KEYSIGHT

Japanese Emergency Call

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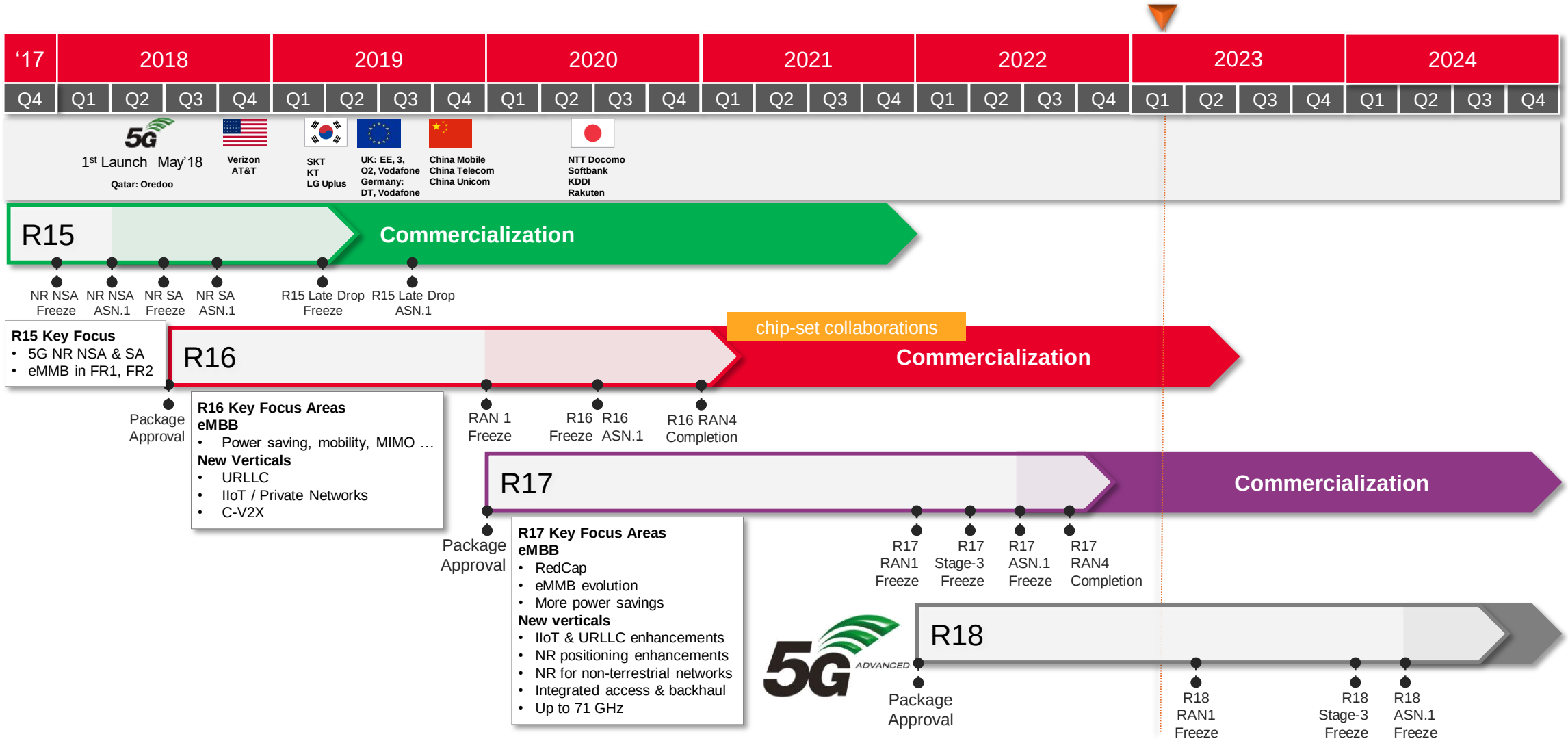
Agenda

1. 5G Mobile Network Evolution
2. Emergency Calls Test Method Considerations
3. Emergency Calls Test Tools

