Anritsu envision:ensure

Signalling Tester MD8475A
Product Introduction

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- High RF Level Accuracy, UL Power/ Frequency Meas.
- CPC, Enhanced Cell FACH, Fast Dormancy, RRC Status Change, CDRX, TBS, BSR

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- SmartStudio Manager (LTE-FDD, LTE-TDD, W-CDMA/HSPA+, GSM/(E)GPRS, C2K/eHRPD, TD-SCDMA)

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- LTE-FDD, LTE-TDD, W-CDMA/HSPA+, GSM/(E)GPRS, C2K/eHRPD, TD-SCDMA/TD-HSPA
- External Packet Data, Throughput Test Result

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- IMS Service: VoLTE, SMS over IMS, SRVCC, CSFB, RCS,
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- Cellular /WLAN Interworking(ePDG, ANDSF,MAPCON etc.)

Basic Feature

Radio Bearer/ Basic Feature

- LTE-FDD, LTE-TDD, W-CDMA/HSPA+, GSM/(E)GPRS, C2K/eHRPD, TD-SCDMA/TD-HSPA
- LTE/2G/3G InterRAT, LTE/2G/3G IntraRAT HO (incl. Measurement Based HO and CSFB)
- SMS: SMS(over SGs)/MMS

Required Test Items for IVS

- Target test application of MD8475A

Repeated Test
- Regression Test
- Collection of statistical data to achieve high quality

Mobility Test
- Connectivity tests on moving between cells
- Connectivity tests on moving between countries

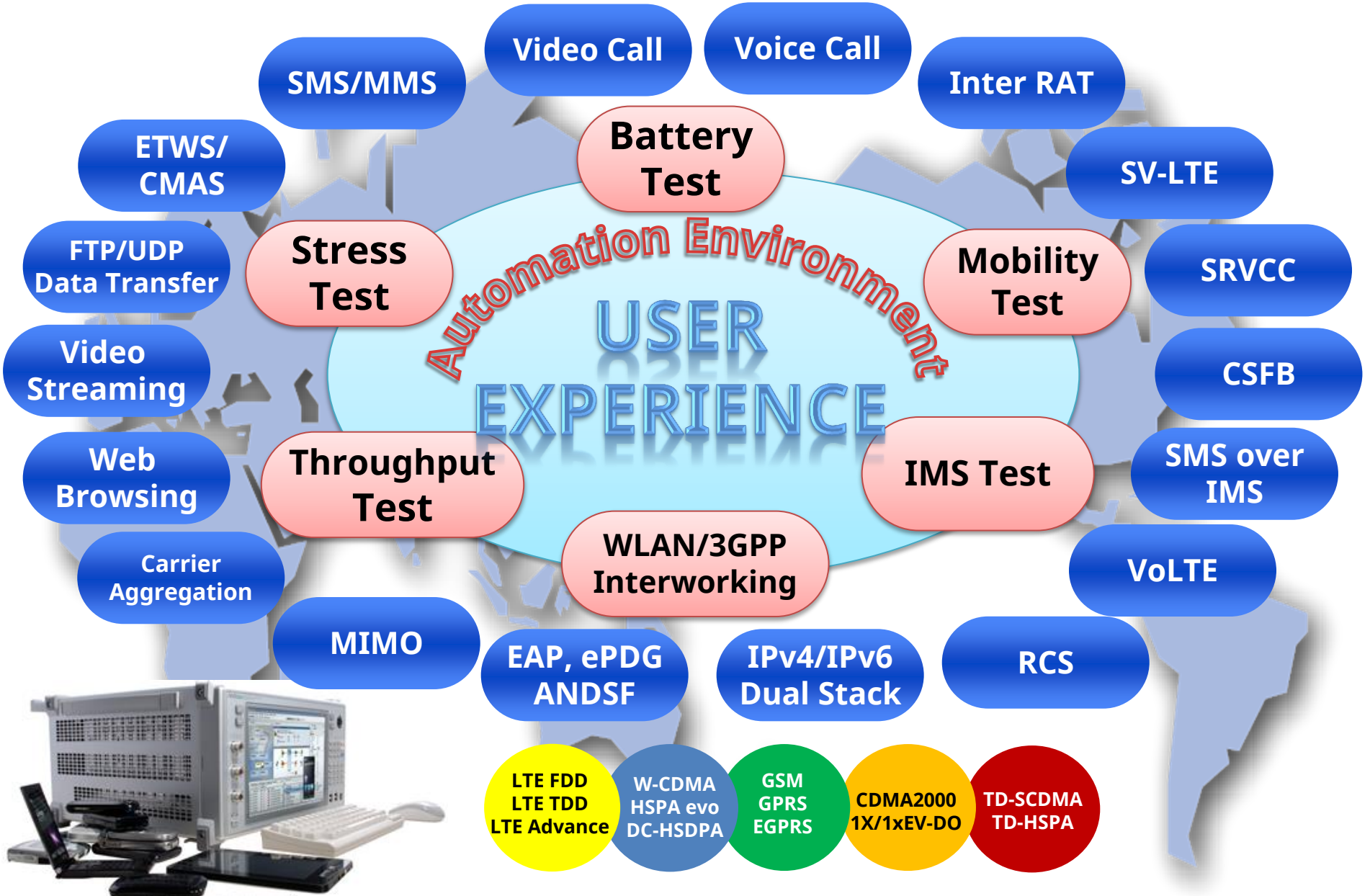
In-vehicle Emergency Call System
- Development in early stage and conformance test for eCall / ERA GLONASS

Audio Quality Test
- Tests defined in GOST

Server Connectivity Test
- Tests to check connectivity for each car vendors' specific services e.g. TOYOTA T-Connect, NISSAN CARWINGS, Honda AcuraLink, GM On-Star
- Available to test connectivity from domestic lab. to the oversea server

MD8475A Concept

MD8475A Concept



MD8475A Concept

Reduce the customer's evaluation cost,
Remove the technical barrier for smartphone evaluation

- **Easy to evaluate/ Needless to create scenarios**
  - Enables to evaluate by just GUI operation with SmartStudio
  - Supports not only normal test but also negative test and complex IMS test without SIP knowledge
- **4G to 2G/3G Multi-RAT test capability for any operator's devices**
  - All Radio bearer and various 2cell test supported
- **Easy setup the Automation Test without high skill**
  - Creates the automation procedure with GUI sequencer
  - Integrated test configuration with UE control and other equipment

MD8475A Medium- and Long-term Concept

- **A goal to reach for “Smartphone Tester”**
  - Keep adding the test capability to GUI based State-Machine
  - Enhance Multi-RAT capability (LTE-CA, 3CC, Mobility etc.) to meet the TTM for Smartphone commercial device R&D
- **Catch up advanced mobile service**
  - Lead new upcoming mobile service and advanced service such as WLAN offloading.
- **Realize Carrier Acceptance Test solution**
  - Realize operator specific acceptance test solution for Smartphone applications and battery performance that will especially become of increasing importance for user experience in the market

MD8475A Overview

MD8475A Product Overview

- **LTE(FDD/TDD) system simulation**
- **Support 150Mbps with 2x2 MIMO / 300Mbps with LTE-CA 2CC MIMO** (2-box config.) **/ 450Mbps with LTE-CA 3CC MIMO** (MD8475A + MD8430A BTM config.)
- **Multi-system capable platform**
  - W-CDMA/HSPA/HSPA evo/DC-HSDPA, GSM/GPRS/EGPRS
  - CDMA2000 1X/EV-DO, TD-SCDMA/HSPA
- **State-machine based GUI "SmartStudio"**
- **Multi-cell IntraRAT / InterRAT capable platform**
  - 2-cell IntraRAT: LTE 2-cell, W-CDMA 2-cell, GSM 2-cell, TDS 2-cell
  - 2-cell InterRAT: LTE/W, LTE/G, LTE-TDD/TDS, W/G, TDS/G
  - 3-cell LTE/LTE/LTE
  - 4-cell InterRAT:LTE/LTE, W/W using 2 boxes
  - CDMA2000 multi-sector / multi-carrier (*script only)
  - LTE-CDMA2000 (Hybrid mode) 2-box Interworking, Optimized HO
  - LTE-CDMA2000 single-box Interworking with 2RF
- **Built-in IMS service function**
  - State machined based CSCF server with supporting network servers
  - Synchronization with radio access network for QoS & mobility management
  - Configurable virtual user agents for end-to-end sessions, enhanced with RCS features
- **Built-in SMS/PWS (ETWS, CMAS) center**
- **Built-in PHY/IP layer throughput monitor**
- **Built-in PHY layer measure monitor**
- **UL RF power measurement** (LTE/W-CDMA/GSM)
- **BLER** (LTE/W-CDMA)

SmartStudio

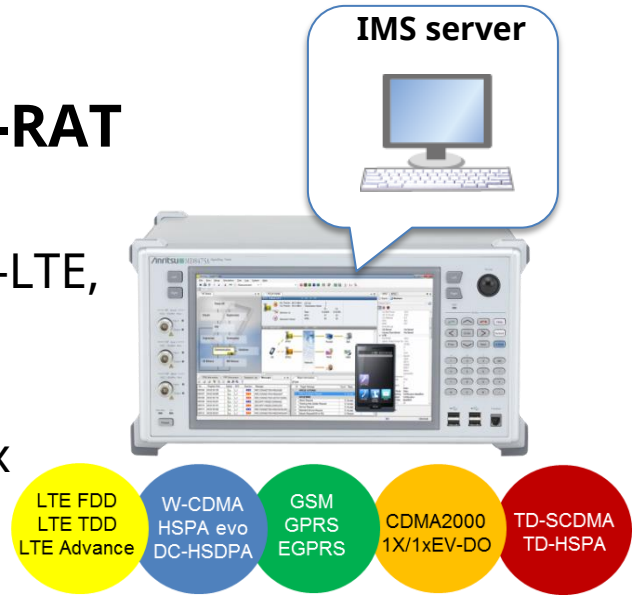
MD8475A Signalling Tester – Unique Features

Integrated IMS test environment with GUI operation

- IMS server is configured by GUI operation
- Highly integrated platform to realize effective troubleshooting (Wireless protocol and SIP messages)
- Advanced built-in IMS server and multi-RAT capability for SR-VCC type tests
- IMS/VoLTE supplementary service and abnormal testing for further application
- No external PC is required for IMS/VoLTE tests

Strong C2K and TDS capabilities for Multi-RAT

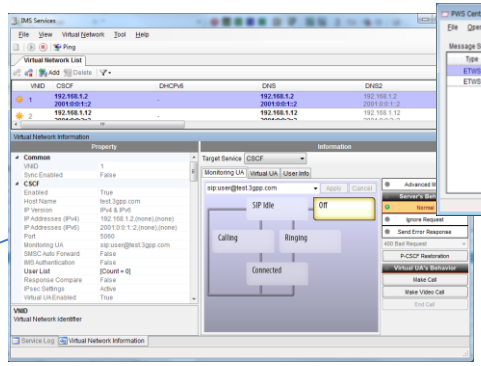
- Install all communication standards
- Various LTE/C2K interworking available such as SV-LTE, eCSFB, redirection/optimized handovers
- Leading TD-SCDMA market position and unique TD-LTE/TD-SCDMA InterRAT capability within 1-box
- Various CSFB combinations available



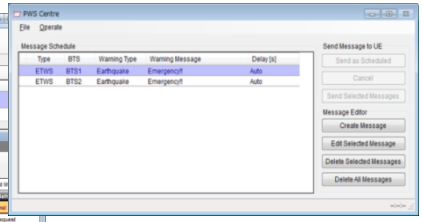
MD8475A Signalling Tester – Unique Features

Easy operation with State-machine GUI (SmartStudio)

- Interactive test environment without complicated test scripts
- Synchronize built-in IMS server
- Set various base station parameters according to user test environment
- Automatic call setting is performed according to DUT capability
- Unique graphical PWS center application available for CMAS/ETWS service



IMS (CSCF) Server



SMS Center
PWS (ETWS/CMAS) Center

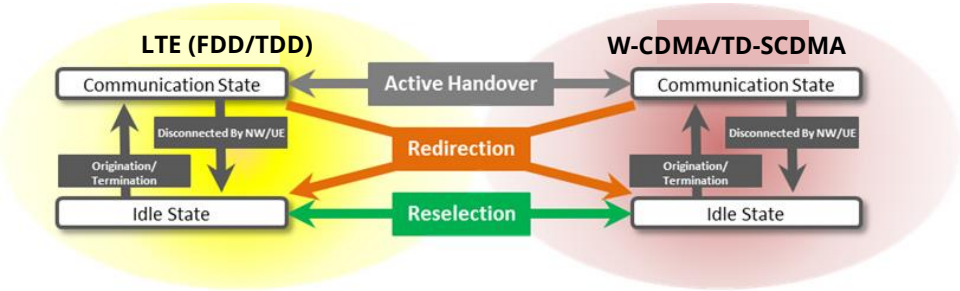
Basic Features

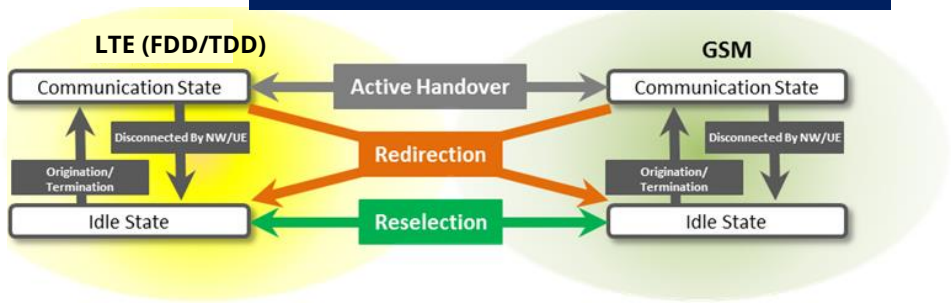
- **Multi-RAT Applications**
- **LTE/C2K Interworking**
- **Cell Setting**
- **State Change/Reject**
- **RF Measurement**

Multi-RAT

- Simple 2-cell handover simulation for commercial Smartphone & Data terminal devices
- MD8475A SmartStudio State-machine helps easy 2-cell test
- No complicated test script is required
  - Cell Selection & Reselection
  - Handover (Intra/Inter-RAT)
    - Redirection
    - Active HO (with or without Measurement)
  - CSFB / e1xCSFB
  - SR-VCC

Repeatable simulation cannot be realized on the actual Network or Base Stations





Multi-RAT – 2-cell Combinations

- MD8475A 2-cell test capability
  - SmartStudio supports all global commercial network combinations

BTS2 \ BTS1	LTE(FDD/TDD)	W-CDMA	GSM	CDMA2000	TD-SCDMA	WLAN
LTE-FDD	✓	✓	✓	✓	✓	✓
TD-LTE	✓	✓	✓	✓	✓	✓
W-CDMA	✓	✓	✓	n/a	n/a	✓
GSM	✓	✓	✓	n/a	✓	✓
CDMA2000	✓	n/a	n/a	n/a	n/a	✓
TD-SCDMA	✓	n/a	✓	n/a	✓	✓
WLAN	✓	✓	✓	✓	✓	

SRVCC

Reference sequence in TS36.523-1 Rel.11

Section	Procedure	to UTRAN(FDD)	to GERAN	Comment
13.4.3.1	E-UTRA voice to UTRA CS voice / SRVCC	Supported	N/A	PS to CS HO(Single call HO)
13.4.3.2	E-UTRA PS voice + PS data to UTRA CS voice + PS data / SRVCC	Supported*1	N/A	PS+PS to CS+PS(Multi-call HO)
13.4.3.3	E-UTRA voice to GSM CS voice / SRVCC	N/A	Supported	PS to CS HO(Single call HO)
13.4.3.4	E-UTRA voice to UTRA CS voice / Unsuccessful case / Retry on old cell / SRVCC	Supported*	N/A	
13.4.3.5	E-UTRA voice to GSM CS voice / Unsuccessful case / Retry on old cell / SRVCC	N/A	Supported*1	
13.4.3.6	E-UTRA PS voice + PS Data / HO cancelled / Notification procedure / SRVCC	Supported*	Not Supported	
13.4.3.7	E-UTRA voice to UTRA CS voice / aSRVCC / MO call	Supported	N/A	PS to CS HO(Single call HO)
13.4.3.8	E-UTRA voice to UTRA CS voice / aSRVCC / MO call / Forked responses	Not Supported	N/A	
13.4.3.9	E-UTRA voice to UTRA CS voice / aSRVCC / MO call / SRVCC HO failure	Supported*1	N/A	
13.4.3.10	E-UTRA voice to UTRA CS voice / aSRVCC / MT call	Supported	N/A	PS to CS HO(Single call HO)
13.4.3.11	E-UTRA voice to UTRA CS voice / aSRVCC / MT call / SRVCC HO failure	Supported*1	N/A	
13.4.3.12	E-UTRA voice to UTRA CS voice / aSRVCC / MT call / User answers in PS domain	Not Supported	N/A	
13.4.3.13	E-UTRA voice to UTRA CS voice / aSRVCC / MT call / User answers in PS domain / SRVCC HO cancelled	Supported*1	N/A	ESM Notification procedure(to check re-Invite procedure)
13.4.3.14	E-UTRA PS voice + PS data to UTRA CS voice + PS data / aSRVCC / MO call	Supported	N/A	PS+PS to CS+PS(Multi-call HO)
13.4.3.15	E-UTRA PS voice + PS data to UTRA CS voice + PS data / aSRVCC / MO call / SRVCC HO cancelled	Supported*1	N/A	ESM Notification procedure(to check re-Invite procedure)
13.4.3.16	E-UTRA PS voice + PS data to UTRA CS voice + PS data / aSRVCC / MT call	Supported	N/A	PS+PS to CS+PS(Multi-call HO)
13.4.3.17	E-UTRA PS voice + PS data to UTRA CS voice + PS data / aSRVCC / MT call / SRVCC HO cancelled	Supported*1	N/A	ESM Notification procedure(to check re-Invite procedure)

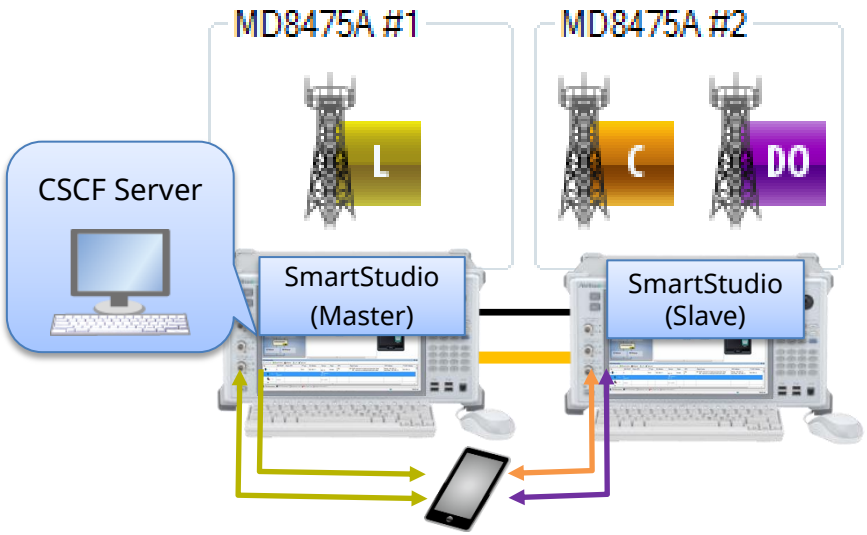
*1) the feature is not verified with a commercial device.

LTE-C2K Interworking

- 2 solutions available for LTE/C2K interworking
  - User can choose LTE/C2K hybrid mode and/or simple test environment
  - Supports all LTE/C2K network conditions with 2-box configuration

2-Box Solution

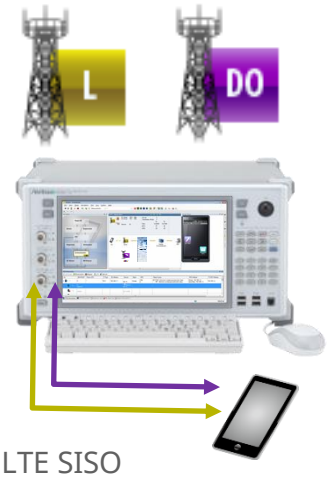
- Master MD8475A can control to slave MD8475A



Single- Box Solution

- Configure LTE/C2K test environment within single platform

- LTE SISO
- CDMA2000 1xRTT (without eHRPD)



- LTE SISO
- CDMA2000 eHRPD (without CDMA2000 1xRTT)

LTE-C2K Interworking

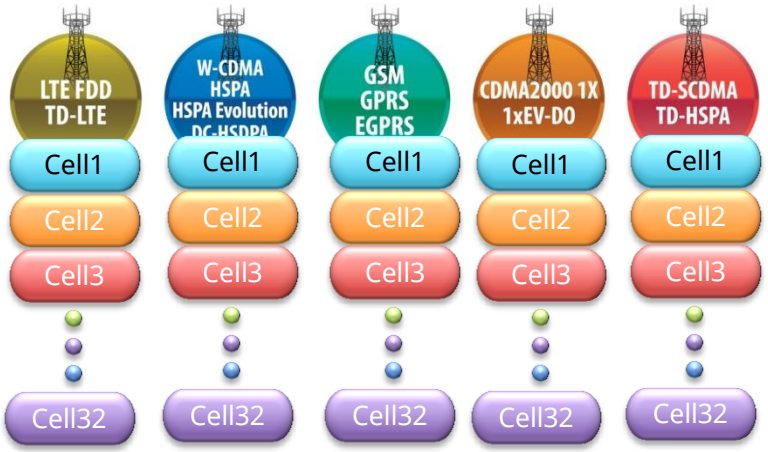
LTE-C2K 1x/eHRPD hybrid simulation model

	Service/Function	Single-box Solution*1	2-Box Solution	SourceBearer (State)	TargetBearer (State)	Procedure	Required function
(1)	Simultaneous Voice and LTE (SV-LTE)	Supported	Supported	E-UTRA (Idle/Connected)	1xRTT (Idle)		
(2)	Reselection (LTE -> C2K 1X)	Supported	Supported	E-UTRA (Idle)	1xRTT (Idle)	Reselection	
(3)	Reselection (C2K 1X -> LTE)	Supported	Supported	1xRTT (Idle)	E-UTRA (Idle)	Reselection	
(4)	MO/MT Voice Call (Rel.8 1xCSFB)	Supported	Supported	E-UTRA (Idle/Connected)	1xRTT (Connected)	Redirection	
(5)	MO/MT Voice Call (ECAM based e1xCSFB)	Supported	Supported	E-UTRA (Idle/Connected)	1xRTT (Connected)	Redirection	SystemTime Sync Pre-Registration(S102)
(6)	MO/MT Voice Call (UHDM based e1xCSFB)	Supported	Supported	E-UTRA (Idle/Connected)	1xRTT (Connected)	Handover	SystemTime Sync Pre-Registration(S102)
(7)	Non-Optimized Reselection (LTE -> eHRPD)	Supported	Supported	E-UTRA (Idle)	HRPD (Idle)	Reselection	
(8)	Non-Optimized Reselection (eHRPD -> LTE)	Supported	Supported	HRPD (Idle)	E-UTRA (Idle)	Reselection	
(9)	Optimized Reselection (LTE -> eHRPD)	Supported	Supported	E-UTRA (Idle)	HRPD (Idle)	Reselection	SystemTime Sync Pre-Registration(S101) Cascade Port Connection
(10)	Non-Optimized Redirection (LTE -> eHRPD)	Supported	Supported	E-UTRA (Connected)	HRPD (Connected)	Redirection	Cascade Port Connection
(11)	Optimized Redirection (LTE -> eHRPD)	Supported	Supported	E-UTRA (Connected)	HRPD (Connected)	Redirection	SystemTime Sync Pre-Registration(S101) Cascade Port Connection
(12)	Optimized Handover (Data Call) (LTE -> eHRPD)	Supported	Supported	E-UTRA (Connected)	HRPD (Connected)	Handover	SystemTime Sync Pre-Registration(S101) Cascade Port Connection

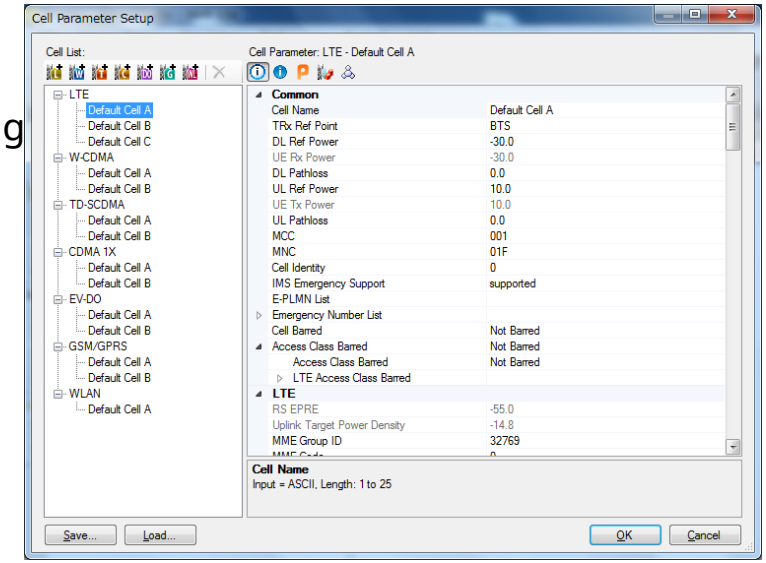
*1: Single-box Solution does not support 1x/EVDO hybrid mode

Cell Setting

- SmartStudio has an internal database that can store up to 32 cell parameter profiles that can be selected to be used for setting up simulation for communicating to the UE.



- SmartStudio can setup many cell parameters from GUI.
  - Cell information e.g. PLMN, TAC/LAC/RAC, Cell ID
  - RF settings e.g. Tx/Rx power, Band, Channel
  - MAC and RLC settings related to packet rate
  - Barring settings e.g. cell barring, access class barring
  - Timer
  - Cell selection / reselection parameters
  - Network name, time zone
  - Input hex message for SIB
  - Neighbour cell list

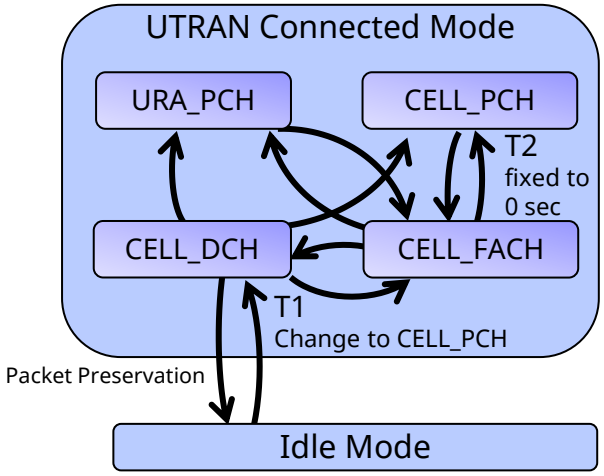


RRC State Change

- Network simulator shall implement inactivity timer so RRC connection will be released when device has been inactive for certain period of time.
  - The duration of the inactivity time shall be adjustable.
  - Network simulator shall be able to re-establish connection (MO/MT) after the connection is released.

