









発展するモバイルネットワークにおける 緊急通報

キーサイト・テクノロジー
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アジェンダ

1. 発展するモバイルネットワーク
2. 緊急通報の課題・試験の概要
3. 緊急通報試験をサポートするツール

3GPPの注目するアプリケーション

Vertical	Release 15	Release 16	Release 17	Release 18
eMBB 	<ul style="list-style-type: none"> 5G New Radio 5G Core Network NSA / SA mode FR2 (mmWave) 	<ul style="list-style-type: none"> Power saving MIMO enh Mobility enh DC/CA DSS NR-U Positioning RRM enh 	<ul style="list-style-type: none"> Power saving MIMO DSS UL Coverage 71GHz MSIM MR DC/CA FR1 1024QAM NR UDC RAN slicing SON Small data Tx from INACTIVE QoE RedCap 	<ul style="list-style-type: none"> NR MIMO evolution Further UL coverage enh Evolution of Duplex Positioning evolution NW energy saving RedCap evolution QoE enh CA enh DSS Mobility enh
IIoT / NPN 		<ul style="list-style-type: none"> URLLC Positioning Private Networks TSN over 5G 	<ul style="list-style-type: none"> Higher accuracy positioning Private network enhancements Enhanced IoT and TSN/ URLLC support RedCap 	<ul style="list-style-type: none"> NTN evolution – IoT RedCap evolution Positioning evolution
Auto 		<ul style="list-style-type: none"> NR sidelink 	<ul style="list-style-type: none"> Enhanced NR-V2X services NR sidelink enhancements NR sidelink relay 	<ul style="list-style-type: none"> NR sidelink evolution Sidelink relay enhancements
RAN 		<ul style="list-style-type: none"> IAB 	<ul style="list-style-type: none"> More IAB eNB architecture evolution 	<ul style="list-style-type: none"> Smart repeaters AI/ML for Air Interface
NTN 			<ul style="list-style-type: none"> NR NTN NB-IoT/eMTC NTN 	<ul style="list-style-type: none"> NTN evolution - NR
Public Safety 			<ul style="list-style-type: none"> NR multi-cast / broadcast services Proximity based services 	<ul style="list-style-type: none"> Sidelink enhancements
VR/XR 			<ul style="list-style-type: none"> VR profiles for streaming Immersive CODEC and teleconferencing 	<ul style="list-style-type: none"> Enhancements for XR
UAV 				<ul style="list-style-type: none"> 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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携帯電話端末の緊急通報における課題

- 複数SIM対応の携帯電話端末で、緊急通報をデータ専用SIMから発呼される、もしくは、緊急通報の位置情報のやりとり時にSIMのID情報が整合せず通信路が切断されたりするなど、緊急通報がつかないケースが発生している、
- 現在は携帯電話端末側でソフトウェアの改修を都度行うことにより不具合の解消が図られているが、今後の複数SIM対応の携帯電話端末の更なる普及を見据え、緊急通報の相互接続性確保に向けた仕組みが求められる。

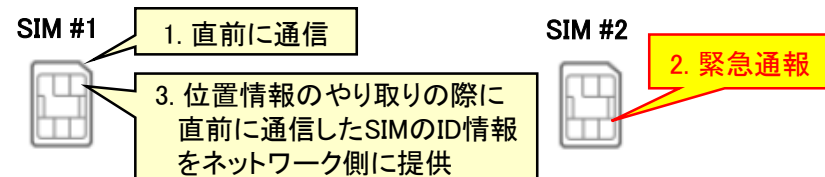
【事例A】 緊急通報をデータSIMから発呼

- 端末側では音声付データSIMとデータ専用SIMの区別ができないため、ユーザーが緊急通報時のSIMを適切に設定しないと緊急通報がつかない。



【事例B】 SIMのID情報の不整合による通信切断

- 緊急通報を行う直前の通信を緊急通報を行うSIMとは別のSIMにより行っていた場合、位置情報のやり取りの際にネットワーク側に別のSIMのID情報が渡されてしまい、ネットワーク側で通信を切断。