3GPP Timeline Summary



Source: 3GPP

3GPP Driving 5G Standards to Support New Vertical Markets

Vertical	Release 15	Release 16	Release 17	Release 18
eMBB	✓ 5G New Radio ✓ 5G Core Network ✓ NSA / SA mode ✓ FR2 (mmWave)	✓ Power saving ✓ MIMO enh ✓ Mobility enh ✓ DC/CA ✓ DSS • NR-U • Positioning • RRM enh	• **Power saving** • MIMO • DSS • **UL Coverage** • 71GHz • MSIM • MR DC/CA • **FR1 1024QAM** • NR UDC • RAN slicing • SON • **Small data Tx from INACTIVE** • QoE	• NR MIMO evolution • Further UL coverage enh • Evolution of Duplex • Positioning evolution • NW energy saving • QoE enh • CA enh • DSS • Mobility enh
IIoT / NPN		• URLLC • Positioning • Private Networks • TSN over 5G	• Higher accuracy positioning • Private network enh • Enhanced IoT and TSN/ URLLC support • RedCap	• NTN evolution – IoT • RedCap evolution • Positioning evolution
Auto		• NR sidelink	• Enhanced NR-V2X services • NR sidelink enhancements • NR sidelink relay	• NR sidelink evolution • Sidelink relay enh
RAN		• IAB	• More IAB • eNB arch evolution	• Smart repeaters • AI/ML for Air Interface
RedCap			• RedCap • Power saving • Small data Tx • UL coverage	• RedCap evolution
NTN			• NR NTN • NB-IoT/eMTC NTN	• NTN evolution - NR
Public Safety			• NR multi-cast / broadcast services • Proximity based services	• Sidelink enhancements
VR/XR			• VR profiles for streaming • Immersive CODEC and teleconferencing	• Enhancements for XR
UAV				• Uncrewed Aerial Vehicle (UAV)

Core specs: Mar 22. **ASN.1**: Jun 22 **Perf specs**: Sep 22

Core specs: Dec 23. **ASN.1**: Mar 24 **Perf specs**: Jun 24

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Consideration on Mobile Phone Emergency Call

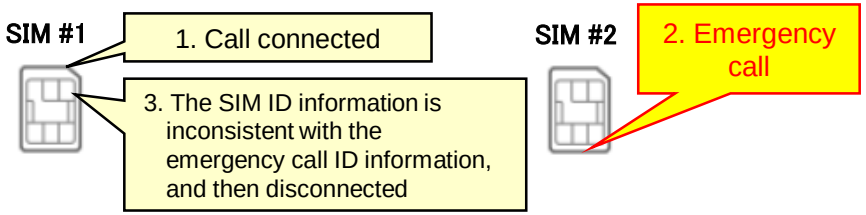
- In the case of an emergency call is made from a data-only SIM on Multiple SIMs mobile phone, There is a case that the emergency call does not work.
- Problems are often being resolved by modifying the software on the mobile phone, but in anticipation of the further deployment of multiple SIMs mobile phone devices in the future, there is a need for a mechanism to ensure interoperability of emergency calls.

【Case A】 Emergency call from Data SIM

- If an emergency call was attempted by a Data SIM other than Voice SIM, the Data SIM ID information would be passed to the network side, and connection would be interrupted on the network side and then disconnected.

【Case B】 disconnection due to inconsistent SIM ID

- If an emergency call is established by a SIM other than the SIM that is applicable for emergency call, the ID information of the other SIM would be passed to the network side when exchanging location information, and connection would be interrupted on the network side, and then disconnected.



Emergency Call Test Methods for Multiple SIMs Mobile Phones

Clarifying requirements for "function to send emergency calls" imposed on mobile phone terminals and "connecting emergency calls to emergency call receiving organizations" imposed on networks.

Define test details for reliable connection to the network for the emergency call function of mobile phones that support multiple SIMs