- Anritsu Response - Supported

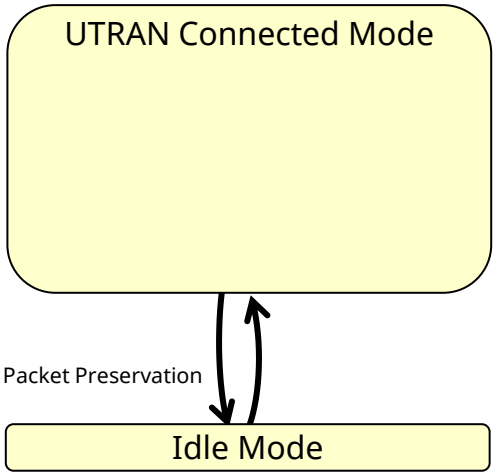
- W-CDMA



Inactivity Timer
MD8475A SmartStudio
Supports;
>T1=Change to CELL_PCH
[5 to 600 sec.]*
>T2 = 0 sec(fixed).

Packet Preservation
MD8475A SmartStudio
Supports;
>Change to Idle Mode
[5 to 600 sec.]*

- LTE/ TD-SCDMA

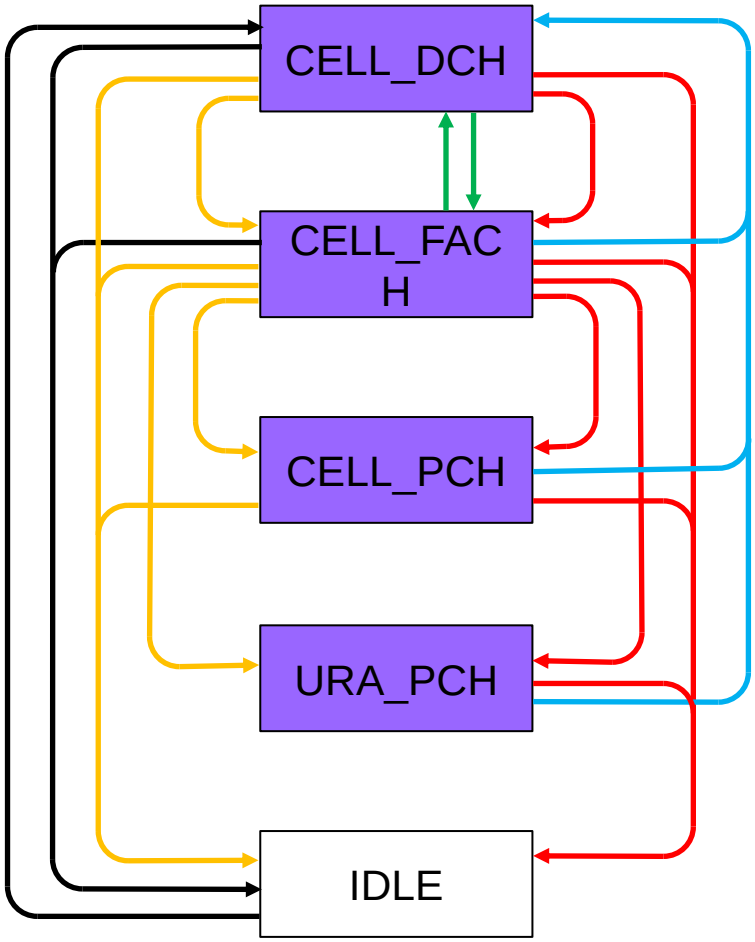


Packet Preservation
MD8475A SmartStudio
Supports;
>Change to Idle Mode
[5 to 600 sec.]*

*:0 is treated as Infinity.

RRC State Change (W-CDMA)

- Brand new triggers for the RRC State Change
  – Fast Dormancy & Measurement Report



Normal path

When request by user or UE, the state transition is performed.

Inactivity timer

When expiring Status Change Timer, the state transition is performed.

Fast Dormancy

When receiving a Signalling connection release message included in the IE "Signalling Connection Release Indication Cause", the state transition is performed.

Traffic Volume

When receiving measurement report for Event 4a / 4b, the state transition is performed.

Anritsu spec

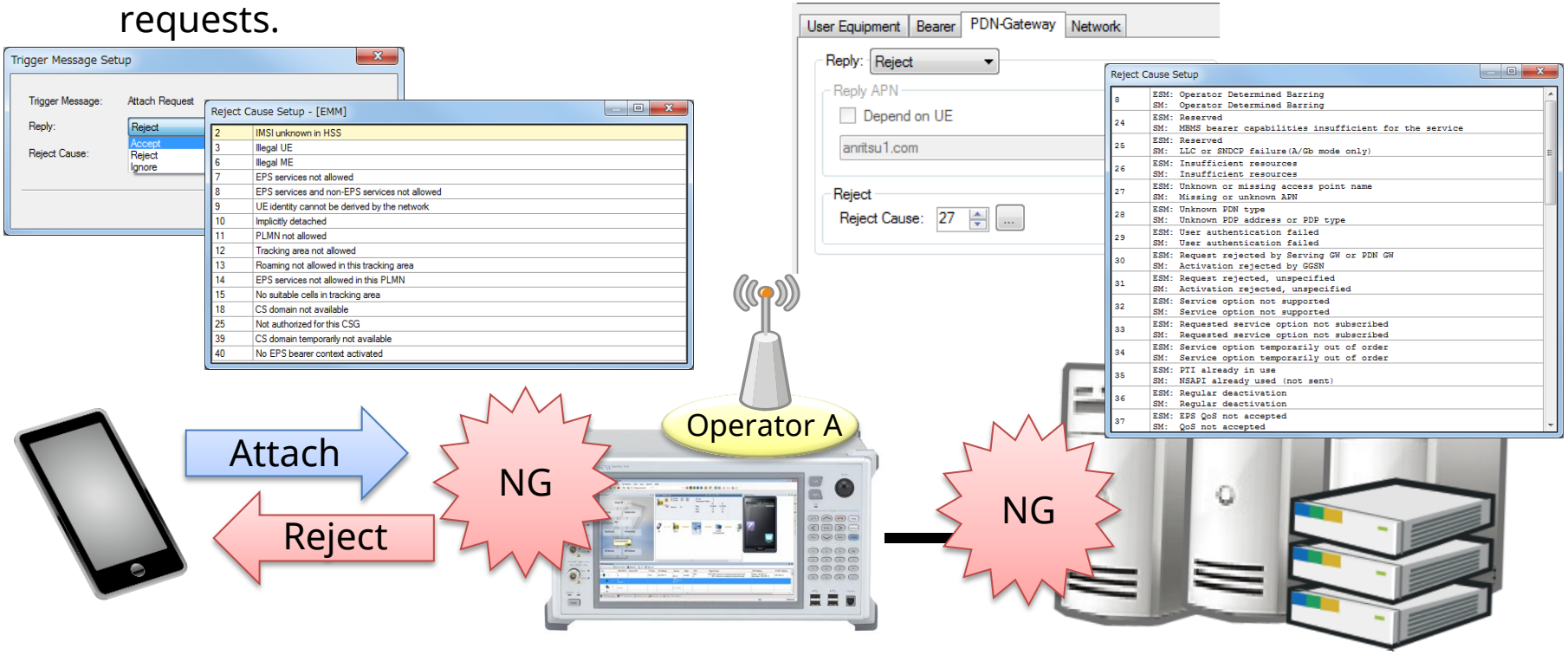
When the communication request of the packet data (etc.) occurs, the state transition is performed.

Reject Function(1/2)

- A semi-normal testing can be performed by easy setup for LTE, W-CDMA, TD-SCDMA, GSM.
  - Attach Reject

    Setting specific messages when the terminal connects to the base station can be used to reject terminal connection requests.
  - APN Reject

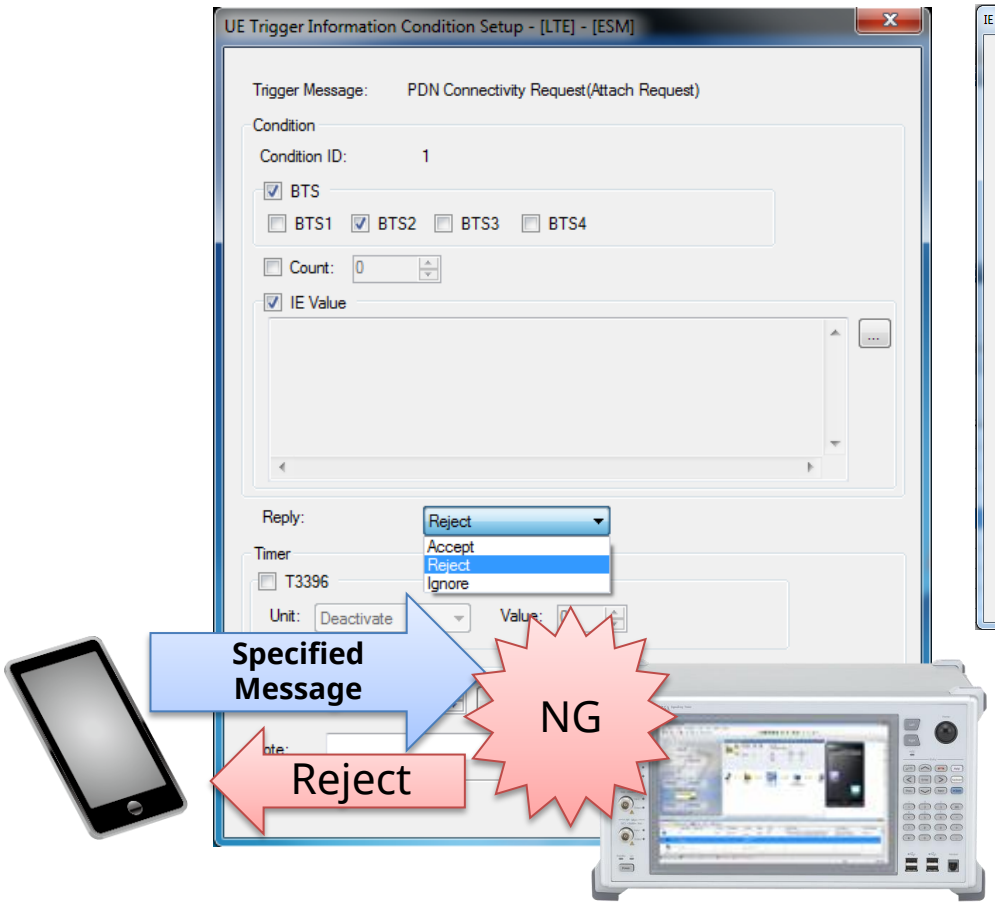
    Setting specific messages when the terminal connects to the network server can be used to reject terminal connection requests.

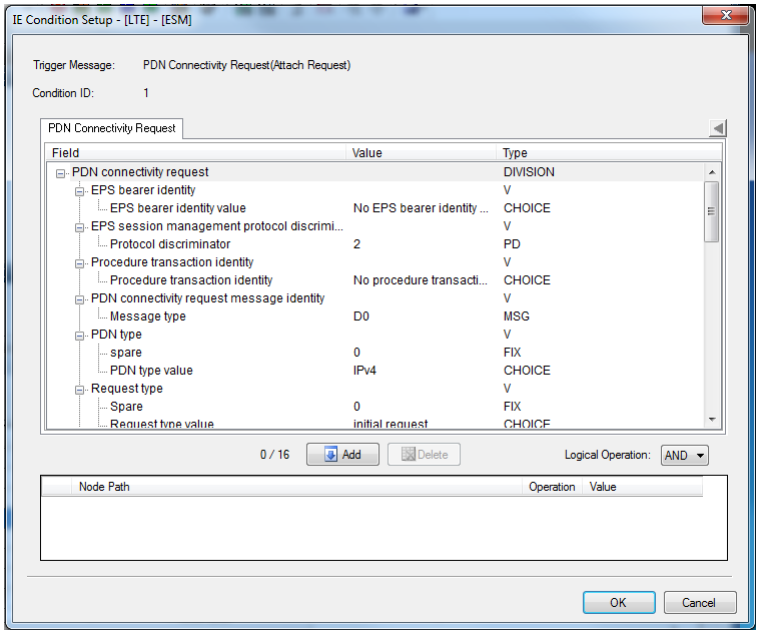


Reject Function(2/2)

- A semi-normal testing can be performed by easy setup.
  - UE Message Reject

    Setting to reject by the condition when MD8475A receives a specified message from UE.



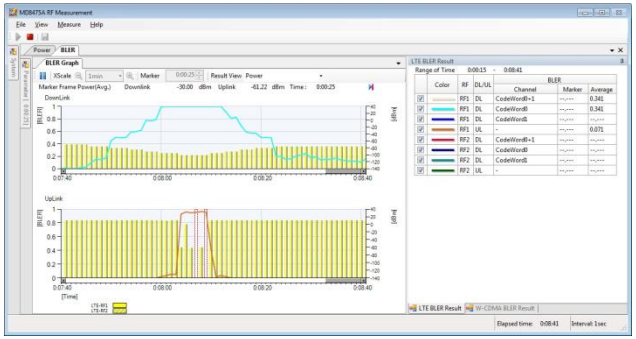


Note: UE Trigger Information Condition can specify several conditions to one UE Message and it perform Accept or Reject or Ignore according to the setting.

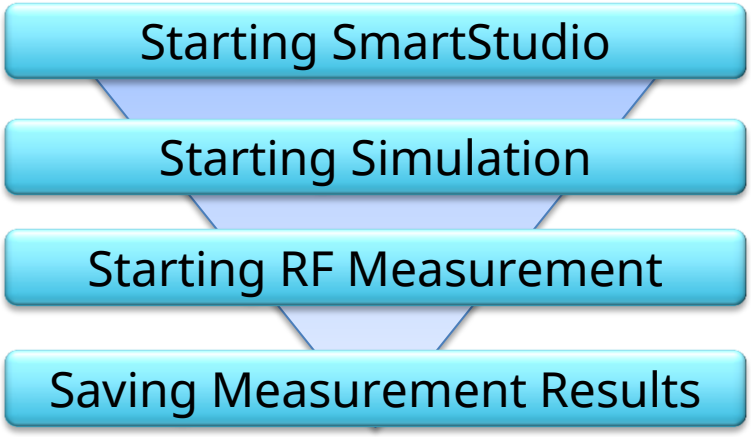
e.g. One Specified Message -> Condition A -> Reject
-> Condition B -> Ignore
-> Condition C -> Accept

RF Measurement*

Current measurement option can analyze Uplink RF power by useful GUI. This test environment is powerful tool for evaluating battery consumption of smartphone.



◆ Evaluation Procedure



MD8475A provides function to measure real air-link power which smartphone outputs under the communication.

*: Support system are LTE FDD/ W-CDMA/ GSM

Tx Specification

- Frequency range: 350MHz to 3600MHz
- Level range: -130 to -10dBm
- Level accuracy:
  ±1.0dB (≥-120dBm, 350MHz≤f ≤3000MHz, 20°C-30°C, Post-CAL)
  ±1.2dB (≥-120dBm, 3000MHz<f ≤3600MHz, 20°C-30°C, Post-CAL)

Rx Specification

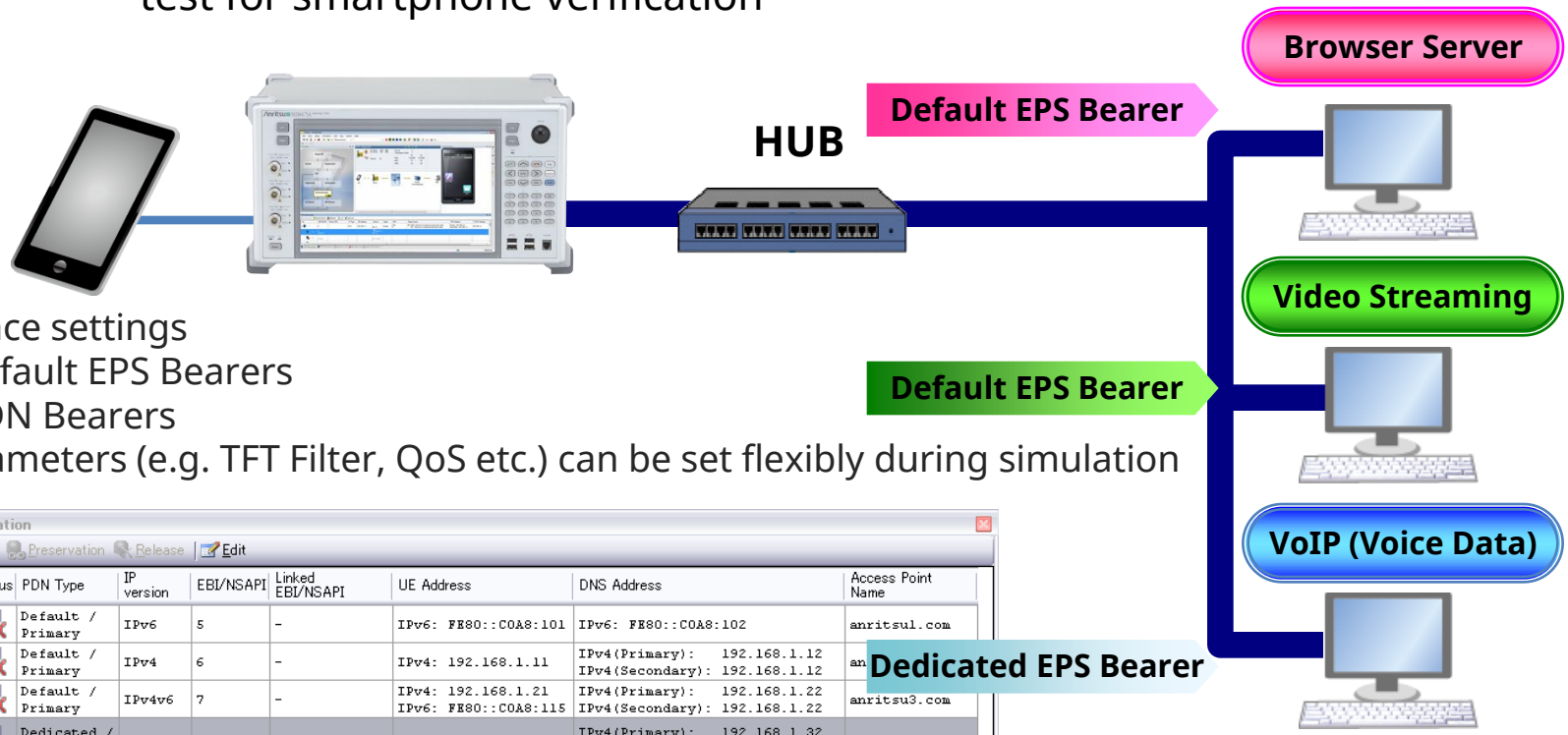
- Frequency range: 350MHz to 3600MHz
- Maximum Input Level: 35dBm
- Level accuracy: (at implemented MX847506A)
  ±1.1dB (≥-120dBm, 350MHz≤f ≤3000MHz, 20°C-30°C, Post-CAL)
  ±1.3dB (≥-120dBm, 3000MHz<f ≤3600MHz, 20°C-30°C, Post-CAL)
- Linearity : (at implemented MX847506A)
  ±0.35dB (0to -40dB, ≥-50dBm)
  ±0.60dB (0to -40dB, ≥-55dBm)

Data Communication

- **Packet Communication**
- **Throughput Performance**
- **LTE Carrier Aggregation**
- **WLAN Offload**

Packet Communication

- **Test Configuration**
  - **Evaluation using multiple application servers**
    - SmartStudio can set up to 8 PDN*1, making it easy to create a multi-application test for smartphone verification



Reference settings
- 8 default EPS Bearers
- 8 PDN Bearers
- Parameters (e.g. TFT Filter, QoS etc.) can be set flexibly during simulation

PDN Information

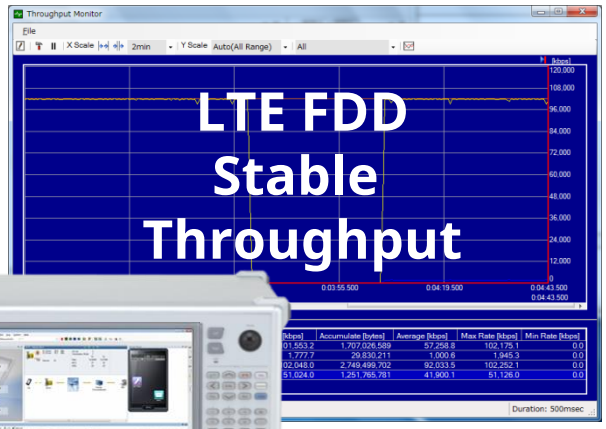
Terminate | Preservation | Release | Edit

Priority	Status	PDN Type	IP version	EBI/NSAPI	Linked EBI/NSAPI	UE Address	DNS Address	Access Point Name
1		Default / Primary	IPv6	5	-	IPv6: FE80::C0A8:101	IPv6: FE80::C0A8:102	anritsu1.com
2		Default / Primary	IPv4	6	-	IPv4: 192.168.1.11	IPv4(Primary): 192.168.1.12 IPv4(Secondary): 192.168.1.12	an
3		Default / Primary	IPv4v6	7	-	IPv4: 192.168.1.21 IPv6: FE80::C0A8:115	IPv4(Primary): 192.168.1.22 IPv4(Secondary): 192.168.1.22	anritsu3.com
4		Dedicated / Secondary	IPv4	8	7	IPv4: 192.168.1.31	IPv4(Primary): 192.168.1.32 IPv4(Secondary): 192.168.1.32	anritsu4.com
5		Default / Primary	IPv4	9	-	IPv4: 192.168.1.41	IPv4(Primary): 192.168.1.42 IPv4(Secondary): 192.168.1.42	anritsu5.com

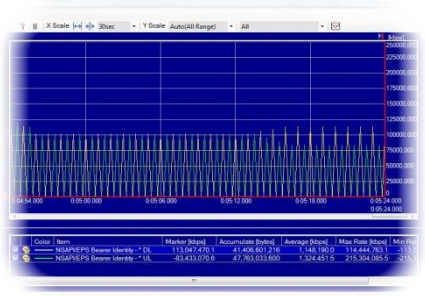
*1: Only LTE supported

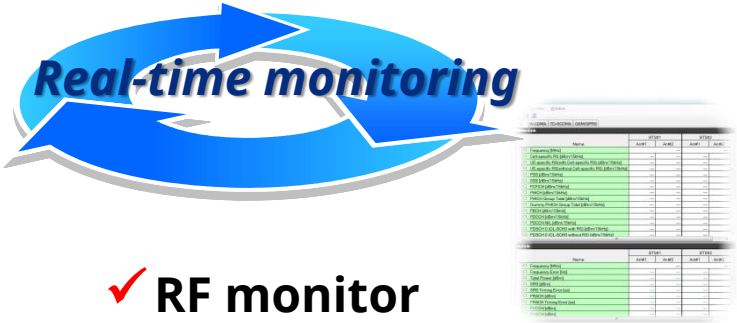
Data Communication – Throughput Performance

- Throughput test over the RF
  - Built-in Server PC (Windows 7)
  - Measure function
    - Throughput monitor
    - Counter
    - RF Monitor

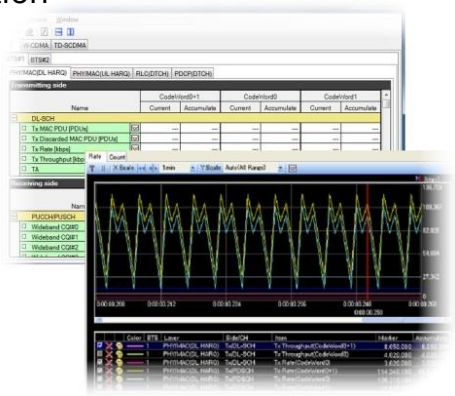


✓ **Throughput monitor**
Checks not only IP level but also MAC level with stable





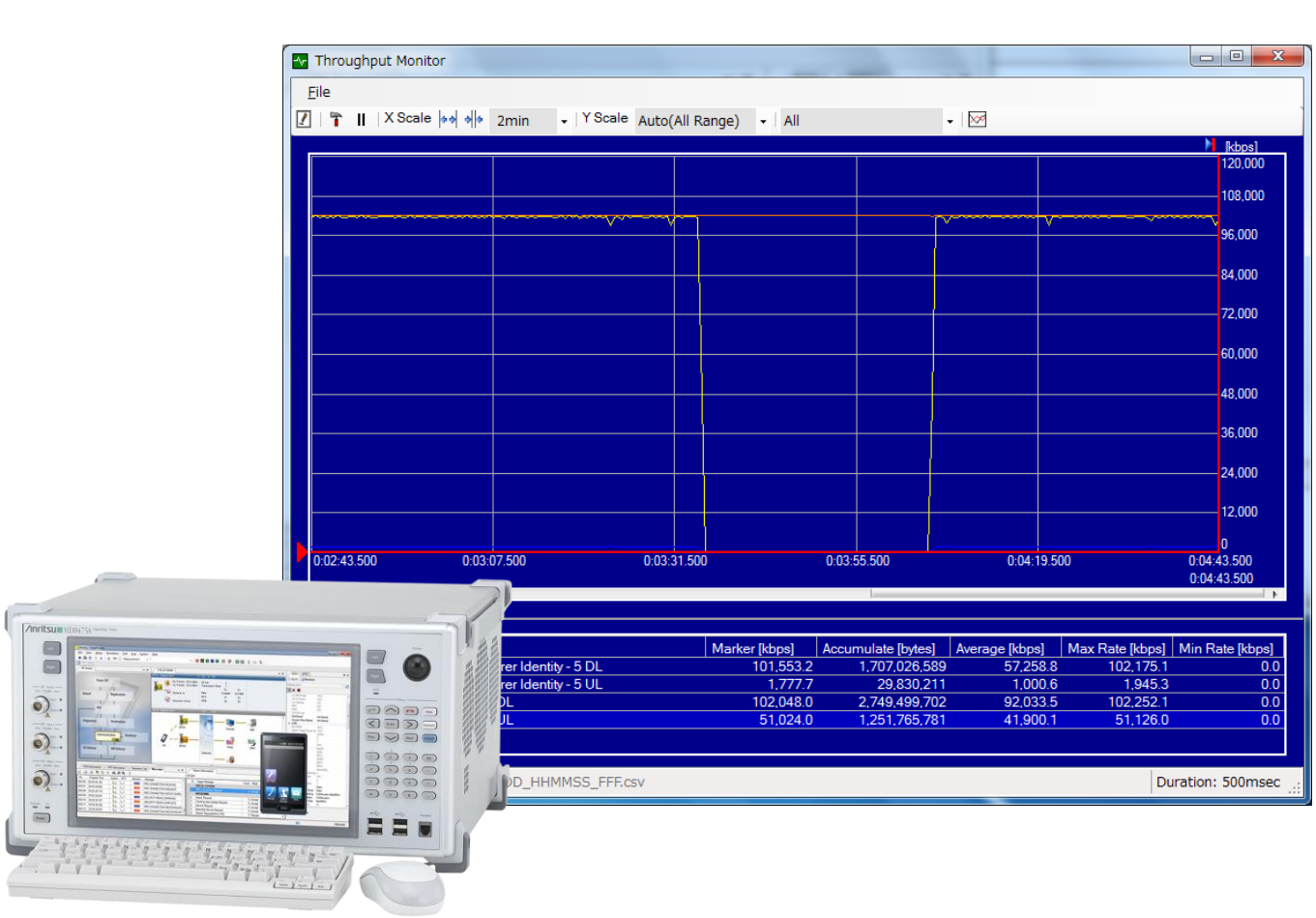
✓ **Counter**
Displays detailed information such as ACK/NAC, MCS