携帯電話端末の緊急通報・機能試験方法に対する検討課題

携帯電話端末側に課せられている「緊急通報を発信する機能」及びネットワーク側に課せられている「緊急通報を緊急通報受理機関に接続すること」の要件明確化

複数SIM対応携帯電話端末の緊急通報機能に関し、ネットワークに確実に接続することを確認するための試験内容

緊急呼に際して行うこと

日本における緊急呼の扱い

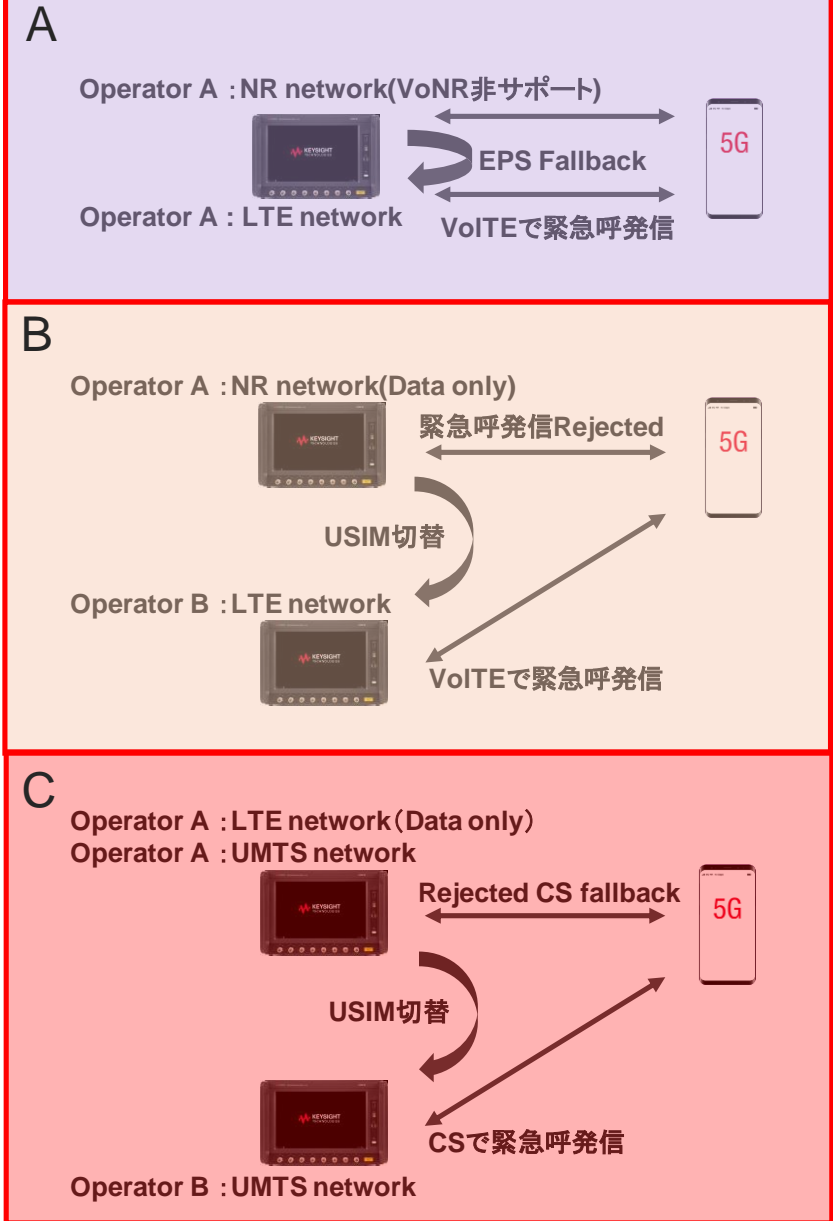
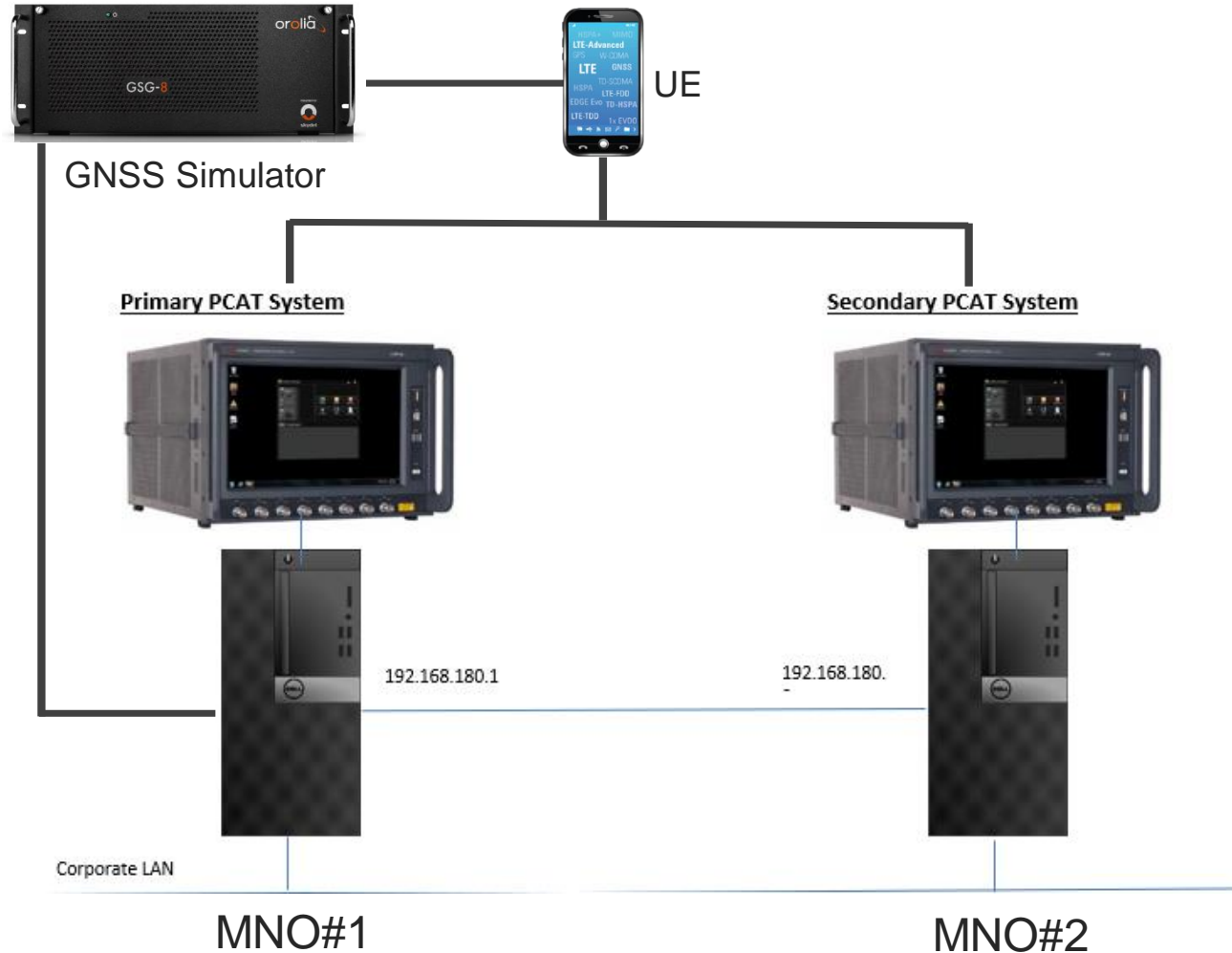
1. 音声対応のUSIMが装着されたUEにて110/118/119をダイヤルした際に利用できる
2. データ専用USIMでは緊急呼を発呼する事ができない
3. USIMが装着されていないUEでは緊急呼を発呼する事ができない