Emergency Call Overview

Emergency Call in Japan

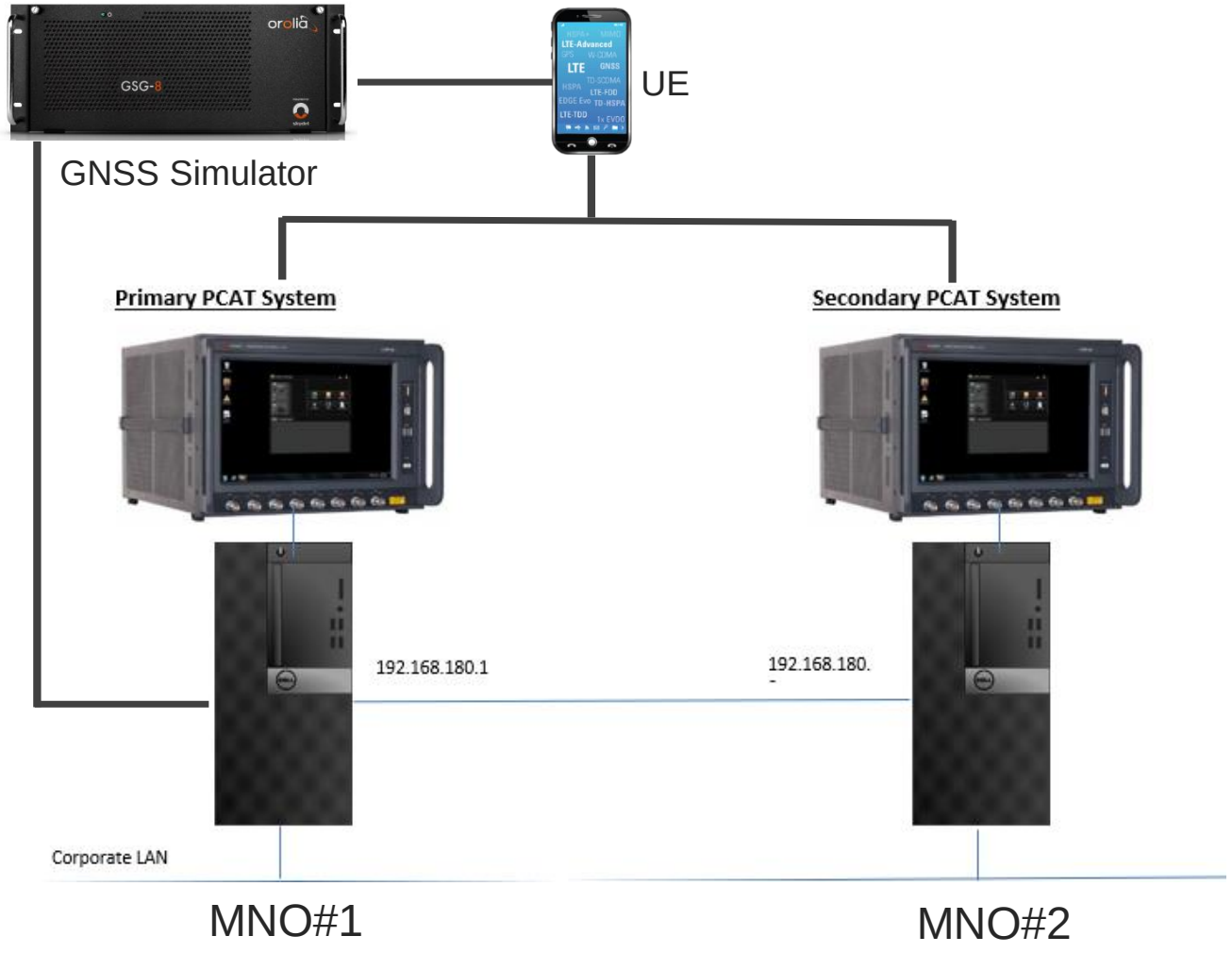
1. Voice USIM can handle Emergency Call when dialing 110/118/119
2. Data USIM can’t be used for Emergency Call
3. UE without USIM can’t be used for Emergency Call

