jio KPI Calculation & Event Definition in VUZE

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1. RACH Success Rate

- Description
  - Ratio of Contention-based RACH Success
    - RACH Procedure (Contention based): from Random Access Request message(MSG1) to Contention Resolution message(MSG4)

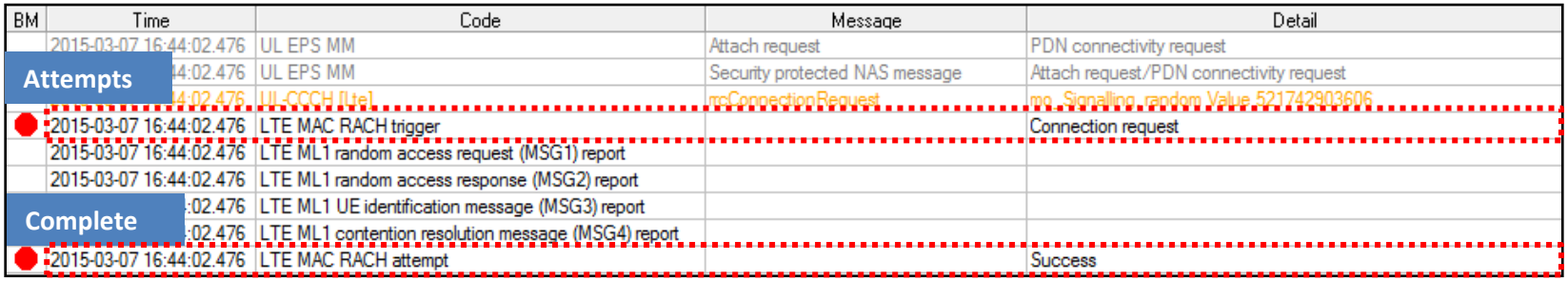
- Target Value
  - >99%

- Used Call Model
  - VoS

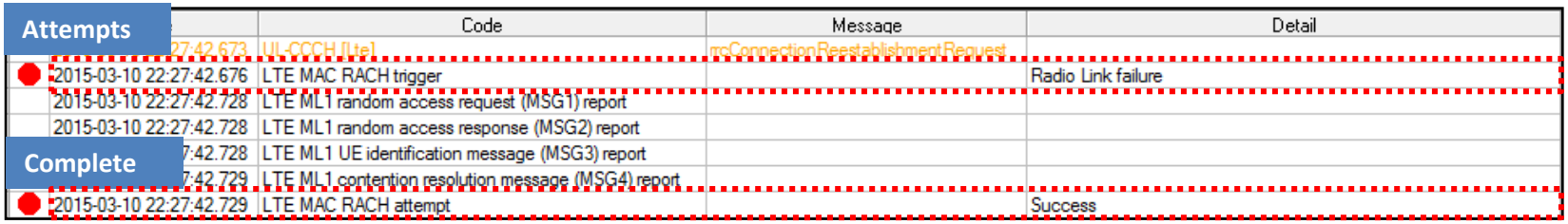
- Formula
  - The number of RACH Success / The number of RACH Attempts(CT Based)
    - RACH Success : LTE MAC RACH Attempt Success (Success of Message 4)
    - RACH Attempts(CT Based) :
      - LTE MAC RACH trigger followed by ‘rrcConnectionRequest’
      - LTE MAC RACH trigger followed by ‘rrcConnectionReestablishmentRequest’

1. RACH Success Rate

- Message from XCAP
  - Initial RRC Connection Setup
    - From LTE MAC RACH trigger by Connection request to LTE MAC RACH attempt Success



  - RRC Connection Re-establishment
    - From LTE MAC RACH trigger by Radio Link failure to LTE MAC RACH attempt Success



1. RACH Success Rate

- Fail Cases
  - Failure at MSG2
    - UE didn't receive Random Access Response (RAR) from eNB due to poor RF environments
    - RACH will be aborted when T300 timer is expired

  ▶ Check RF environment (RSRP/SINR)

BM	Time	Code	Message	Detail
	2015-03-12 17:38:31.138	UL EPS MM	Service request	
	2015-03-12 17:38:31.138	UL-CCCH [Lte]	rrcConnectionRequest	mo_Data, s-TMSI(mmec 2, m-TMSI 3895606716)
●	2015-03-12 17:38:31.138	LTE MAC RACH trigger		Connection request
	2015-03-12 17:38:31.141	LTE ML1 random access request (MSG1) report		
	2015-03-12 17:38:31.141	LTE MAC RACH attempt		Failure at MSG2
	2015-03-12 17:38:31.141	LTE ML1 random access request (MSG1) report		
	2015-03-12 17:38:31.141	LTE MAC RACH attempt		Failure at MSG2
	2015-03-12 17:38:31.141	LTE ML1 random access request (MSG1) report		
	2015-03-12 17:38:31.217	LTE MAC RACH attempt		Failure at MSG2
	2015-03-12 17:38:31.217	LTE ML1 random access request (MSG1) report		
	2015-03-12 17:38:31.217	LTE MAC RACH attempt		Failure at MSG2
	2015-03-12 17:38:31.217	LTE ML1 random access request (MSG1) report		
	2015-03-12 17:38:31.217	LTE MAC RACH attempt		Failure at MSG2
	2015-03-12 17:38:31.217	LTE ML1 random access request (MSG1) report		
	2015-03-12 17:38:31.217	LTE MAC RACH attempt		Failure at MSG2
	2015-03-12 17:38:31.218	LTE ML1 random access request (MSG1) report		
●	2015-03-12 17:38:31.353	LTE MAC RACH attempt		Aborted

1. RACH Success Rate

- Fail Cases
  - Failure at MSG4 due to CT Timer expired
    - UE didn't receive MSG4 from eNB within the pre-defined CT timer(56sf)

▶ Check RF environment (RSRP/SINR)

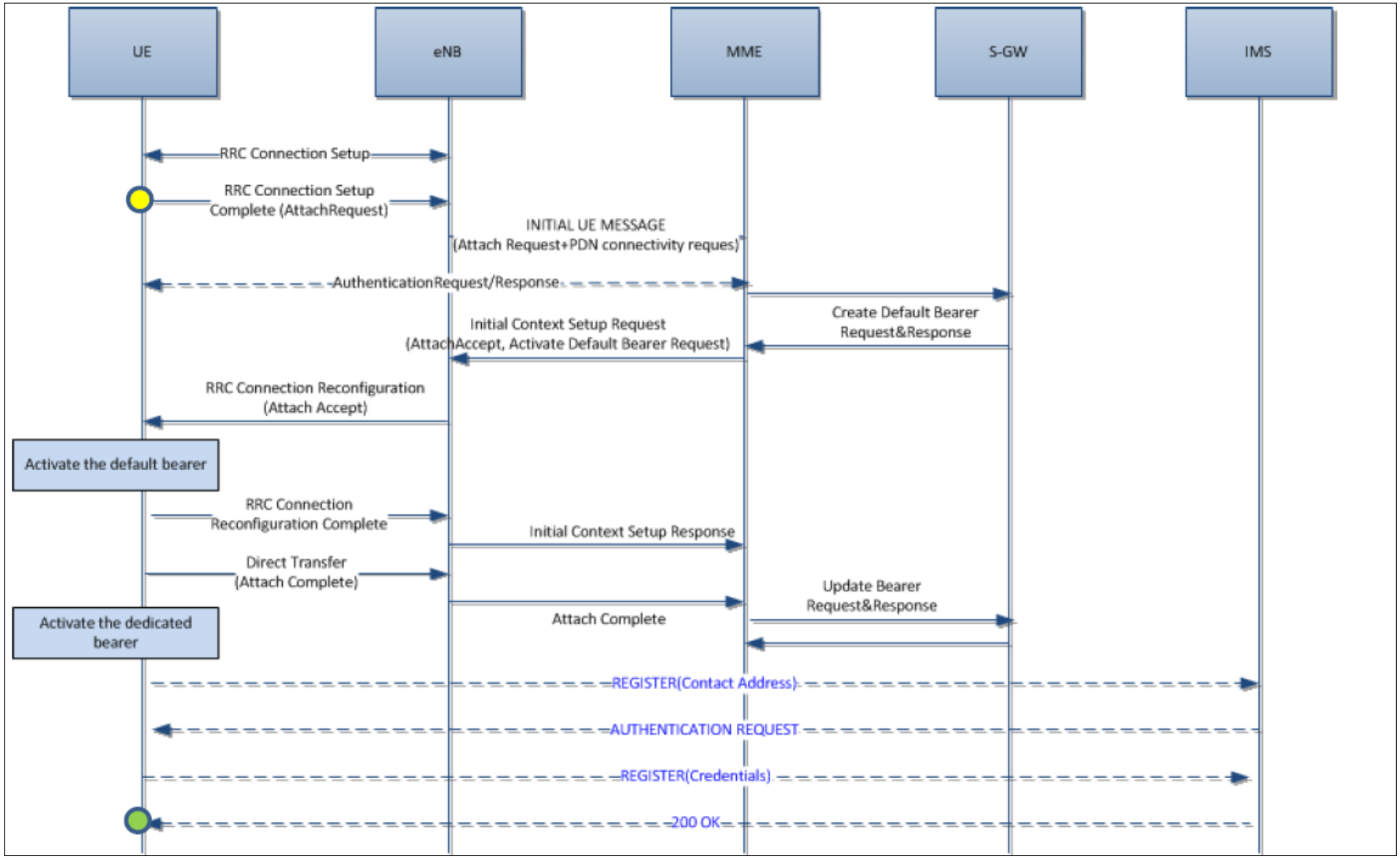
BM	Time	Code	Message	Detail
	2015-03-12 17:38:30.692	UL EPS MM	Service request	
●	2015-03-12 17:38:30.692	UL-CCCH [Lte]	rrcConnectionRequest	mo_Data, s-TMSI(mmec 2, m-TMSI 3895606716)
	2015-03-12 17:38:30.692	LTE MAC RACH trigger		Connection request
	2015-03-12 17:38:30.702	LTE ML1 random access request (MSG1) report		
	2015-03-12 17:38:30.702	LTE MAC RACH attempt		Failure at MSG2
	2015-03-12 17:38:30.702	LTE ML1 random access request (MSG1) report		
	2015-03-12 17:38:30.726	LTE MAC RACH attempt		Failure at MSG2
	2015-03-12 17:38:30.727	LTE ML1 random access request (MSG1) report		
	2015-03-12 17:38:30.727	LTE ML1 random access response (MSG2) report		
	2015-03-12 17:38:30.727	LTE ML1 UE identification message (MSG3) report		
●	2015-03-12 17:38:30.904	LTE MAC RACH attempt		Failure at MSG4 due to CT timer expired
	2015-03-12 17:38:30.904	LTE ML1 contention resolution message (MSG4) report		

2. Attach Success Rate

- Description
  - Ratio of LTE Attach Success
    - Attach Procedure : from RRC Connection Setup Complete with Attach Request to IMS Registration
- Target Value
  - >99%
- Used Call Model
  - VoS
- Formula
  - The number of Attach Success / The number of Attach Attempts
    - Attach Success : Receiving SIP 200 OK for IMS Registration after ‘rrcConnectionSetupComplete’ with Attach Request
    - Attach Attempts : Sending ‘rrcConnectionSetupComplete’ with Attach Request

2. Attach Success Rate

- Attach Procedure



2. Attach Success Rate

- Message from XCAP
  - From ‘rrcConnectionSetupComplete’ message (with Attach Request) to SIP 200 OK message for IMS REGISTER

BM	Time	Code	Message	Detail
	2015-02-21 03:02:25.369	BCCH-DL-SCH [Lte]	systemInformation	sib2
	2015-02-21 03:02:25.371	UL-CCCH [Lte]	rrcConnectionRequest	mo_Signalling, random Value 627707124481
	2015-02-21 03:02:25.494	LTE MAC RACH trigger		Connection request
	2015-02-21 03:02:25.494	LTE ML1 random access request (MSG1) report		
	2015-02-21 03:02:25.494	LTE ML1 random access response (MSG2) report		
	2015-02-21 03:02:25.494	LTE ML1 UE identification message (MSG3) report		
	2015-02-21 03:02:25.495	LTE ML1 contention resolution message (MSG4) report		
	2015-02-21 03:02:25.495	LTE MAC RACH attempt		Success
	2015-02-21 03:02:25.495	DL-CCCH [Lte]	rrcConnectionSetup	
	2015-02-21 03:02:25.495	UL-DCCH [Lte]	rrcConnectionSetupComplete	Security protected NAS message/Attach request/PDN connectivity request
	2015-02-21 03:02:25.588	BCCH-DL-SCH [Lte]	systemInformation	sib3
	2015-02-21 03:02:25.590	DL-DCCH [Lte]	dlInformationTransfer	Security protected NAS message
	2015-02-21 03:02:25.713	UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message
	2015-02-21 03:02:25.779	DL-DCCH [Lte]	dlInformationTransfer	Security protected NAS message/Security mode command
	2015-02-21 03:02:25.781	UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message
	2015-02-21 03:02:25.886	BCCH-DL-SCH [Lte]	systemInformation	sib4
	2015-02-21 03:02:25.886	DL-DCCH [Lte]	dlInformationTransfer	Security protected NAS message
	2015-02-21 03:02:25.886	UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message
	2015-02-21 03:02:25.969	DL-DCCH [Lte]	ueCapabilityEnquiry	
	2015-02-21 03:02:25.969	UL-DCCH [Lte]	ueCapabilityInformation	
	2015-02-21 03:02:26.001	DL-DCCH [Lte]	securityModeCommand	
	2015-02-21 03:02:26.001	UL-DCCH [Lte]	securityModeComplete	
	2015-02-21 03:02:26.001	DL-DCCH [Lte]	rrcConnectionReconfiguration	Security protected NAS message
	2015-02-21 03:02:26.003	UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
	2015-02-21 03:02:26.003	UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message
	2015-02-21 03:02:26.080	DL-DCCH [Lte]	dlInformationTransfer	Security protected NAS message
	2015-02-21 03:02:26.476	BCCH-DL-SCH [Lte]	systemInformationBlockType1	MCC 405() ,MNC 874() ,cellIdentity 746512[eNBID 2916, CID 16]
	2015-02-21 03:02:26.095	BCCH-BCH [Lte]	masterInformationBlock	
	2015-02-21 03:02:26.482	UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message
	2015-02-21 03:02:26.493	DL-DCCH [Lte]	rrcConnectionReconfiguration	Security protected NAS message
	2015-02-21 03:02:26.527	UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
	2015-02-21 03:02:26.527	UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message
	2015-02-21 03:02:27.338	UDP Tx-SIP	UDP	0, 5060, 5060, REGISTER sip:ims.mnc874.mcc405.3gppnetwork.org SIP/2.0
	2015-02-21 03:02:27.465	UDP Rx-SIP	UDP	0, 5060, 5060, SIP/2.0 401 Unauthorized
	2015-02-21 03:02:27.838	UDP Tx-SIP	UDP	0, 5060, 5060, REGISTER sip:ims.mnc874.mcc405.3gppnetwork.org SIP/2.0
	2015-02-21 03:02:27.973	UDP Rx-SIP	UDP	0, 5060, 5060, SIP/2.0 200 OK
	2015-02-21 03:02:27.973	DL-DCCH [Lte]	rrcConnectionReconfiguration	Security protected NAS message

Attempts

Complete

2. Attach Success Rate

- Fail Cases
  - Initial Attach Fail by S1 interface issue
    - UE didn’t receive “dlInformationTransfer" message after RRC Connection Setup Complete

▶ Check the stability of S1 interface

BM	Time	Code	Message	Detail
	2015-02-21 02:59:08.614	UL EPS MM	Security protected NAS message	Attach request/PDN connectivity request
●	2015-02-21 02:59:08.614	UL-CCCH [Lte]	rrcConnectionRequest	mo_Signalling, random Value 542566080156
	2015-02-21 02:59:08.614	LTE MAC RACH trigger		Connection request
	2015-02-21 02:59:08.614	BCCH-DL-SCH [Lte]	systemInformation	sib3
	2015-02-21 02:59:08.614	LTE ML1 random access request (MSG1) report		
	2015-02-21 02:59:08.614	BCCH-DL-SCH [Lte]	systemInformation	sib4
	2015-02-21 02:59:08.615	LTE ML1 random access response (MSG2) report		
	2015-02-21 02:59:08.615	LTE ML1 UE identification message (MSG3) report		
	2015-02-21 02:59:08.621	LTE ML1 contention resolution message (MSG4) report		
				Success
			rrcConnectionSetup	
			systemInformation	
			rrcConnectionSetupComplete	Security protected NAS message/Attach request/PDN connectivity request
	2015-02-21 03:00:13.666	BCCH-BCH [Lte]	masterInformationBlock	
	2015-02-21 03:00:13.666	BCCH-DL-SCH [Lte]	systemInformationBlockType1	MCC 405() ,MNC 874() ,cellIdentity 745489[eNBID 2912, CID 17]
	2015-02-21 03:00:13.666	BCCH-DL-SCH [Lte]	systemInformation	sib3
	2015-02-21 03:00:13.833	BCCH-DL-SCH [Lte]	systemInformation	sib2
	2015-02-21 03:00:13.833	LTE NAS EMM state		
	2015-02-21 03:00:13.834	LTE NAS ESM Procedure state		
	2015-02-21 03:00:13.834	LTE NAS EMM state		
	2015-02-21 03:00:13.834	UL EPS MM	Attach request	PDN connectivity request
	2015-02-21 03:00:13.834	UL EPS MM	Security protected NAS message	Attach request/PDN connectivity request
●	2015-02-21 03:00:13.834	UL-CCCH [Lte]	rrcConnectionRequest	mo_Signalling, random Value 247539532516
	2015-02-21 03:00:13.834	LTE MAC RACH trigger		Connection request
	2015-02-21 03:00:13.834	LTE ML1 random access request (MSG1) report		
	2015-02-21 03:00:13.834	LTE ML1 random access response (MSG2) report		
	2015-02-21 03:00:13.834	LTE ML1 UE identification message (MSG3) report		
	2015-02-21 03:00:13.834	LTE ML1 contention resolution message (MSG4) report		
	2015-02-21 03:00:13.834	LTE MAC RACH attempt		Success
	2015-02-21 03:00:13.834	DL-CCCH [Lte]	rrcConnectionSetup	
	2015-02-21 03:00:13.871	UL-DCCH [Lte]	rrcConnectionSetupComplete	Security protected NAS message/Attach request/PDN connectivity request
	2015-02-21 03:00:13.927	BCCH-DL-SCH [Lte]	systemInformation	sib4
	2015-02-21 03:00:13.928	DL-DCCH [Lte]	dlInformationTransfer	Security protected NAS message