緊急呼試験の流れ

1. SIPプロトコルによる発呼手順
2. 音声用のベアラを張る
3. 位置情報の測位計算を行う

システム構成

Dual USIM Dual Standbyシステム
 Simulator/制御PC毎にMNOネットワークを構築



緊急通報試験・参考シーケンス (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手順

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ベアラとIMSベアラの設定とSIP Registration

緊急通報試験・参考シーケンス (2)

緊急通報による発信 (EPSFallback後)

- 緊急呼用IMSベアラ (sos) の確立
- SIPプロトコルによる呼接続手順

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

GNSS Simulatorの設定と起動

NONE	User Prompt [Click 'OK' then initiate MO emergency call to 112]
	Comment [//Emergency Bearer Context establishment]
NONE	Loq 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]

緊急通報試験・参考シーケンス (測位情報)

	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

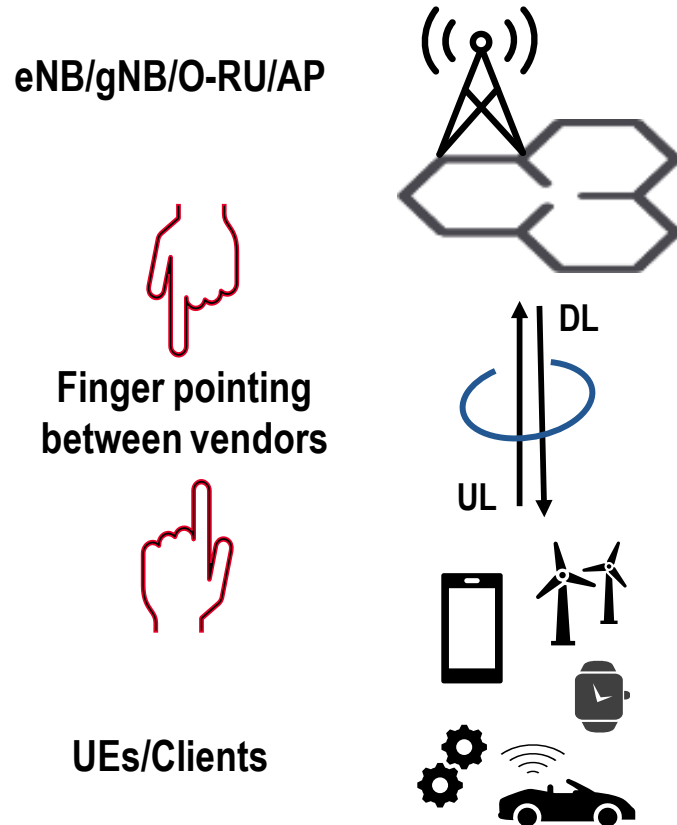
LPP手順

- アシストデータの提供
- 測位結果の取得

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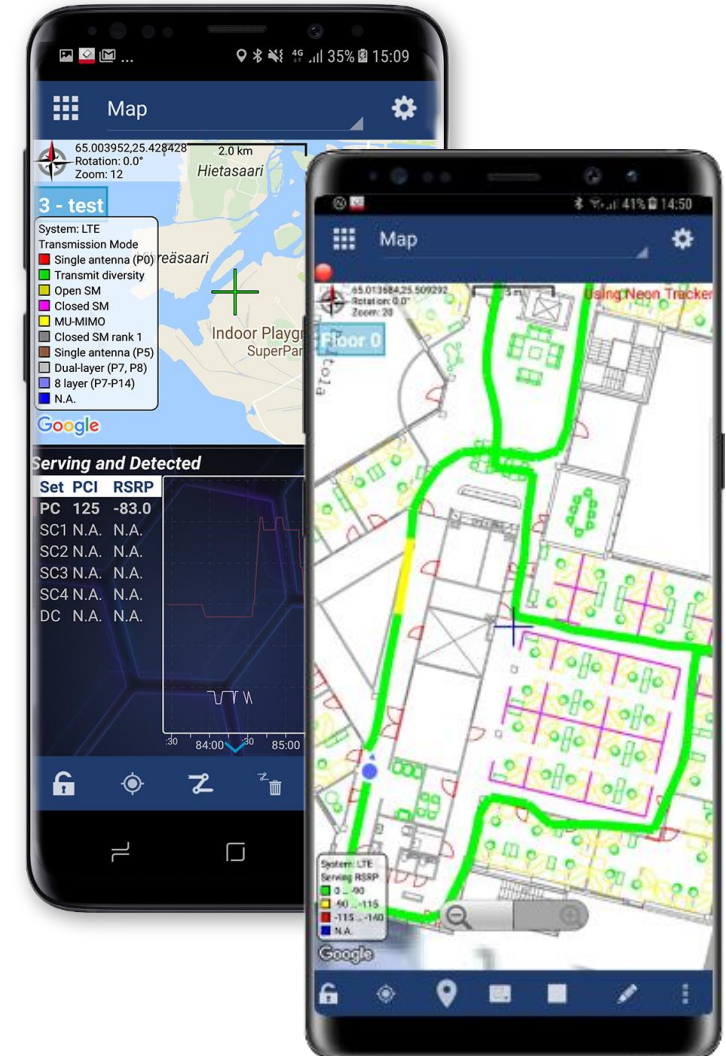
機能と接続に係る解析と問題点