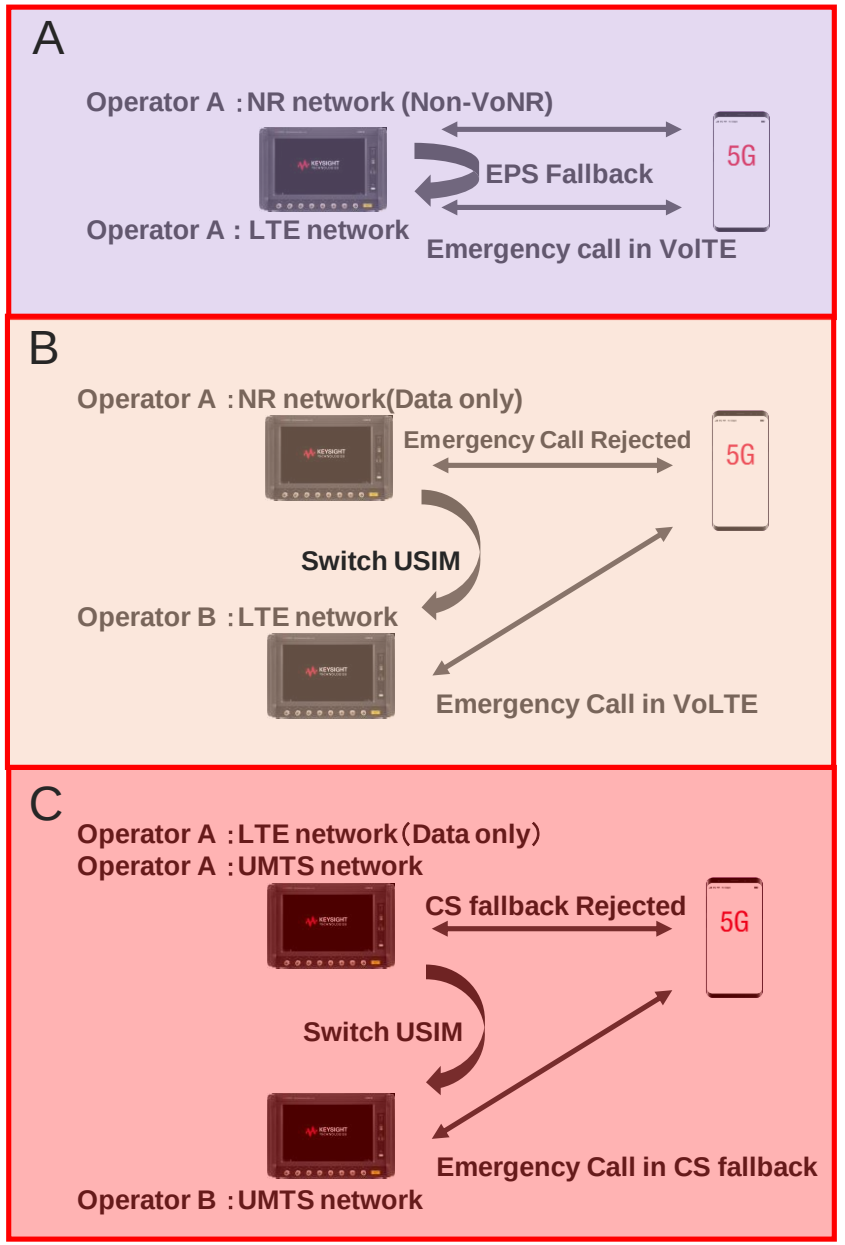
Emergency Call procedure

1. SIP Protocol
2. Bearer for Voice call
3. Positioning Calculation of UE Location

Emergency Call Test Setup

For Dual SIM Dual Standby





Emergency Call Test Sequence (1)

NR-Cell A		Activate NR 5G Cell [Cell A, DL P
E-Cell A	NONE	Activate LTE Cell [E-Cell A]
		User Prompt [Click 'OK' then swit
NR-Cell A	SS <-- MS	RRC Setup Request
NR-Cell A	SS --> MS	RRC Setup
NR-Cell A	SS <-- MS	RRC Setup Complete
NR-Cell A	SS <-- MS	Registration Request
		IF Condition ((Id_type != "eNR5G
NR-Cell A	SS --> MS	Identity Request
NR-Cell A	SS <-- MS	Identity Response
		ENDIF Condition
NR-Cell A	SS --> MS	Authentication Request
NR-Cell A	SS <-- MS	Authentication Response
NR-Cell A	SS --> MS	NAS Security Mode Command
NR-Cell A	SS <-- MS	NAS Security Mode Complete
NR-Cell A	SS --> MS	RRC Security Mode Command
NR-Cell A	SS <-- MS	RRC Security Mode Complete
NR-Cell A	SS --> MS	UE Capability Enquiry
NR-Cell A	SS <-- MS	UE Capability Information
NR-Cell A	SS --> MS	UE Capability Enquiry
NR-Cell A	SS <-- MS	UE Capability Information
NR-Cell A	SS --> MS	Registration Accept
NR-Cell A	SS <-- MS	Registration Complete

NR Registration

NR-Cell A	SS <-- MS	PDU Session Establishment Request
NR-Cell A	SS --> MS	PDU Session Establishment Accept
NR-Cell A	SS --> MS	RRC Reconfiguration
NR-Cell A	SS <-- MS	RRC Reconfiguration Complete
NR-Cell A	SS <-- MS	PDU Session Establishment Request
NR-Cell A	SS --> MS	PDU Session Establishment Accept
NR-Cell A	SS --> MS	RRC Reconfiguration
NR-Cell A	SS <-- MS	RRC Reconfiguration Complete
		IMS Command [message expect REGISTER 120]
		IMS Command [message expect register]
		IMS Command [check registered]

Internet Bearer, IMS Bearer, and SIP Registration

Emergency Call Test Sequence (2)