No message from MME after rrcConnectionSetupComplete

2. Attach Success Rate

- Fail Cases
  - No Receiving TCP ACK for Sync
    - UE didn't receive TCP Acknowledgement (SYNC+ACK) for IMS Register after Default Bearer Setup

▶ Check Configuration of N7K router

▶ Check the stability of Backhaul and S1 interface

TIME_STAMP	NAS Default EPS Bearer Act. Procedure QCI	NAS Dedicated EPS Bearer Act. Procedure QCI
2015-02-04 03:29:44.463		QCI1
2015-02-04 03:30:24.371	QCI9	
2015-02-04 03:30:24.784	QCI9	
2015-02-04 03:30:27.259		QCI5
2015-02-04 03:30:50.547		QCI1
2015-02-04 03:31:29.767	QCI9	
2015-02-04 03:31:30.913	QCI9	
2015-02-04 03:31:33.788		QCI5
2015-02-04 03:31:55.669		QCI1
2015-02-04 03:32:35.223	QCI9	
2015-02-04 03:32:35.869	QCI9	
2015-02-04 03:32:38.517		QCI5
2015-02-04 03:33:00.882		QCI1
2015-02-04 03:33:41.538	QCI9	
2015-02-04 03:33:41.797	QCI9	
2015-02-04 03:37:26.763	QCI9	
2015-02-04 03:37:27.564	QCI9	
2015-02-04 03:37:29.523		QCI5
2015-02-04 03:37:52.225		QCI1
2015-02-04 03:38:32.702	QCI9	
2015-02-04 03:38:33.761	QCI9	
2015-02-04 03:38:36.290		QCI5
2015-02-04 03:38:58.043		QCI1
2015-02-04 03:39:38.462	QCI9	
Count	356	353
Minimum		
Maximum		
Average		
Stdev		
Median		

BM	Time	Code	Message	Detail
	2015-03-12 12:55:24.400	UL-CCCH [Lte]	rrcConnectionRequest	mo_Signalling, random Value 828667338507
	2015-03-12 12:55:24.431	DL-CCCH [Lte]	rrcConnectionSetup	
●	2015-03-12 12:55:24.498	UL-DCCH [Lte]	rrcConnectionSetupComplete	Security protected NAS message/Attach request/PDN connectivity request
	2015-03-12 12:55:24.577	DL-DCCH [Lte]	dlInformationTransfer	
	2015-03-12 12:55:24.679	UL-DCCH [Lte]	ulInformationTransfer	
	2015-03-12 12:55:24.757	DL-DCCH [Lte]	dlInformationTransfer	
	2015-03-12 12:55:24.757	UL-DCCH [Lte]	ulInformationTransfer	
	2015-03-12 12:55:24.854	DL-DCCH [Lte]	dlInformationTransfer	
	2015-03-12 12:55:24.855	UL-DCCH [Lte]	ulInformationTransfer	
	2015-03-12 12:55:24.956	DL-DCCH [Lte]	ueCapabilityEnquiry	
	2015-03-12 12:55:24.956	UL-DCCH [Lte]	ueCapabilityInformation	ue-Category 3
	2015-03-12 12:55:25.008	DL-DCCH [Lte]	securityModeCommand	
	2015-03-12 12:55:25.008	UL-DCCH [Lte]	securityModeComplete	
	2015-03-12 12:55:25.008	DL-DCCH [Lte]	rrcConnectionReconfiguration	Security protected NAS message
	2015-03-12 12:55:25.014	UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
	2015-03-12 12:55:25.015	UL-DCCH [Lte]	ulInformationTransfer	
	2015-03-12 12:55:25.077	DL-DCCH [Lte]	dlInformationTransfer	
	2015-03-12 12:55:34.923	UL-DCCH [Lte]	ulInformationTransfer	
	2015-03-12 12:55:35.058	DL-DCCH [Lte]	dlInformationTransfer	
	2015-03-12 12:55:35.059	DL-DCCH [Lte]	dlInformationTransfer	
	2015-03-12 12:55:37.750	UL-DCCH [Lte]	ulInformationTransfer	
			uration	Security protected NAS message
			urationComplete	
	2015-03-12 12:55:40.260	TCP Tx-SIP	TCP	57693, 48269, 5060, Seq:872341229, Ack:0
	2015-03-12 12:55:41.263	TCP Tx-SIP	TCP	57694, 48269, 5060, Seq:872341229, Ack:0
	2015-03-12 12:55:43.267	TCP Tx-SIP	TCP	57695, 48269, 5060, Seq:872341229, Ack:0
	2015-03-12 12:55:45.044	UL-DCCH [Lte]	ulInformationTransfer	
	2015-03-12 12:55:45.045	DL-DCCH [Lte]	dlInformationTransfer	
	2015-03-12 12:55:45.045	DL-DCCH [Lte]	dlInformationTransfer	
	2015-03-12 12:55:47.750	UL-DCCH [Lte]	ulInformationTransfer	
	2015-03-12 12:56:15.025	UL-DCCH [Lte]	ulInformationTransfer	
	2015-03-12 12:56:15.055	DL-DCCH [Lte]	dlInformationTransfer	
	2015-03-12 12:56:15.055	DL-DCCH [Lte]	dlInformationTransfer	
	2015-03-12 12:56:25.037	UL-DCCH [Lte]	ulInformationTransfer	
	2015-03-12 12:56:25.069	DL-DCCH [Lte]	dlInformationTransfer	
	2015-03-12 12:56:25.069	DL-DCCH [Lte]	dlInformationTransfer	
	2015-03-12 12:56:31.417	UL-DCCH [Lte]	ulInformationTransfer	
	2015-03-12 12:56:34.232	UL-CCCH [Lte]	rrcConnectionRequest	mo_Signalling, random Value 791789819965

No receiving ACK message for TCP Sync.

2. Attach Success Rate

- Fail Cases
  - 403 Forbidden
    - UE didn't receive SIP 200 OK message for IMS registration due to IMS server error

※ Another core side issue codes could be analyzed with the similar way

▶ Check Core network (including IMS server)

BM	Time	Code	Message	Detail
	2015-03-07 17:25:58.169	UL-CCCH [Lte]	rrcConnectionRequest	mo_Signalling, random Value 570457709081
	2015-03-07 17:25:58.217	DL-CCCH [Lte]	rrcConnectionSetup	
●	2015-03-07 17:25:58.228	UL-DCCH [Lte]	rrcConnectionSetupComplete	Security protected NAS message/Attach request/PDN connectivity request
	2015-03-07 17:25:58.370	DL-DCCH [Lte]	dlInformationTransfer	Security protected NAS message
	2015-03-07 17:25:58.501	UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message
	2015-03-07 17:25:58.561	DL-DCCH [Lte]	dlInformationTransfer	Security protected NAS message/Security mode command
	2015-03-07 17:25:58.561	UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message
	2015-03-07 17:25:58.774	DL-DCCH [Lte]	dlInformationTransfer	Security protected NAS message
	2015-03-07 17:25:58.774	UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message
	2015-03-07 17:25:58.885	DL-DCCH [Lte]	ueCapabilityEnquiry	
	2015-03-07 17:25:58.885	UL-DCCH [Lte]	ueCapabilityInformation	
	2015-03-07 17:25:58.922	DL-DCCH [Lte]	securityModeCommand	
	2015-03-07 17:25:58.922	UL-DCCH [Lte]	securityModeComplete	
	2015-03-07 17:26:03.421	TCP Tx-SIP	TCP	39890, 52160, 5060, Seq:350017866, Ack:0
	2015-03-07 17:26:03.423	TCP Rx-SIP	TCP	0, 5060, 52160, Seq:3070051757, Ack:350017867
	2015-03-07 17:26:03.423	TCP Tx-SIP	TCP	39891, 52160, 5060, Seq:350017867, Ack:3070051758
	2015-03-07 17:26:03.427	TCP Tx-SIP	TCP	39892, 52160, 5060, Seq:350017867, Ack:3070051758, REGISTER sip:ims.mnc868.mcc405.3
	2015-03-07 17:26:03.536	TCP Rx-SIP	TCP	29742, 5060, 52160, Seq:3070051758, Ack:350018876
	2015-03-07 17:26:31.408	UL-DCCH [Lte]	measurementReport	ServCell[rsrp -102dBm, rsrq -18.5dB] NeighCells[PCI 234(rsrp -97dBm, rsrq -12.0dB)]
	2015-03-07 17:26:31.656	UL-DCCH [Lte]	measurementReport	ServCell[rsrp -102dBm, rsrq -18.5dB] NeighCells[PCI 234(rsrp -97dBm, rsrq -12.0dB)]
	2015-03-07 17:26:31.667	DL-DCCH [Lte]	rrcConnectionReconfiguration	
	2015-03-07 17:26:31.684	UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
			TCP	29743, 5060, 52160, Seq:3070051758, Ack:350018876, SIP/2.0 401 Unauthorized
			TCP	39893, 52160, 5060, Seq:350018876, Ack:3070052320
	2015-03-07 17:26:35.733	TCP Tx-SIP	TCP	39894, 52160, 5060, Seq:350018876, Ack:3070052320, REGISTER sip:ims.mnc868.mcc405.3
	2015-03-07 17:26:35.794	TCP Rx-SIP	TCP	29744, 5060, 52160, Seq:3070052320, Ack:350019981
	2015-03-07 17:26:35.795	TCP Rx-SIP	TCP	29745, 5060, 52160, Seq:3070052320, Ack:350019981, SIP/2.0 403 Forbidden
	2015-03-07 17:26:35.804	TCP Tx-SIP	TCP	39895, 52160, 5060, Seq:350019981, Ack:3070052740
	2015-03-07 17:26:40.828	TCP Tx-SIP	TCP	39896, 52160, 5060, Seq:350019981, Ack:3070052740, REGISTER sip:ims.mnc868.mcc405.3
●	2015-03-07 17:26:40.901	TCP Rx-SIP	TCP	29746, 5060, 52160, Seq:3070052740, Ack:350020991, SIP/2.0 403 Forbidden
	2015-03-07 17:26:40.901	TCP Tx-SIP	TCP	39897, 52160, 5060, Seq:350020991, Ack:3070053161
	2015-03-07 17:26:43.461	UL-DCCH [Lte]	measurementReport	ServCell[rsrp -99dBm, rsrq -17.5dB] NeighCells[PCI 12(rsrp -94dBm, rsrq -12.5dB)]
	2015-03-07 17:26:43.756	DL-DCCH [Lte]	rrcConnectionReconfiguration	
	2015-03-07 17:26:43.760	UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	

No 200 OK for Registration

2. Attach Success Rate

- Fail Cases
  - Initial Attach Fail
    - — After RRC Connection Setup Complete, UE was released due to ‘PDN CONNECTIVITY REJECT’ message from MME
      - ※ Reject Cause : #30 (Request rejected by Serving GW or PDN GW)

▶ Check Core network (including IMS server)

Index	BM	Time	Code	Message	
1057		2015-03-18 19:41:18.798	Qc. LTE[Chipset]	-----[0xB0EE] LTE NAS EMM state	
1058		2015-03-18 19:41:18.857	Qc. LTE[Chipset]	-----[0xB0E6] LTE NAS ESM Procedure state	
1059		2015-03-18 19:41:18.857	Qc. LTE[Chipset]	-----[0xB0EE] LTE NAS EMM state	
1060	●	2015-03-18 19:41:18.857	UL EPS MM	--Attach request	PDN connectivity request
1061		2015-03-18 19:41:18.857	UL EPS MM	--Security protected NAS message	Attach request/PDN connectivity request
1062		2015-03-18 19:41:18.858	UL-CCCH [Lte]	-rrcConnectionRequest	mo_Signalling, random Value 120597445169
1063		2015-03-18 19:41:18.858	Qc. LTE[Chipset]	-----[0xB061] LTE MAC RACH trigger	Connection request
1064		2015-03-18 19:41:18.858	BCCH-DL-SCH [Lte]	-systemInformation	sib3
1065		2015-03-18 19:41:18.858	Qc. LTE[Chipset]	-----[0xB167] LTE ML1 random access reque	
1066		2015-03-18 19:41:18.858	BCCH-DL-SCH [Lte]	-systemInformation	sib4
1067		2015-03-18 19:41:18.859	Qc. LTE[Chipset]	-----[0xB168] LTE ML1 random access respo	
1068		2015-03-18 19:41:18.859	Qc. LTE[Chipset]	-----[0xB169] LTE ML1 UE identification mess	
1069		2015-03-18 19:41:18.859	Qc. LTE[Chipset]	-----[0xB16A] LTE ML1 contention resolution	
1070		2015-03-18 19:41:18.859	Qc. LTE[Chipset]	-----[0xB062] LTE MAC RACH attempt	Success
1071		2015-03-18 19:41:18.859	DL-CCCH [Lte]	-rrcConnectionSetup	
1072		2015-03-18 19:41:18.859	UL-DCCH [Lte]	-rrcConnectionSetupComplete	Security protected NAS message/Attach request/PDN connectivity request
1073		2015-03-18 19:41:19.048	DL-DCCH [Lte]	-dlInformationTransfer	
1074		2015-03-18 19:41:19.048	DL EPS MM	--Security protected NAS message	
1075		2015-03-18 19:41:19.048	DL EPS MM	--Authentication request	
1076		2015-03-18 19:41:19.098	UL EPS MM	--Authentication response	
1077		2015-03-18 19:41:19.098	UL EPS MM	--Security protected NAS message	
1078		2015-03-18 19:41:19.098	UL-DCCH [Lte]	-ulInformationTransfer	
1079		2015-03-18 19:41:19.233	DL-DCCH [Lte]	-dlInformationTransfer	
1080		2015-03-18 19:41:19.233	DL EPS MM	--Security protected NAS message	Security mode command
1081		2015-03-18 19:41:19.233	DL EPS MM	--Security mode command	
1082		2015-03-18 19:41:19.233	UL EPS MM	--Security mode complete	
1083		2015-03-18 19:41:19.233	UL EPS MM	--Security protected NAS message	
1084		2015-03-18 19:41:19.233	UL-DCCH [Lte]	-ulInformationTransfer	
1085		2015-03-18 19:41:19.430	DL-DCCH [Lte]	-dlInformationTransfer	
1086		2015-03-18 19:41:19.430	DL EPS MM	--Security protected NAS message	
1087		2015-03-18 19:41:19.431	DL EPS SM	--ESM information request	
1088		2015-03-18 19:41:19.431	UL EPS SM	--ESM information response	
1089		2015-03-18 19:41:19.431	UL EPS MM	--Security protected NAS message	
1090		2015-03-18 19:41:19.431	UL-DCCH [Lte]	-ulInformationTransfer	
1094		2015-03-18 19:41:20.104	DL EPS MM	--Security protected NAS message	
1095	●	2015-03-18 19:41:20.104	DL EPS MM	--Attach reject	PDN connectivity reject
1096		2015-03-18 19:41:20.105	Qc. LTE[Chipset]	-----[0xB0EE] LTE NAS EMM state	
1097		2015-03-18 19:41:20.105	Qc. LTE[Chipset]	-----[0xB0E6] LTE NAS ESM Procedure state	
1098		2015-03-18 19:41:20.870	BCCH-DL-SCH [Lte]	-systemInformationBlockType1	MCC 405() ,MNC 856() ,cellIdentity 724498[eNBID 2830, CID 18]
1099		2015-03-18 19:41:20.870	BCCH-BCH [Lte]	-masterInformationBlock	
1100		2015-03-18 19:41:30.180	Qc. LTE[Chipset]	-----[0xB0EE] LTE NAS EMM state	

Attach Reject : PDN Connectivity Reject

Index	BM	Time	Code	Message
1		2015-03-18 18:41:20.104	DL EPS MM	Attach reject
2		2015-03-18 18:41:31.576	DL EPS MM	Attach reject
3		2015-03-18 18:42:40.308	DL EPS MM	Attach reject
4		2015-03-18 18:42:52.523	DL EPS MM	Attach reject
5		2015-03-18 18:43:03.949	DL EPS MM	Attach reject

[2015 Mar 18 18:41:20.104] DL EPS MM - Attach reject

Version : 1
STD_VERSION : 9
STD_VERSION_MAJOR : 5
STD_VERSION_MINOR : 0
NAS Data Length : 10