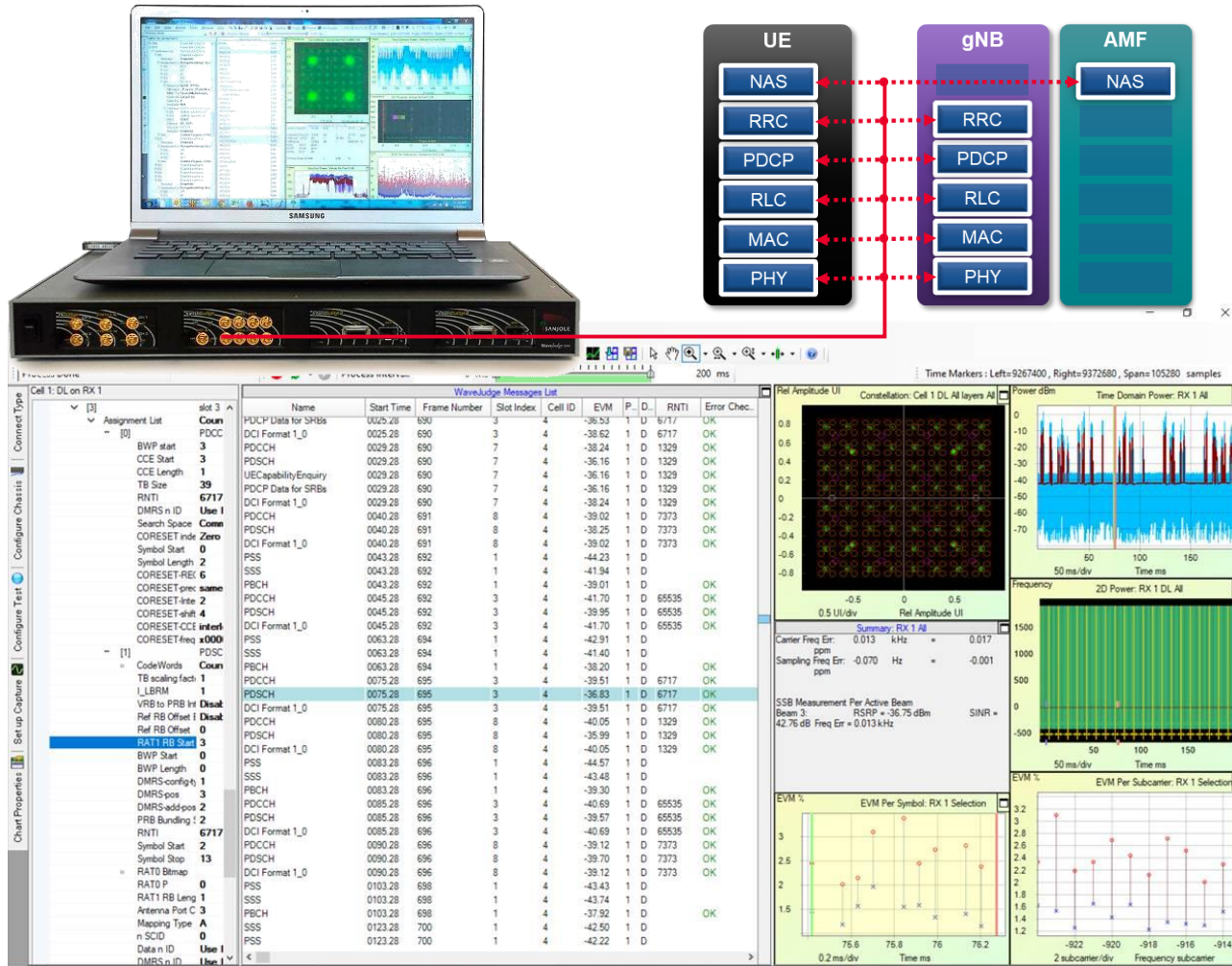
- Difficult to determine what Protocol messages were sent/received, relative to what/when PHY events occurred
- Diagnosing the root causes of problems between layers often takes hours, days or even weeks
- How to capture signals without interfering communications