Emergency Call Connection
(EPS Fallback)
- Emergency call IMS Bearer (sos)
- SIP Protocol call connection

NONE	Tap8 Test Step [SCPIRegexStep]	COMmon:PREset
NONE	Tap8 Test Step [SCPIRegexStep]	LPP:FEAtures:GNSS 1
NONE	Tap8 Test Step [SCPIRegexStep]	LPP:TRAnsport:RESpack 1
NONE	Tap8 Test Step [SCPIRegexStep]	:LPP:TRAnsport:SOCket EPC
	KPM Agent Control	
NONE	Tap8 Test Step [SCPIRegexStep]	:COMmon:CONFig:TESTcase TC103_246
NONE	Tap8 Test Step [SCPIRegexStep]	:COMmon:CONFig:SUBTest ST103_246
NONE	Tap8 Test Step [SCPIRegexStep]	:COMmon:CONFig:SCENario SC103_246
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:ADDRess "201.20.2.3"
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:TARGet GSG_821
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:ATTENuator 50
NONE	Tap8 Test Step [SCPIRegexStep]	:COMmon:CONFig:APPLY
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:CONSTel:GPS:ENABled 1
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:CONSTel:GAL:ENABled 1
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:USIGnal L1CA,1
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:USIGnal G1,0
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:USIGnal E1,1
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:USIGnal B1,0
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:CONSTel:GLO:ENABled 0
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:CONSTel:BDS:ENABled 0
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:INITialise
NONE	Tap8 Test Step [SCPIRegexStep]	:GNSS:CONTroller:START

NSS Simulator Setup & Startup

NONE	User Prompt [Click 'OK' then initiate MO emergency call to 112]
	Comment [//Emergency Bearer Context establishment]
NONE	Log Marker
SS <-- MS	PDN Connectivity Request
SS --> MS	Activate Default EPS Bearer Context Request
SS --> MS	RRC Connection Reconfiguration
SS <-- MS	RRC Connection Reconfiguration Complete
SS <-- MS	Activate Default EPS Bearer Context Accept
	Comment [//Verify Device requests the "sos" APN]
NONE	IF Condition ((PDN_Request_Type == "eRequest_type_emergency"))
	Verdict: (PASS)
	ELSE Condition
	Verdict: (FAIL)
	ENDIF Condition
	IMS Command [message expect REGISTER 120]
	IMS Command [message expect INVITE 120]
	IMS Command [send message 183 true]
	Comment [//Dedicated Bearer Establishment for Emergency call]
SS --> MS	Activate Dedicated EPS Bearer Context Request
SS --> MS	RRC Connection Reconfiguration
SS <-- MS	RRC Connection Reconfiguration Complete
SS <-- MS	Activate Dedicated EPS Bearer Context Accept
	IMS Command [message expect 180 10 downlink]
	IMS Command [call answer]
	IMS Command [message expect ACK 30]
	IMS Command [start rtp monitor]
	IMS Command [verify rtp received]

Emergency Call Test Sequence (Domestic)

	NONE	Comment [//Case C-Plane LPP]
	NONE	IF Condition ((C_Plane_LPP == "True"))
E-Cell A	SS --> MS	Downlink Generic NAS Transport
E-Cell A	SS <-- MS	Uplink Generic NAS Transport
	NONE	Adjust Variable - UL_NAS_Transport_Msg = UL_LPP_ACK
	NONE	IF Condition (((UL_NAS_Transport_Msg == "2C00") || (UL_NAS
E-Cell A	SS <-- MS	Uplink Generic NAS Transport
		ENDIF Condition
	NONE	IF Condition ((GPS_GLONASS_Device == "False"))
E-Cell A	SS --> MS	Downlink Generic NAS Transport
E-Cell A	SS <-- MS	Uplink Generic NAS Transport
E-Cell A	SS --> MS	Downlink Generic NAS Transport
		ELSE Condition
E-Cell A	SS --> MS	Downlink Generic NAS Transport
E-Cell A	SS <-- MS	Uplink Generic NAS Transport
E-Cell A	SS --> MS	Downlink Generic NAS Transport
		ENDIF Condition
E-Cell A	SS <-- MS	Uplink Generic NAS Transport
	NONE	Adjust Variable - UL_NAS_Transport_Msg = UL_LPP_ACK
	NONE	IF Condition (((UL_NAS_Transport_Msg == "2C00") || (UL_NAS
E-Cell A	SS <-- MS	Uplink Generic NAS Transport
		ENDIF Condition
E-Cell A	SS --> MS	Downlink Generic NAS Transport
		ENDIF Condition