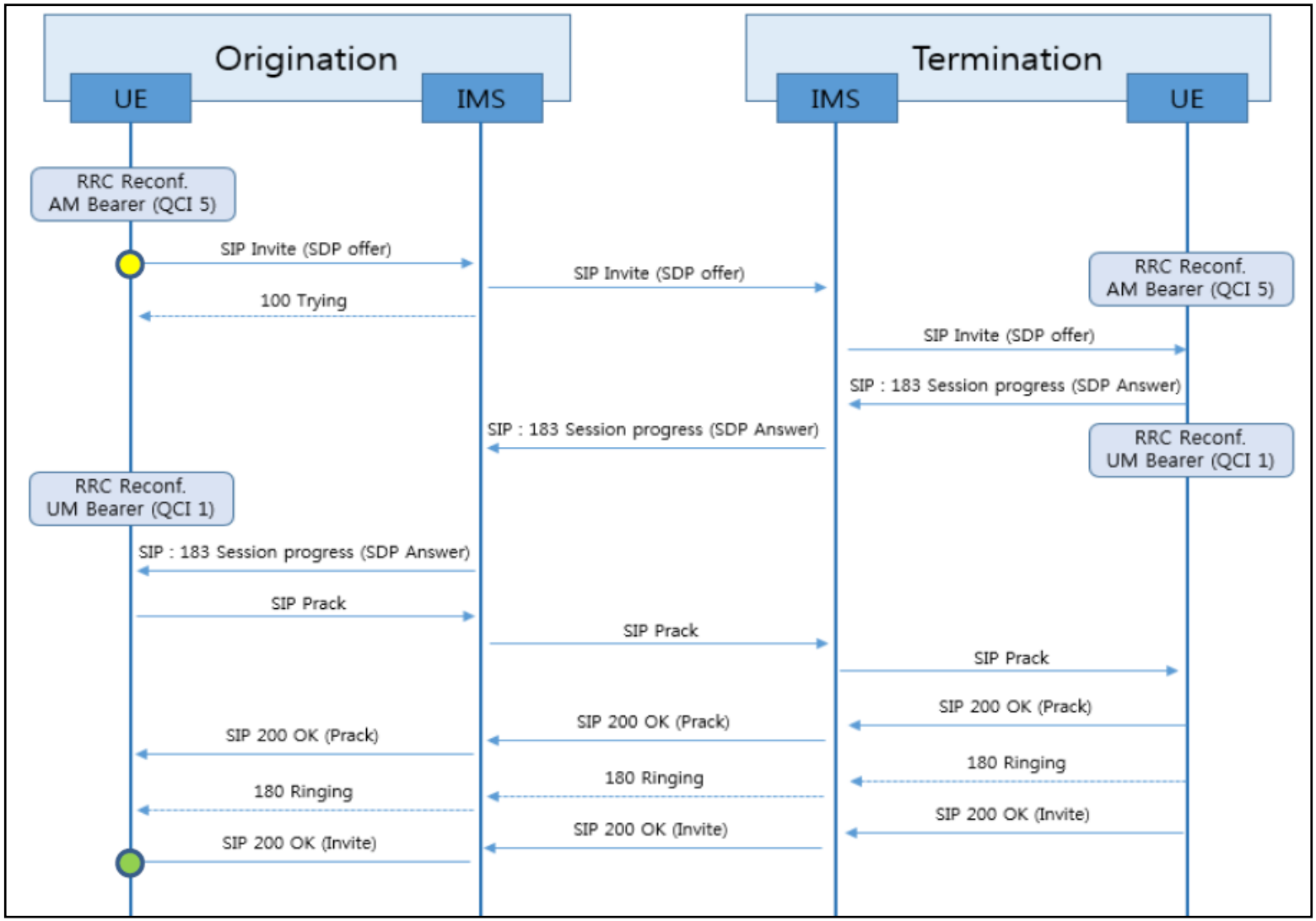
ATTACH_REJECT:
SecurityHeaderType: 0
EMMCause: 19 (ESM failure)
ESMMessageContainer:
NasMessageDnData: 0x522FD11E
[Nas Message Data] :
PDN_CONNECTIVITY_REJECT:
EPSBearerIdentity: 5
ProcedureTransactionIdentity: 47
ESMCause:
Cause: 30 (Request rejected by Serving GW or PDN GW)

3. VoLTE Setup Success Rate

- Description
  - Ratio of VoLTE Call Setup Success
    - VoLTE Setup Procedure : from INVITE to 200 OK for INVITE
- Target Value
  - > 99%
- Used Call Model
  - VoS
- Formula
  - The number of VoLTE Setup Successes / The number of VoLTE Setup Attempts
    - VoLTE Setup Success : Receiving SIP 200 OK message for INVITE
      (After a dedicate bearer with QCI 1 is activated)
    - VoLTE Setup Attempt : Sending SIP INVIVTE message (with originating SDP)

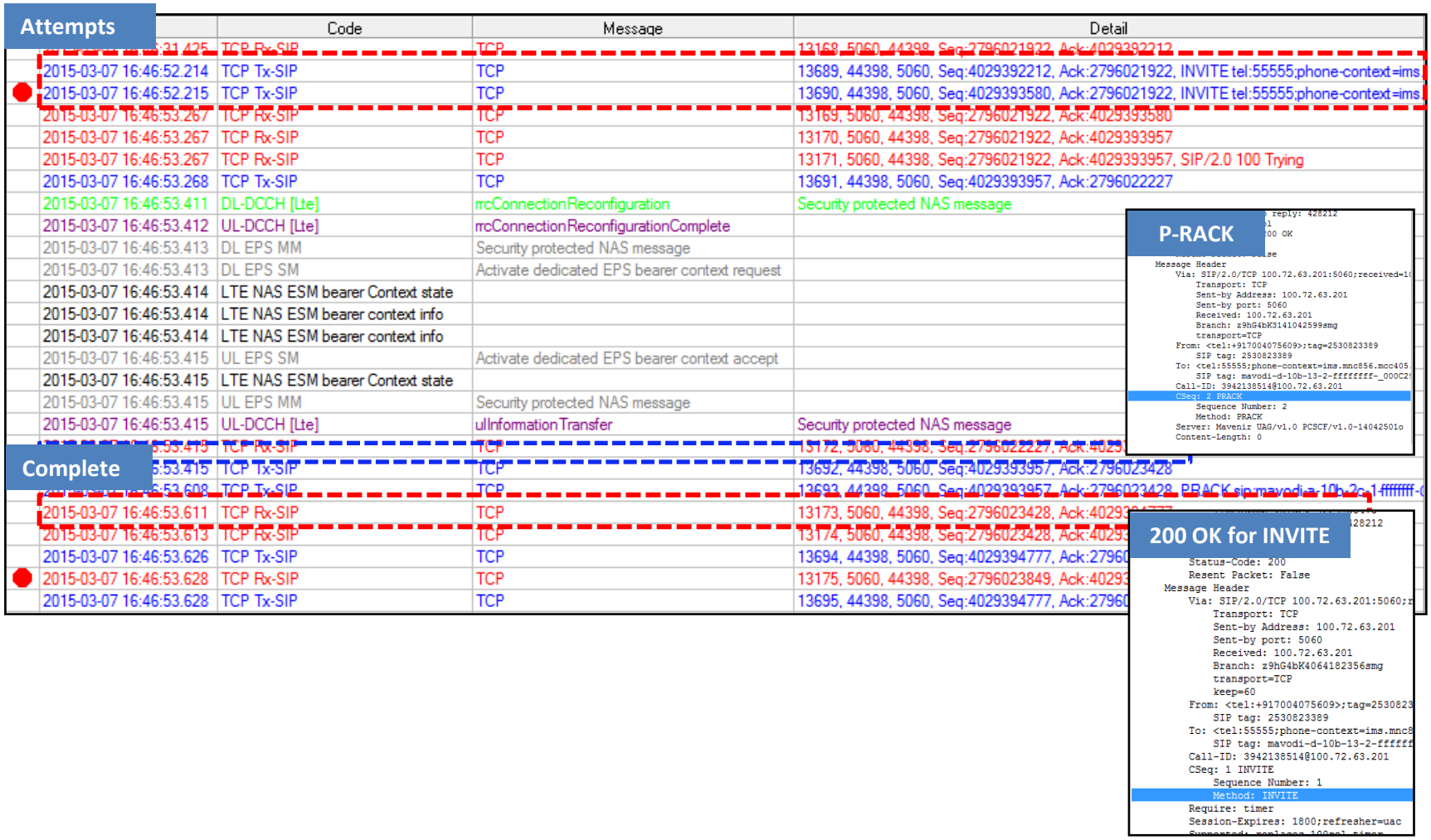
3. VoLTE Setup Success Rate

- VoLTE Setup Procedure



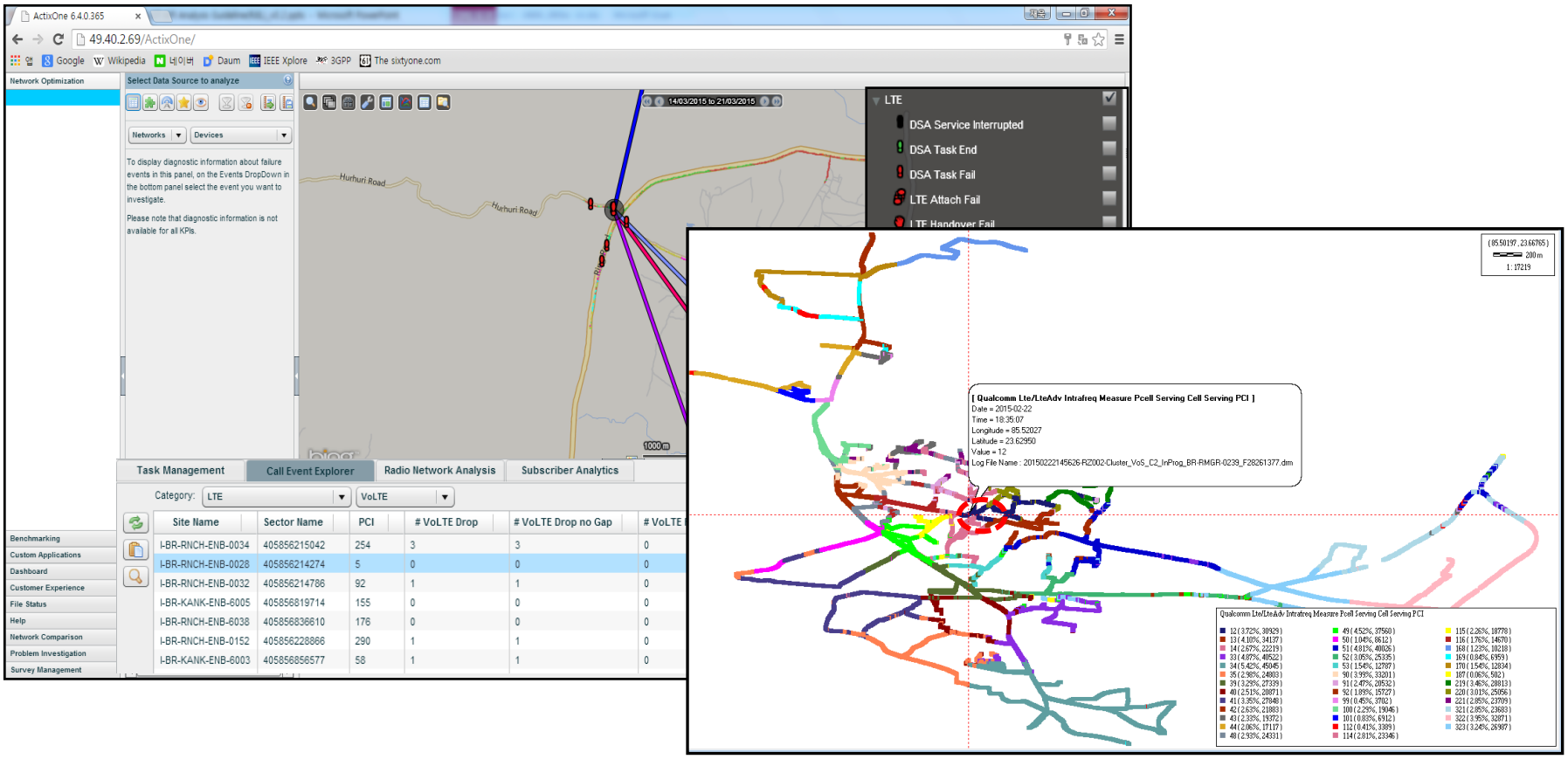
3. VoLTE Setup Success Rate

- Message from XCAP
  - From SIP INVITE message to SIP 200 OK message for INVITE



3. VoLTE Setup Success Rate

- Analysis using ActixOne and XCAP
  - Check the fail events found in ActixOne in XCAP also
  - Check the detailed messages in XCAP for the fail events
  - Define the issues whether the issue is comes from core network or not
    - Refer IMS issue code in Appendix



3. VoLTE Setup Success Rate

- Fail Cases
  - 487 Request Terminated
    - UE didn't receive SIP 200 OK message for invite due to IMS server error

※ Another core side issue code error could be analyzed with the similar way

▶ Check Core network (including IMS Server)

BM	Time	Code	Message	Detail
	2015-03-07 17:00:18.430	TCP Rx-SIP	TCP	38947, 5060, 40008, Seq:259461379, Ack:2586158398
	2015-03-07 17:00:36.028	TCP Tx-SIP	TCP	32417, 40008, 5060, Seq:2586158398, Ack:259461379, INVITE tel:55555;phone-context=ims.mnc86
●	2015-03-07 17:00:36.035	TCP Tx-SIP	TCP	32418, 40008, 5060, Seq:2586159766, Ack:259461379, INVITE tel:55555;phone-context=ims.mnc86
	2015-03-07 17:00:36.069	TCP Rx-SIP	TCP	38948, 5060, 40008, Seq:259461379, Ack:2586159766
	2015-03-07 17:00:36.069	TCP Rx-SIP	TCP	38949, 5060, 40008, Seq:259461379, Ack:2586160145
	2015-03-07 17:00:36.076	TCP Rx-SIP	TCP	38950, 5060, 40008, Seq:259461379, Ack:2586160145, SIP/2.0 100 Trying
	2015-03-07 17:00:36.077	TCP Tx-SIP	TCP	32419, 40008, 5060, Seq:2586160145, Ack:259461685
	2015-03-07 17:00:37.010	DL-DCCH [Lte]	rrcConnectionReconfiguration	Security protected NAS message
	2015-03-07 17:00:37.015	UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
	2015-03-07 17:00:37.016	DL EPS MM	Security protected NAS message	
	2015-03-07 17:00:37.016	TCP Rx-SIP	TCP	38951, 5060, 40008, Seq:259461685, Ack:2586160145, SIP/2.0 183 Session Progress
	2015-03-07 17:00:37.028	TCP Tx-SIP	TCP	32420, 40008, 5060, Seq:2586160145, Ack:259462886
	2015-03-07 17:00:37.028	DL EPS SM	Activate dedicated EPS bearer context request	
	2015-03-07 17:00:37.028	LTE NAS ESM bearer Context state		
	2015-03-07 17:00:37.028	LTE NAS ESM bearer context info		
	2015-03-07 17:00:37.028	LTE NAS ESM bearer context info		
	2015-03-07 17:00:37.032	UL EPS SM	Activate dedicated EPS bearer context accept	
	2015-03-07 17:00:37.032	LTE NAS ESM bearer Context state		
	2015-03-07 17:00:37.038	UL EPS MM	Security protected NAS message	
	2015-03-07 17:00:37.038	UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message
	2015-03-07 17:00:37.179	TCP Tx-SIP	TCP	32421, 40008, 5060, Seq:2586160145, Ack:259462886, PRACK sip:mavodi-8-10b-14-2-ffffffff-@dl1tas
	2015-03-07 17:00:37.273	TCP Rx-SIP	TCP	38952, 5060, 40008, Seq:259462886, Ack:2586160965
		x-SIP	TCP	38953, 5060, 40008, Seq:259462886, Ack:2586160965, SIP/2.0 200 OK
		x-SIP	TCP	32422, 40008, 5060, Seq:2586160965, Ack:259463307
●	2015-03-07 17:00:47.607	TCP Rx-SIP	TCP	38954, 5060, 40008, Seq:259463307, Ack:2586160965, SIP/2.0 487 Request Terminated
	2015-03-07 17:00:47.608	TCP Tx-SIP	TCP	32423, 40008, 5060, Seq:2586160965, Ack:259464092

No 200 OK for INVITE

3. VoLTE Setup Success Rate

- Fail Cases
  - 500 Server Internal Error
    - — UE didn't receive SIP 183 Session Progress message from IMS due to server error

▶ Check Core network (including IMS Server)

BM	Time	Code	Message	Detail
	2015-03-14 15:41:53.563	BCCH-BCH [Lte]	masterInformationBlock	
	2015-03-14 15:42:10.401	TCP Tx-SIP	TCP	4433, 44050, 5060, Seq:2470764402, Ack:3594678885, INVITE tel:55555;phone-context=ims.mnc863.mc
●	2015-03-14 15:42:10.401	TCP Tx-SIP	TCP	4434, 44050, 5060, Seq:2470765770, Ack:3594678885, INVITE tel:55555;phone-context=ims.mnc863.mc
	2015-03-14 15:42:10.569	TCP Rx-SIP	TCP	58327, 5060, 44050, Seq:3594678885, Ack:2470765770
	2015-03-14 15:42:10.624	TCP Rx-SIP	TCP	58328, 5060, 44050, Seq:3594678885, Ack:2470766152
		x-SIP	TCP	58329, 5060, 44050, Seq:3594678885, Ack:2470766152, SIP/2.0 100 Trying
		-SIP	TCP	4435, 44050, 5060, Seq:2470766152, Ack:3594679193
●	2015-03-14 15:42:11.371	TCP Rx-SIP	TCP	58330, 5060, 44050, Seq:3594679193, Ack:2470766152, SIP/2.0 500 Server Internal Error
	2015-03-14 15:42:11.371	TCP Tx-SIP	TCP	4436, 44050, 5060, Seq:2470766152, Ack:3594679636
	2015-03-14 15:42:11.409	TCP Tx-SIP	TCP	4437, 44050, 5060, Seq:2470766152, Ack:3594679636, ACK tel:55555;phone-context=ims.mnc863.mcc4
	2015-03-14 15:42:11.491	TCP Rx-SIP	TCP	58331, 5060, 44050, Seq:3594679636, Ack:2470766636