モバイルネットワークの性能評価

- **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

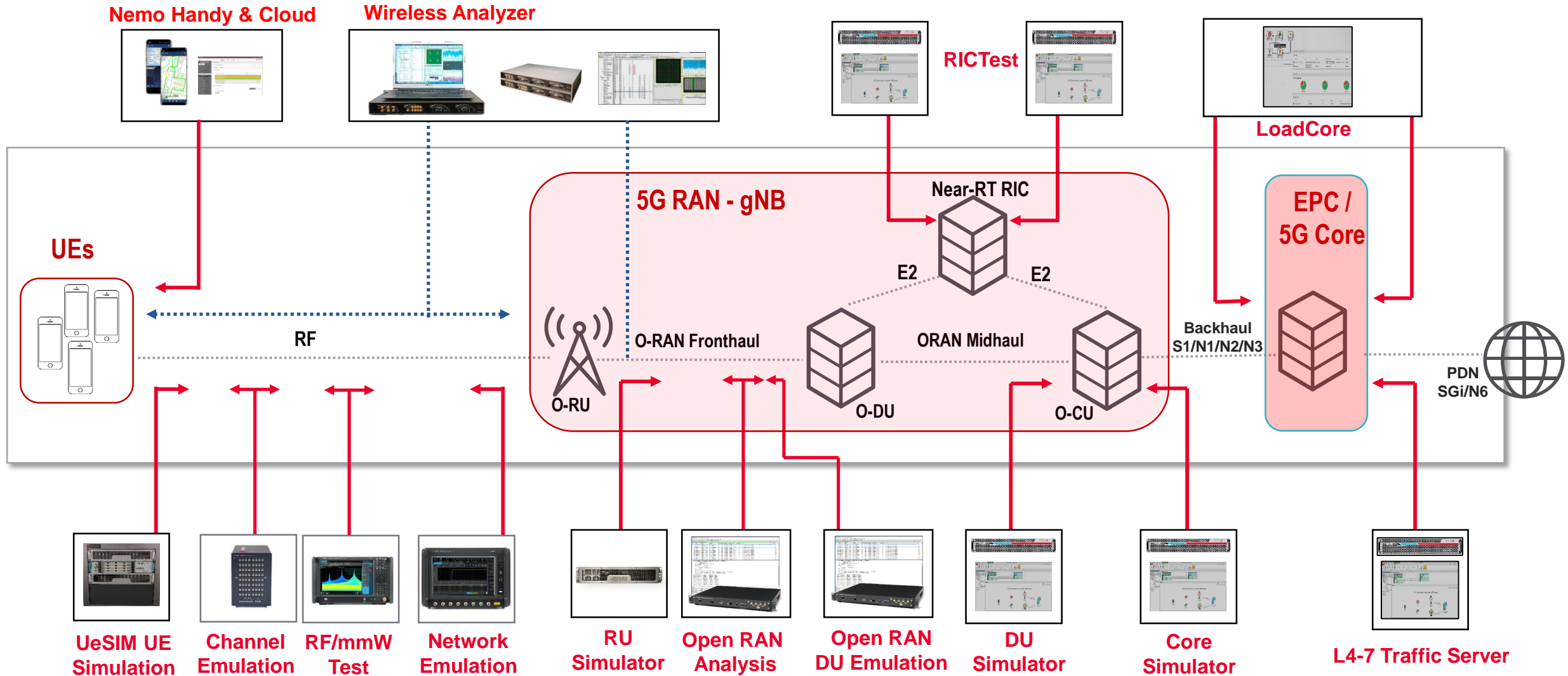


端末 - 基地局間での接続性問題のトラブルシューティング



- 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.

5Gモバイルネットワークの試験ソリューション





Optional Title of the Presentation