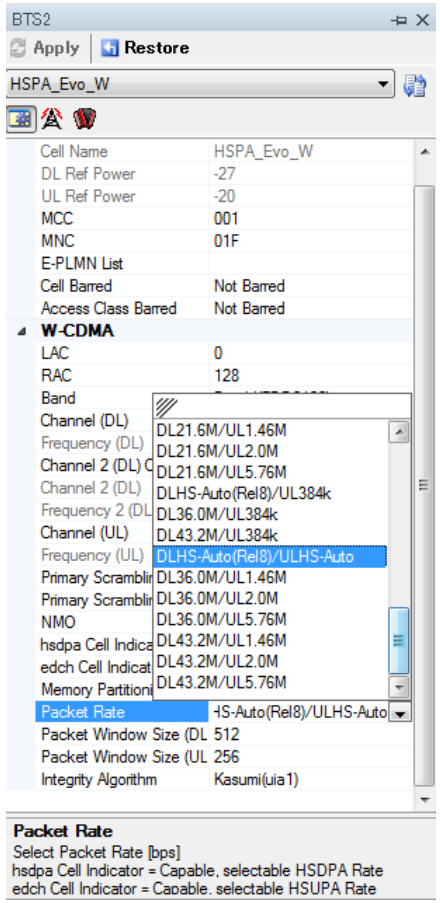


✓ **RF monitor**
Displays frequencies and TRx power for each channel

Data Communication – Throughput Performance

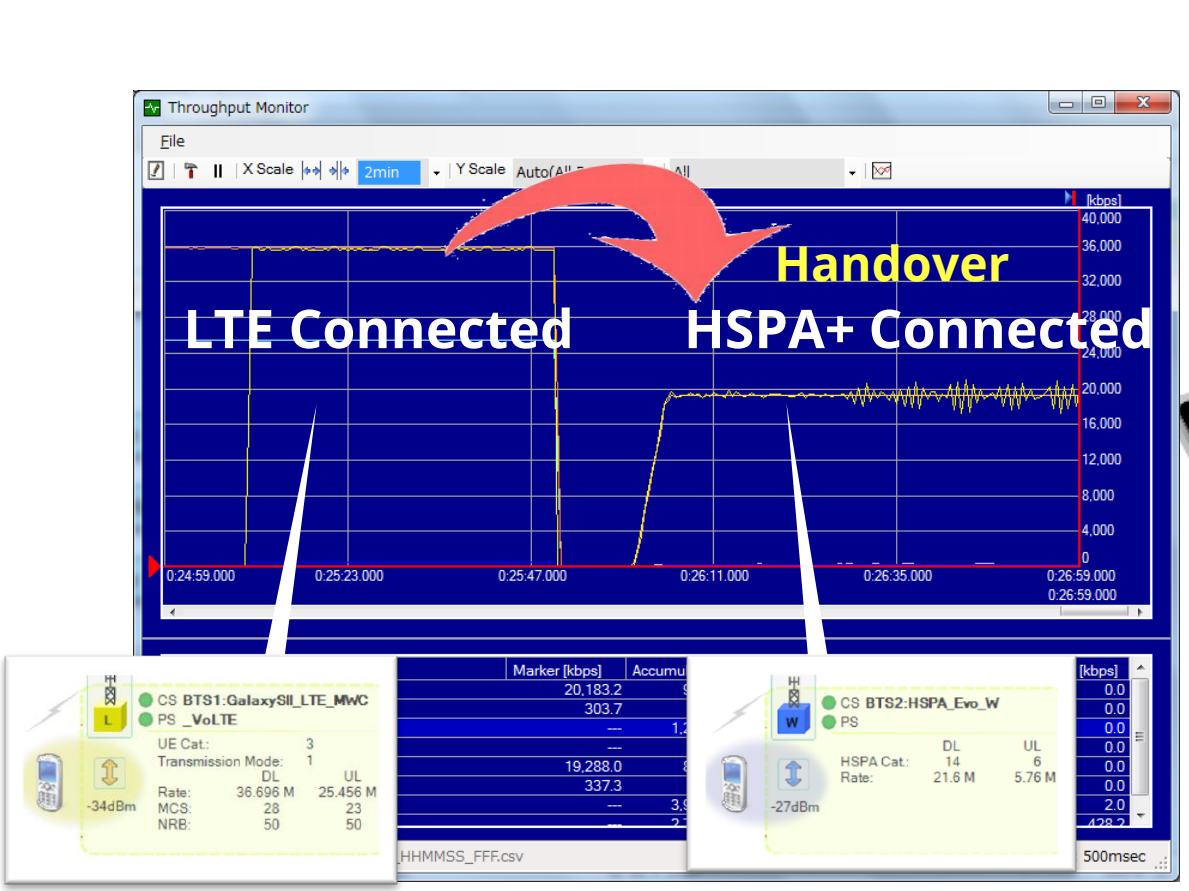
- DC-HSDPA 42 Mbps Throughput Example

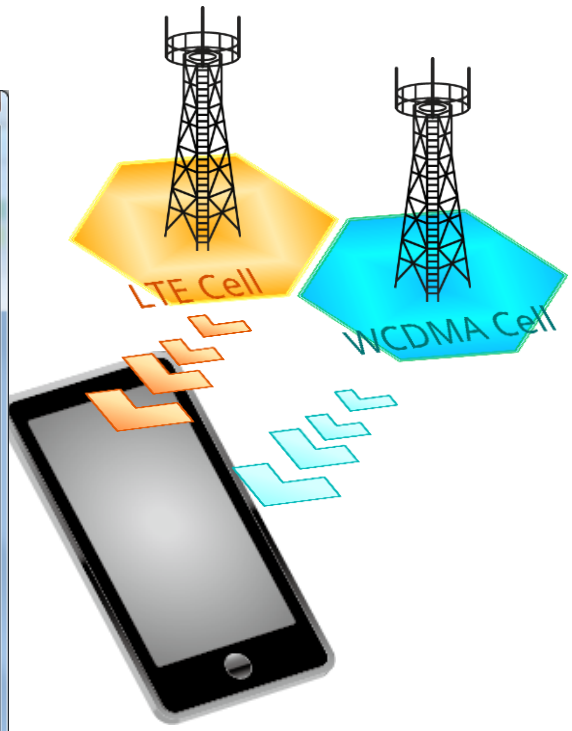




Data Communication - Throughput Performance

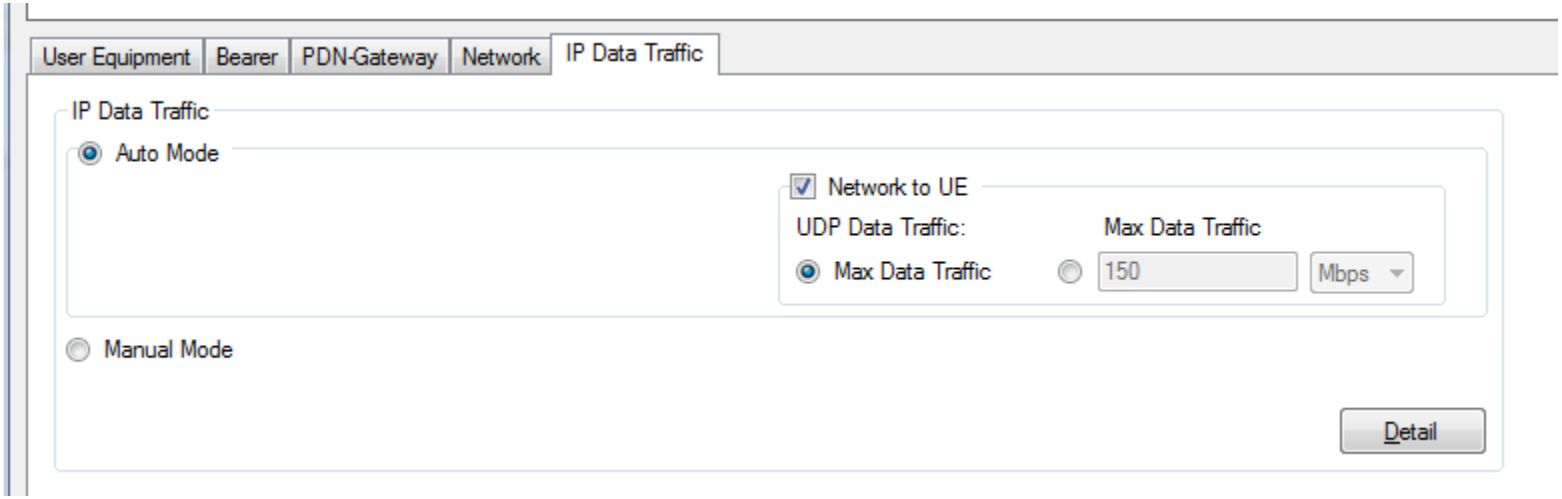
- Graphical tool available for easy troubleshooting
  - Data throughput test with InterRAT (e.g. LTE/HSPA+ handover)





Data Communication - Throughput Performance

- Traffic generator is included
  - You can test DL max throughput by easy operation.
  - Detail traffic control is also available.

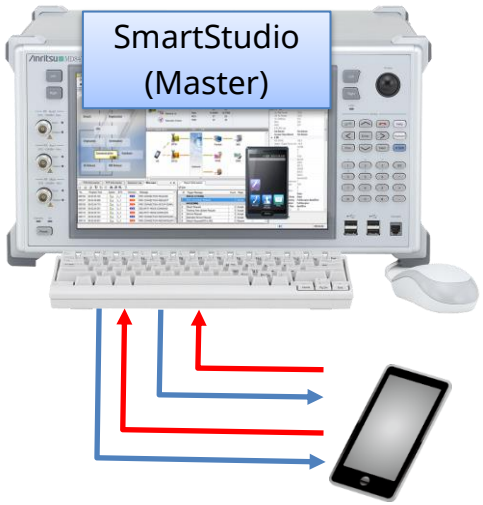


2CC SISO & MIMO

- LTE FDD/TDD mode are supported
- Realize easy setup with GUI operation for commercial LTE-CA device verification

2CC SISO (Single-Box Solution)*

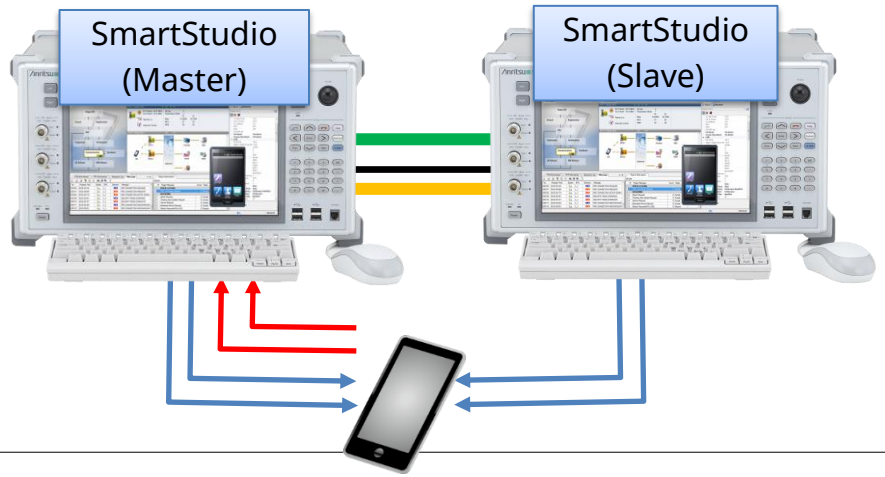
- Support functions
  - ✓ PHY/IP Throughput DL 150 Mbps/UL 50 Mbps
- Test applications
  - ✓ Simple packet connectivity tests with CA
- Operations
  - ✓ Single box support 2CC SISO



** MX847550A-040 LTE Carrier Aggregation Option required*

2CC 2x2 MIMO (2-Box Solution)*

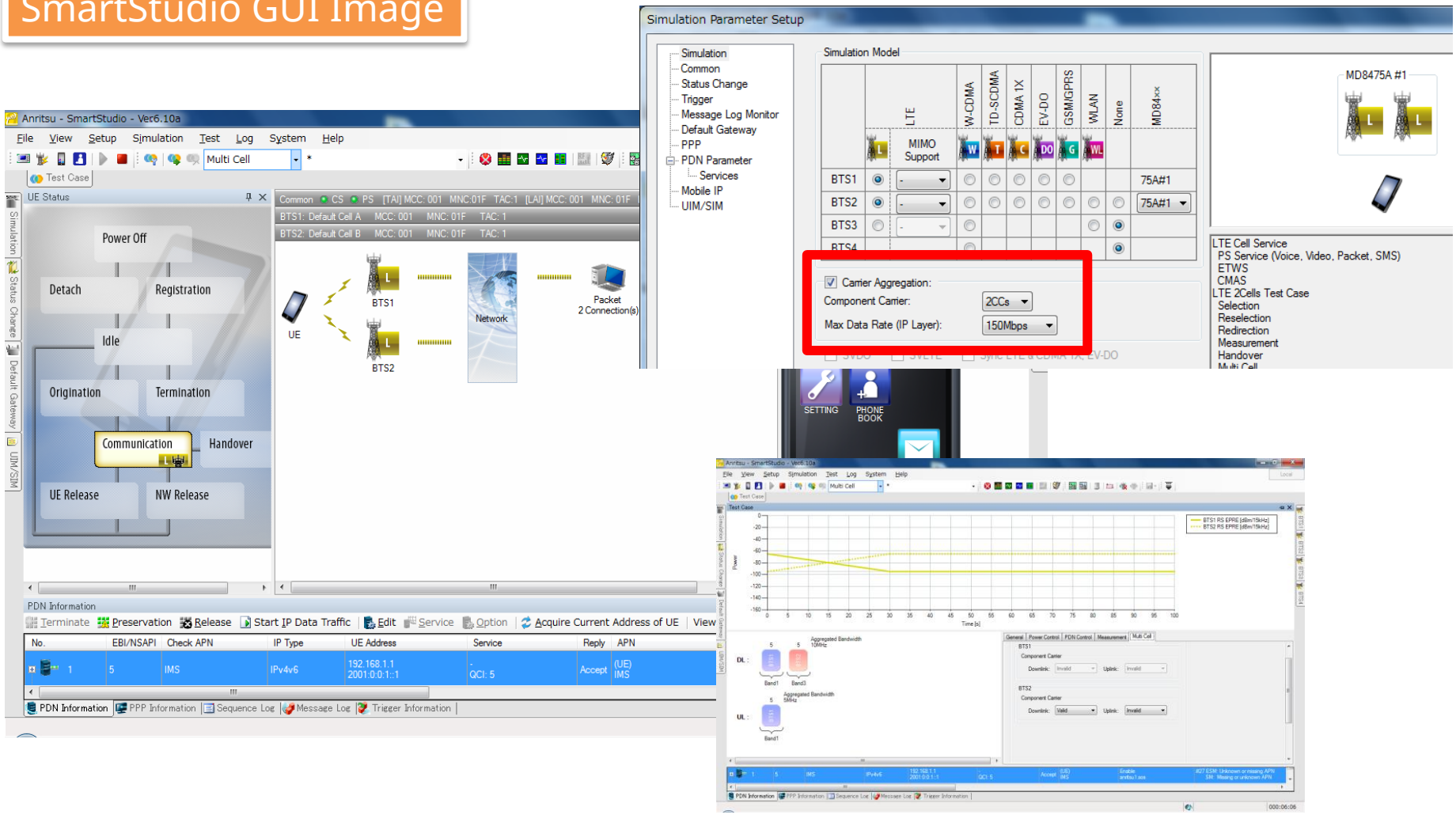
- Support functions
  - ✓ RF Throughput DL 300 Mbps/UL 50 Mbps
  - ✓ IP Throughput DL 150 Mbps/UL 50 Mbps
- Test applications
  - ✓ Operator's device acceptance tests
  - ✓ Battery consumption tests
- Operations
  - ✓ Single GUI (SmartStudio on the master MD8475A) controls slave box also



Easy GUI operation

- All set up is done by easy GUI operation

SmartStudio GUI Image



3CA Solution

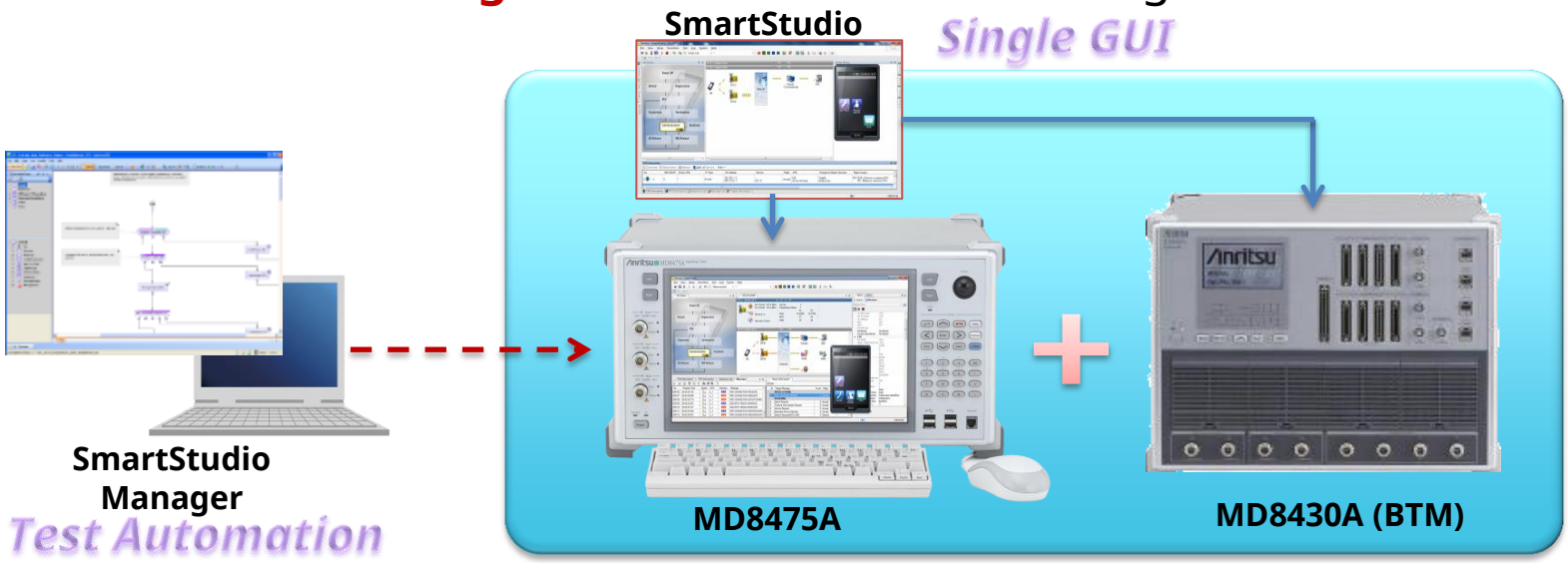
Product Overview

- Combination of MD8475A (Master unit) and MD8430A BTM (Slave unit) supports 3CA & 2x2 MIMO testing environment(*1)
- Application/Function test can be performed under 3CA SISO/MIMO condition

Test Operation

Realizes totally same test operation as MD8475A single box !

- **SmartStudio** can control for both units from a single GUI
- **SmartStudio Manager** realizes automated testing environment



**LTE Carrier Aggregation Option (MX847550A-040) and LTE Carrier Aggregation DL3CCs Option (MX847550A-041) are required*

(*1) The combination of MD8475A and MD8430A(ETM) is also possible

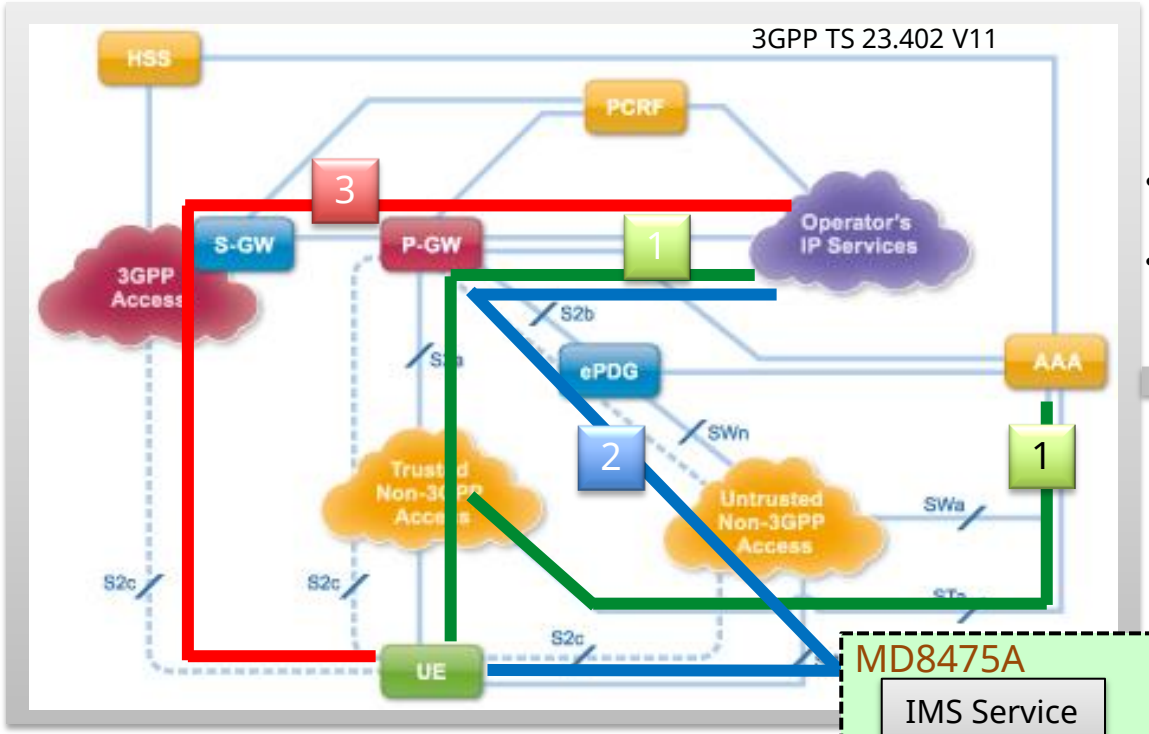
WLAN Offload Solution

- MD8475A SmartStudio will simulate EAP/ANDSF/ePDG functions for WLAN Offloading as one of advanced services

  - MX847570A-070 WLAN Offload Basic Option
  - MX847570A-071 ePDG Option
  - MX847570A-072 ANDSF Option
  - MX847570A-073 Extended ePDG Option

- **Provide the following server environment (refer to 3GPP architecture model);**
  - 3GPP AAA Server (EAP-SIM/AKA/RADIUS)
  - Operators IP Services (ANDSF)
  - ePDG
- **Test Applications**
  - Authentication Test (EAP-SIM / EAP-AKA Full Auth, Fast Re-Auth)
  - Mobility Test between LTE Cellular and WLAN (ANDSF)
  - Throughput Performance Test (WLAN and Cellular)
  - ePDG normal test, error response test

WLAN Offload Solution Configuration



Package Solution for WLAN Offload

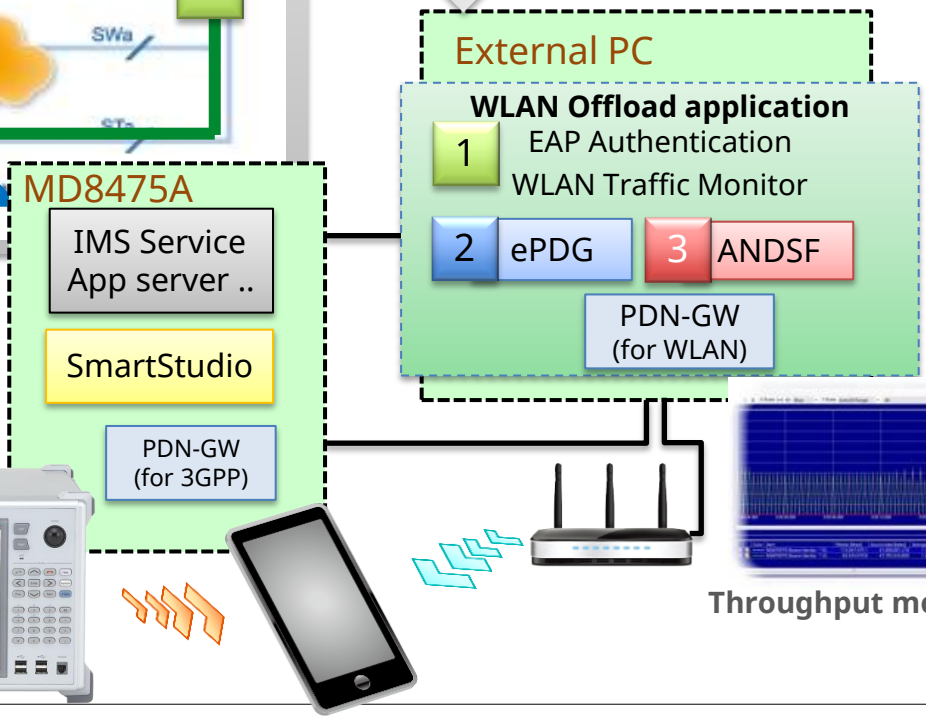
- *Note: For ePDG, due to the switching method of downlink data, it might be on an external PC.*
- *This solution needs to use commercial WLAN-AP.*

(Recommended model :CISCO AIR-SAP2602E-x-K9)