LPP procedure
- Assist Data
- Position Calculation

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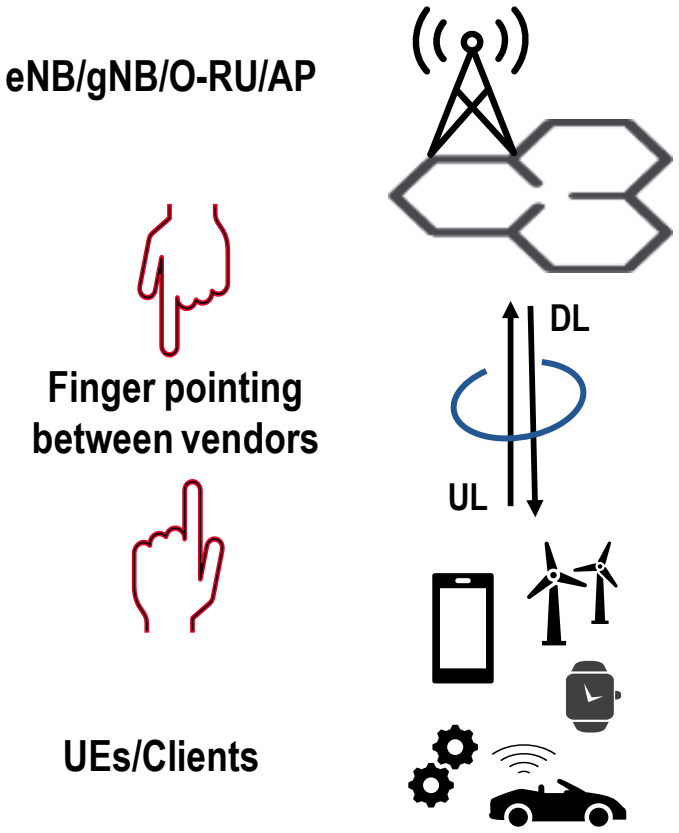
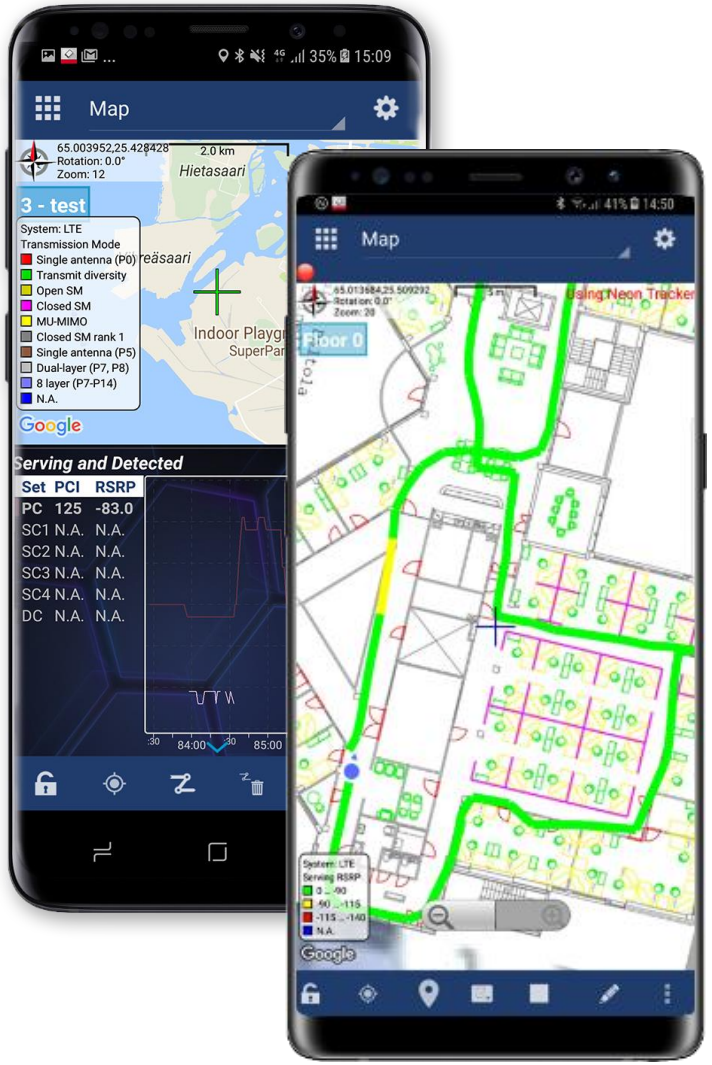
Troubleshooting Functional & Interoperability Issues