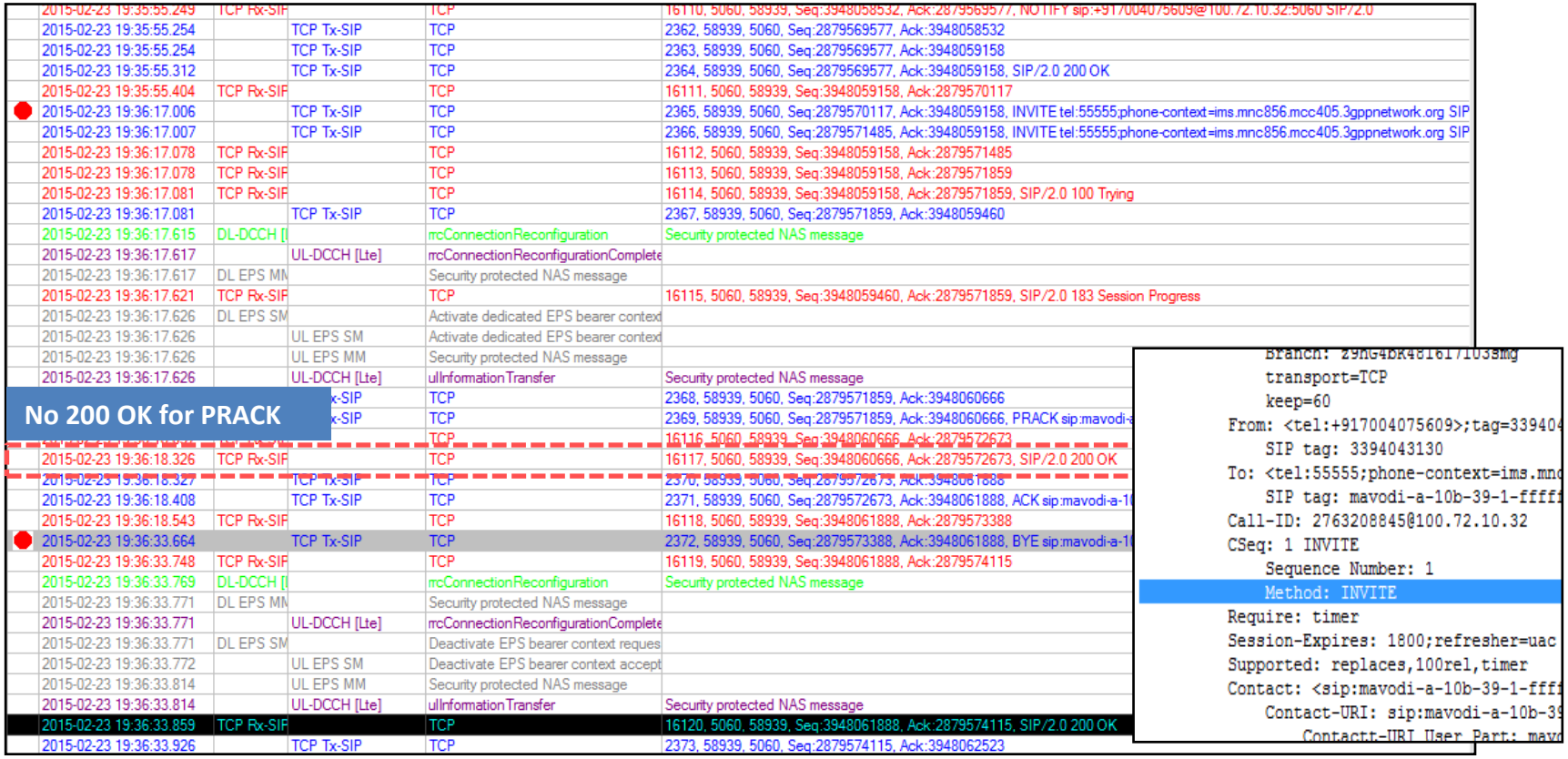
No 200 OK for INVITE

3. VoLTE Setup Success Rate

- Fail Cases
  - No 200 OK for PRACK
    - UE didn't receive SIP 200 OK message for P-RACK when RF environment was good

      ※ SIP 200 Status Code : The 200 status code is the ACK message which represents the request was received and processed successfully

▶ Check Core network (including IMS Server)



3. VoLTE Setup Success Rate

- Fail Cases
  - No 100 Trying
    - UE didn't receive 100 Trying message after invite even through RF Environment is good

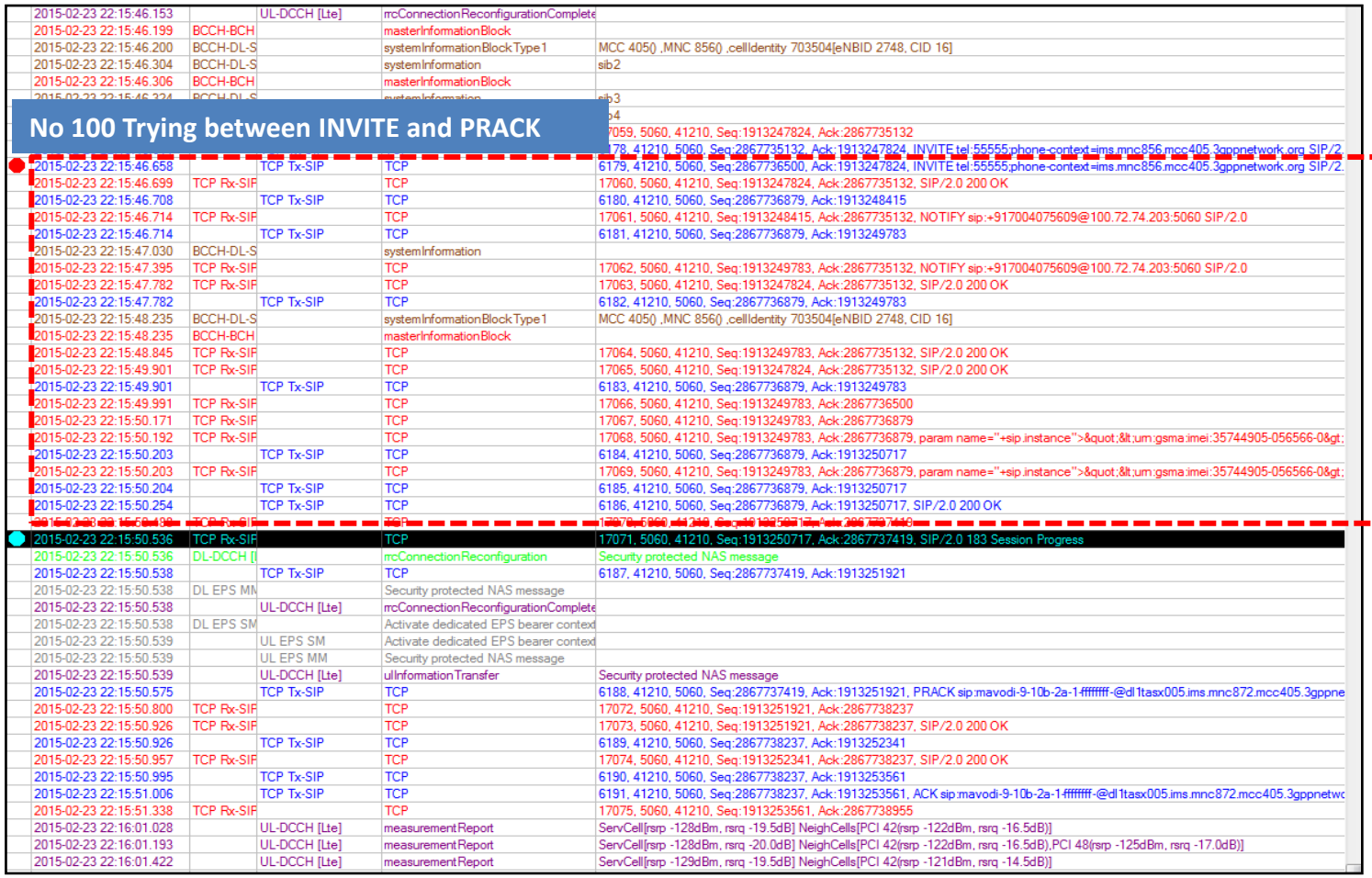
▶ Check Core network (including IMS Server)

BM	Time	Code[Fwd]	Code[Rev]	Message	Detail
	2015-02-23 23:16:59.121		UL EPS MM	Security protected NAS message	
	2015-02-23 23:16:59.121		UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message
	2015-02-23 23:17:01.234	BCCH-DL-S		systemInformation	sib4
●	2015-02-23 23:17:08.563		TCP Tx-SIP	TCP	57545, 33347, 5060, Seq:880236519, Ack:2488052766, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2.
	2015-02-23 23:17:08.580		TCP Tx-SIP	TCP	57546, 33347, 5060, Seq:880237887, Ack:2488052766, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2.
	2015-02-23 23:17:08.901		TCP Tx-SIP	TCP	57547, 33347, 5060, Seq:880236519, Ack:2488052766, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2.
	2015-02-23 23:17:09.377		TCP Tx-SIP	TCP	57548, 33347, 5060, Seq:880236519, Ack:2488052766, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2.
	2015-02-23 23:17:10.286		TCP Tx-SIP	TCP	57549, 33347, 5060, Seq:880236519, Ack:2488052766, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2.
	2015-02-23 23:17:12.311		TCP Tx-SIP	TCP	57550, 33347, 5060, Seq:880236519, Ack:2488052766, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2.
	2015-02-23 23:17:16.295		TCP Tx-SIP	TCP	57551, 33347, 5060, Seq:880236519, Ack:2488052766, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2.
	2015-02-23 23:17:24.325		TCP Tx-SIP	TCP	57552, 33347, 5060, Seq:880236519, Ack:2488052766, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2.
	2015-02-23 23:17:40.389		TCP Tx-SIP	TCP	57553, 33347, 5060, Seq:880236519, Ack:2488052766, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2.
	2015-02-23 23:17:52.606		TCP Tx-SIP	TCP	57554, 33347, 5060, Seq:880238262, Ack:2488052766, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2.
	2015-02-23 23:17:53.404		UL-DCCH [Lte]	measurementReport	ServCell[rsrp -104dBm, rsrq -16.0dB] NeighCells[PCI 48(rsrp -97dBm, rsrq -12.0dB)]
	2015-02-23 23:17:53.513	DL-DCCH [I		rrcConnectionReconfiguration	
	2015-02-23 23:17:53.545		UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
	2015-02-23 23:17:53.584	BCCH-BCH		masterInformationBlock	
	2015-02-23 23:17:53.585	BCCH-DL-S		systemInformationBlockType1	MCC 405() ,MNC 856() ,cellIdentity 825104[eNBID 3223, CID 16]
	2015-02-23 23:17:53.587	BCCH-DL-S		systemInformation	sib2
	2015-02-23 23:17:53.800	BCCH-DL-S		systemInformation	sib3
	2015-02-23 23:17:53.800	BCCH-DL-S		systemInformation	sib4
	2015-02-23 23:17:54.483	BCCH-DL-S		systemInformation	
	2015-02-23 23:17:55.689	BCCH-DL-S		systemInformationBlockType1	MCC 405() ,MNC 856() ,cellIdentity 825104[eNBID 3223, CID 16]
	2015-02-23 23:17:55.689	BCCH-BCH		masterInformationBlock	
	2015-02-23 23:18:01.262		UL-DCCH [Lte]	measurementReport	ServCell[rsrp -107dBm, rsrq -16.0dB] NeighCells[PCI 170(rsrp -102dBm, rsrq -13.0dB)]
	2015-02-23 23:18:01.318	DL-DCCH [I		rrcConnectionReconfiguration	
	2015-02-23 23:18:01.344		UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
	2015-02-23 23:18:01.386	BCCH-BCH		masterInformationBlock	
	2015-02-23 23:18:01.388	BCCH-DL-S		systemInformationBlockType1	MCC 405() ,MNC 856() ,cellIdentity 824594[eNBID 3221, CID 18]
	2015-02-23 23:18:01.388	BCCH-DL-S		systemInformation	sib2
	2015-02-23 23:18:01.388	BCCH-DL-S		systemInformation	sib3
	2015-02-23 23:18:01.388	BCCH-DL-S		systemInformation	sib4
	2015-02-23 23:18:12.433		TCP Tx-SIP	TCP	57555, 33347, 5060, Seq:880236519, Ack:2488052766, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2.
	2015-02-23 23:18:21.501		UL-DCCH [Lte]	measurementReport	ServCell[rsrp -100dBm, rsrq -15.0dB] NeighCells[PCI 44(rsrp -94dBm, rsrq -12.0dB)]
	2015-02-23 23:18:21.529	DL-DCCH [I		rrcConnectionReconfiguration	
	2015-02-23 23:18:21.540		UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
	2015-02-23 23:18:21.570	BCCH-BCH		masterInformationBlock	
	2015-02-23 23:18:21.613	BCCH-DL-S		systemInformationBlockType1	MCC 405() ,MNC 856() ,cellIdentity 724242[eNBID 2829, CID 18]
	2015-02-23 23:18:21.614	BCCH-DL-S		systemInformation	sib3
	2015-02-23 23:18:21.761	BCCH-DL-S		systemInformation	sib2
	2015-02-23 23:18:21.947	BCCH-DL-S		systemInformation	sib4
	2015-02-23 23:18:22.853		UL-DCCH [Lte]	measurementReport	ServCell[rsrp -102dBm, rsrq -16.5dB] NeighCells[PCI 169(rsrp -96dBm, rsrq -10.5dB)]
	2015-02-23 23:18:22.890		UL-DCCH [Lte]	measurementReport	ServCell[rsrp -102dBm, rsrq -16.0dB] NeighCells[PCI 169(rsrp -95dBm, rsrq -10.5dB),PCI 170(rsrp -97dBm, rsrq -11.5dB)]
	2015-02-23 23:18:22.892	DL-DCCH [I		rrcConnectionReconfiguration	
	2015-02-23 23:18:22.922		UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
	2015-02-23 23:18:22.932	BCCH-BCH		masterInformationBlock	
	2015-02-23 23:18:22.971	BCCH-DL-S		systemInformationBlockType1	MCC 405() ,MNC 856() ,cellIdentity 824593[eNBID 3221, CID 17]
	2015-02-23 23:18:23.040	BCCH-DL-S		systemInformation	sib2
	2015-02-23 23:18:23.229	BCCH-DL-S		systemInformation	sib3
	2015-02-23 23:18:23.229	BCCH-DL-S		systemInformation	sib4
●	2015-02-23 23:18:43.663		UL EPS MM	Detach request	
	2015-02-23 23:18:43.663		UL EPS MM	Security protected NAS message	

3. VoLTE Setup Success Rate

- Fail Cases
  - No 100 Trying
    - UE didn't receive 100 Trying message which comes from IMS Server

▶ Check Core network (including IMS Server)



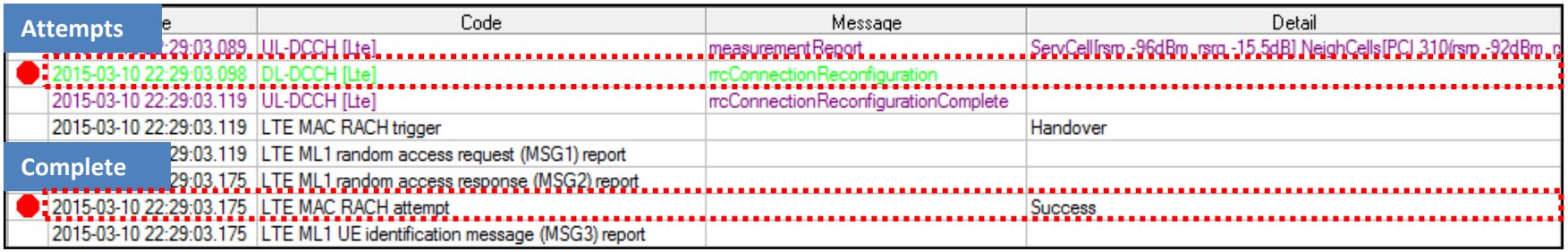
2015-02-23 22:15:46.153		UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
2015-02-23 22:15:46.199	BCCH-BCH		masterInformationBlock	
2015-02-23 22:15:46.200	BCCH-DL-S		systemInformationBlockType1	MCC 405() ,MNC 856() ,cellIdentity 703504[eNBID 2748, CID 16]
2015-02-23 22:15:46.304	BCCH-DL-S		systemInformation	sib2
2015-02-23 22:15:46.306	BCCH-BCH		masterInformationBlock	
2015-02-23 22:15:46.324	BCCH-DL-S		systemInformation	sib3
				b4
				7059, 5060, 41210, Seq:1913247824, Ack:2867735132
				178, 41210, 5060, Seq:2867735132, Ack:1913247824, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2
2015-02-23 22:15:46.658		TCP Tx-SIP	TCP	6179, 41210, 5060, Seq:2867736500, Ack:1913247824, INVITE tel:55555;phone-context=ims.mnc856.mcc405.3gppnetwork.org SIP/2.
2015-02-23 22:15:46.699	TCP Rx-SIP		TCP	17060, 5060, 41210, Seq:1913247824, Ack:2867735132, SIP/2.0 200 OK
2015-02-23 22:15:46.708		TCP Tx-SIP	TCP	6180, 41210, 5060, Seq:2867736879, Ack:1913248415
2015-02-23 22:15:46.714	TCP Rx-SIP		TCP	17061, 5060, 41210, Seq:1913248415, Ack:2867735132, NOTIFY sip:+917004075609@100.72.74.203:5060 SIP/2.0
2015-02-23 22:15:46.714		TCP Tx-SIP	TCP	6181, 41210, 5060, Seq:2867736879, Ack:1913249783
2015-02-23 22:15:47.030	BCCH-DL-S		systemInformation	
2015-02-23 22:15:47.395	TCP Rx-SIP		TCP	17062, 5060, 41210, Seq:1913249783, Ack:2867735132, NOTIFY sip:+917004075609@100.72.74.203:5060 SIP/2.0
2015-02-23 22:15:47.782	TCP Rx-SIP		TCP	17063, 5060, 41210, Seq:1913247824, Ack:2867735132, SIP/2.0 200 OK
2015-02-23 22:15:47.782		TCP Tx-SIP	TCP	6182, 41210, 5060, Seq:2867736879, Ack:1913249783
2015-02-23 22:15:48.235	BCCH-DL-S		systemInformationBlockType1	MCC 405() ,MNC 856() ,cellIdentity 703504[eNBID 2748, CID 16]
2015-02-23 22:15:48.235	BCCH-BCH		masterInformationBlock	
2015-02-23 22:15:48.845	TCP Rx-SIP		TCP	17064, 5060, 41210, Seq:1913249783, Ack:2867735132, SIP/2.0 200 OK
2015-02-23 22:15:49.901	TCP Rx-SIP		TCP	17065, 5060, 41210, Seq:1913247824, Ack:2867735132, SIP/2.0 200 OK
2015-02-23 22:15:49.901		TCP Tx-SIP	TCP	6183, 41210, 5060, Seq:2867736879, Ack:1913249783
2015-02-23 22:15:49.991	TCP Rx-SIP		TCP	17066, 5060, 41210, Seq:1913249783, Ack:2867736500
2015-02-23 22:15:50.171	TCP Rx-SIP		TCP	17067, 5060, 41210, Seq:1913249783, Ack:2867736879
2015-02-23 22:15:50.192	TCP Rx-SIP		TCP	17068, 5060, 41210, Seq:1913249783, Ack:2867736879, param name="+sip.instance">"<urn:gsma:imei:35744905-056566-0>
2015-02-23 22:15:50.203		TCP Tx-SIP	TCP	6184, 41210, 5060, Seq:2867736879, Ack:1913250717
2015-02-23 22:15:50.203	TCP Rx-SIP		TCP	17069, 5060, 41210, Seq:1913249783, Ack:2867736879, param name="+sip.instance">"<urn:gsma:imei:35744905-056566-0>
2015-02-23 22:15:50.204		TCP Tx-SIP	TCP	6185, 41210, 5060, Seq:2867736879, Ack:1913250717
2015-02-23 22:15:50.254		TCP Tx-SIP	TCP	6186, 41210, 5060, Seq:2867736879, Ack:1913250717, SIP/2.0 200 OK
2015-02-23 22:15:50.496	TCP Rx-SIP		TCP	
2015-02-23 22:15:50.536	TCP Rx-SIP		TCP	17071, 5060, 41210, Seq:1913250717, Ack:2867737419, SIP/2.0 183 Session Progress
2015-02-23 22:15:50.536	DL-DCCH [I		rrcConnectionReconfiguration	Security protected NAS message
2015-02-23 22:15:50.538		TCP Tx-SIP	TCP	6187, 41210, 5060, Seq:2867737419, Ack:1913251921
2015-02-23 22:15:50.538	DL EPS MM		Security protected NAS message	
2015-02-23 22:15:50.538		UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
2015-02-23 22:15:50.538	DL EPS SM		Activate dedicated EPS bearer context	
2015-02-23 22:15:50.539		UL EPS SM	Activate dedicated EPS bearer context	
2015-02-23 22:15:50.539		UL EPS MM	Security protected NAS message	
2015-02-23 22:15:50.539		UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message
2015-02-23 22:15:50.575		TCP Tx-SIP	TCP	6188, 41210, 5060, Seq:2867737419, Ack:1913251921, PRACK sip:mavodi-9-10b-2a-1-ffffffff-@dl1tasx005.ims.mnc872.mcc405.3gppne
2015-02-23 22:15:50.800	TCP Rx-SIP		TCP	17072, 5060, 41210, Seq:1913251921, Ack:2867738237
2015-02-23 22:15:50.926	TCP Rx-SIP		TCP	17073, 5060, 41210, Seq:1913251921, Ack:2867738237, SIP/2.0 200 OK
2015-02-23 22:15:50.926		TCP Tx-SIP	TCP	6189, 41210, 5060, Seq:2867738237, Ack:1913252341
2015-02-23 22:15:50.957	TCP Rx-SIP		TCP	17074, 5060, 41210, Seq:1913252341, Ack:2867738237, SIP/2.0 200 OK
2015-02-23 22:15:50.995		TCP Tx-SIP	TCP	6190, 41210, 5060, Seq:2867738237, Ack:1913253561
2015-02-23 22:15:51.006		TCP Tx-SIP	TCP	6191, 41210, 5060, Seq:2867738237, Ack:1913253561, ACK sip:mavodi-9-10b-2a-1-ffffffff-@dl1tasx005.ims.mnc872.mcc405.3gppnetwo
2015-02-23 22:15:51.338	TCP Rx-SIP		TCP	17075, 5060, 41210, Seq:1913253561, Ack:2867738955
2015-02-23 22:16:01.028		UL-DCCH [Lte]	measurementReport	ServCell[rsrp -128dBm, rsrq -19.5dB] NeighCells[PCI 42(rsrp -122dBm, rsrq -16.5dB)]
2015-02-23 22:16:01.193		UL-DCCH [Lte]	measurementReport	ServCell[rsrp -128dBm, rsrq -20.0dB] NeighCells[PCI 42(rsrp -122dBm, rsrq -16.5dB),PCI 48(rsrp -125dBm, rsrq -17.0dB)]
2015-02-23 22:16:01.422		UL-DCCH [Lte]	measurementReport	ServCell[rsrp -129dBm, rsrq -19.5dB] NeighCells[PCI 42(rsrp -121dBm, rsrq -14.5dB)]