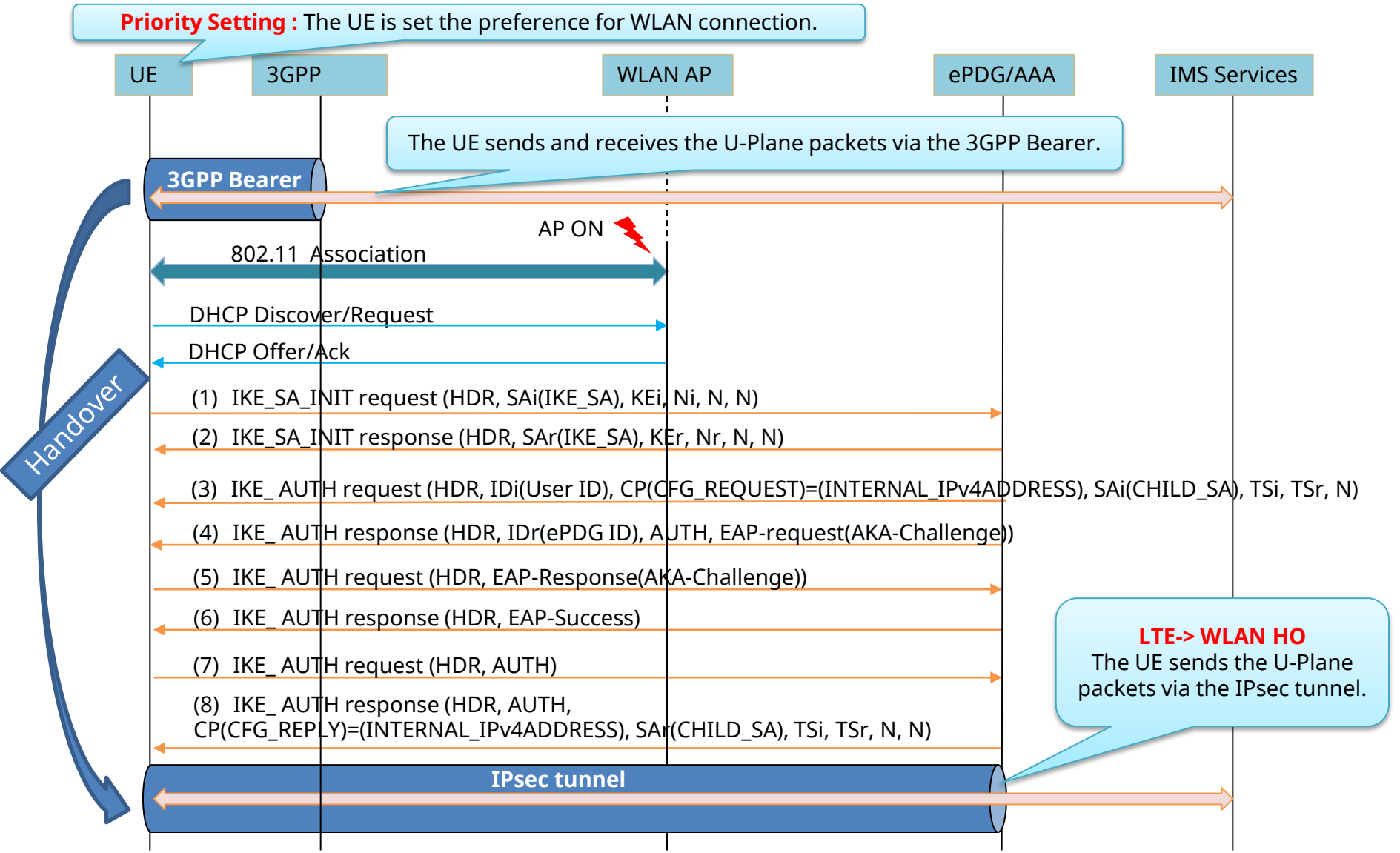
1 EAP authentication for Trusted non-3GPP Access

2 IPsec tunneling for Untrusted non-3GPP Access

3 ANDSF policy derivative

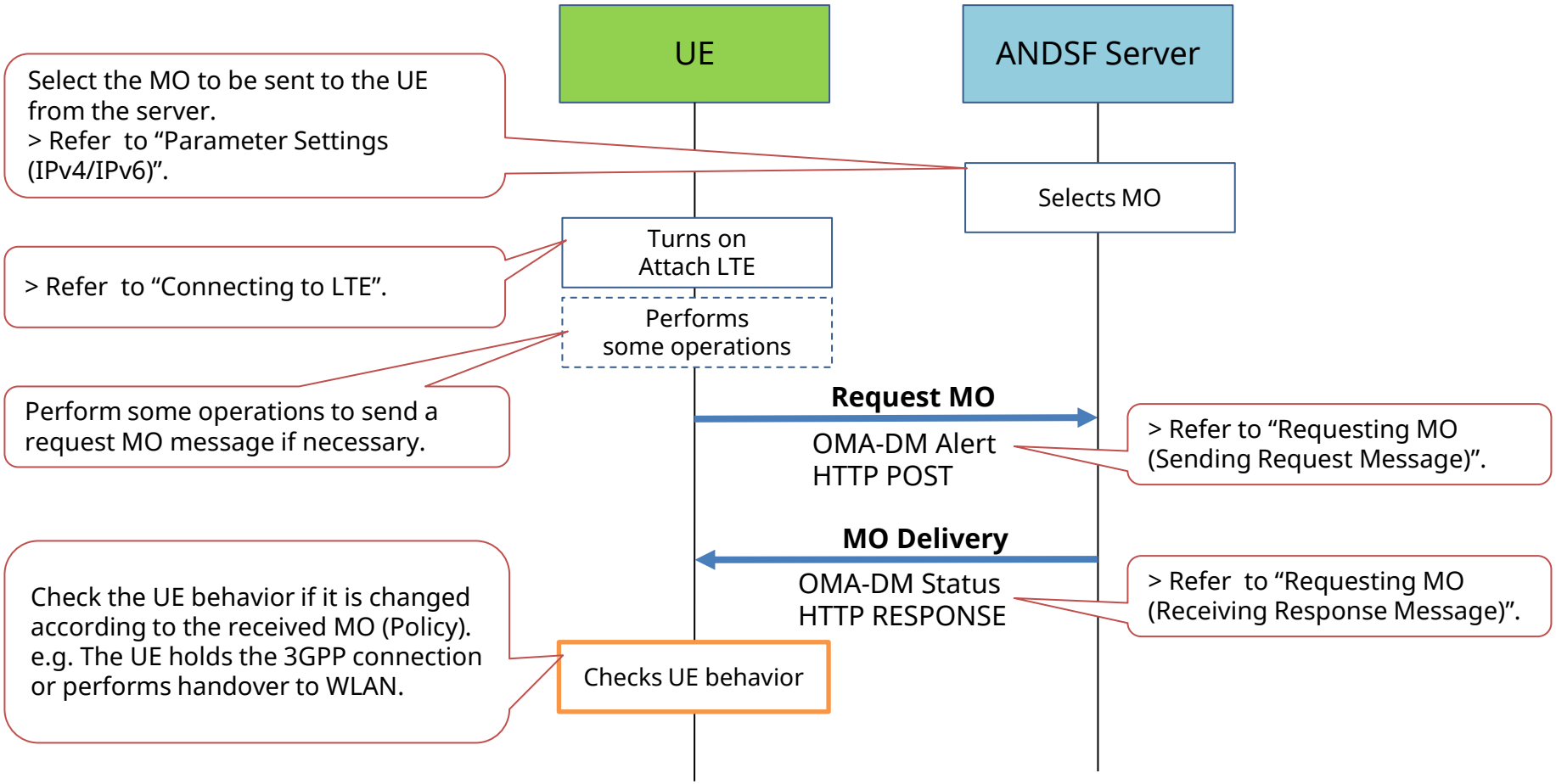


LTE -> WLAN Handover Sequence



ANDSF Overview

The ANDSF supports the Pull model and Push model.



Function Details (EAP-SIM/EAP-AKA, ANDSF)

Function	Description
EAP-SIM/EAP-AKA	Communication protocols RADIUS (Remote Authentication Dial In User Service)/ UDP/IPv4/ IPv6/and Ether
	Authentication EAP-AKA (RFC 4187), EAP-SIM (RFC 4186)
	Vector generation algorithm Test algorithm defined in 3GPP TS 34.108 and conversion functions (c2, c3) in 3GPP TS 33.102 MILENAGE algorithm defined in 3GPP TS 35.205

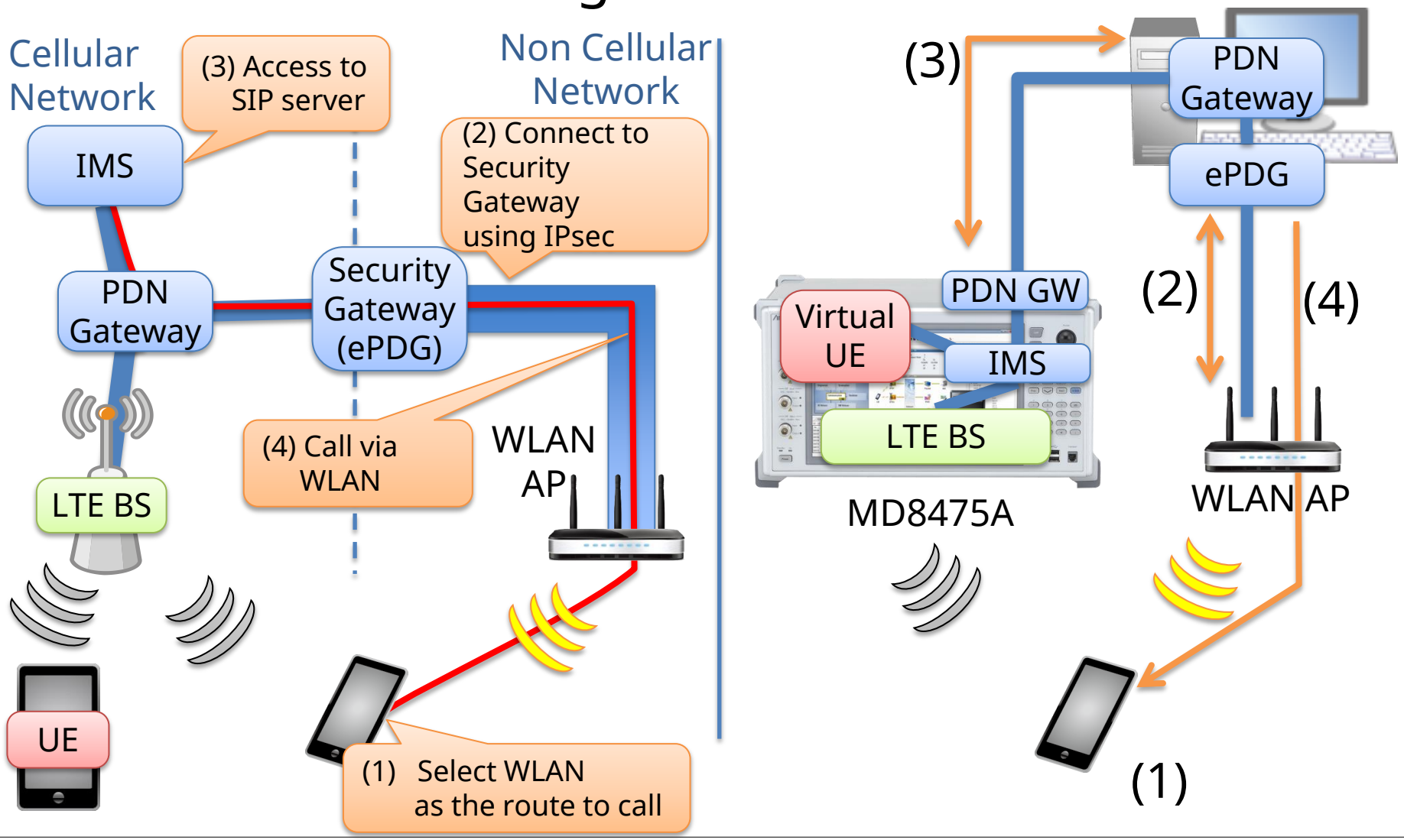
Function	Description
ANDSF	Communication protocols TLS (Transport Layer Security) 1.0/1.1/1.2
	Models Pull model (3GPP TS 24.302 6.8.2.2.3) Push model (3GPP TS 24.302 6.8.2.2.2)
	Notification message push WAP Push

Function Details (ePDG)

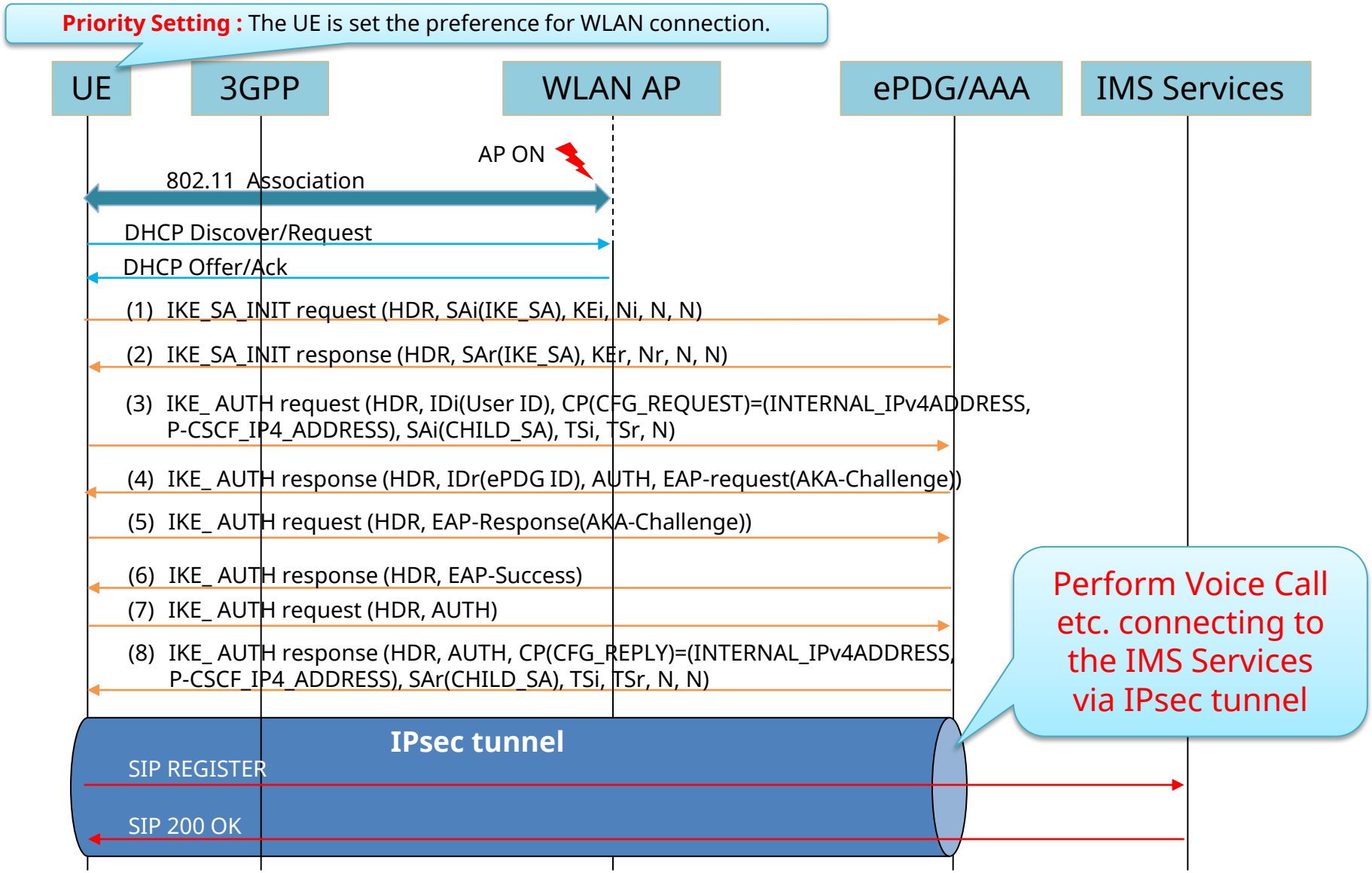
Function	Description
ePDG	Communication protocols IPv4 / IPv6 / ESP (3GPP TS 33.234 6.6)
	IKE IKEv2 (RFC 5996) RSA Digital Signature(X.509)
	Authentication EAP-AKA Full Auth, Fast Re-auth (RFC 4187)
	Vector generation algorithm Test algorithm defined in 3GPP TS 34.108 MILENAGE algorithm defined in 3GPP TS 35.205
	Security algorithm AES-CBC-128, AES-CBC-256, AES-CTR-128, 3DES, DES, NULL for encryption HMAC-SHA1-96, HMAC-MD5-96, AES-XCBC-96 for integrity
	Diffie-Hellman Group Group1(768bit), Group2(1024bit), Group5(1536bit) , Group14(2048bit)
	ESN support Extended Sequence Numbers 0

WLAN Calling

- Environment using MD8475A



WLAN Calling Sequence

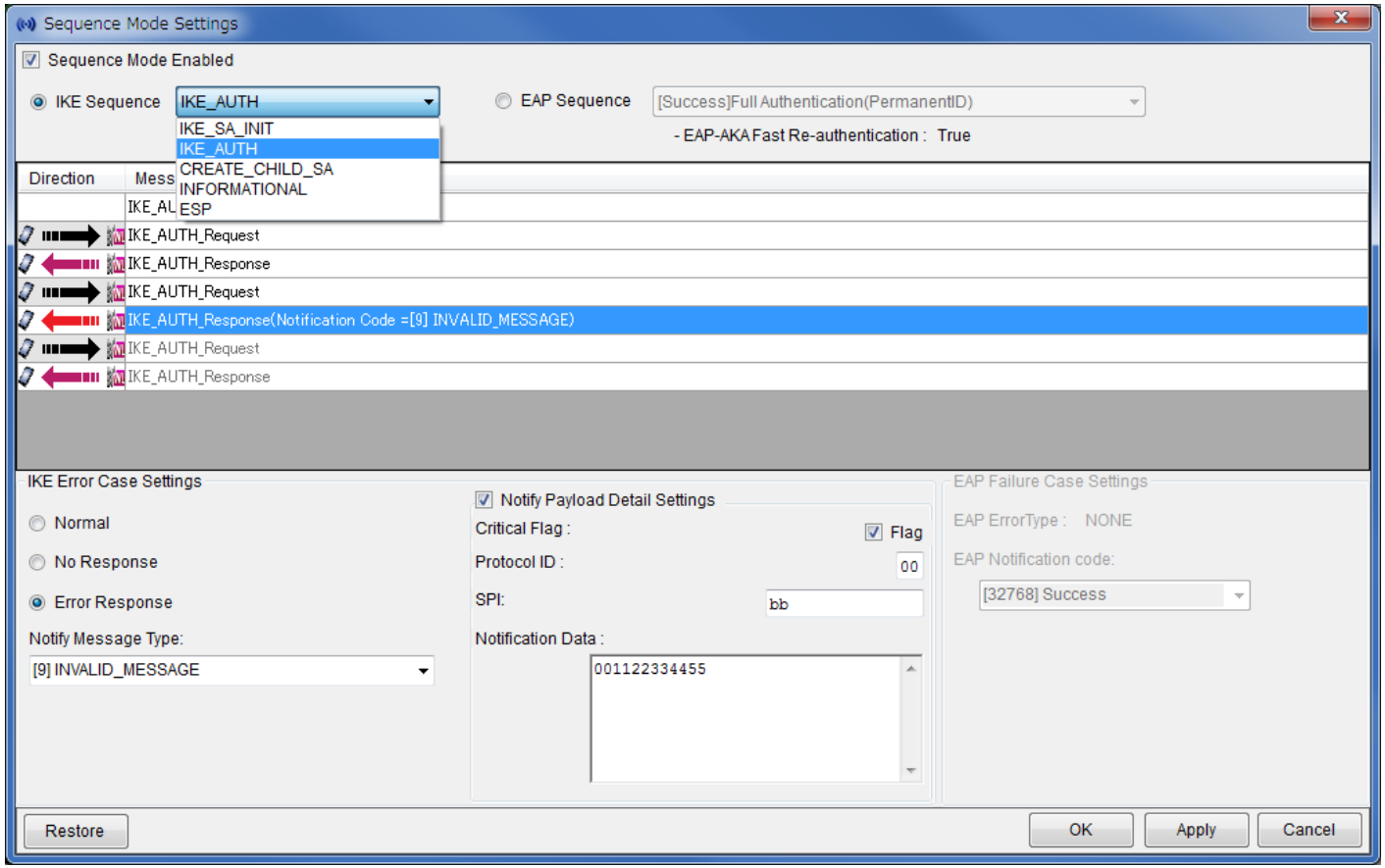


Extended ePDG Option (1/2)

No Response / Error Response can be set for ePDG response.

Select message

Set error condition

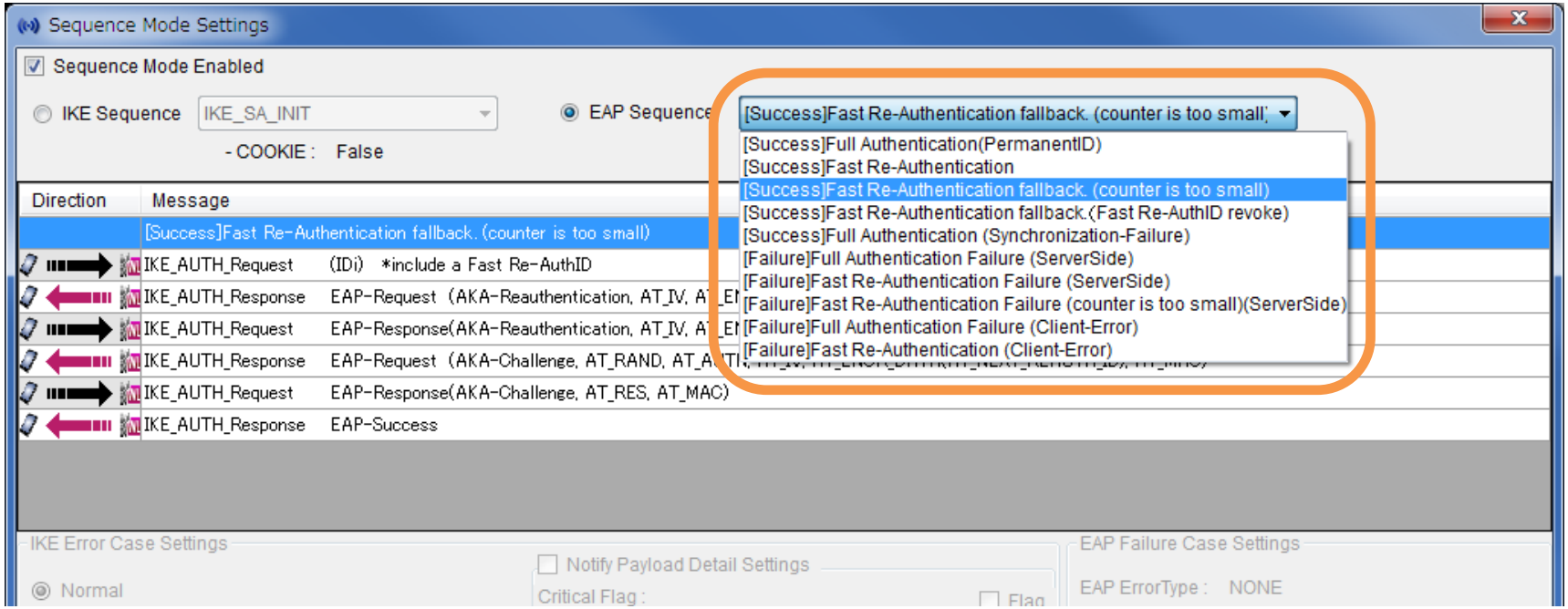


* The options below are required.
WLAN Offload Basic Option (MX847570A-070)
ePDG Option (MX847570A-071)
Extended ePDG Option (MX847570A-073)

Extended ePDG Option (2/2)

EAP-AKA Fast Re-Authentication is supported.

Fast Re-Authentication is the feature on reconnecting with ePDG to reduce network load and to connect with UE quickly, by reusing the key generated on first connection.