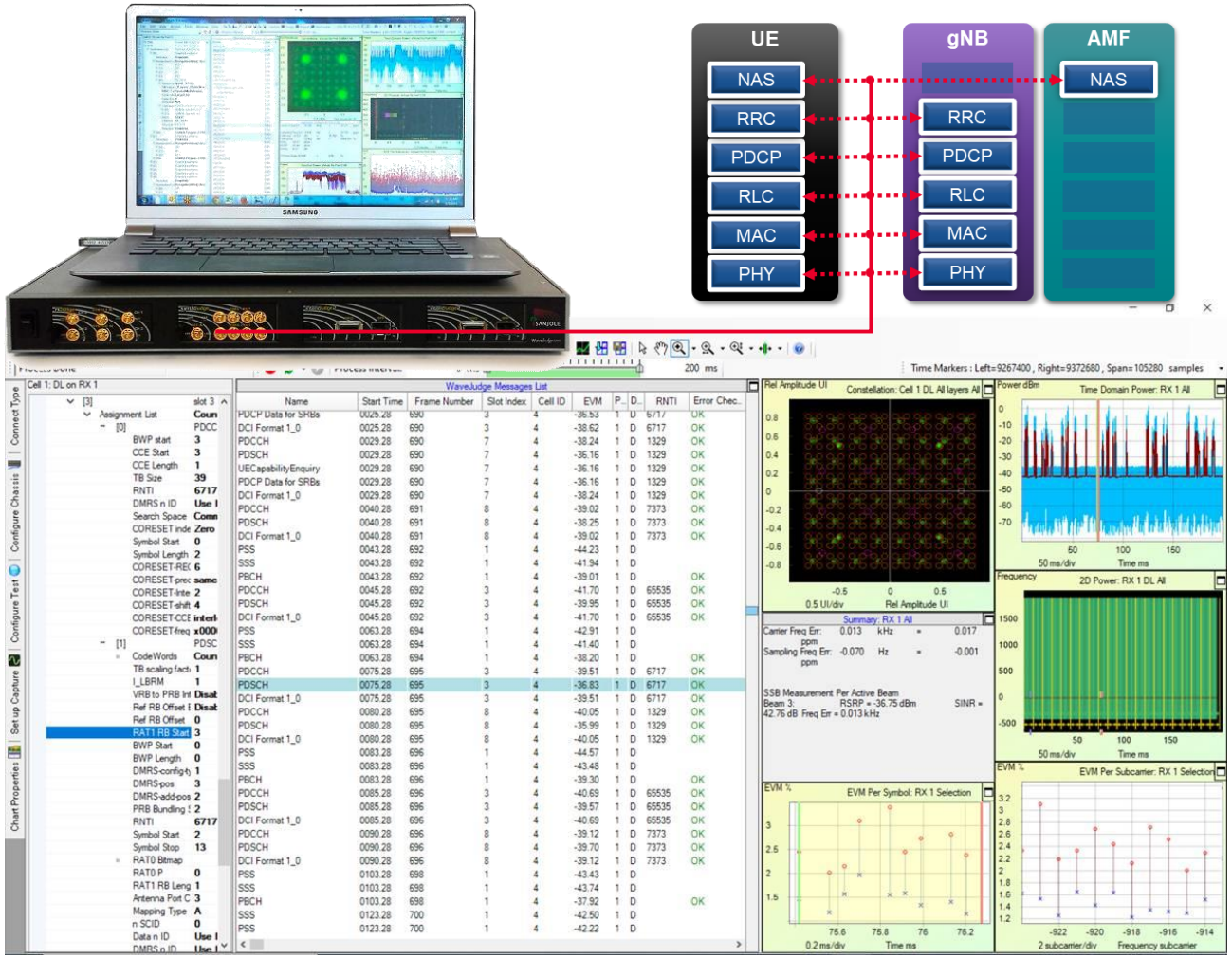
- Difficult to determine what Protocol messages were sent/received, relative to what/when PHY events occurred
- Diagnosing the root causes of problems between layers often takes hours, days or even weeks
- How to capture signals without interfering communications