4. Handover Success Rate

- Description
  - Ratio of Handover Success for the intra-frequency LTE Handover Procedure
    - Handover procedure : from RRC Connection Reconfiguration (contains HO command) to LTE MAC RACH Attempt Success for RRC Connection Reconfiguration Complete
- Target Value
  - >98%
- Used Call Model
  - LDL1, LUL and VoL (Separate)
- Formula
  - The number of Handover Success / The number of Handover Attempts
    - Handover Success : LTE MAC RACH Attempt Success for ‘rrcConnectionReconfigurationComplete’
    - Handover Attempts : Sending ‘rrcConnectionReconfiguration’ (contains HO command)

4. Handover Success Rate

- Message from XCAP
  - From ‘rrcConnectionReconfiguration’ message (with HO Command) to LTE MAC RACH attempt Success



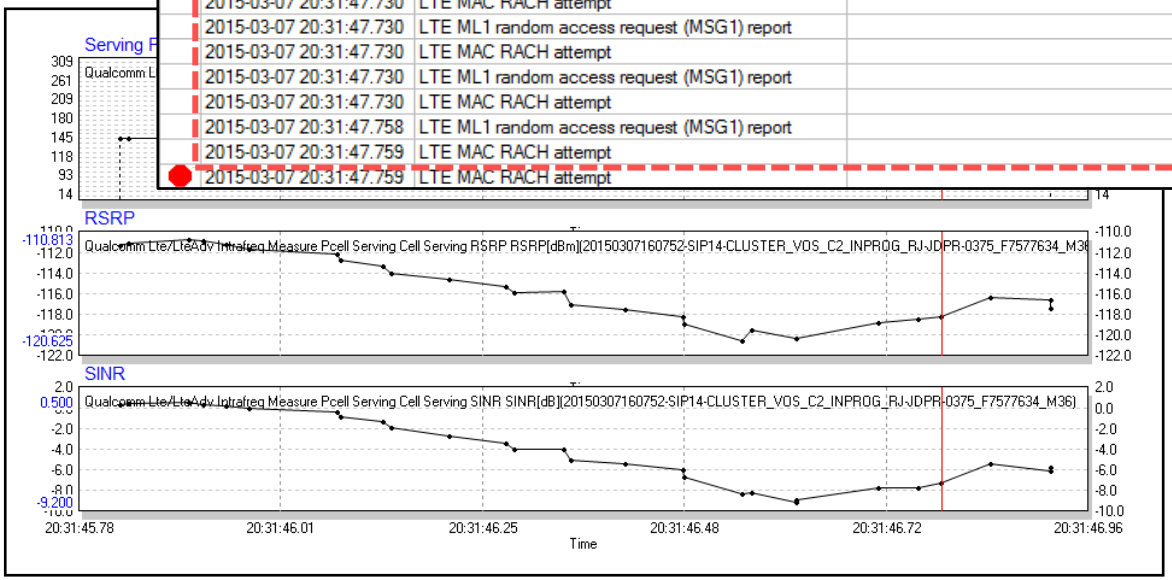
e	Code	Message	Detail
:29:03.089	UL-DCCH [Lte]	measurementReport	ServCell[rsrp -96dBm, rsrq -15.5dB] NeighCells[PCI 310(rsrp -92dBm, r
2015-03-10 22:29:03.098	DL-DCCH [Lte]	rrcConnectionReconfiguration	
2015-03-10 22:29:03.119	UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
2015-03-10 22:29:03.119	LTE MAC RACH trigger		Handover
29:03.119	LTE ML1 random access request (MSG1) report		
29:03.175	LTE ML1 random access response (MSG2) report		
2015-03-10 22:29:03.175	LTE MAC RACH attempt		Success
2015-03-10 22:29:03.175	LTE ML1 UE identification message (MSG3) report		

4. Handover Success Rate

- Fail Cases
  - Failure at MSG2
    - UE didn't receive RAR(MSG2) from eNB due to poor RF environments

▶ Check RF environment (RSRP/SINR)

BM	Time	Code	Message	Detail
	2015-03-07 20:31:46.619	UL-DCCH [Lte]	measurementReport	ServCell[rsrp -118dBm, rsrq -19.0dB] NeighCells[PCI 209(
●	2015-03-07 20:31:46.789	DL-DCCH [Lte]	rrcConnectionReconfiguration	
	2015-03-07 20:31:46.791	UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
	2015-03-07 20:31:46.791	LTE MAC RACH trigger		Handover
	2015-03-07 20:31:46.797	LTE ML1 random access request (MSG1) report		
	2015-03-07 20:31:46.798	LTE MAC RACH attempt		Failure at MSG2
	2015-03-07 20:31:46.798	LTE ML1 random access request (MSG1) report		
	2015-03-07 20:31:46.846	LTE MAC RACH attempt		Failure at MSG2
	2015-03-07 20:31:46.846	LTE ML1 random access request (MSG1) report		
	2015-03-07 20:31:46.847	LTE MAC RACH attempt		Failure at MSG2
	2015-03-07 20:31:46.847	LTE ML1 random access request (MSG1) report		
	2015-03-07 20:31:46.917	LTE MAC RACH attempt		Failure at MSG2
	2015-03-07 20:31:46.917	LTE ML1 random access request (MSG1) report		
	2015-03-07 20:31:47.730	LTE MAC RACH attempt		Failure at MSG2
	2015-03-07 20:31:47.730	LTE ML1 random access request (MSG1) report		
	2015-03-07 20:31:47.730	LTE MAC RACH attempt		Failure at MSG2
	2015-03-07 20:31:47.730	LTE ML1 random access request (MSG1) report		
	2015-03-07 20:31:47.730	LTE MAC RACH attempt		Failure at MSG2
	2015-03-07 20:31:47.758	LTE ML1 random access request (MSG1) report		
	2015-03-07 20:31:47.759	LTE MAC RACH attempt		Failure at MSG2
●	2015-03-07 20:31:47.759	LTE MAC RACH attempt		Aborted



4. Handover Success Rate

- Fail Cases
  - RLF during HO
    - UE didn't succeed Handover due to Radio link failure during HO procedure

▶ Check RF Environments (RSRP/SINR)

BM	Time	Code	Message	Detail
	2015-03-17 19:50:36.908	UL-DCCH [Lte]	measurementReport	ServCell[rsrp -118dBm, rsrq -20.0dB] NeighCells[PCI 18(rsrp -1
●	2015-03-17 19:50:37.111	DL-DCCH [Lte]	rrcConnectionReconfiguration	
	2015-03-17 19:50:37.143	LTE NAS EMM state		
	2015-03-17 19:50:37.415	BCCH-BCH [Lte]	masterInformationBlock	
	2015-03-17 19:50:37.415	BCCH-DL-SCH [Lte]	systemInformationBlockType1	MCC 405() ,MNC 868() ,cellIdentity 1025553[eNBID 4006, CI
	2015-03-17 19:50:37.416	BCCH-DL-SCH [Lte]	systemInformation	sib2
	2015-03-17 19:50:37.416	BCCH-DL-SCH [Lte]	systemInformation	sib3
	2015-03-17 19:50:37.416	BCCH-DL-SCH [Lte]	systemInformation	sib4
	2015-03-17 19:50:37.416	BCCH-DL-SCH [Lte]	systemInformation	
	2015-03-17 19:50:37.416	UL-CCCH [Lte]	rrcConnectionReestablishmentRequest	
	2015-03-17 19:50:37.416	LTE MAC RACH trigger		Radio Link failure
	2015-03-17 19:50:37.416	LTE ML1 random access request (MSG1) report		
	2015-03-17 19:50:37.467	LTE ML1 random access response (MSG2) report		
	2015-03-17 19:50:37.467	LTE ML1 UE identification message (MSG3) report		
	2015-03-17 19:50:37.470	LTE ML1 contention resolution message (MSG4) report		
	2015-03-17 19:50:37.470	LTE MAC RACH attempt		Success
●	2015-03-17 19:50:37.470	DL-CCCH [Lte]	rrcConnectionReestablishmentReject	
	2015-03-17 19:50:37.517	LTE NAS EMM state		

4. Handover Success Rate

- Fail Cases
  - PCI Duplication
    - UE didn't receive RAR(MSG2) due to referring the wrong cell

▶ Check PCI Collision and Confusion in NBR list from LSM

BM	Time	Code	Message	
	2015-03-21 22:49:30.664	UL-DCCH [Lte]	measurementReport	S
●	2015-03-21 22:49:30.673	DL-DCCH [Lte]	rrcConnectionReconfiguration	
	2015-03-21 22:49:30.691	UL-DCCH [Lte]	rrcConnectionReconfigurationComplete	
	2015-03-21 22:49:30.691	LTE MAC RACH trigger		H
	2015-03-21 22:49:30.691	LTE ML1 random access request (MSG1) report		
	2015-03-21 22:49:30.694	LTE MAC RACH attempt		Fa
	2015-03-21 22:49:30.694	LTE ML1 random access request (MSG1) report		
	2015-03-21 22:49:30.719	LTE MAC RACH attempt		Fa
	2015-03-21 22:49:30.719	LTE ML1 random access request (MSG1) report		
	2015-03-21 22:49:30.764	LTE MAC RACH attempt		Fa
	2015-03-21 22:49:30.764	LTE ML1 random access request (MSG1) report		
	2015-03-21 22:49:30.764	LTE MAC RACH attempt		Fa
	2015-03-21 22:49:30.765	LTE ML1 random access request (MSG1) report		
	2015-03-21 22:49:30.784	LTE MAC RACH attempt		Fa
	2015-03-21 22:49:31.635	LTE ML1 random access request (MSG1) report		
	2015-03-21 22:49:31.635	LTE MAC RACH attempt		Fa
	2015-03-21 22:49:31.644	LTE ML1 random access request (MSG1) report		
	2015-03-21 22:49:31.655	LTE MAC RACH attempt		Fa
●	2015-03-21 22:49:31.655	LTE MAC RACH attempt		Aborted
	2015-03-21 22:49:31.692	LTE NAS EMM state		
	2015-03-21 22:49:31.954	BCCH-BCH [Lte]	masterInformationBlock	
	2015-03-21 22:49:31.954	BCCH-DL-SCH [Lte]	systemInformationBlockType1	MCC 4050
	2015-03-21 22:49:32.053	BCCH-DL-SCH [Lte]	systemInformation	sib2
	2015-03-21 22:49:32.094	UL-CCCH [Lte]	rrcConnectionReestablishmentRequest	
	2015-03-21 22:49:32.094	LTE MAC RACH trigger		Radio Link f
	2015-03-21 22:49:32.094	LTE ML1 random access request (MSG1) report		
	2015-03-21 22:49:32.094	LTE ML1 random access response (MSG2) report		
	2015-03-21 22:49:32.094	LTE ML1 UE identification message (MSG3) report		
	2015-03-21 22:49:32.106	LTE ML1 contention resolution message (MSG4) re		
	2015-03-21 22:49:32.106	LTE MAC RACH attempt		Success

RACH info

```
RACH configuration subpacket (0x3)
n : 2
: 28
PREAMBLE_INIT_POWER(dB) : -108
POWER_RAMPING_SETUP(dB) : 2
RA_INDEX1 : 28
RA_INDEX2 : 56
PREAMBLE_TRANS_MAX : 10
CONT_RESOL_TIMER : 56
MSG_SIZE_GROUP_A : 7
GROUP_B_Power_OFFSET(dB) : 1
PMAX(dBm) : 23
DELTA_PREAMBLE_MSG3(dB) : 4
PRACH_CONFIG : 3
CS_ZONE_LENGTH : 12
LOG_ROOT_SEQ_INDEX : 310
PRACH_FREQ_OFFSET : 5
HIGH_SPEED_FLAG : 0
MAX_RETX_MSG3 : 4
RA_RSP_WIN_SIZE : 10
```

SIB2

```
: 11
RRC_VER_minor : 1
RB_ID : 0
PHYSICAL_CELL_ID : 318
FREQ : 38875
Subframe_number : 0
System_frame_number : 176
PDU_NUM : BCCH_DL_SCH Message
SIB_Mask_in_SI : 0x00000004
ENCODED_MSG_LEN : 28
value BCCH-DL-SCH-Message ::=
  message c1 : systemInformation :
    criticalExtensions systemInformation-r8 :
      sib-TypeAndInfo
        sib2 :
          radioResourceConfigCommon
            rach-ConfigCommon
            bcch-Config
            pcch-Config
            prach-Config
              rootSequenceIndex 120
              prach-ConfigInfo
                prach-ConfigIndex 3
                highSpeedFlag FALSE
                zeroCorrelationZoneConfig 12
                prach-FreqOffset 5
            pdsch-ConfigCommon
            pusch-ConfigCommon
            pucch-ConfigCommon
            soundingRS-UL-ConfigCommon setup :
            uplinkPowerControlCommon
              ul-CyclicPrefixLength len1
```

4. Handover Success Rate

- Fail Cases
  - No Measurement Report
    - — Measurement parameters are not configured in eNB