* The options below are required.
WLAN Offload Basic Option (MX847570A-070)
ePDG Option (MX847570A-071)
Extended ePDG Option (MX847570A-073)

Mobile Services

- VoLTE/SMS Applications
- RoHC on LTE
- IMS Enhancement
- RCS (Rich Communication Suite)
- PWS (Public Warning System)
- VoLTE Emergency Call

Comprehensive Functional Test Environment IMS Service

Key Unique Points

☑ Ease of use

- SmartStudio GUI allows users to set and configure the IMS test easy
- No complicated test scripts are required for IMS setting

☑ Comprehensive IMS Test

- Supports a lot of tests including irregular tests and supplementary service
- PSAP of Add-in Service has functions to emergency test and loop back voice data

☑ Analysis and Debug

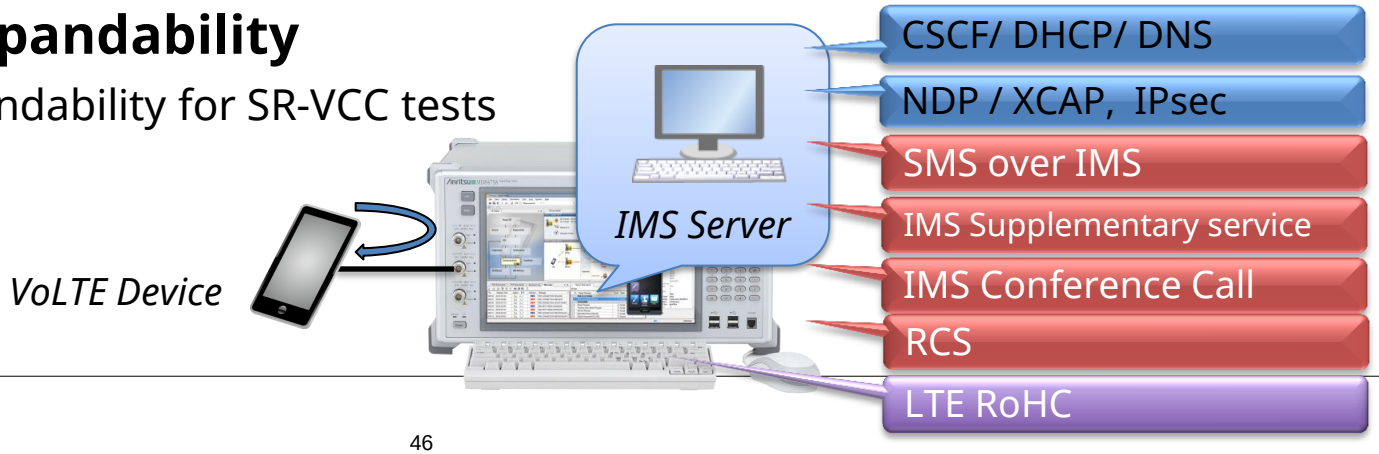
- Wireshark and Signalling protocol logging can be checked simultaneously

☑ Built-in Servers

- IMS and relevant application server can be installed within single platform
- No external server required then realize small-footprint environment

☑ Multi-RAT Expandability

- Enough expandability for SR-VCC tests

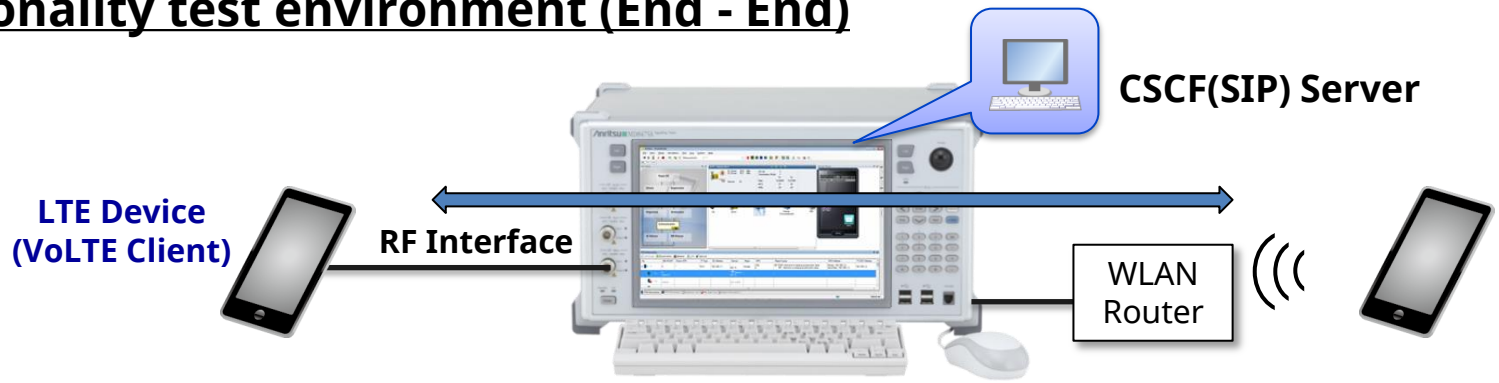


VoLTE Functional Test

- Functional test on VoLTE
  - Built-in SIP Server & P-CSCF configures loopback and E2E VoLTE test with small-footprint environment

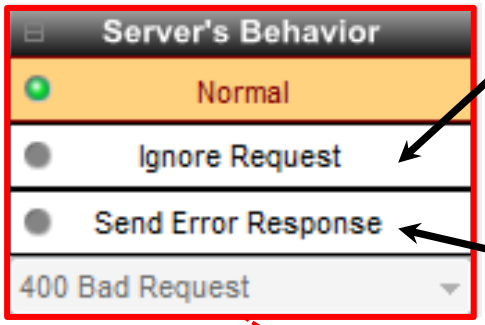
Functionality test environment (Loopback Case)

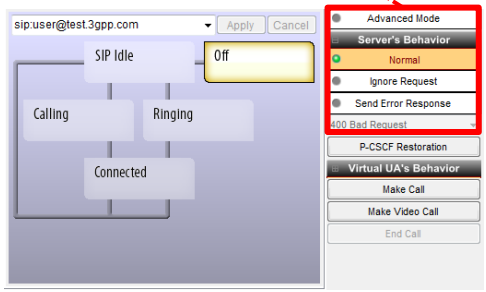
Functionality test environment (End - End)



VoLTE Functional Test – Abnormal Server Condition

- Subnormal & Abnormal test conditions
  - Server behavior *
    - Supports a lot of causes without complicated test scripts

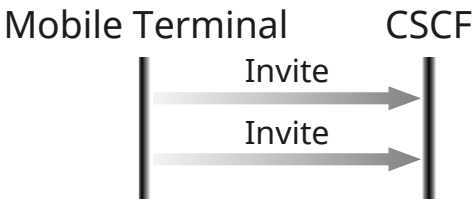




CSCF Information Window

Ignore Request

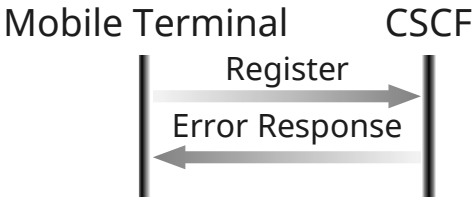
CSCF Service ignores all requests and simulates down server on real network or complete network shutdown



Send Error Response

CSCF Service sends any specified error response to all requests

Examples:

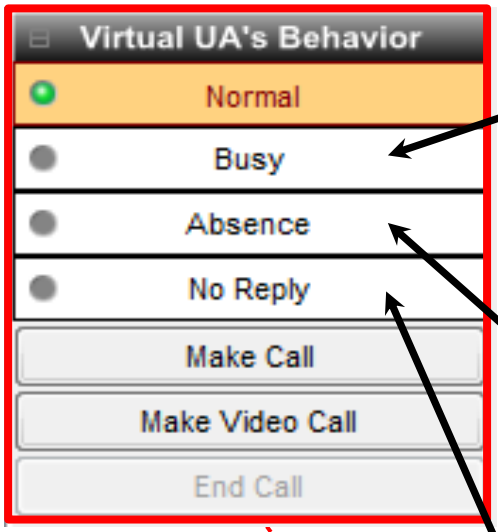


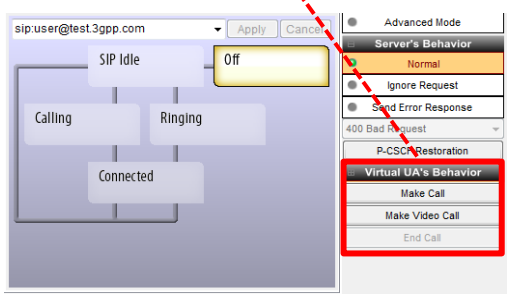
- 400 Bad Request
- 401 Unauthorized
- 402 Payment Required
- 403 Forbidden
- 404 Not Found
- 405 Method Not Allowed
  ....etc.
- 491 Request Pending
- 493 Undecipherable
- 505 Version Not Supported
- 580 Precondition Failure
- 600 Busy Everywhere
- 606 Not Acceptable
  .... etc.

** Extended CSCF option (MX847570A-080) required*

VoLTE Functional Test – Various Virtual UA Behavior

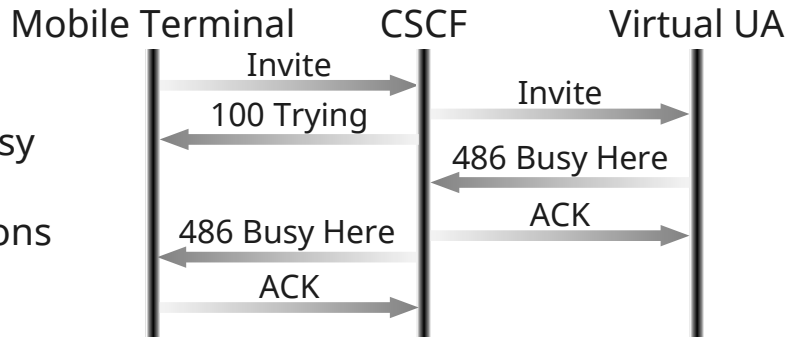
- Virtual UA's Behavior *
  - Supports various UA behavior without complicated test scripts



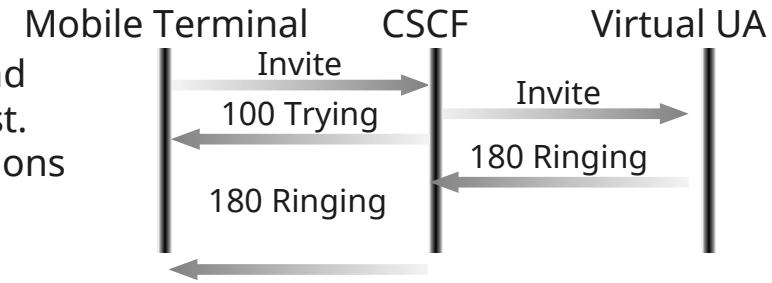


CSCF Information Window

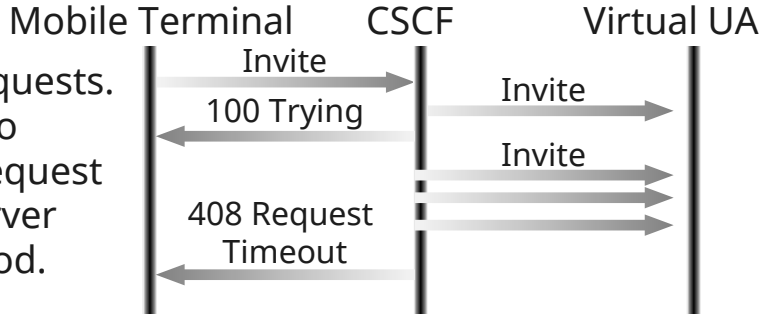
Busy
Virtual UA sends 486 Busy Here to Invite request. Simulates communications busy status.



Absence
Virtual UA does not send 200 OK to Invite request. Simulates communications absence.



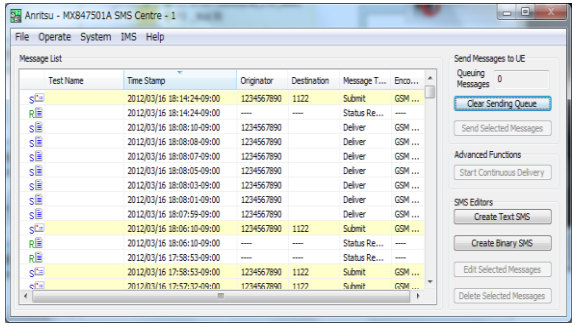
No Reply
Virtual UA ignores all requests. Simulates no response to communications. 408 Request Timeout is sent from server after specified time period.



** Extended CSCF option (MX847570A-080) required*

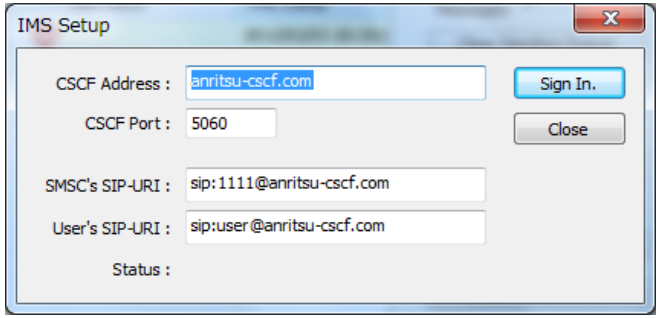
Message Service Test – SMS over IMS / SGSN

- Built-in SMS Centre support both procedures
  - SMS over SGSN: Sending/Receiving SMS over SGSN



SMS Centre

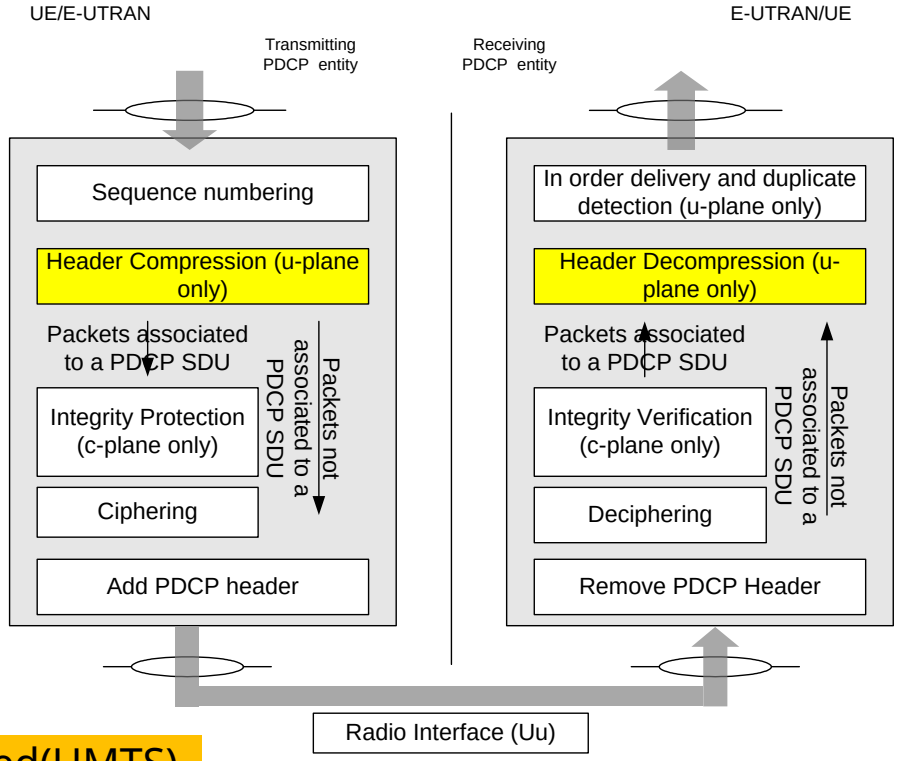
  - SMS over IMS: Sending/Receiving SMS over IP
    - SIP registration



SIP Registration Window

RoHC on LTE - Reducing the IP packet overhead

- What's RoHC?
  This is an algorithm of header compression to improve efficiency to transfer IP packet. Noisy propagation environment is one of the characteristics of wireless network. In such an environment, there is sometimes significant packet loss. RoHC was developed to resolve such problem.



ID ---------- Profile

- 0x0000: No compression(LTE)/Uncompressed(UMTS)
- 0x0001: RTP/UDP/IP
- 0x0002: UDP/IP
- 0x0003: ESP/IP
- 0x0004: IP

Supported by MX847550A-060

VoLTE Functional Test – Supplementary Service

- VoLTE Supplementary Services
  - In IMS architecture, supplementary services are also needed like CS service (Call Forwarding, Call Hold/Resume, Connected Line Identification Presentation/Restriction, etc)
  - Supports various simulation service defined in 3GPP by GUI simple operation

IMS Supplementary Service option (MX847570A-081) offers following SS for IMS clients

Abbreviation	PSTN/ISDN simulation service	PSTN/ISDN supplementary service	Support	Reference Spec.
CFU	Communication Forwarding Unconditional	Call Forwarding Unconditional	Yes	TS24.604
CFB	Communication Forwarding on Busy user	Call Forwarding Busy	Yes	TS24.604
CFNR	Communication Forwarding on No Reply	Call Forwarding No Reply	Yes	TS24.604
OIP	Originating Identification Presentation	Calling Line Identification Presentation	Yes	TS24.607
OIR	Originating Identification Restriction	Calling Line Identification Restriction	Yes	TS24.607
TIP	Terminating Identification Presentation	Connected Line Identification Presentation	Yes	TS24.608
TIR	Terminating Identification Restriction	Connected Line Identification Restriction	Yes	TS24.608
CW	CommunicationWaiting	Call Waiting	Yes	TS24.615
HOLD	Communication Hold	Call Hold	Yes	TS24.610
MWI	Message Waiting Indication	Message Waiting Indication	Yes	TS24.606
CB	Communication Barring	Call Barring	Yes	TS24.611

VoLTE Functional Test – Conference Call

- VoLTE Conference Call*
  - Supports various conference call relevant functions with GUI operation of IMS server (Event message, generation of meeting, reservation, participation, etc.)

Comparison of 3GPP TS24.605

Item	Supported
4.5.2.1.1 User joining a conference	✓
4.5.2.1.2 User inviting another user to a conference	✓
4.5.2.1.3 User leaving a conference	✓
4.5.2.1.4 User creating a conference	✓
4.5.2.1.5 Subscription for the conference event package	✓
4.5.2.2.1 Conference focus	✓
4.5.2.2.2 Conference notification service	✓
4.5.2.7 Actions at the destination UE	✓
4.6.1 Communication HOLD (HOLD)	✓
4.6.3 Terminating Identification Restriction (TIR)	✓
4.6.5 Originating Identification Restriction (OIR)	✓

**Need IMS Supplementary Service option (MX847570A-081))*

IMS/IPsec Function Table

- Follow IMS fundamental technologies to support smartphone IMS verifications

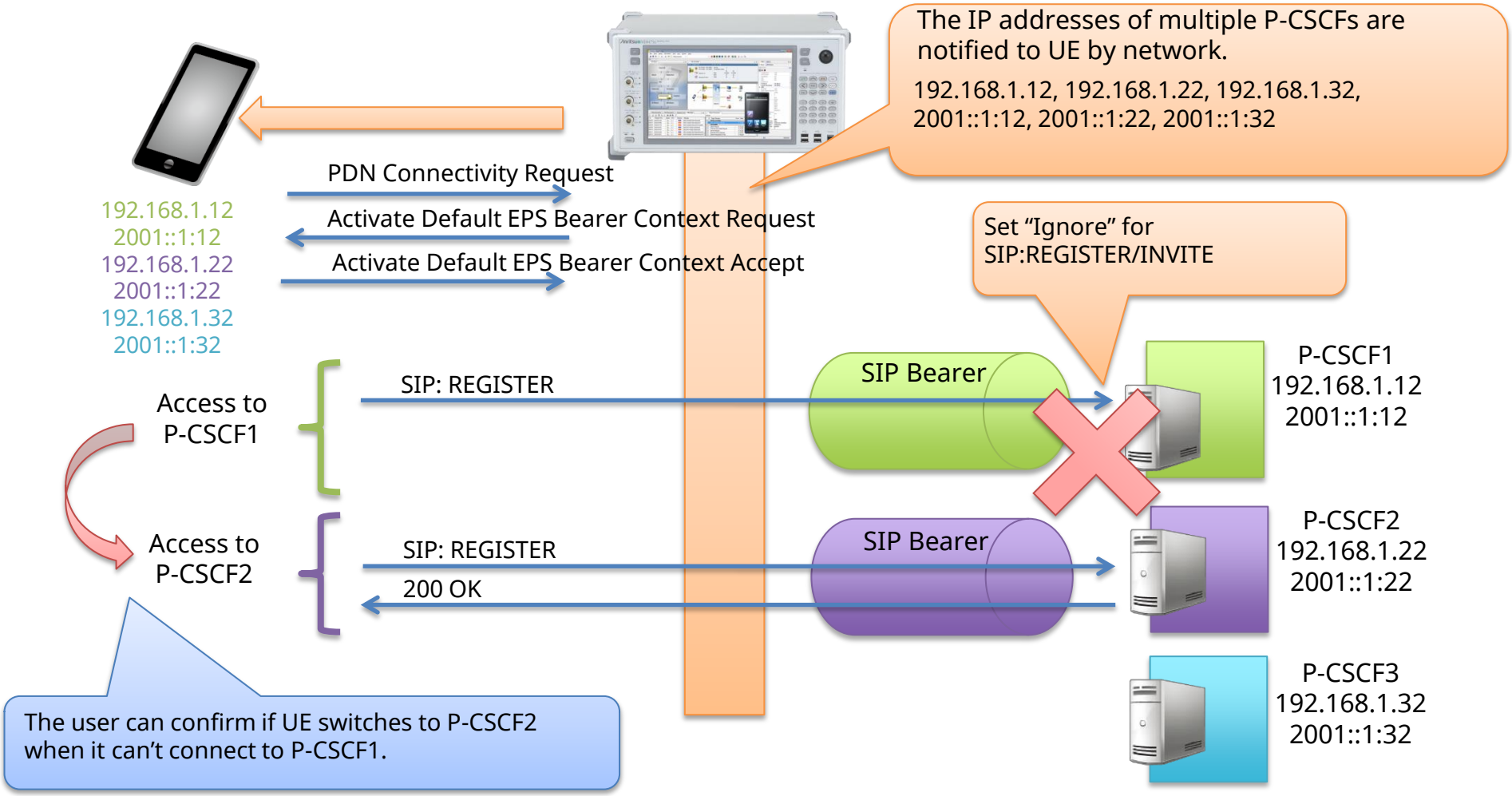
Item	Comments
Authentication method	HTTP Digest Authentication Using AKAv1
	HTTP Digest Authentication Using AKAv2
	Comparing RES with XRES
	Comparing RES with XRES when AUTS parameter is present
Transport protocol	UDP
	TCP
Verification of Security header	Security-verify header
Integrity algorithm	HMAC-SHA1-96
	HMAC-MD5-96
Encryption algorithm	NULL
	AES-CBC-128bit
	3DES-CBC
Logging feature	Logging key information (Sequence Number, Nonce etc.)
	Logging decrypted data at reception
Removing Security Association	

Multiple P-CSCF (1/2)

- What is “Multiple P-CSCF” function?
  - A network operator sometimes provision multiple P-CSCFs to disperse network load, and the network provides the IP addresses of multiple P-CSCFs in this case.
  - UE sometimes shows an incorrect behaviour to access to a P-CSCF. So whether UE accesses to a correct P-CSCF is a significant key point of verification on PDN connectivity establishment.
  - Anritsu provides:
    - ✓ a function to set IP addresses of up to 3 P-CSCFs.
    - ✓ a function to set accept/ignore UE’s access to P-CSCFs.
  - Due to the functions above, the user can confirm:
    - ✓ if UE can access to the correct P-CSCF
    - ✓ how UE behaves when it can’t get any response from a P-CSCF
  - Anritsu provides a large benefit to customers through creating abnormal procedure easily.

Multiple P-CSCF (2/2)

- Example of a specific use case for Multiple P-CSCF



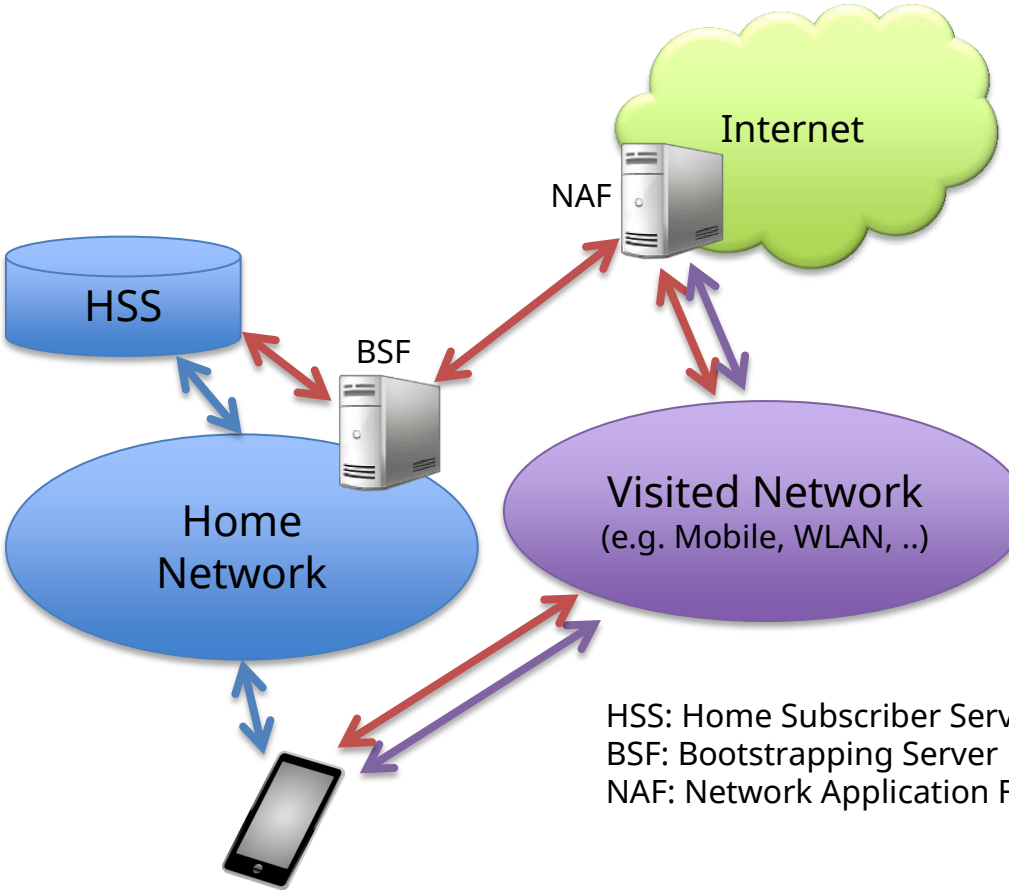
GBA Authentication Option (1/3)

- What is “GBA”?
  - The 3GPP defined the GAA (Generic Authentication Architecture) as the framework for various peer authentication methods within the NGN world, in particular for Internet-based services.
  - Within the GAA, the Generic Bootstrapping Architecture (GBA) defines the functions that are required to authenticate a client to a Web-based service using his 3G subscription.
    - ✓ The points of GBA:
      - An authentication method for Internet-based service
      - To reuse of 3GPP authentication (ISIM)
      - A HTTP-based authentication
  - Internet access is explosively growing, and the access is mainly done by smartphone nowadays. The conventional authentication methods for the Internet are showing their weakness compared with GBA. So network operators are faced with a subject to improve the security.