Monitoring Wireless Mobile Network Performance

- **Measures** and **monitors wireless mobile networks** (including WiFi) performance and coverage from 2G to 5G SA
- Suitable for performing measurements **especially in indoor** offices and venues
- Rich variety of **real-time displays**, full RF and signaling data is stored to a measurement file from the **diagnostics interfaces**
- **Works on latest Android-based flagship terminals**
- Flexible **scripting** and **test sequencing** for different test needs
- Remote control and monitoring

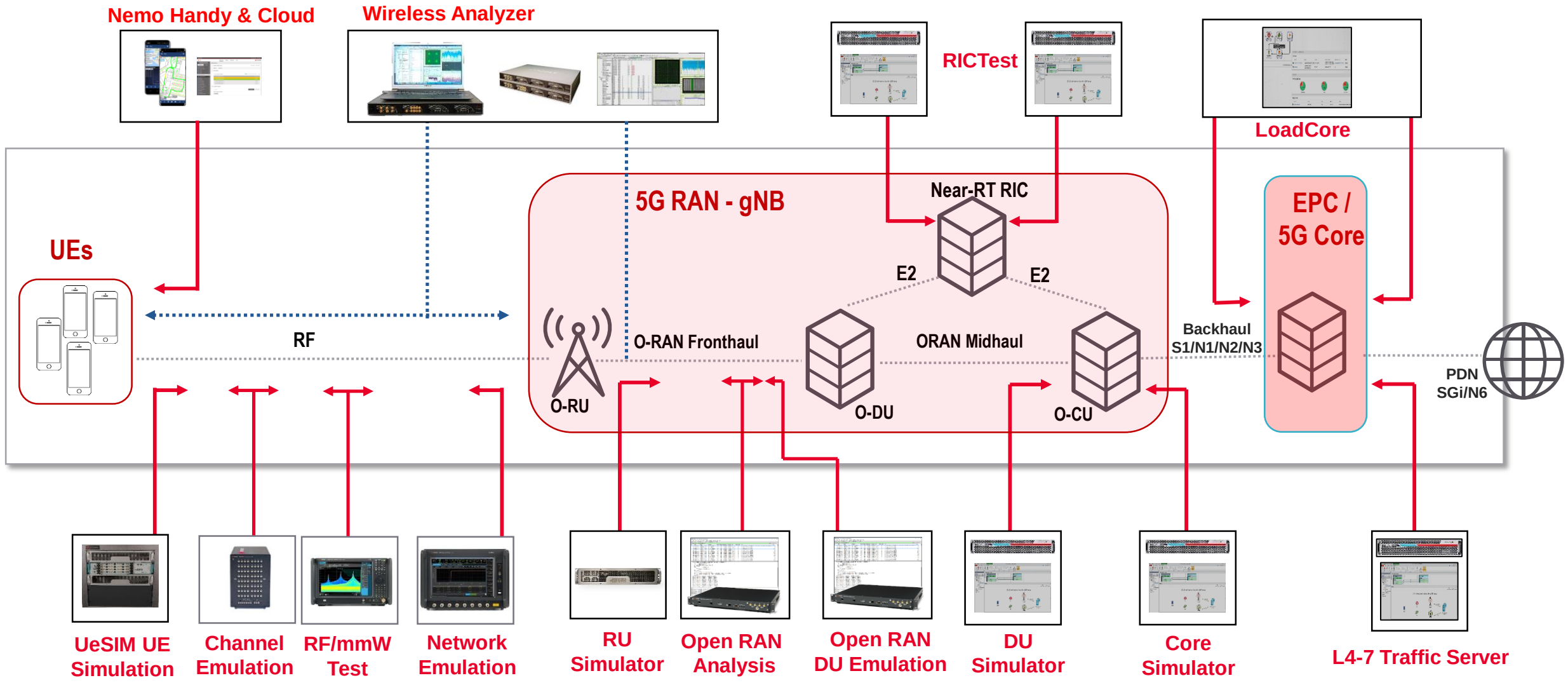


UE and gNB Interoperability Test Trouble Shooting



- **Situation:** With a new optimized software algorithm implemented on gNB to achieve higher DL throughput, UE detected ~80% PDSCH BLER compared with legacy algorithm.
- **Pain Point:** New gNB algorithm is working on a different UE chipset and cannot find significant issues. From UE side, need to conduct labor intensive troubleshooting into the code as high BLER is typically a complex problem.
- **Solution:** Using WaveJudge 5000 to analyze the IQ data and a bug related to PDSCH PRB offset from UE Model is identified easily just in a short time.

Keysight End-To-End 5G Test Portfolio



Optional Title of the Presentation