▶ Check eNB Parameter or configuration

Index	BM	Time	Code	Message	
506		2015-03-04 16:32:29.793	Qc. LTE[Chipset]	-----[0xB0E5] LTE NAS ESM bearer context info	
507		2015-03-04 16:32:29.793	Qc. LTE[Chipset]	-----[0xB0E5] LTE NAS ESM bearer context info	
508		2015-03-04 16:32:29.793	Qc. LTE[Chipset]	-----[0xB0E5] LTE NAS ESM bearer context info	
509		2015-03-04 16:32:29.910	BCCH-DL-SCH [Lte]	--systemInformation	sib4
510		2015-03-04 16:32:30.571	BCCH-DL-SCH [Lte]	--systemInformationBlockType1	MCC 405()
511		2015-03-04 16:32:30.571	BCCH-BCH [Lte]	--masterInformationBlock	
512		2015-03-04 16:33:08.908	UL-DCCH [Lte]	--measurementReport	ServCell[rsr
513		2015-03-04 16:33:08.946	DL-DCCH [Lte]	--rrcConnectionReconfiguration	
514		2015-03-04 16:33:08.957	UL-DCCH [Lte]	--rrcConnectionReconfigurationComplete	
515		2015-03-04 16:33:08.957	Qc. LTE[Chipset]	-----[0xB061] LTE MAC RACH trigger	Handover
516		2015-03-04 16:33:08.957	Qc. LTE[Chipset]	-----[0xB167] LTE ML1 random access request (MSG1) report	
517		2015-03-04 16:33:08.974	Qc. LTE[Chipset]	-----[0xB062] LTE MAC RACH attempt	Success
518		2015-03-04 16:33:08.974	Qc. LTE[Chipset]	-----[0xB168] LTE ML1 random access response (MSG2) report	
519		2015-03-04 16:33:08.974	Qc. LTE[Chipset]	-----[0xB169] LTE ML1 UE identification message (MSG3) report	
520		2015-03-04 16:33:08.975	BCCH-BCH [Lte]	--masterInformationBlock	
521		2015-03-04 16:33:08.975	BCCH-DL-SCH [Lte]	--systemInformationBlockType1	MCC 405()
522		2015-03-04 16:33:08.975	BCCH-DL-SCH [Lte]	--systemInformation	sib2
523		2015-03-04 16:33:08.975	BCCH-DL-SCH [Lte]	--systemInformation	sib4
524		2015-03-04 16:33:08.975	BCCH-DL-SCH [Lte]	--systemInformation	
525		2015-03-04 16:33:08.997	Qc. LTE[Chipset]	-----[0xB0EE] LTE NAS EMM state	
526		2015-03-04 16:33:10.272	BCCH-DL-SCH [Lte]	--systemInformation	
527		2015-03-04 16:33:11.477	BCCH-DL-SCH [Lte]	--systemInformationBlockType1	MCC 405()
528		2015-03-04 16:33:11.477	BCCH-BCH [Lte]	--masterInformationBlock	
529		2015-03-04 16:33:40.530	FTP Call Event	End By User	
530		2015-03-04 16:33:40.531	FTP Call Event	Release Start	[0]
531		2015-03-04 16:33:40.571	FTP Call Event	Release End	
532		2015-03-04 16:33:40.571	FTP Call Event	Call End	
533		2015-03-04 16:33:41.025	FTP Call Event	FTP Server Reply	426 Failure
534		2015-03-04 16:33:41.141	FTP Call Event	FTP Server Reply	225 No trar
535		2015-03-04 16:33:41.228	FTP Call Event	FTP Server Reply	221 Goodb
536		2015-03-04 16:36:22.186	FTP Call Event	Idle Start - None	1
537		2015-03-04 16:36:37.250	FTP Call Event	Setup Start	
538		2015-03-04 16:36:37.250	FTP Call Event	Call Start-Down	1
539		2015-03-04 16:36:37.251	FTP Call Event	Traffic Setup Start	
540		2015-03-04 16:36:37.261	FTP Call Event	FTP Connecting	172.31.162
541		2015-03-04 16:36:37.368	FTP Call Event	FTP Server Reply	220 (vsFTP
542		2015-03-04 16:36:37.416	FTP Call Event	FTP Server Reply	331 Please
543		2015-03-04 16:36:37.496	FTP Call Event	FTP Server Reply	230 Login s
544		2015-03-04 16:36:37.496	FTP Call Event	FTP Connected	172.31.162
545		2015-03-04 16:36:37.538	FTP Call Event	FTP Server Reply	211-Feature
546		2015-03-04 16:36:37.583	FTP Call Event	FTP Server Reply	200 Always
547		2015-03-04 16:36:37.633	FTP Call Event	FTP Server Reply	250 Directo
548		2015-03-04 16:36:37.676	FTP Call Event	FTP Server Reply	200 Switch
549		2015-03-04 16:36:37.715	FTP Call Event	FTP Server Reply	213 77809(

```
[ 2015  Mar  4    16:33:08.946 ]  DL-DCCH [Lte] - rrcConnectionReconfiguration

Version_number : 6
RRC_REL : 9
RRC_VER_Major : 11
RRC_VER_minor : 1
RB_ID : 1
PHYSICAL_CELL_ID : 169
FREQ : 38800
Subframe_number : N/A
System_frame_number : N/A
PDU_NUM : DL_DCCH Message
SIB_Mask_in_SI : 0x00000000
ENCODED_MSG_LEN : 75

value DL-DCCH-Message ::=
  message c1 : rrcConnectionRe
       rrc-TransactionIdentifier 0,
       criticalExtensions c1 : rrcConnectionReconfiguration-r8 :
            measConfig
              measObjectToRemoveList
                1
              ,
              reportConfigToRemoveList
                1
              ,
              measIdToRemoveList
                1
              ,
              quantityConfig
              ,
              s-Measure 97,
              speedStatePars release : NULL
            ,
            mobilityControlInfo
              targetPhysCellId 322,
              carrierBandwidth
                dl-Bandwidth n100
              ,
              additionalSpectrumEmission 1,
              t304 ms1000,
              newUE-Identity '01000100 11010000'B,
              radioResourceConfigCommon
                rach-ConfigCommon
                  preambleInfo
                    numberOfRA-Preambles n56,
                    preamblesGroupAConfig
                      sizeOfRA-PreamblesGroupA n28,
```

Measurement parameters are not configured

5. Call Drop Rate

- Description
  - Ratio of Dropped VoLTE Calls and Abnormal Release of Data Call
- Target Value
  - <1%
- Used Call Model
  - LDL1, LUL and VoL (Separate)
- Formula
  - (The number of VoLTE Call Drops + The number of Abnormal Release for LDL1, LUL and VoL) / (Summation of the number of Calls Attempts for LDL1, LUL and VoL)
    - VoLTE Call Drop : Call is terminated by receiving BYE message from network side
    - Abnormal Release : UE is released without 'rrcConnectionRelease' message
      (RRC Connection Request without RRC Connection Release)
    - The number of Call Attempts for LDL1 : Roundup(Sum(MAC DL Bytes(LDL1))/52,428,800Bytes)
    - The number of Call Attempts for LUL : Roundup(Sum(MAC UL Bytes(LUL))/10,485,760Bytes)
    - The number of Call Attempts for VoL : Roundup(Sum(VoLTE Call Duration(VoL))/90sec)

5. Call Drop Rate

- Fail Cases
  - Poor RF Environments
    - UE didn’t received RTP packets due to poor RF quality

  ▶ Check RF environment (RSRP/SINR)

5. Call Drop Rate

- Fail Cases
  - Service Reject
    - — UE didn't received RTP packets due to service reject from core network

▶ Check Core network (including IMS Server)

BM	Time	Code	Message	Detail
	2015-03-17 23:07:25.385	UDP Tx-RTP	UDP	59293, 50000, 35680, Seq:2219, AMR-WB/16000/1, SN:2219
	2015-03-17 23:07:25.396	UDP Tx-RTP	UDP	59294, 50000, 35680, Seq:2220, AMR-WB/16000/1, SN:2220
	2015-03-17 23:07:25.403	UDP Tx-RTP	UDP	59295, 50000, 35680, Seq:2221, AMR-WB/16000/1, SN:2221
	2015-03-17 23:07:25.430	UDP Tx-RTP	UDP	59296, 50000, 35680, Seq:2222, AMR-WB/16000/1, SN:2222
	2015-03-17 23:07:25.443	UDP Tx-RTP	UDP	59297, 50000, 35680, Seq:2223, AMR-WB/16000/1, SN:2223
	2015-03-17 23:07:25.444	UDP Tx-RTP	UDP	59298, 50000, 35680, Seq:2224, AMR-WB/16000/1, SN:2224
	2015-03-17 23:07:25.454	UDP Tx-RTP	UDP	59299, 50000, 35680, Seq:2225, AMR-WB/16000/1, SN:2225
	2015-03-17 23:07:25.515	UDP Tx-RTP	UDP	59300, 50000, 35680, Seq:2226, AMR-WB/16000/1, SN:2226
	2015-03-17 23:07:25.515	UDP Tx-RTP	UDP	59301, 50000, 35680, Seq:2227, AMR-WB/16000/1, SN:2227
	2015-03-17 23:07:25.515	BCCH-BCH [Lte]	masterInformationBlock	
	2015-03-17 23:07:25.516	UDP Tx-RTP	UDP	59302, 50000, 35680, Seq:2228, AMR-WB/16000/1, SN:2228
	2015-03-17 23:07:25.591	UDP Tx-RTP	UDP	59303, 50000, 35680, Seq:2229, AMR-WB/16000/1, SN:2229
	2015-03-17 23:07:25.591	UDP Tx-RTP	UDP	59304, 50000, 35680, Seq:2230, AMR-WB/16000/1, SN:2230
	2015-03-17 23:07:25.592	UDP Tx-RTP	UDP	59305, 50000, 35680, Seq:2231, AMR-WB/16000/1, SN:2231
	2015-03-17 23:07:25.593	UDP Tx-RTP	UDP	59306, 50000, 35680, Seq:2232, AMR-WB/16000/1, SN:2232
	2015-03-17 23:07:25.602	DL-DCCH [Lte]	dlInformationTransfer	Service reject
	2015-03-17 23:07:25.602	DL-DCCH [Lte]	rrcConnectionRelease	
	2015-03-17 23:07:25.602	DL EPS MM	Service reject	
	2015-03-17 23:07:25.602	LTE NAS EMM state		
	2015-03-17 23:07:25.602	LTE NAS ESM bearer Context state		
	2015-03-17 23:07:25.602	LTE NAS ESM bearer Context state		
	2015-03-17 23:07:25.602	LTE NAS ESM bearer Context state		

Service Reject

```
Version : 1
STD_VERSION : 9
STD_VERSION_MAJOR : 5
STD_VERSION_MINOR : 0
NAS Data Length : 3

SERVICE_REJECT:
 SecurityHeaderType: 0
 EMMCause: 10 (Implicitly detached)
```

5. Call Drop Rate

- Fail Cases
  - Poor RF Environments
    - UE was released from eNB without ‘rrcConnectionRelease’ message due to Out-of-Sync.

  ▶ Check RF environment (RSRP/SINR)

5. Call Drop Rate

- Fail Cases
  - Abnormal release by S1 Interface issue
    - UE was released from eNB without ‘rrcConnectionRelease’ message due to S1 interface

▶ Check Backhaul and S1 Interface

BM	Time	Code	Message	Detail
	2015-03-17 20:39:59.261	LTE NAS EMM state		
	2015-03-17 20:39:59.261	UL EPS MM	Service request	
●	2015-03-17 20:39:59.261	UL-CCCH [Lte]	rrcConnectionRequest	mo_Data, s-TMSI(mmec 1, m-TMSI 4027654423)
	2015-03-17 20:39:59.262	LTE MAC RACH trigger		Connection request
	2015-03-17 20:39:59.367	LTE ML1 random access request (MSG1) report		
	2015-03-17 20:39:59.367	LTE ML1 random access response (MSG2) report		
	2015-03-17 20:39:59.367	LTE ML1 UE identification message (MSG3) report		
	2015-03-17 20:39:59.368	LTE ML1 contention resolution message (MSG4) report		
	2015-03-17 20:39:59.368	LTE MAC RACH attempt		Success
			rrcConnectionSetup	
			rrcConnectionSetupComplete	Service request
	2015-03-17 20:40:04.382	LTE NAS EMM state		
	2015-03-17 20:40:04.382	LTE NAS EMM state		
	2015-03-17 20:40:04.722	LTE NAS EMM state		
	2015-03-17 20:40:04.722	UL EPS MM	Service request	
●	2015-03-17 20:40:04.722	UL-CCCH [Lte]	rrcConnectionRequest	mo_Data, s-TMSI(mmec 1, m-TMSI 4027654423)
	2015-03-17 20:40:04.722	LTE MAC RACH trigger		Connection request
	2015-03-17 20:40:04.723	LTE ML1 random access request (MSG1) report		
	2015-03-17 20:40:04.723	LTE ML1 random access response (MSG2) report		
	2015-03-17 20:40:04.723	LTE ML1 UE identification message (MSG3) report		
	2015-03-17 20:40:04.733	LTE ML1 contention resolution message (MSG4) report		
	2015-03-17 20:40:04.733	LTE MAC RACH attempt		Success
	2015-03-17 20:40:04.733	DL-CCCH [Lte]	rrcConnectionSetup	
	2015-03-17 20:40:04.734	UL-DCCH [Lte]	rrcConnectionSetupComplete	Service request

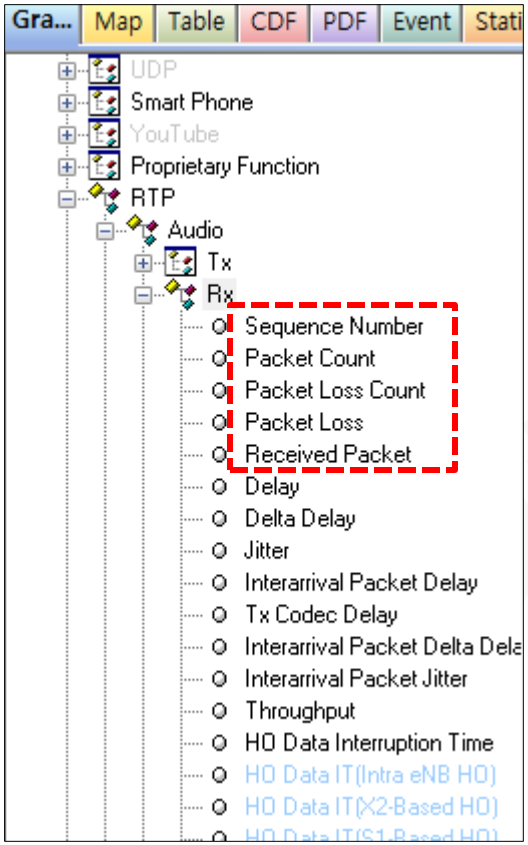
No ‘rrcConnectionRelease’ message

6. VoLTE RTP Packet Loss Rate

- Description
  - Ratio of Lost VoLTE RTP Packet
    - Causes for packet loss : network congestion, late arrivals etc.
- Target Value
  - <1%
- Used Call Model
  - VoL
- Formula
  - The number of Lost VoLTE RTP Packets / The number of Transmitted VoLTE RTP Packets
    - Lost VoLTE RTP Packets will be calculated based on the received RTP Packet Sequence Number

6. VoLTE RTP Packet Loss Rate

- Analysis using ActixOne and XCAP
  - Check RTP Packet Loss events using XCAP
    - Check the event time for RTP Packet Loss
      - Packet count/Packet Loss Count

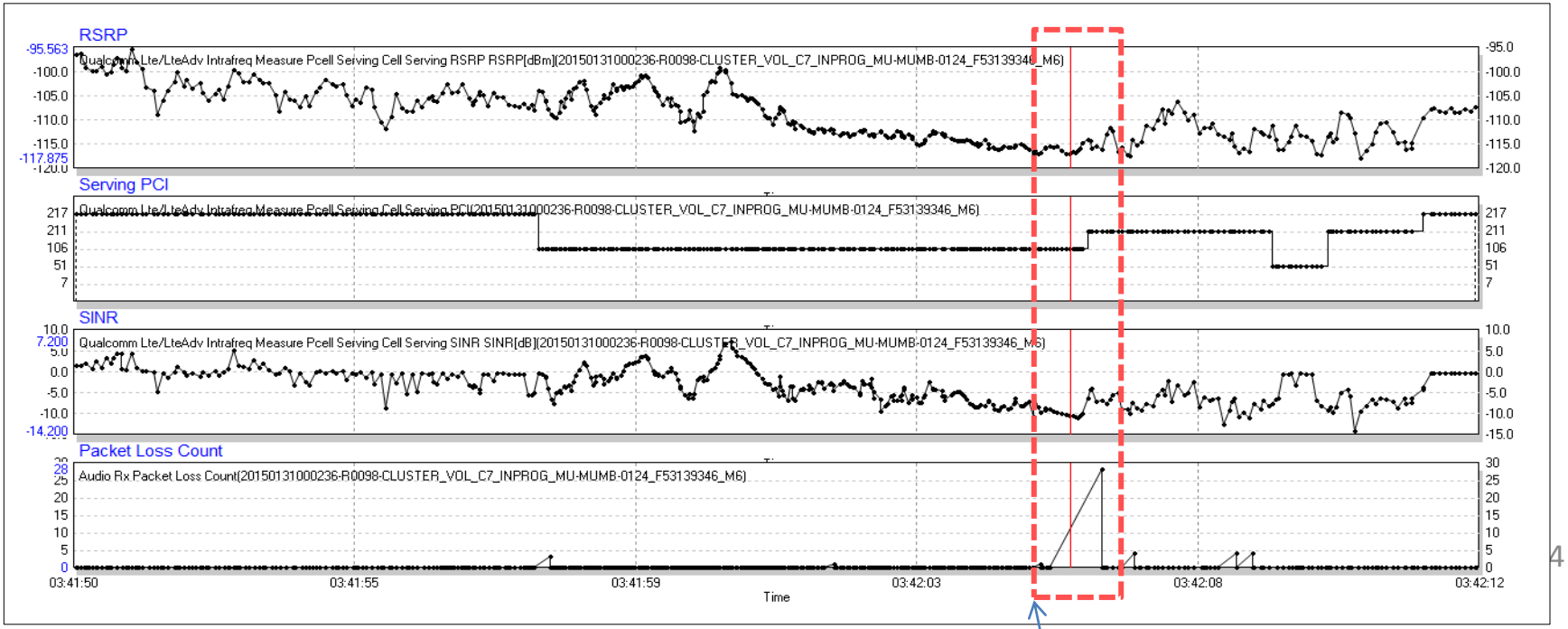


TIME_STAMP	Audio Rx Sequence Number	Audio Rx Packet Count	Audio Rx Packet Loss Count	Audio Rx Packet Loss (%)
2015-01-31 04:44:10.061	6017	1	0	0.00
2015-01-31 04:44:10.061	6018	1	0	0.00
2015-01-31 04:44:10.085	6019	1	0	0.00
2015-01-31 04:44:10.085	6020	1	0	0.00
2015-01-31 04:44:10.162	6021	1	0	0.00
2015-01-31 04:44:10.162	6022	1	0	0.00
2015-01-31 04:44:10.245	6023	1	0	0.00
2015-01-31 04:44:10.245	6024	1	0	0.00
2015-01-31 04:44:10.245	6025	1	0	0.00
2015-01-31 04:44:10.245	6026	1	0	0.00
2015-01-31 04:44:10.288	6027	1	0	0.00
2015-01-31 04:44:10.288	6028	1	0	0.00
2015-01-31 04:44:10.288	6029	1	0	0.00
2015-01-31 04:44:10.288	6030	1	0	0.00
2015-01-31 04:44:10.384	6031	1	0	0.00
2015-01-31 04:44:10.384	6032	1	0	0.00
2015-01-31 04:44:10.384	6033	1	0	0.00
2015-01-31 04:44:10.384	6034	1	0	0.00
2015-01-31 04:44:10.444	6035	1	0	0.00
2015-01-31 04:44:10.444	6036	1	0	0.00
2015-01-31 04:44:10.488	6037	1	0	0.00
2015-01-31 04:44:10.488	6038	1	0	0.00
2015-01-31 04:44:10.539	6039	1	0	0.00
Count	514205	514205	514185	514185
Minimum		1	0	0.00
Maximum		13	219	99.54
Average		1.00	0.01	0.32
Stdev		0.02	0.45	4.55
Median		1	0	0.00