**GBA Authentication Option (MX847570A-084) is required*

GBA Authentication Option (2/3)

- Functions and Interfaces on GBA network



[Process]

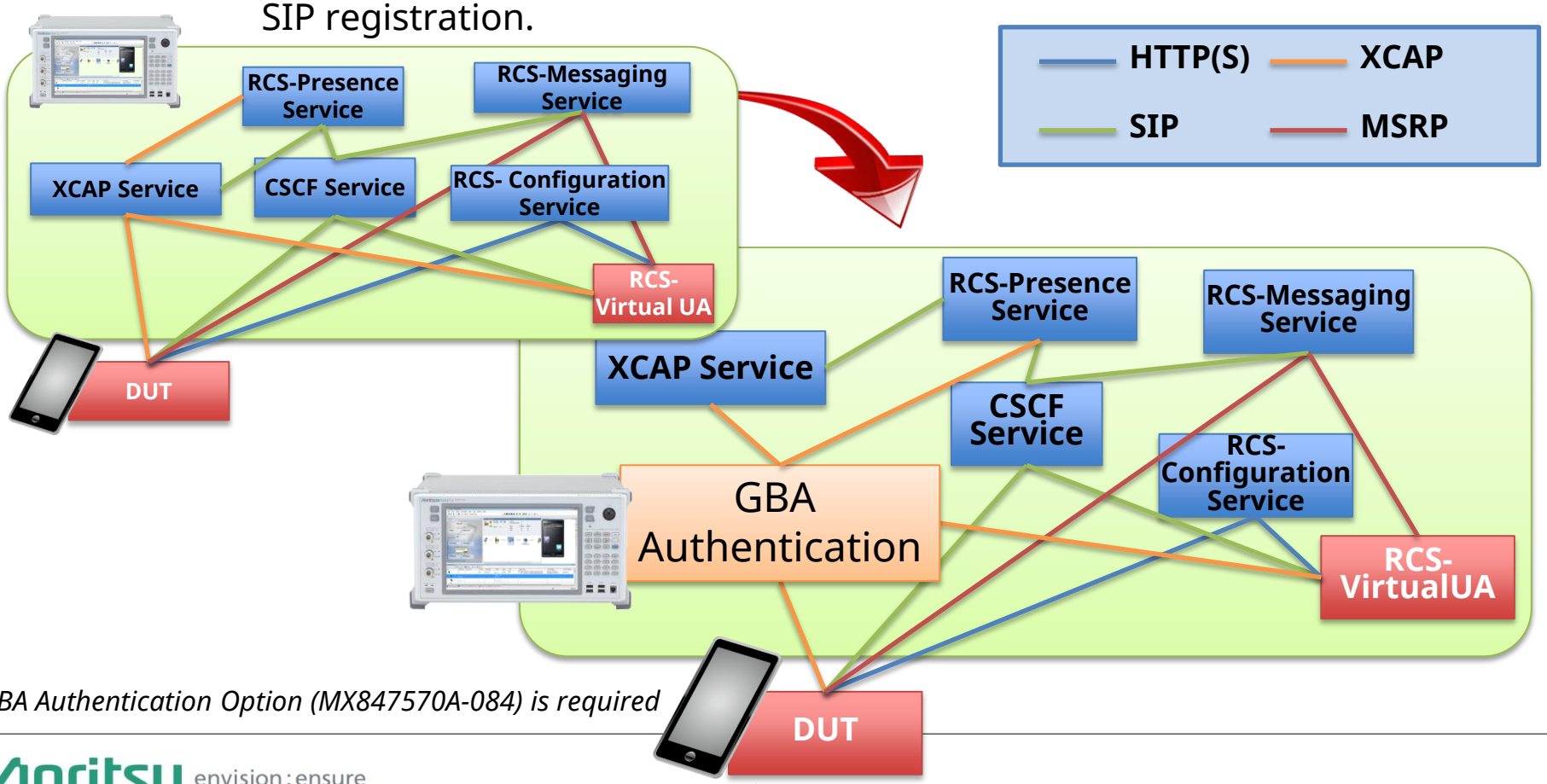
1. When the UE accesses the Internet without going through the home network,
2. UE authenticates with the SIM information.

HSS: Home Subscriber Server
BSF: Bootstrapping Server Function
NAF: Network Application Function

**GBA Authentication Option (MX847570A-084) is required*

GBA Authentication Option (3/3)

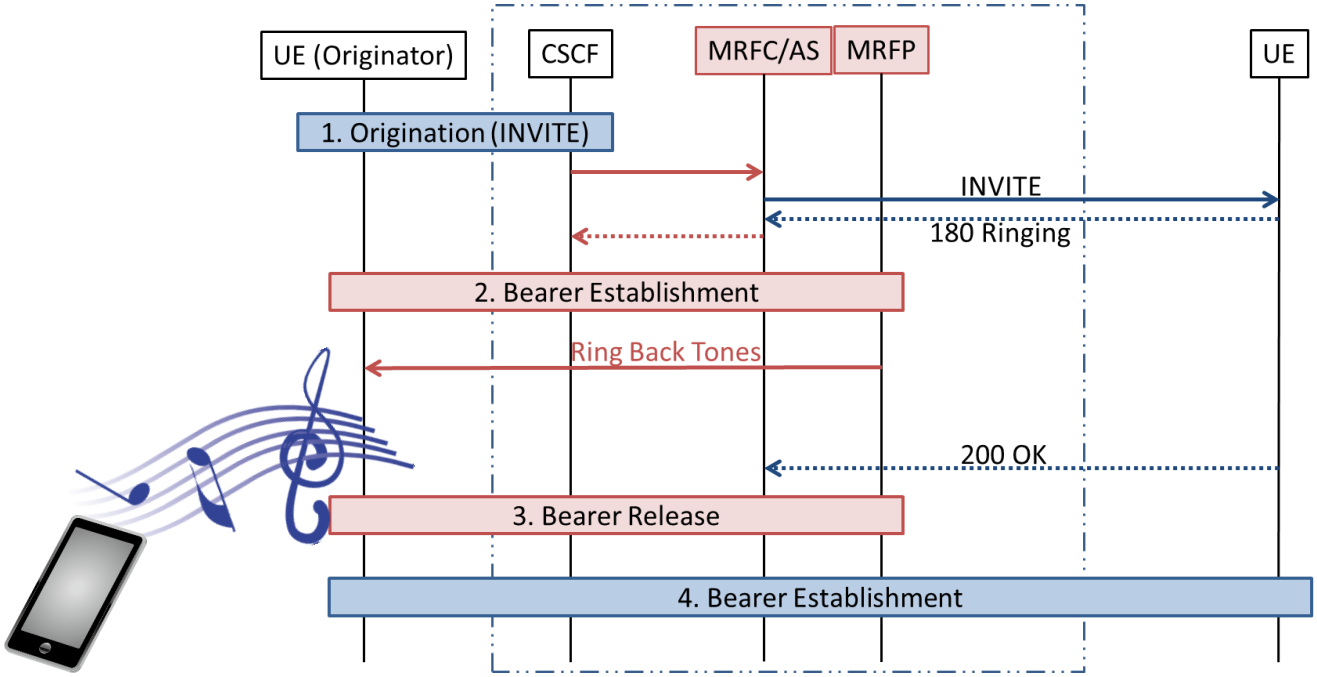
- Anritsu provides the following environments:
  - ✓ An authentication procedure and several kinds of setting parameter to emulate GBA operation
  - ✓ GBA procedure combined with XCAP-based service
    - e.g., authentication when UE gets its capability from XCAP server after SIP registration.



**GBA Authentication Option (MX847570A-084) is required*

IMS Early Media Option

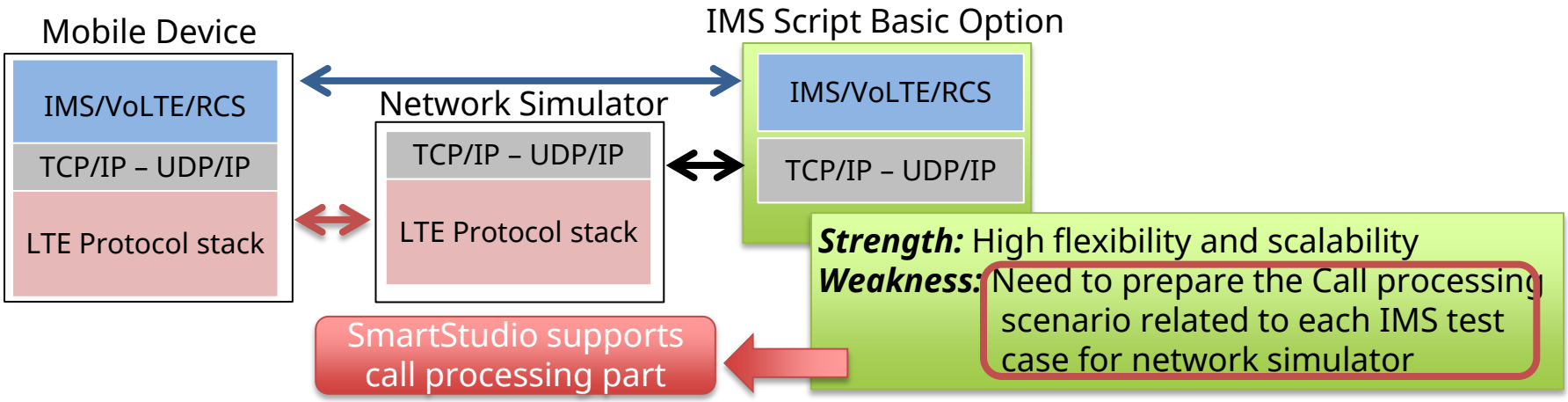
- VoLTE Early Media function*
  - Supports Early Media sequence of IMS with GUI operation of IMS server
  - Supports Customized Alerting Tone(CAT) by Network Ring Back Tone(NRBT) test environment*



* *IMS Early Media Option (MX847570A-085) required*

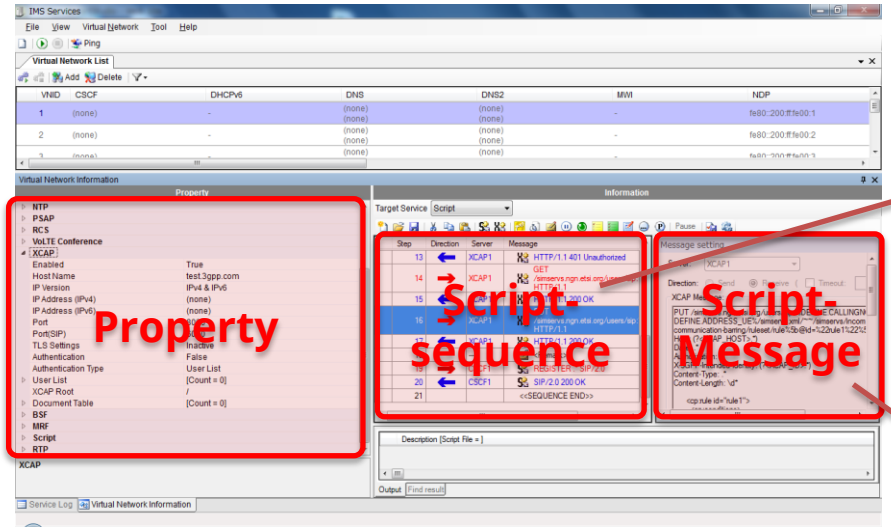
IMS Script Basic Option / XCAP Script Option

- Provides the scripting environment for a CSCF server, XCAP server, and Virtual UA within SmartStudio.
- Scripts can be created using a ladder sequence, supporting high flexibility and scalability.
- The Smartphone vendor can easily configure both a test environment;
  - ✓ for the leading edge of operator services
  - ✓ for various tests such as subnormal and abnormal test conditions
- Call processing of LTE is by using the SmartStudio, the user can focus on function of IMS / RCS development and evaluation.



*IMS Script Basic Option (MX847570A-060) , XCAP Script Option (MX847570A-061) are required

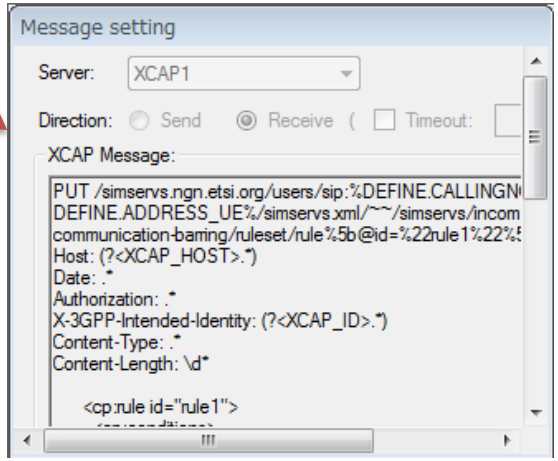
IMS Script Basic Option / XCAP Script Option



Script-sequence

Step	Direction	Server	Message
13	←	XCAP1	HTTP/1.1 401 Unauthorized
14	→	XCAP1	GET /simservs.ngn.etsi.org/users/sip:HTTP/1.1
15	←	XCAP1	HTTP/1.1 200 OK
16	→	XCAP1	PUT /simservs.ngn.etsi.org/users/sip:HTTP/1.1
17	←	XCAP1	HTTP/1.1 200 OK
18		---	<Remark>
19	→	CSCF1	REGISTER .* SIP/2.0
20	←	CSCF1	SIP/2.0 200 OK
21			<<SEQUENCE END>>

Script-Message



Property area:

Set the parameters for CSCF / XCAP like IP address

Script area:

Supports to edit and execute a sequence message between UE and CSCF / XCAP

Sample Script:

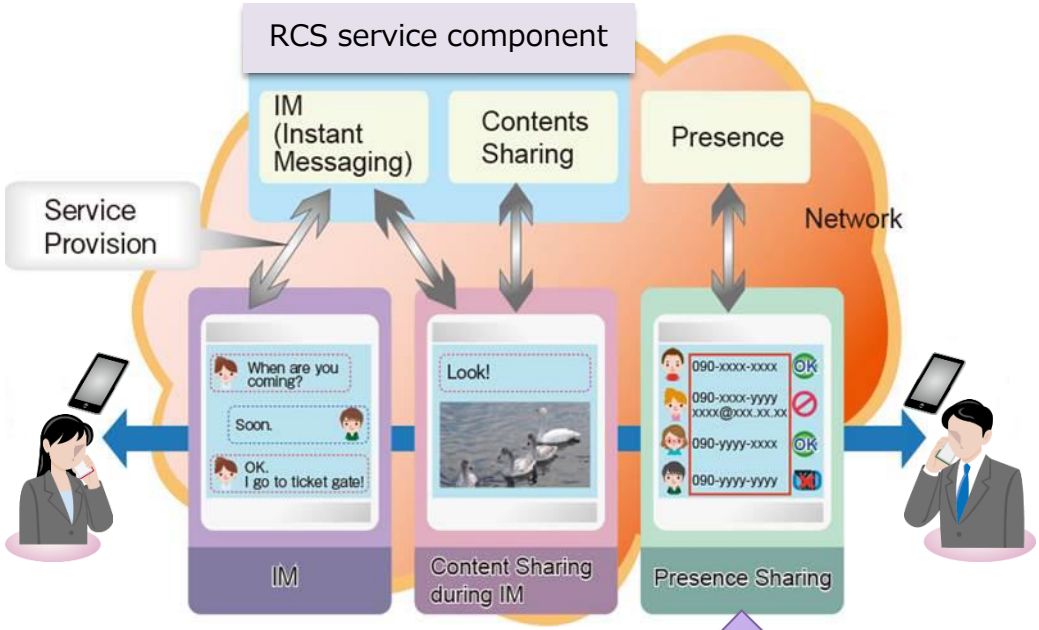
Prepare the following type of scripts(with or without AUTH)

- Registration
- Voice(VoLTE) MO / MT
- SMS(over IMS) send / receive
- Communication Barring

**IMS Script Basic Option (MX847570A-060) , XCAP Script Option (MX847570A-061) are required*

RCS (Rich Communication Suite)

- Supports the enhancement messaging service will be adopted by carriers worldwide

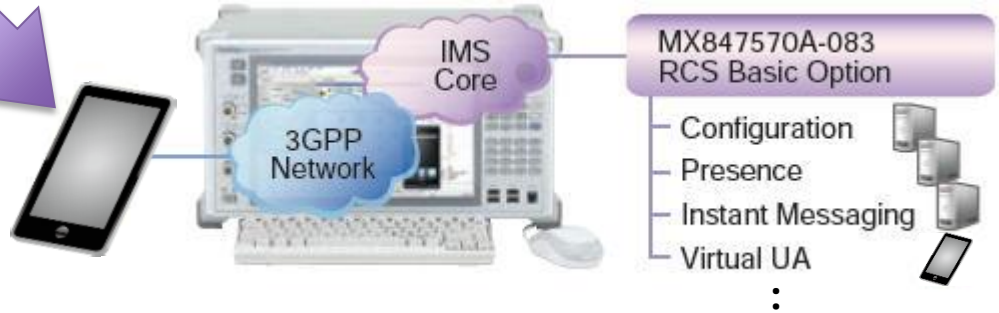


RCS features:

- ✓ **Enhancement messaging**
  - Instant Messaging, 1to1 chat, group chat
- ✓ **Contents sharing**
  - File Transfer, Contents sharing
- ✓ **Communication**
  - IR.92 VoLTE, IR.94 Video
- ✓ **Enhanced Address Book**
  - Social Presence Information
- ✓ **Geolocation**

MD8475A/SmartStudio:

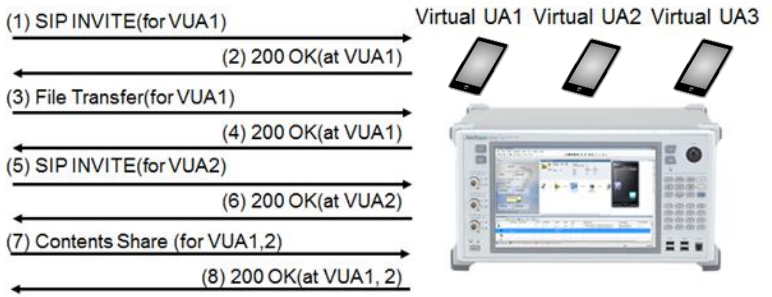
- **Built-in IMS server supports RCS**
- **Up to 5 Virtual UAs(user agents)**



** MX847570A-083 RCS Basic Option required*

RCS Option enhancement

- 1 to 1 Chat (CPM)
  - ✓ 1 to 1 Chat (CPM): Chat session over CPM
  - ✓ MO/MT Chat support
  - ✓ Chat message logging
  - ✓ Support for store and forward (message is sent at getting online)



- Group Chat
  - ✓ Upgrade from 1 to 1 Chat to Group Chat
  - ✓ Support for 5 Virtual UAs on SmartStudio side
  - ✓ Chat session: based on CPM protocol
  - ✓ Chat message logging in one window for 1 to 1 Chat and Group Chat
  - ✓ Support for store and forward (message is sent at getting online)
- File Transfer
  - ✓ Image file transfer: 5 extensions support: jpeg/jpg, bmp, gif, png
    - Other file format: transferred as binary
  - ✓ File transfer support during 1 to 1/Group Chat
  - ✓ Real time display of image file when received on Virtual UA
  - ✓ Transfer status display (Transfer progress)
  - ✓ Support for store and forward (message is sent at getting online)
- Standalone Messaging
- Content sharing
  - ✓ Content Sharing during/without a voice call
  - ✓ Share Video during a call in the multi device environment
  - ✓ Share an Image during a call

Comparison of RCS 5.1 Service

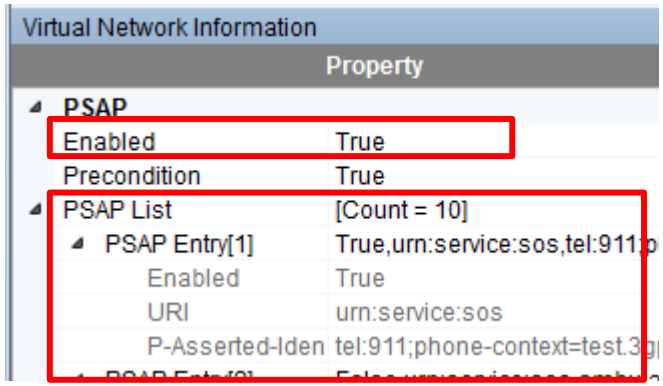
Item	Support	Comment
Configuration & Registration	✓	Support only HTTP(S) base
Capability discovery	✓	
Standalone messaging	✓	
1-to-1 Chat	✓	
Group Chat	✓	
File Transfer	✓	
Content sharing	✓	
Social Presence Information	✓(*1)	(*1) Geolocation service is not supported.
IP Voice Call	✓	Support only IR.92 base Interaction with CS voice is not supported.
IP Video Call (IR.94)	✓	Support only IR.94 base
Geolocation services		Under planning

** MX847570A-083 RCS Basic Option required*

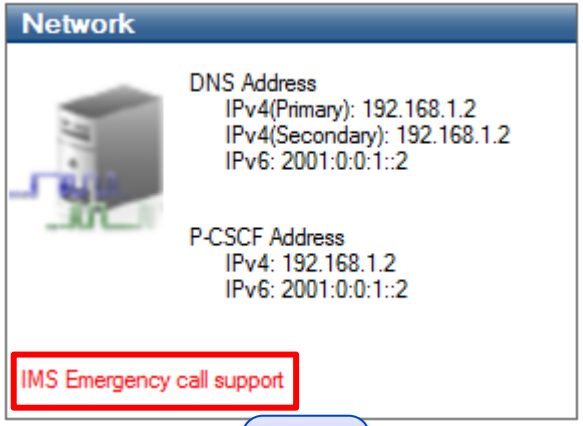
VoLTE Emergency Call

- VoLTE Emergency Call function
  - Supports VoLTE Emergency Call* with GUI operation of IMS service and Simulation parameter setting, Cell parameter setting.

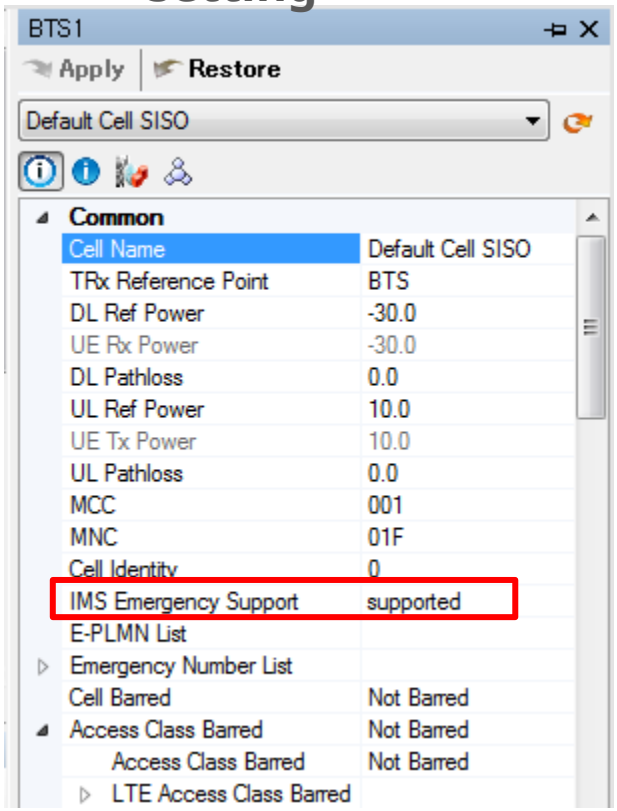
IMS service



Simulation parameter setting



Cell parameter setting



** For Video Call, MX847570A-080 Extended CSCF Option required*

IMS Function Summary(1/2)

Section	Function	Outline	MX847570A	GUI Option					Script Option *2	
				MX847570A-080	MX847570A-081	MX847570A-083	MX847570A-084	MX847570A-085	MX847570A-060	MX847570A-061
General	SIP REGIST Test	Function for verifying CSCF server Bind/Unbind operation	✓						✓	
	IPsec	Function for on/off at IPsec (3DES, AES).	✓						✓	
	DNS Server	Function for resolving address using DNS	✓							
	NTP Server	Function for synchronizing time using NTP	✓							
	PSAP Server	Function for looping-back voice for IMS Emergency	✓						✓	
	X-CAP Server	Function for verifying service using XML file	✓							✓
	BSF Server	Function for GBA					✓			
	No Server (Network) Response Test	Function for verifying operation when no response due to error at server or network		✓					✓	✓
	Server Error Test	Function for verifying operation when error response received from server when error at server		✓					✓	✓
	Multi P-CSCF	Function for reporting up to three P-CSCF servers to UE		✓						
VoLTE / VT	Calling Sequence Test	Function for verifying call sequence from UE	✓						✓	
	Incoming (Answering) Call Sequence Test	Function for verifying call sequence to UE		✓*1					✓	
	Voice Loopback Test	Function for looping-back and sending uplink voice data to verify call at UE side	✓						✓	
	Early media Test	Function for verifying early media sequence and Ring Back Tone						✓		
	Disconnection (from UE) Sequence Test	Function for verifying disconnection sequence from UE	✓						✓	
	Disconnection (from NW) Sequence Test	Function for verifying disconnection sequence from network		✓*1					✓	
	Called Party Busy Test	Function for verifying operation when called party busy		✓					✓	
	Called Party Not Found Test	Function for verifying operation when called party not found		✓					✓	
	Called Party No Reponse Test	Function for verifying operation when no response from called party		✓					✓	
	Codec Selection Tx	Function for confirming VoLTE/VT traffic with any codec; also performs loopback		✓					✓	
	VoLTE/VT Upgrade/Downgrade	Switches VoLTE/VT during call		✓					✓	
	Call ID Display/Block	TS 24.607 Verifies IMS test terminal call ID display ON/OFF			✓				✓	✓
	Incoming Call ID Display/Block	TS 24.608 Verifies IMS test terminal incoming call ID display ON/OFF			✓				✓	✓
	Call Forwarding, Holding, Catchphone	Function for simulating TS 24.604, TS24.610, TS 24.615 call forwarding, call holding, and catchphone functions			✓					✓
	VoLTE Conference Environment	Function for verifying TS.24.605 VoLTE Conference related tests (Event message, HOLD, etc.)			✓				✓	✓
	Message Waiting Indication	Function for notifying users of voice mail services about arriving voice mail			✓				✓	✓

*1: This option is not required if opposite UE is prepared.
*2: Message scripts must be created for testing.

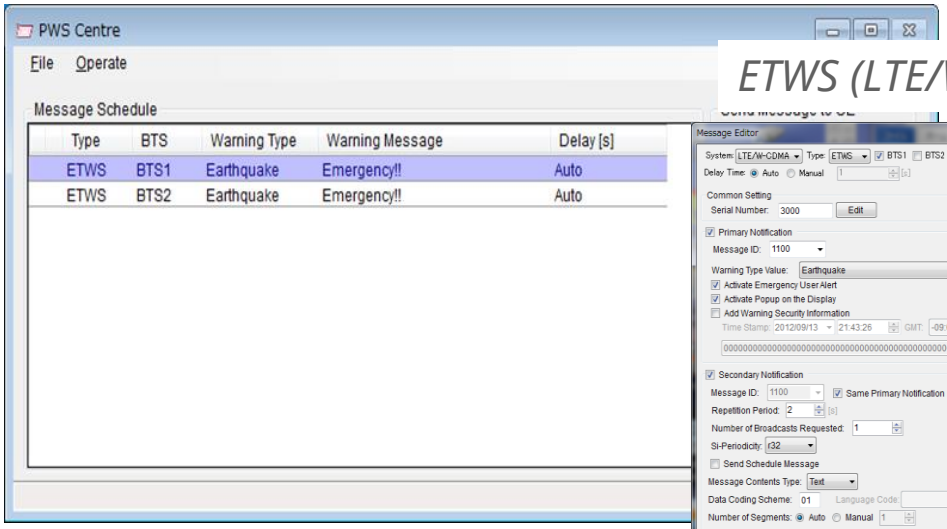
IMS Function Summary(2/2)

Section	Function	Outline	MX847570A	GUI Option					Script Option *2	
				MX847570A-080	MX847570A-081	MX847570A-083	MX847570A-084	MX847570A-085	MX847570A-060	MX847570A-061
RCS	Configuration	Function for creating and updating UE configuration data using XML file				✓				
	Presence	Function for configuring from UE using XML file				✓				
	Instant Messaging	Function for sending and receiving Instant Message using XML file				✓				
	RCS Address Book	Function for registering and saving UE contacts using RCS				✓				
	1 to 1 Chat (CPM)	Function for 1 to 1 chat				✓				
	Group Chat	Function for multi party chat (Maximum 5 users)				✓				
	File Transfer	Function for sending and receiving same files between chat user				✓				
	Contents Sharing	Function for sharing a video or an image during voice call/without voice call				✓				
SMS over IMS	SMS Message Send Test	Function for verifying UE SMS message sending	✓						✓	✓
	SMS Message Receive Test	Function for verifying UE SMS message receiving	✓						✓	✓
IPv6 Addressing	IP Address Allocation and Test (RA)	Function for verifying IP address setting at RA receipt	✓							
	IP Address Allocation and Test (DHCPv6)	Function for verifying IP address setting allocated from DHCPv6 server	✓							
VoLTE Emergency Call	VoLTE Emergency Call (Voice)	Function for verifying IP VoLTE Emergency Call		✓						

*2: Message scripts must be created for testing.

Message Service Test – Public Warning System

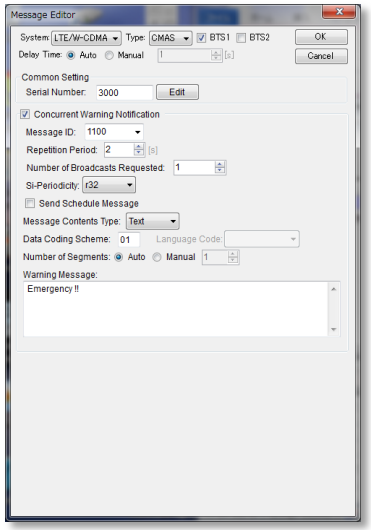
- Public Warning System (PWS) Message test
  - Earthquake Tsunami Warning System (ETWS) on LTE/WCDMA
    - Primary Notification
    - Secondary Notification
  - Commercial Mobile Alert Service (CMAS) on LTE/W-CDMA/CDMA2000/GSM



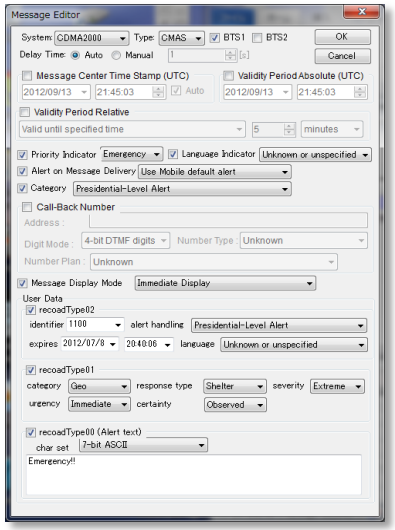
PWS Centre

ETWS (LTE/W)

CMAS (LTE/W/G)



CMAS (CDMA2000)



Automated Test Solution

- Automation Framework Overview
- Regression Test
- Battery Consumption
- IP Tester Control Library
- Smartphone Control Platform
- SSM Test Configuration
- eCall Tester Control Library

MD8475A Automated Test Solution Overview

Validate UE functionality during development cycle to reduce TTM
- Minimize field/drive testing, characterize performance, test applications

Highlights:

Multi-technology/multi-cell signaling scenarios
- cost effective, small footprint solution

State machine driven
- straightforward parameters with no script design

Create automated test sequences
- join multiple scenarios for drive test simulation

Automate once
- Re-use your configuration across Anritsu automated solutions

Technologies
LTE(FDD/TDD),
W-CDMA/HSPA/HSPA evo/DC-HSDPA,
GSM/GPRS/EGPRS
CDMA2000 1X/EV-DO,
TD-SCDMA/HSPA

Types of Tests
Signaling: Basic, IRAT Handovers, CSFB, VoLTE-IMS
Performance: data throughput, data efficiency
Applications: Video streaming, web browsing, RCS

Product Description; MX847503A SmartStudio Manager

- **Product Attributes**
  - **Ease of use, without requiring in depth knowledge of 3GPP protocols**
    - Intuitive graphical user interface to expedite creation and execution of test cases
  - **Evaluates application behavior under different network conditions**
    - Simulate different QoS, data throughput and mobility scenarios
  - **Captures logs and reports results to application developer**
    - Provides protocol log of message sequence for analysis

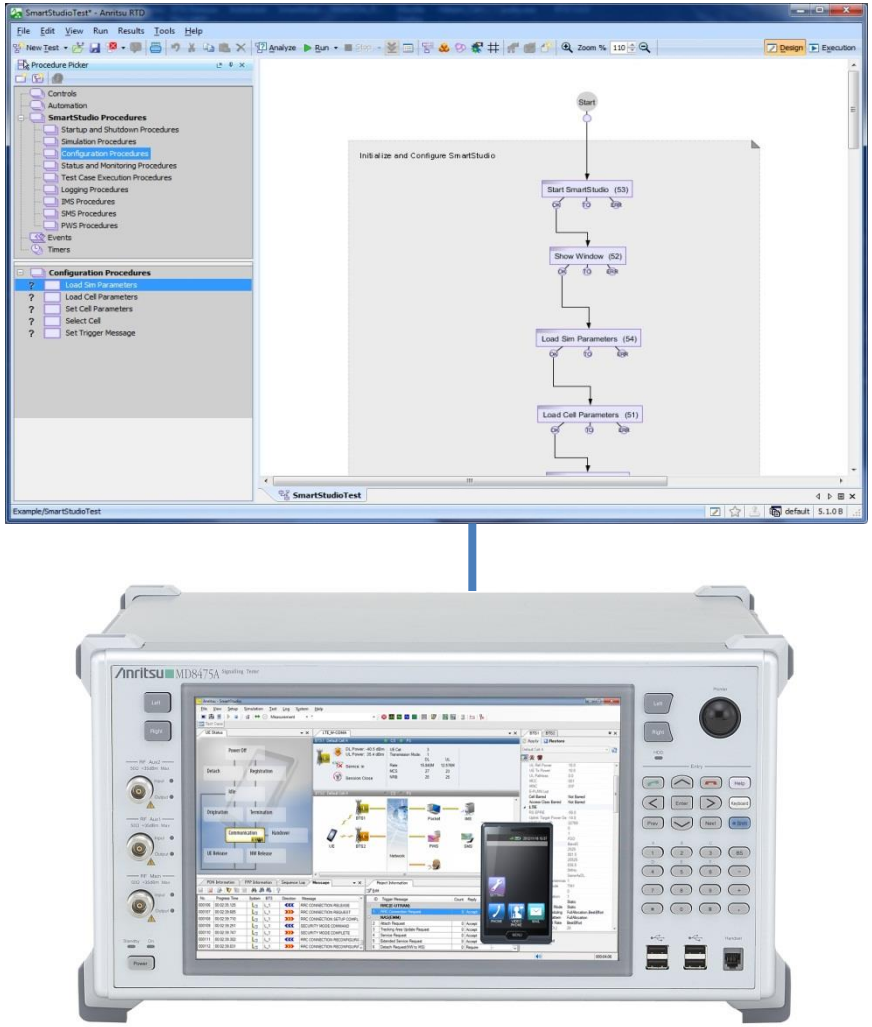
Functional Testing

Product Description; MX847503A SmartStudio Manager

- **Customer Values**
  - Contribute to configure turn key solution to meet short verification cycle
  - Create automation Test Sequence easy based on sample Test Sequences
  - Expandability for external equipment control such as power supply, W-LAN AP to allow users to configure various types of automated environment easy for Smartphone user experience verification
  - Realize “24/7” automated tests
- **Sample Test Sequences – over 180 tests available**
  - UE Function Test
    - Registration / Service / SMS / CMAS / ETWS / CSFB / Barring / throughput / Emergency / WLAN
  - Mobility Test
    - Selection / Reselection / Redirection / Handover / SRVCC
  - GSMA TS09Test
    - Stand-by Test / Talk Time Test / Browsing / FTP Download
  - IMS Test
    - Attach / VoLTE / ViLTE / SMS over IMS / supplementary service / RCS

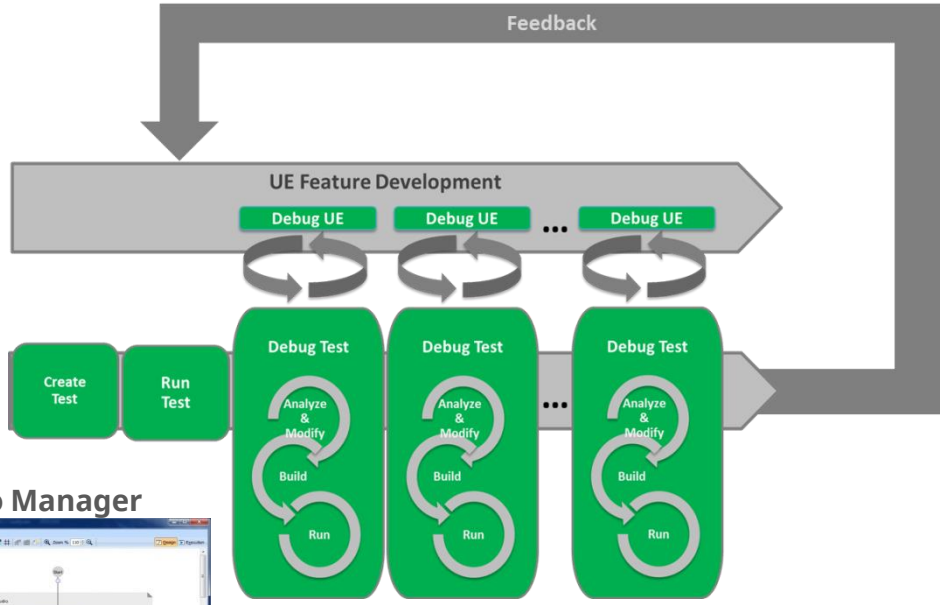
Test Application Examples

- Software Regression Test
  - Mobility Test
  - Stress Test
- Battery Consumption Test
- Device Thermal Test
- Data Throughput Test
- eCall / ERA GLONASS Test

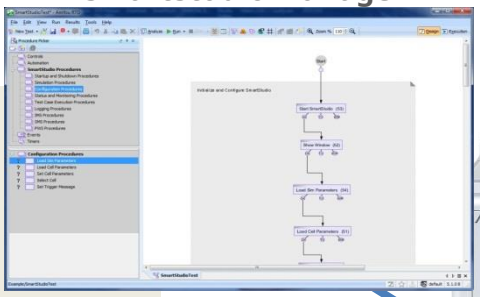


Software Regression Test

- Type of software testing to find new software bugs and check if existing functions and new functions work without any problem after enhancement
- Simple automated test environment allows users to reduce software development cycle



SmartStudio Manager



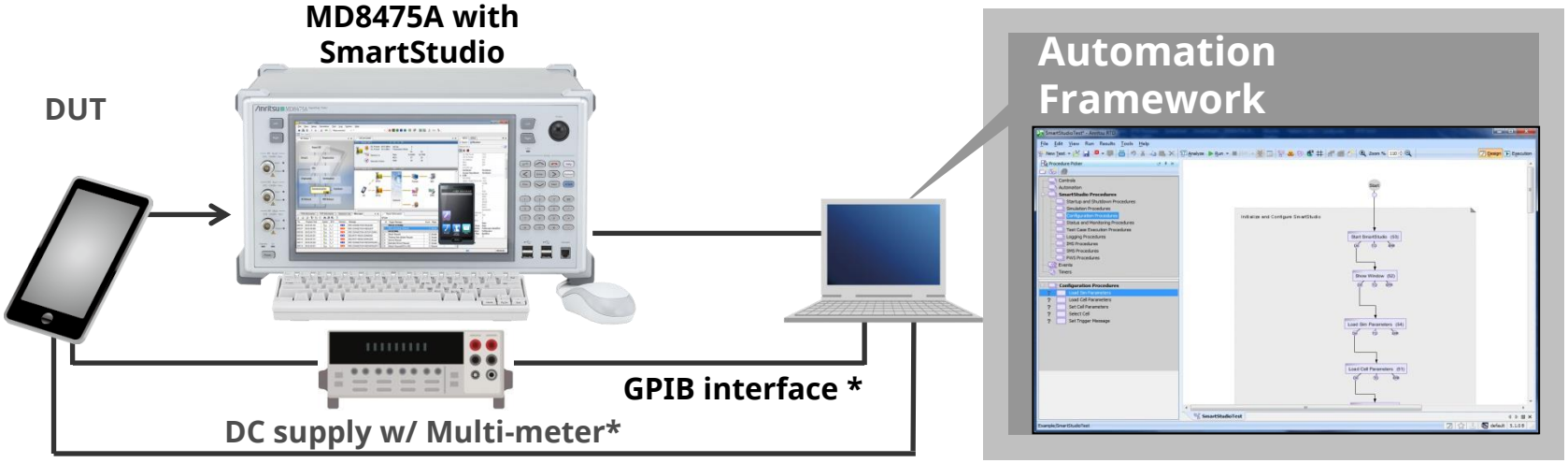
Sample Test Sequences

- Registration
- Service
- PWS
- Cell Barred
- CS Emergency
- Stress test
- Tput testing
- Mobility

etc.

Battery Consumption

- GSMA TS.09 Battery Life Measurement test solution



  - Features:
    - GSMA TS.09 compliance
    - Easy parameter setup & operation
    - UE Control
    - Automated Test System used Ethernet remote control

Better battery life performance is a key point of differentiation to win for the Chipset and Smartphone manufacturers

**Customer supplied*

Battery Consumption Test Sequence List

Procedure	Radio system	File Name	Summary
Stand-by test	G	TS09_GSM_StandbyTime.test	Current measurement test while UE is in Idle mode in GSM cell
Stand-by test	G	TS09_G_StandbyTime.test	Current measurement test while UE is in Idle mode in GSM/GPRS cell
Stand-by test	W	TS09_W_StandbyTune.test	Current measurement test while UE is in Idle mode in W-CDMA cell
Stand-by test	G-W	TS09_GSM_W_StandbyTime.test	Current measurement test while UE is in Idle mode in GSM cell with W-CDMA neighbour cells information
Stand-by test	G-W	TS09_G_W_StandbyTime.test	Current measurement test while UE is in Idle mode in GSM/CPRS cell with W-CDMA neighbour cells information
Stand-by test	W-G	TS09_W_G_StandbyTime.test	Current measurement test while UE is in Idle mode in W-CDMA cell with GSM/GPRS neighbour cells information
Stand-by test	L	TS09_L_StandbyTime.test	Current measurement test while UE is in Idle mode in LTE cell
MOMR: Talk time Test	G	TS09_GSM_TalkTime_MO_MR.test	Current measurement test while UE is in voice communication in GSM cell (UE origination, UE release)
MTNR: Talk time Test	G	TS09_GSM_TalkTime_MT_NR.test	Current measurement test while UE is in voice communication in GSM cell (UE termination, NW release)
MOMR: Talk time Test	W	TS09_W_TalkTime_MO_MR.test	Current measurement test while UE is in voice communication in W-CDMA cell (UE origination, UE release)
MTNR: Talk time Test	W	TS09_W_TalkTime_MT_NR.test	Current measurement test while UE is in voice communication in W-CDMA cell (UE termination, NW release)
Packet Switch Transfer Test	G	TS09_GPRS_PacketSwitchedTransfer.test	Current measurement test while UE is in packet communication in GSM/GPRS cell G Packet : DL 83.1k / UL20.8k
Packet Switch Transfer Test	W	TS09_W_PacketSwitchedTransfer.test	Current measurement test while UE is in packet communication in W-CDMA cell W Packet : DL 7.2M / UL 5.76M
Packet Switch Transfer Test (Download)	L	TS09_L_PacketSwitchedTransfer_FileDownload.test	Current measurement test while UE is in packet communication in LTE cell (FTP download) L Packet : DL 5.16M / UL 5.54M @ 10MHz
Packet Switch Transfer Test (Upload)	L	TS09_L_PacketSwitchedTransfer_FileUpload.test	Current measurement test while UE is in packet communication in LTE cell (FTP upload) L Packet : DL 5.16M / UL 5.54M @ 10MHz
Packet Switch Transfer Test (Down/Upload)	L	TS09_L_PacketSwitchedTransfer_ParallerFileDlUl.test	Current measurement test while UE is in packet communication in LTE cell (FTP download, FTP upload) L Packet : DL 21.4M / UL 22.9M @ 10MHz
Browsing Test	W	TS09_W_HTMLBrowsing.test	Current measurement test while UE is in packet communication in W-CDMA cell (HTML Browsing) W Packet : DL 7.2M / UL 5.76M
Browsing Test (Full Web Browsers)	W	TS09_W_HTMLBrowsing_Full.test	Current measurement test while UE is in packet communication in W-CDMA cell (HTML Browsing) W Packet : DL 7.2M / UL 5.76M
Streaming Content Test (Video)	L	TS09_L_StreamingContent_Video.test	Current measurement test while UE is in packet communication in LTE cell (Video Streaming) L Packet : DL 5.16M / UL 5.54M @ 10MHz MIMO used
Streaming Content Test (Audio)	L	TS09_L_StreamingContent_Audio.test	L Packet : DL 5.16M / UL 5.54M @ 10MHz MIMO used
Video Telephony Test	W	TS09_W_VideoTelephony.test	Current measurement test while UE is in packet communication in LTE cell (Audio Streaming)
FTP Download Test	W	TS09_W_FTPDownload.test	Current measurement test while UE is in Video call in W-CDMA cell W Packet : DL 7.2M / UL 5.76M
FTP Download Test	G	TS09_GPRS_FTPDownload.test	Current measurement test while UE is in packet communication in W-CDMA cell (FTP Download) G Packet : DL 83.1k / UL20.8k

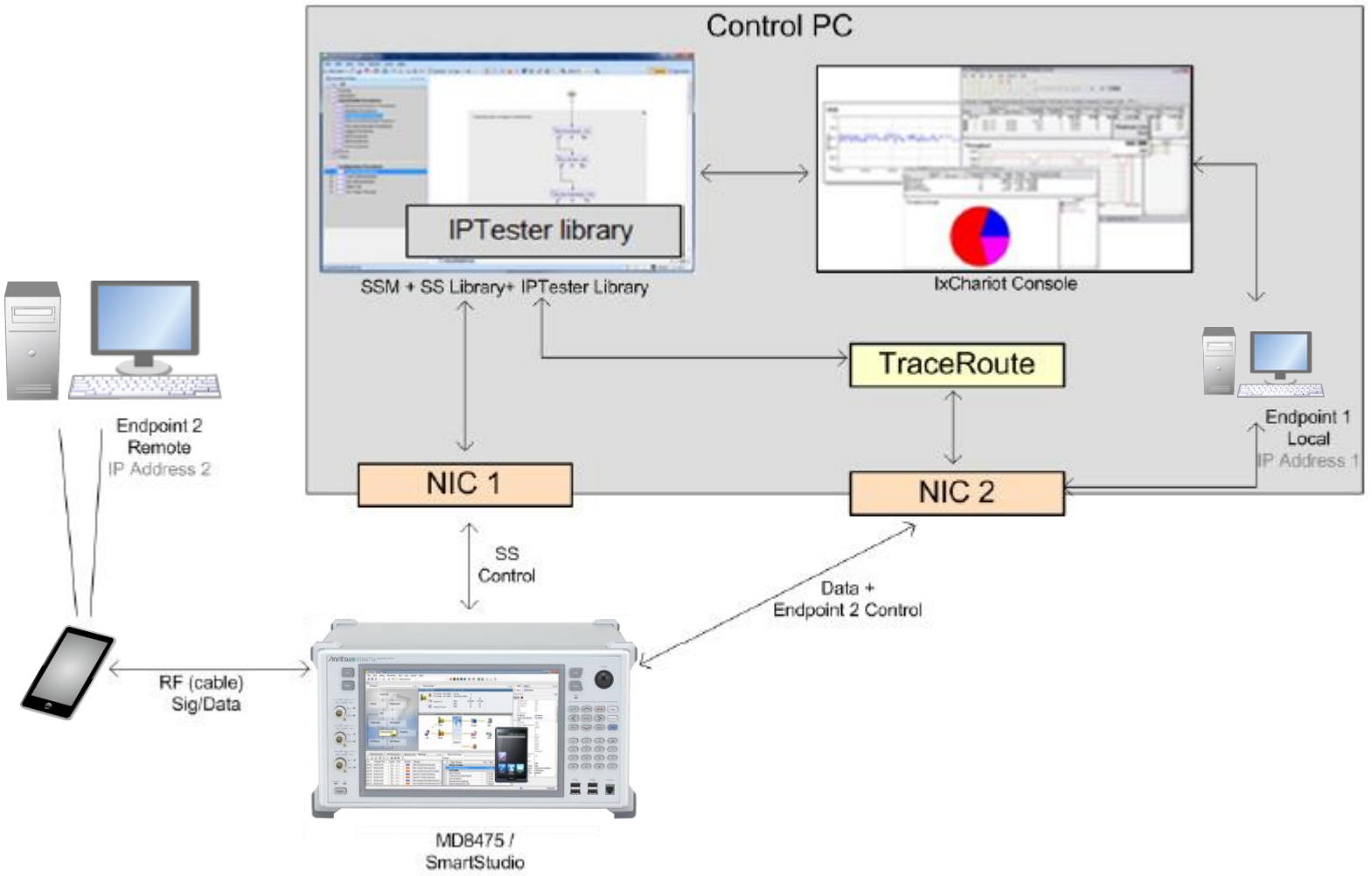
IP Tester Control Library (1/2)

- What is “IP Tester Control Library”?
  - People enjoy many kinds of benefits by using the Internet and the access is operated by their smartphone.
  - Nowadays smartphone should offer not only easy operation but also its stability for the Internet access to the people. This is a key for UE development.
  - IXIA IxChariot has been a highly well-received tool for IP network testing.
  - IP Tester Control Library is a collection of procedures used to control the IXIA IxChariot remotely.
  - Anritsu provides the following features with this library:
    - automating IP throughput testing
    - an integrated solution for testing 3GPP and 3GPP2 wireless protocols as well as IP performance measurement and analysis
  - Due to the functions above, the user can perform:
    - ✓ UE’s performance under high IP throughput testing condition
    - ✓ UE’s stability by repeated procedures under automated testing environment
  - Anritsu provides a large benefit to customers through creating this automated measurement environment easily.

**IP Tester Control Library (MX847503A-901) is required*

IP Tester Control Library (2/2)

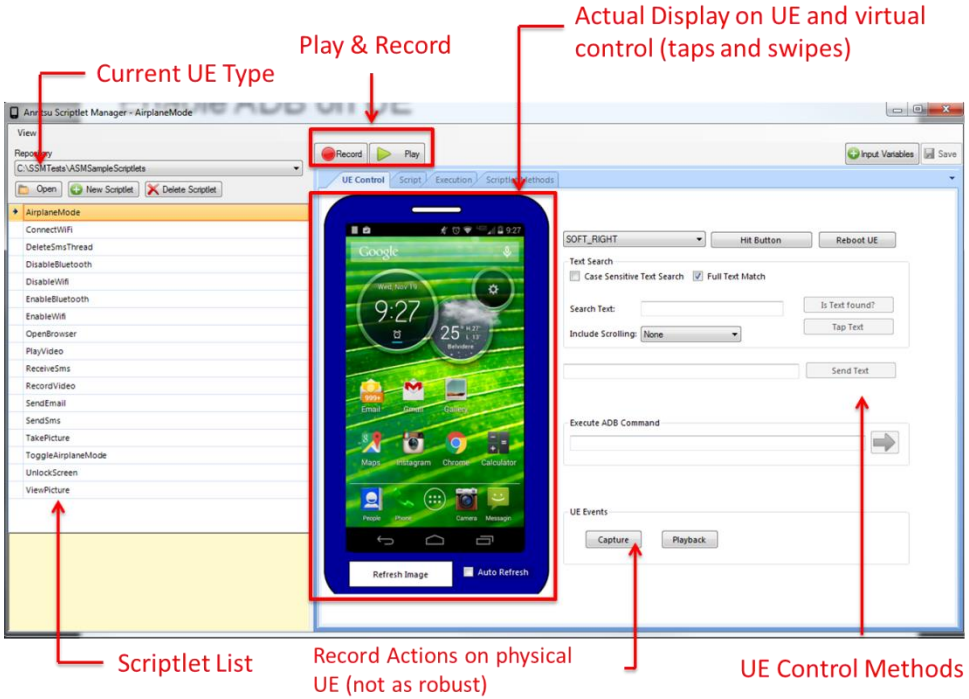
- Setup with SmartStudio Manager



*IP Tester Control Library (MX847503A-901) is required

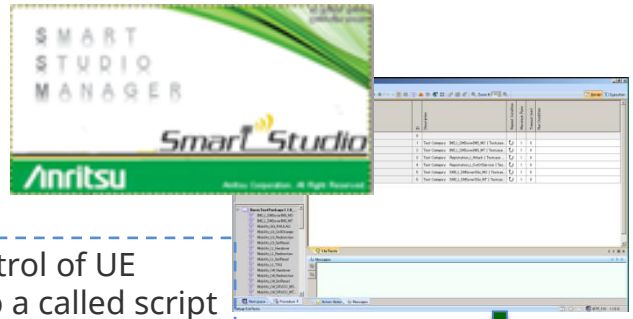
Smartphone Control Platform

- Anritsu provides the following features with this environment:
  - Editor for recording UE's behaviour and creating a script for UE automation control
  - Invoking the script by automated test engine of SmartStudio Manager
  - Supported OS: Android
- Due to the functions above, the user can do:
  - UE's regression testing before its release
  - UE's stability testing by repeated procedures under automated testing environment easily
  - Reuse and modify the existing scripts for other test script easily