6. VoLTE RTP Packet Loss Rate

- Fail Cases
  - Poor RF Environments
    - RTP Packets were lost due to poor RF environments(RSRP/SINR)

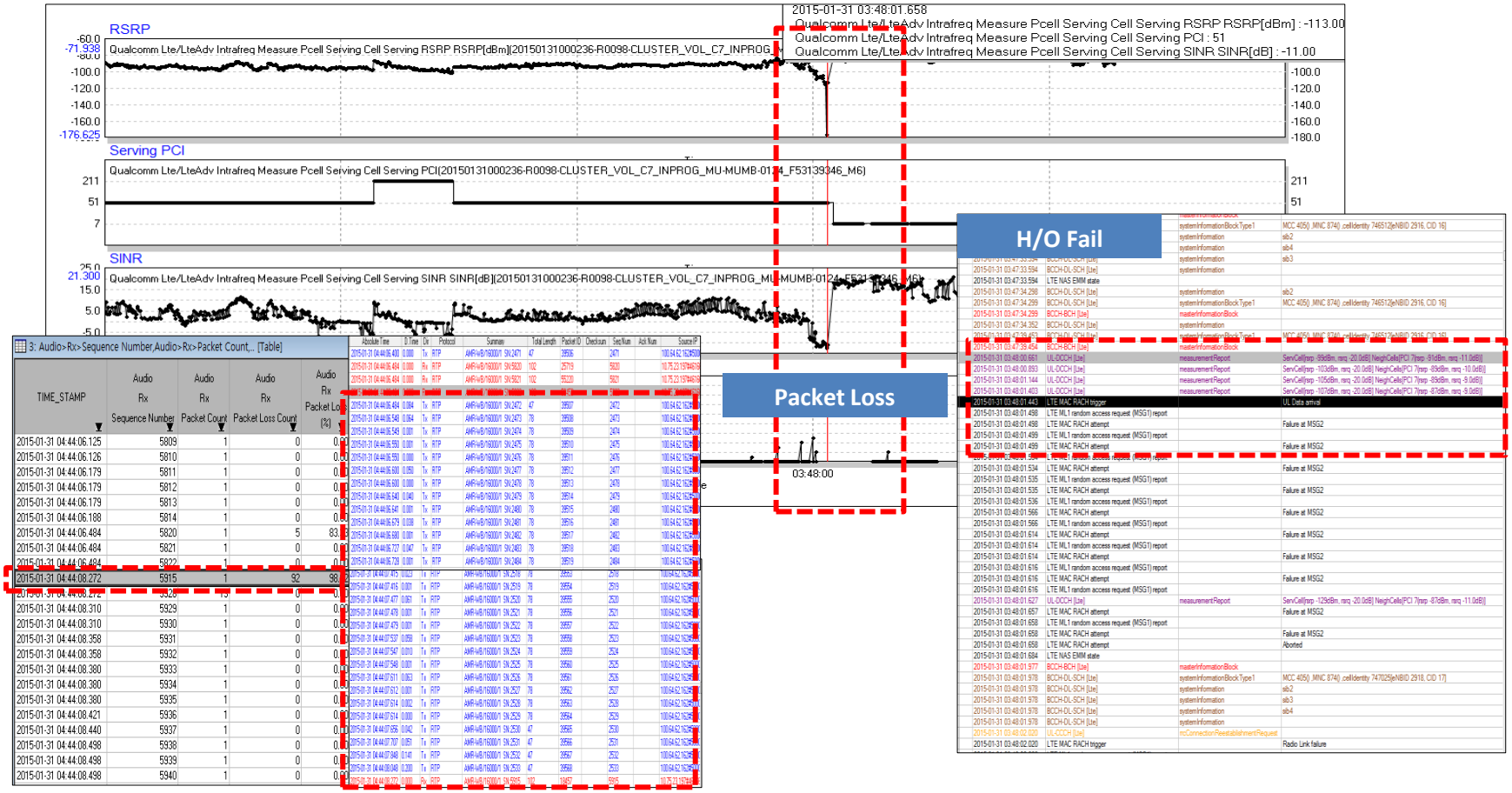
▶ RF Optimization



6. VoLTE RTP Packet Loss Rate

- Fail Case
  - Handover Fail
    - RTP Packets were lost due to HO Fail

▶ Check Neighbor list in LSM (check missing neighbor)



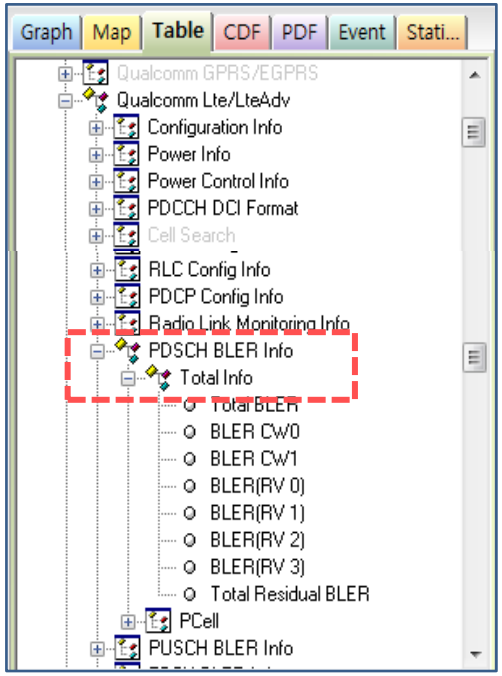
7. Average BLER DL (Info)

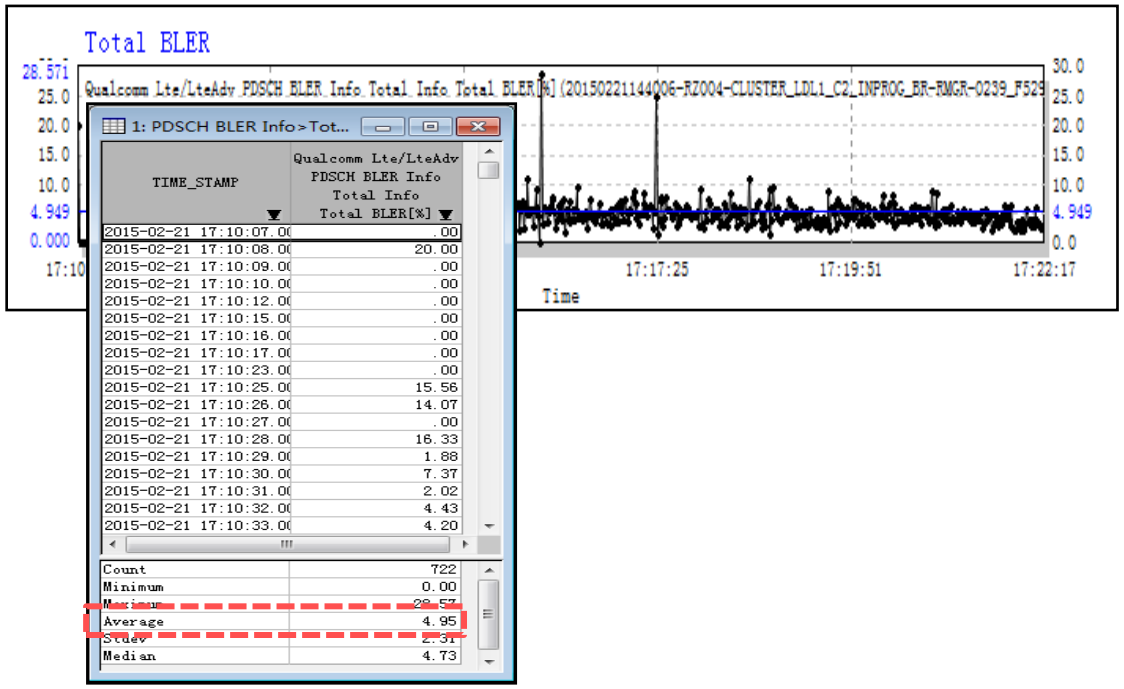
- Description
  - Average NACK rate in DL for the initial transmission within exclusion zone
- Target Value
  - -
- Used Call Model
  - LDL1, LUL (Merge)
- Formula
  - Average of DL BLER for the binned samples within exclusion zone

7. Average BLER DL (Info)

- Analysis using XCAP

  - Check BLER DL in XCAP
    - Check Graph or Table> Qualcomm LTE/LteAdv> PDSCH BLER Info> Total Info> Total BLER





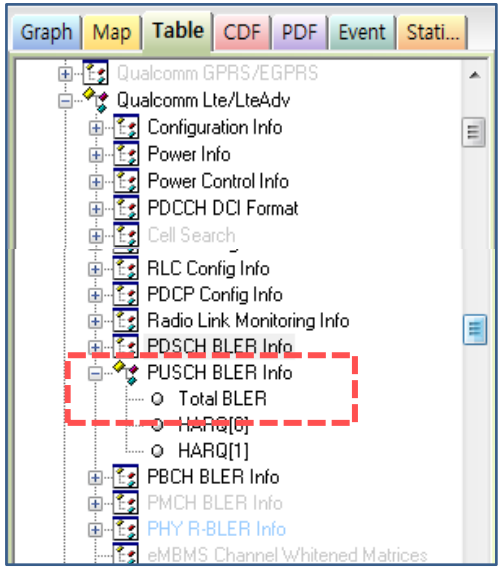
8. Average BLER UL (Info)

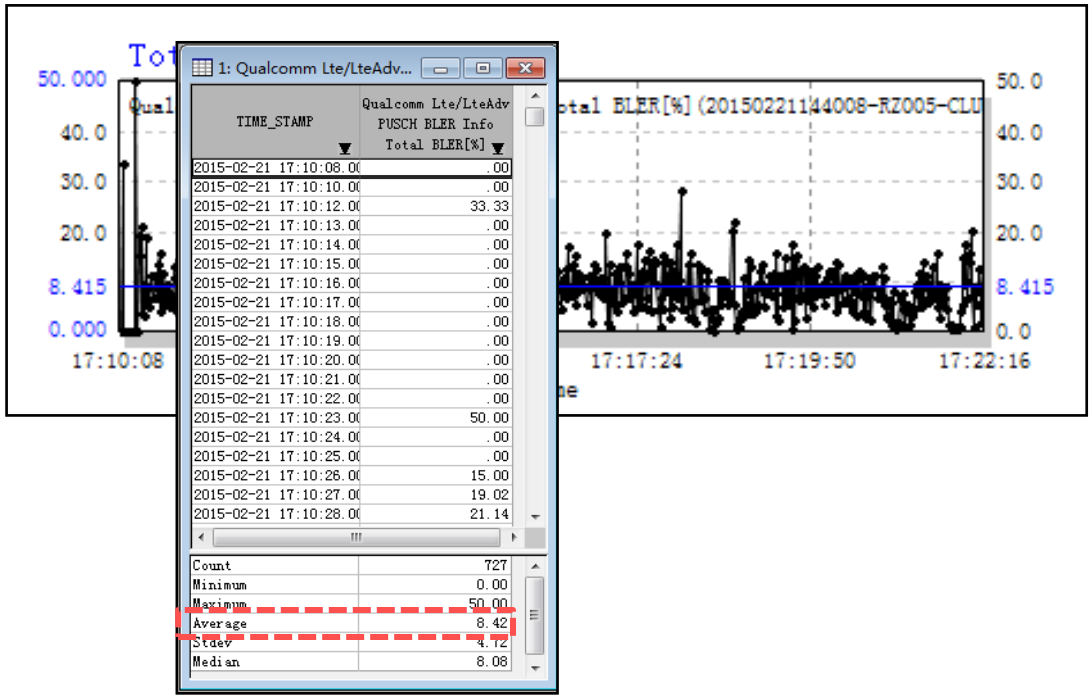
- Description
  - Average NACK rate in UL for the initial transmission within exclusion zone
- Target Value
  - -
- Used Call Model
  - LDL1, LUL (Merge)
- Formula
  - Average of UL BLER for the binned samples within exclusion zone

8. Average BLER UL (Info)

- Analysis using XCAP

  - Check BLER DL in XCAP
    - Check Graph or Table> Qualcomm LTE/LteAdv> PDSCH BLER Info> Total Info> Total BLER





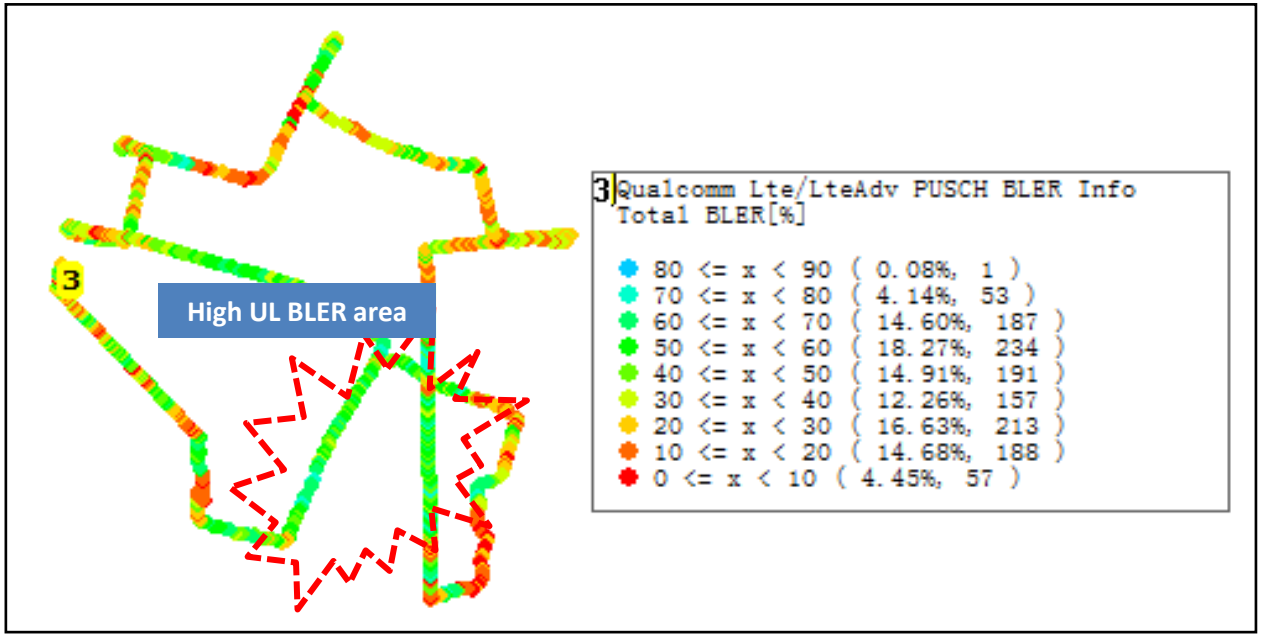
8. Average BLER UL (Info)

- Fail Cases
  - High UL BLER due to Interference
    - — High UL BLER was detected withtin specific area due to interference
    - ※ UL would be affected more severely than DL due to high sensitivity and antenna gain of eNB

▶ Check IoT level in LSM

▶ Detect Interference source using spectrum analyzer at the field

※ Interference source should be removed before CLOT

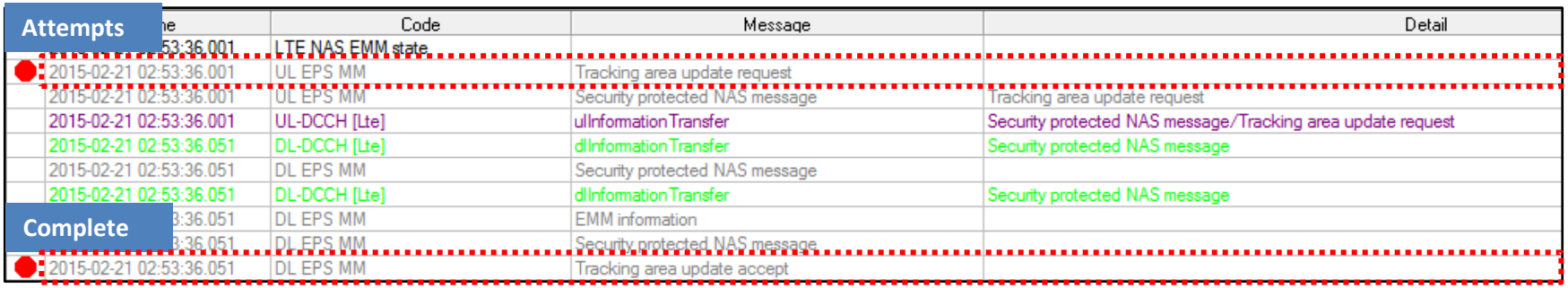


9. TAU Success Rate (Info)

- Description
  - Ratio of Tracking Area Update (TAU) Success
    - TAU procedure : from Tracking Area Update Request to Tracking Area Update Success in NAS L3 message
- Target Value
  - -
- Used Call Model
  - LDL1, LUL and VoL (Separate)
- Formula
  - The number of TAU Success / The number of TAU Attempts
    - TAU Success : Receiving ‘Tracking area update accept’ (DL EPS MM)
    - TAU Attempt : Sending ‘Tracking area update request’ (UL EPS MM)

9. TAU Success Rate (Info)

- Message from XCAP
  - From Tracking area update request (UL EPS MM) to Tracking area update success (DL EPS MM)

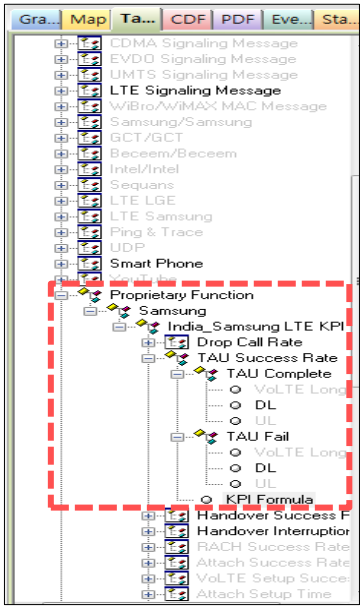


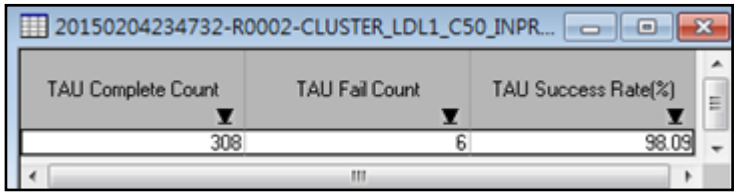
Code	Message	Detail
LTE NAS EMM state		
UL EPS MM	Tracking area update request	
UL EPS MM	Security protected NAS message	Tracking area update request
UL-DCCH [Lte]	ulInformationTransfer	Security protected NAS message/Tracking area update request
DL-DCCH [Lte]	dlInformationTransfer	Security protected NAS message
DL EPS MM	Security protected NAS message	
DL-DCCH [Lte]	dlInformationTransfer	Security protected NAS message
DL EPS MM	EMM information	
DL EPS MM	Security protected NAS message	
DL EPS MM	Tracking area update accept	