Architecture

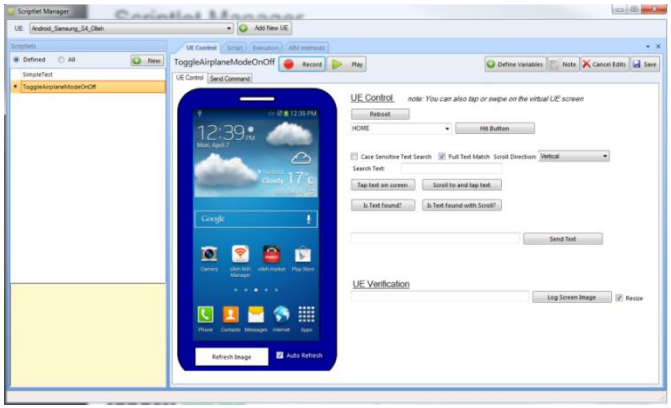
- Logical architecture



Interaction between UE and GUI to record UE's behaviour via ADB

Remote control of UE according to a called script

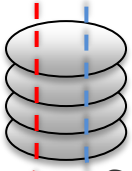
Kick Remote Execution



GUI to create a script

UE

Calling a script



Script repository

Remote Execution

Script creation part

Store the created script on this GUI

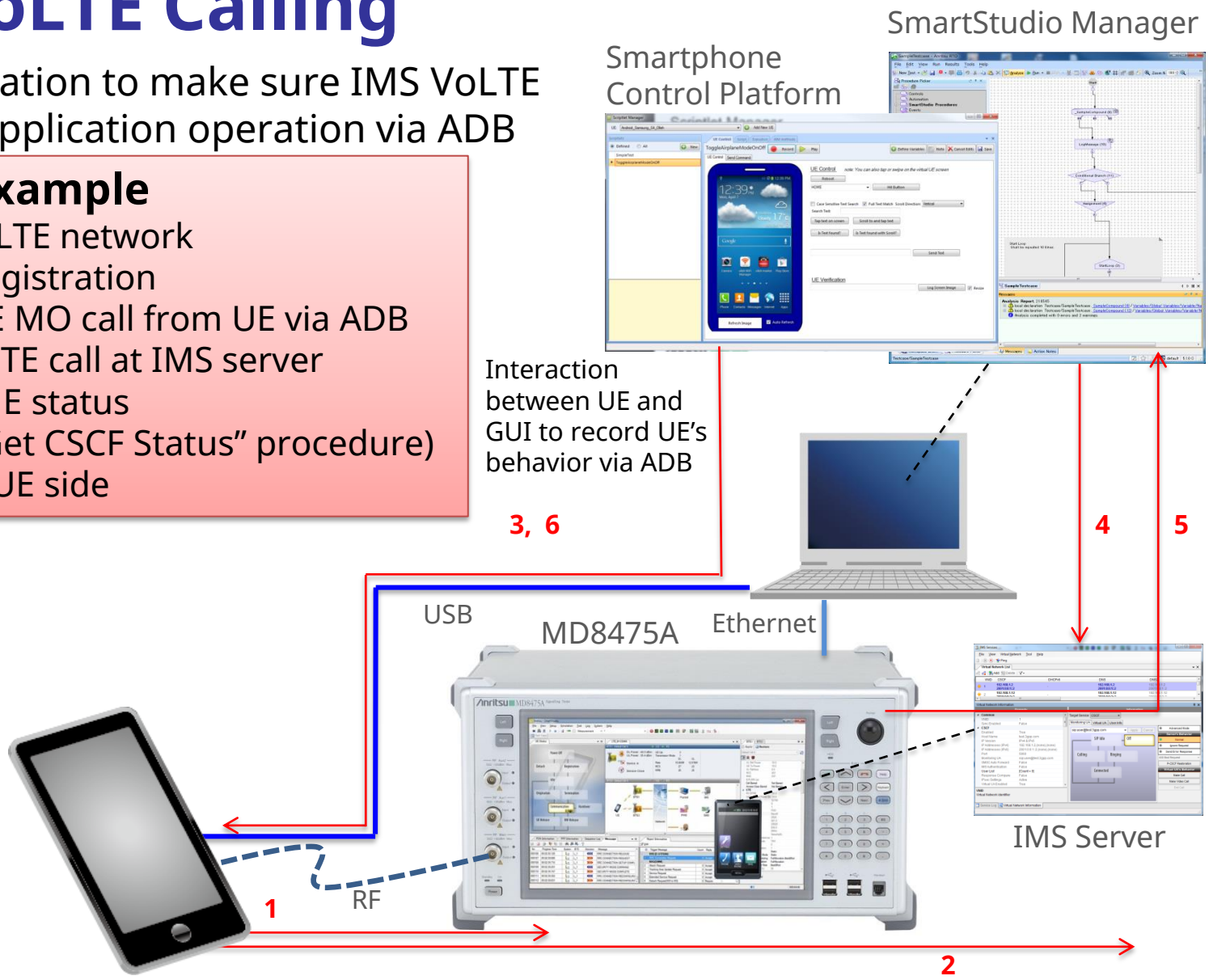
Script execution part

IMS VoLTE Calling

Test configuration to make sure IMS VoLTE calling with application operation via ADB

Test Case Example

1. Register to LTE network
2. Make SIP registration
3. Make VoLTE MO call from UE via ADB
4. Receive VoLTE call at IMS server
5. Check the UE status
   (by using “Get CSCF Status” procedure)
6. End call by UE side

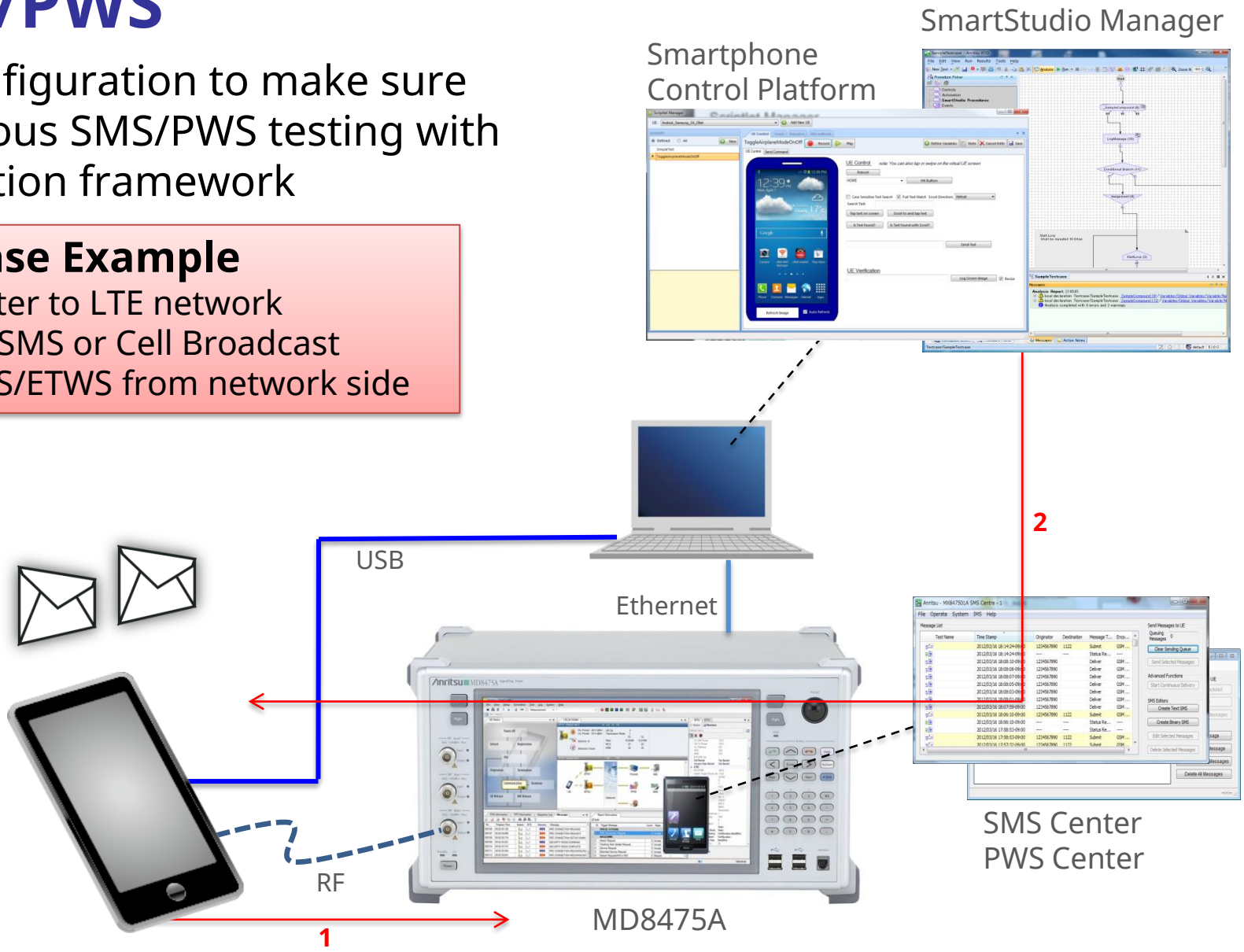


SMS/PWS

Test configuration to make sure continuous SMS/PWS testing with automation framework

Test Case Example

1. Register to LTE network
2. Send SMS or Cell Broadcast /CMAS/ETWS from network side

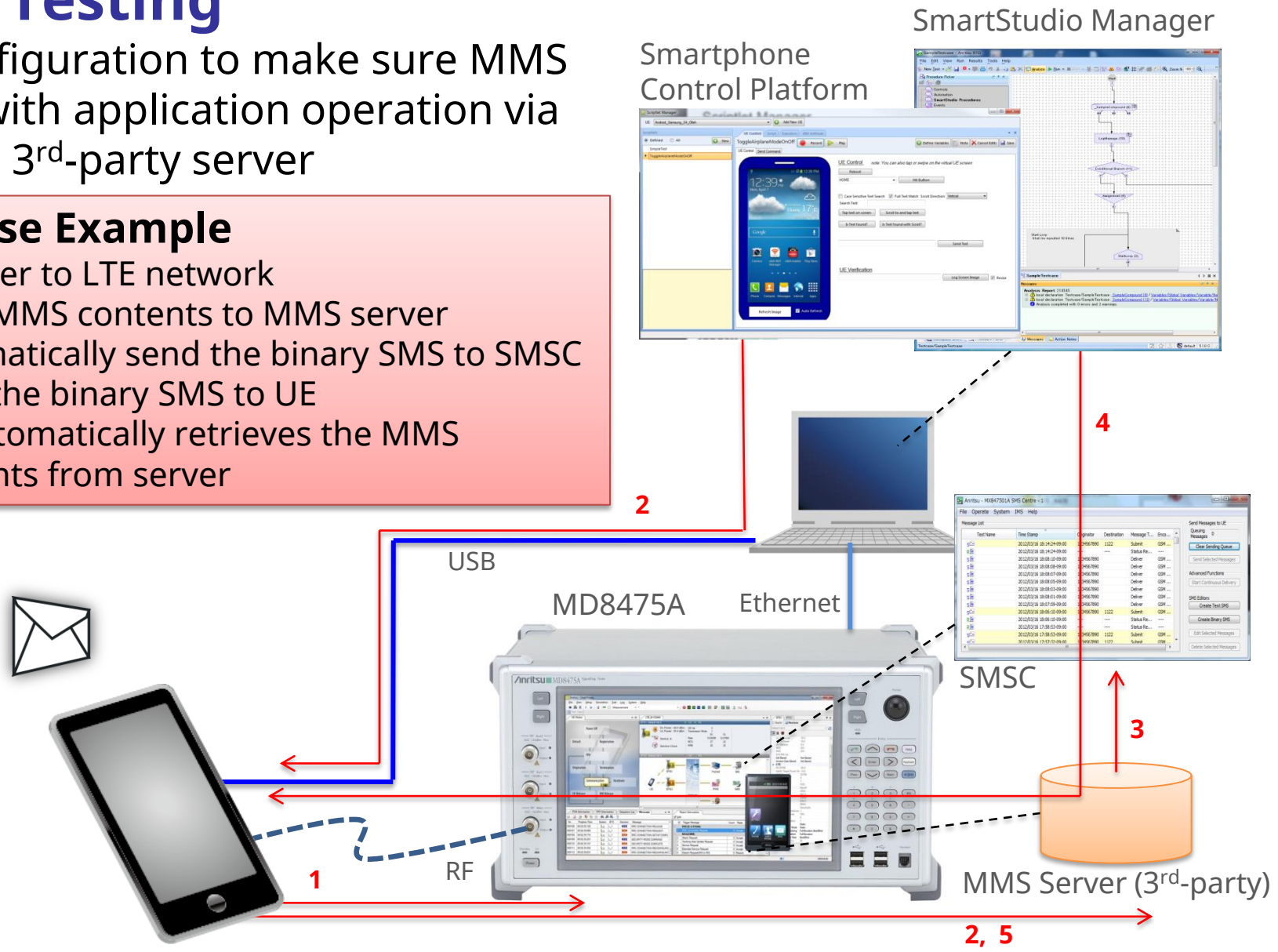


MMS Testing

Test configuration to make sure MMS testing with application operation via ADB and 3rd-party server

Test Case Example

1. Register to LTE network
2. Send MMS contents to MMS server
3. Automatically send the binary SMS to SMSC
4. Send the binary SMS to UE
5. UE automatically retrieves the MMS contents from server

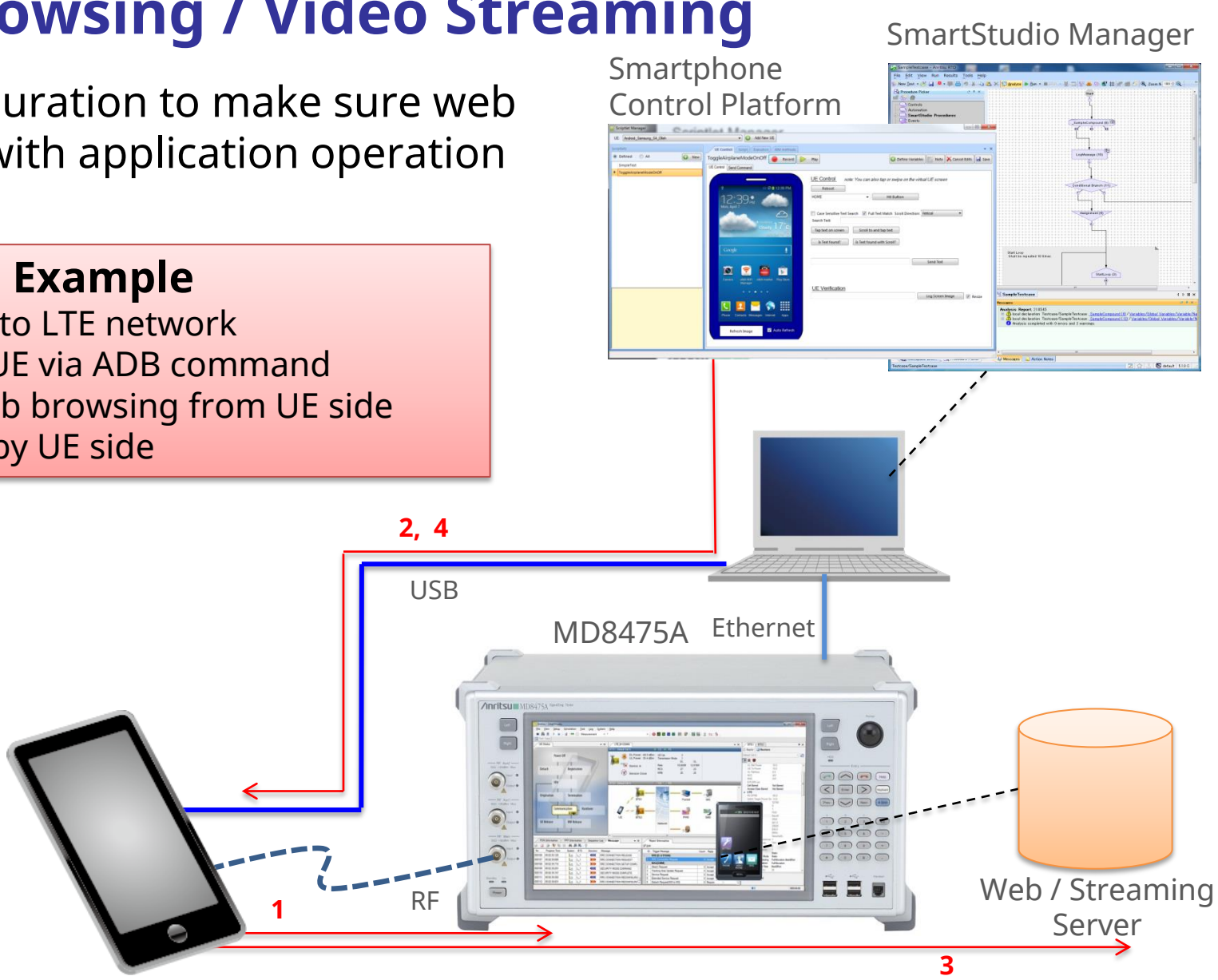


Web Browsing / Video Streaming

Test configuration to make sure web browsing with application operation via ADB

Test Case Example

1. Register to LTE network
2. Control UE via ADB command
3. Make web browsing from UE side
4. End call by UE side

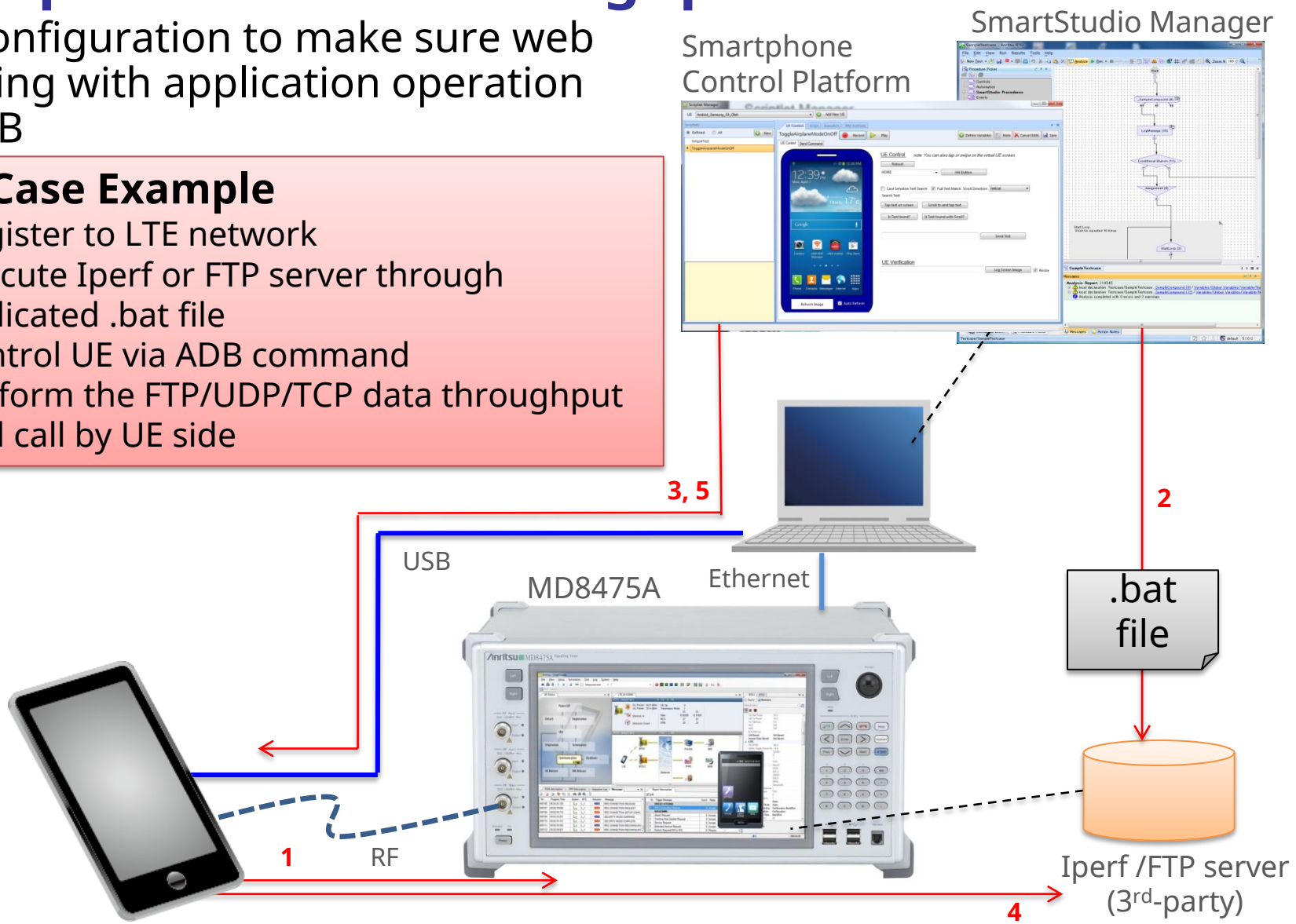


FTP/ Iperf for Data Throughput Test

Test configuration to make sure web browsing with application operation via ADB

Test Case Example

1. Register to LTE network
2. Execute Iperf or FTP server through dedicated .bat file
3. Control UE via ADB command
4. Perform the FTP/UDP/TCP data throughput
5. End call by UE side



WLAN Offload

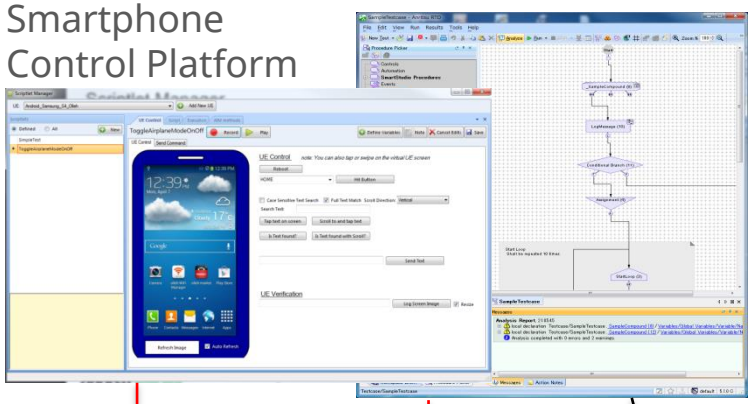
Test Case Example

1. Register to LTE network
2. Packet call over LTE via ADB
3. Control SmartStudio (LTE), WLAN AP and external WLAN OL application by SSM
4. Perform WLAN OL
5. End call by UE side

WLA N OL application
- EAP Authentication
- ePDG
- ANDSF

Smartphone Control Platform

SmartStudio Manager



Ethernet

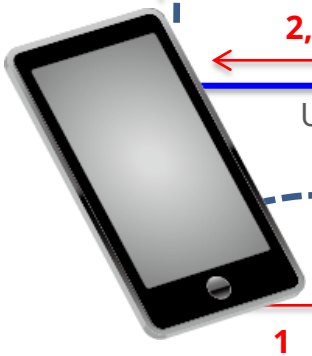
WLAN AP

3

3

4

Call Proc A



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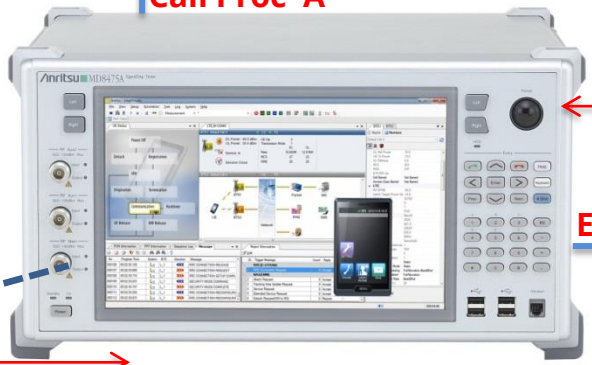
USB



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Ether 1

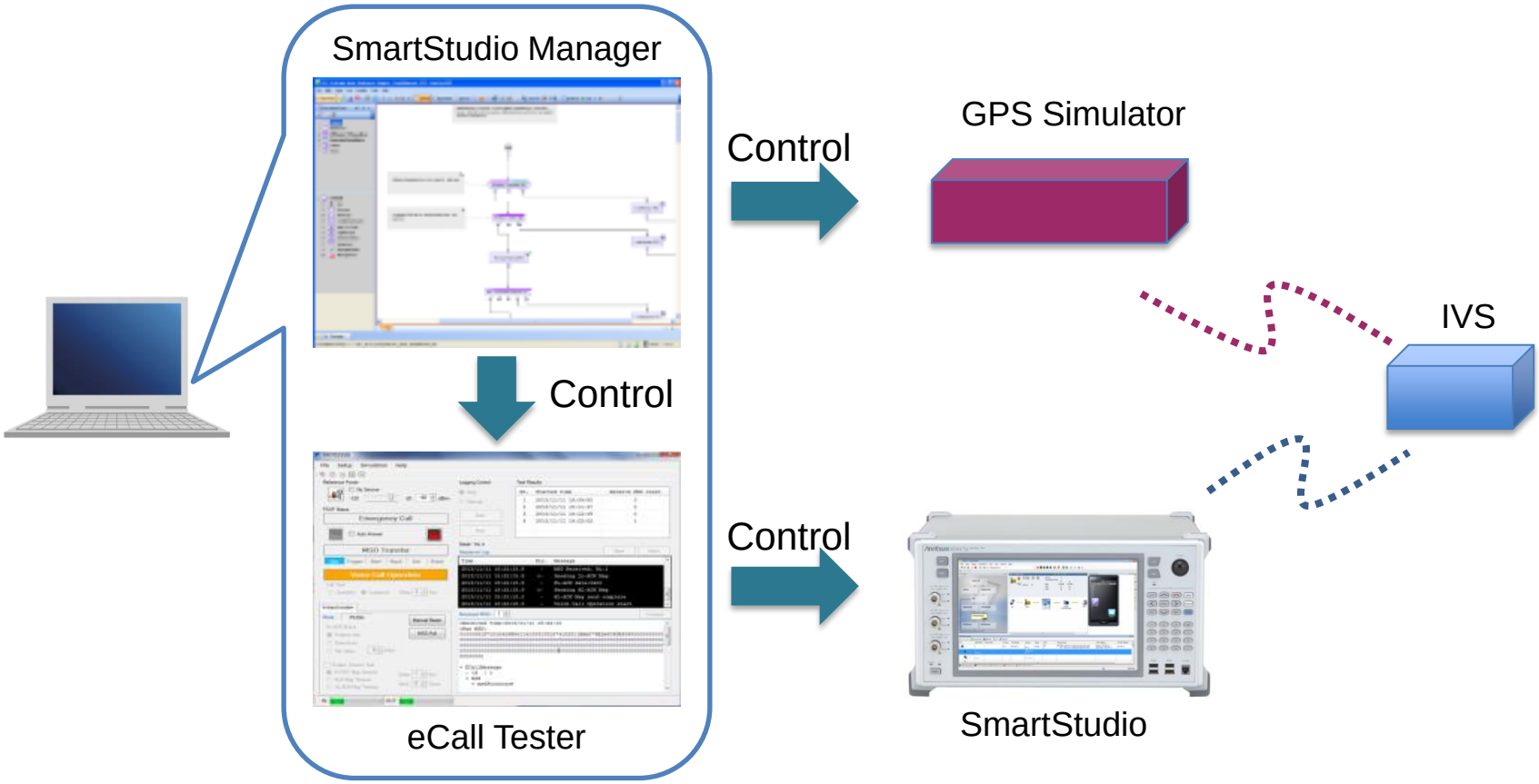
RF

1

MD8475A

eCall Tester Control Library

- New library to control MX703330E eCall Tester from SSM
  - By installing SSM and eCall Tester into same external PC, eCall Tester can be automated.



- eCall Tester (MX703330E), eCall Tester Control Library (MX847503A-923) are required.
- For ERA GLONASS tests, MSD ERA GLONASS Option (MX703330E-031) are required.

Anritsu

envision : ensure

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