9. TAU Success Rate (Info)

- Analysis using XCAP

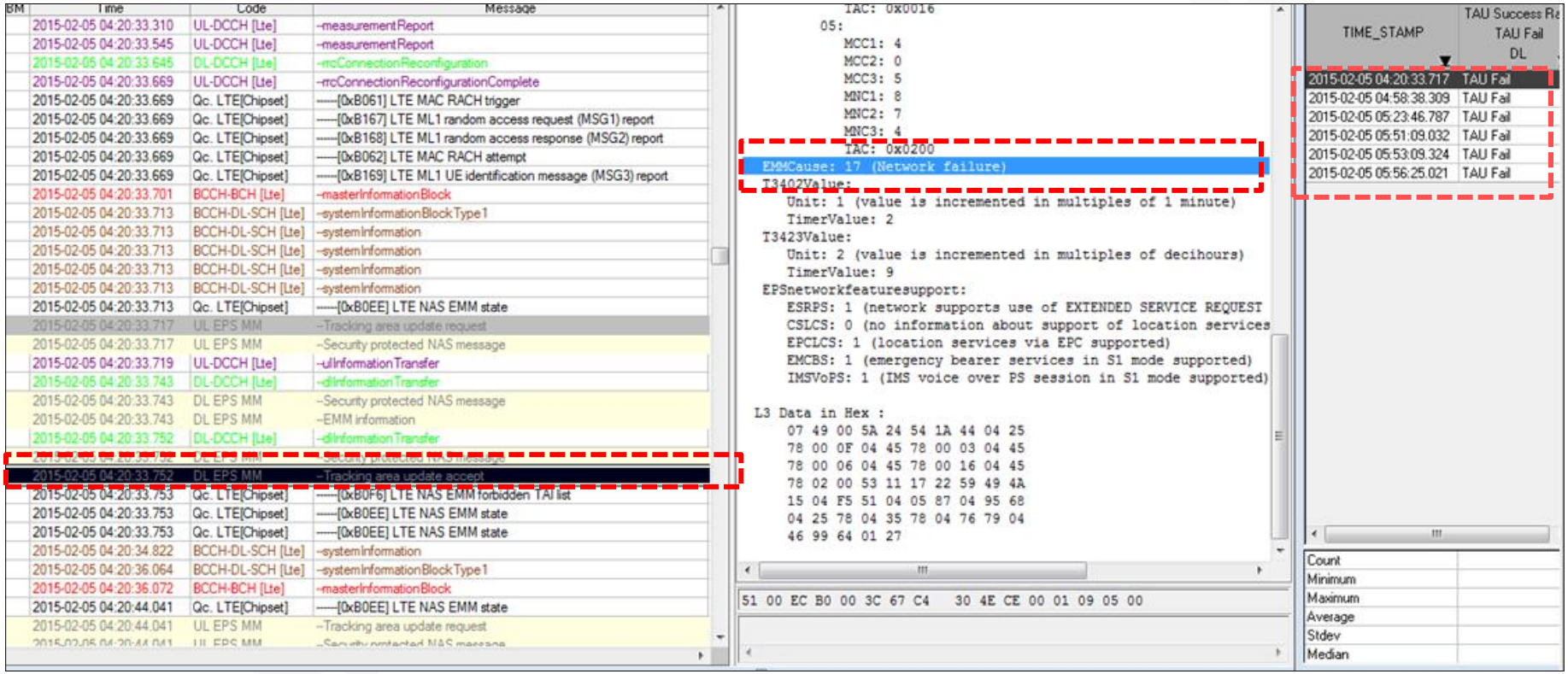
  - Check TAU fail events in XCAP
    - Check the specific event time for TAU fails





9. TAU Success Rate (Info)

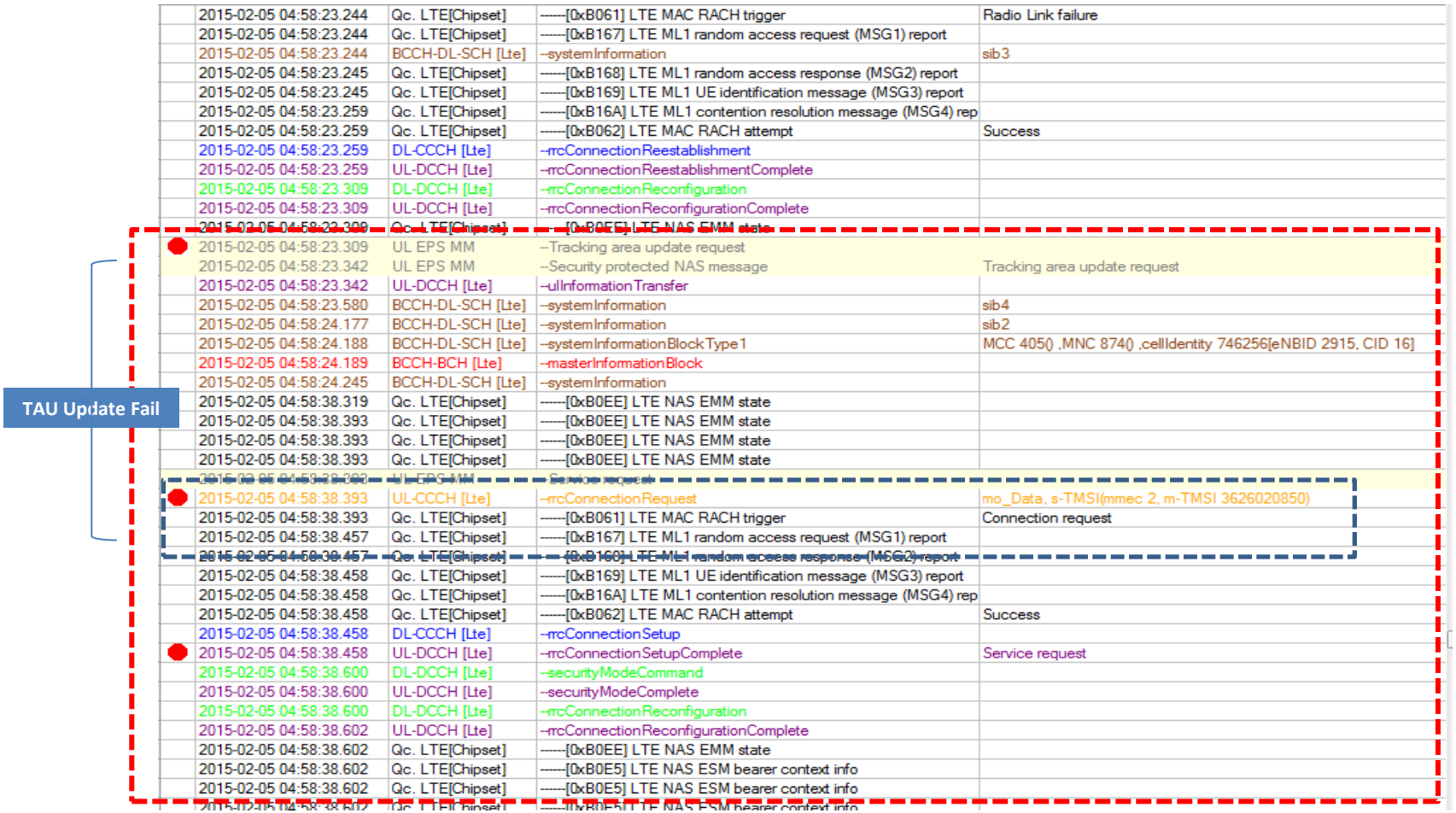
- Analysis using ActixOne and XCAP
  - Check the detailed messages in XCAP for the fail events



9. TAU Success Rate (Info)

- Fail Cases
  - No TAU Update Message
    - — After sending the TAU Message, UE didn't receive the TAU accept

▶ Check Core network (including MME)



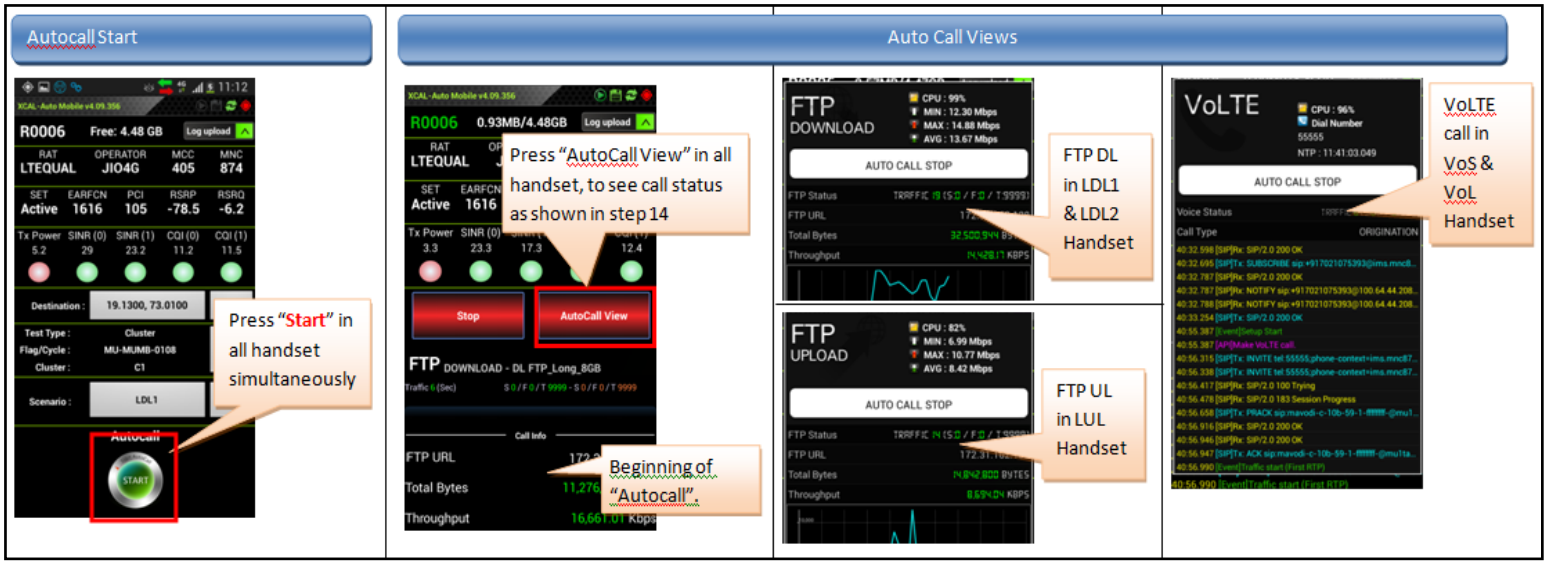
	2015-02-05 04:58:23.244	Qc. LTE[Chipset]	------[0xB061] LTE MAC RACH trigger	Radio Link failure
	2015-02-05 04:58:23.244	Qc. LTE[Chipset]	------[0xB167] LTE ML1 random access request (MSG1) report	
	2015-02-05 04:58:23.244	BCCH-DL-SCH [Lte]	--systemInformation	sib3
	2015-02-05 04:58:23.245	Qc. LTE[Chipset]	------[0xB168] LTE ML1 random access response (MSG2) report	
	2015-02-05 04:58:23.245	Qc. LTE[Chipset]	------[0xB169] LTE ML1 UE identification message (MSG3) report	
	2015-02-05 04:58:23.259	Qc. LTE[Chipset]	------[0xB16A] LTE ML1 contention resolution message (MSG4) rep	
	2015-02-05 04:58:23.259	Qc. LTE[Chipset]	------[0xB062] LTE MAC RACH attempt	Success
	2015-02-05 04:58:23.259	DL-CCCH [Lte]	--rrcConnectionReestablishment	
	2015-02-05 04:58:23.259	UL-DCCH [Lte]	--rrcConnectionReestablishmentComplete	
	2015-02-05 04:58:23.309	DL-DCCH [Lte]	--rrcConnectionReconfiguration	
	2015-02-05 04:58:23.309	UL-DCCH [Lte]	--rrcConnectionReconfigurationComplete	
	2015-02-05 04:58:23.309	Qc. LTE[Chipset]	------[0xB0EE] LTE NAS EMM state	
●	2015-02-05 04:58:23.309	UL EPS MM	--Tracking area update request	
	2015-02-05 04:58:23.342	UL EPS MM	--Security protected NAS message	Tracking area update request
	2015-02-05 04:58:23.342	UL-DCCH [Lte]	--ulInformationTransfer	
	2015-02-05 04:58:23.580	BCCH-DL-SCH [Lte]	--systemInformation	sib4
	2015-02-05 04:58:24.177	BCCH-DL-SCH [Lte]	--systemInformation	sib2
	2015-02-05 04:58:24.188	BCCH-DL-SCH [Lte]	--systemInformationBlockType1	MCC 405() ,MNC 874() ,cellIdentity 746256[eNBID 2915, CID 16]
	2015-02-05 04:58:24.189	BCCH-BCH [Lte]	--masterInformationBlock	
	2015-02-05 04:58:24.245	BCCH-DL-SCH [Lte]	--systemInformation	
	2015-02-05 04:58:38.319	Qc. LTE[Chipset]	------[0xB0EE] LTE NAS EMM state	
	2015-02-05 04:58:38.393	Qc. LTE[Chipset]	------[0xB0EE] LTE NAS EMM state	
	2015-02-05 04:58:38.393	Qc. LTE[Chipset]	------[0xB0EE] LTE NAS EMM state	
	2015-02-05 04:58:38.393	Qc. LTE[Chipset]	------[0xB0EE] LTE NAS EMM state	
	2015-02-05 04:58:38.393	UL EPS MM	--Service request	
●	2015-02-05 04:58:38.393	UL-CCCH [Lte]	--rrcConnectionRequest	mo_Data, s-TMSI(mmec 2, m-TMSI 3626020850)
	2015-02-05 04:58:38.393	Qc. LTE[Chipset]	------[0xB061] LTE MAC RACH trigger	Connection request
	2015-02-05 04:58:38.457	Qc. LTE[Chipset]	------[0xB167] LTE ML1 random access request (MSG1) report	
	2015-02-05 04:58:38.457	Qc. LTE[Chipset]	------[0xB168] LTE ML1 random access response (MSG2) report	
	2015-02-05 04:58:38.458	Qc. LTE[Chipset]	------[0xB169] LTE ML1 UE identification message (MSG3) report	
	2015-02-05 04:58:38.458	Qc. LTE[Chipset]	------[0xB16A] LTE ML1 contention resolution message (MSG4) rep	
	2015-02-05 04:58:38.458	Qc. LTE[Chipset]	------[0xB062] LTE MAC RACH attempt	Success
	2015-02-05 04:58:38.458	DL-CCCH [Lte]	--rrcConnectionSetup	
●	2015-02-05 04:58:38.458	UL-DCCH [Lte]	--rrcConnectionSetupComplete	Service request
	2015-02-05 04:58:38.600	DL-DCCH [Lte]	--securityModeCommand	
	2015-02-05 04:58:38.600	UL-DCCH [Lte]	--securityModeComplete	
	2015-02-05 04:58:38.600	DL-DCCH [Lte]	--rrcConnectionReconfiguration	
	2015-02-05 04:58:38.602	UL-DCCH [Lte]	--rrcConnectionReconfigurationComplete	
	2015-02-05 04:58:38.602	Qc. LTE[Chipset]	------[0xB0EE] LTE NAS EMM state	
	2015-02-05 04:58:38.602	Qc. LTE[Chipset]	------[0xB0E5] LTE NAS ESM bearer context info	
	2015-02-05 04:58:38.602	Qc. LTE[Chipset]	------[0xB0E5] LTE NAS ESM bearer context info	
	2015-02-05 04:58:38.602	Qc. LTE[Chipset]	------[0xB0E5] LTE NAS ESM bearer context info	

Appendix

- Issue Code – IMS & EMM

CLOT Test Scenario

- Drive Test
  - It will be used 5 handsets to perform five tests using Accuver DM tool installed in mobile handset
  - Each handset will perform one of the test given below
    1. FTP DL 1
    2. FTP DL 2
    3. FTP UL
    4. VoLTE Long
    5. VoLTE Short
  - All test scenarios are already predefined in Accuver DM tool
    - Drive test engineer will select different test scenarios per handset



Issue Codes

- IMS Issue Code for VoLTE

NO	Codes	Description
1	403	Forbidden
2	487	Request Terminated
3	500	Internal Server Error
4	501	Not Implemented
5	502	Bad Gateway
6	503	Service Unavailable
7	504	Service Time-out
8	505	SIP Version Not Supported
9	513	Message Too Large

Issue Codes

- PDN Connectivity Reject
  - If the PDN CONNECTIVITY REQUEST cannot be accepted by the network, then MME shall send a *PDN CONNECTIVITY REJECT* message to the UE.
    - This message shall contain an **ESM cause** value which indicates the reason for rejecting the UE requested PDN connectivity.
    - The ESM cause IE typically indicates one of the following ESM cause values;
      - Refer to section 6.5.1.4 in the 3GPP TS 24.301 for detailed information

#	EMM Cause	#	EMM Cause
#8	operator determined barring	#35:	PTI already in use
#26	insufficient resources	#38	network failure
#27	missing or unknown APN	#50	PDN type IPv4 only allowed
#28	unknown PDN type	#51	PDN type IPv6 only allowed
#29	user authentication failed	#53:	ESM information not received
#30	request rejected by Serving GW or PDN GW	#54	PDN connection does not exist
#31	request rejected, unspecified	#55	multiple PDN connections for a given APN not allowed
#32	service option not supported	#95	111: protocol errors
#33	requested service option not subscribed	#112	APN restriction value incompatible with active EPS bearer context.
#34	service option temporarily out of order		