Product Introduction

Anritsu

MD8475A

Signalling Tester

MD8475A Signalling Tester
Product Introduction

SmartStudio

Anritsu Corporation

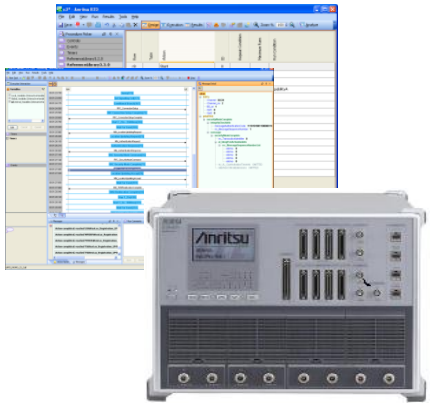
June. 2012 Version 6.00

Contents

Contents

Anritsu LTE Terminal Test Solutions

- **Support LTE system end-to-end test needs, such as hardware and software R&D, conformance test and manufacturing**



MD8430A Signalling Tester
MX786201A RTD
LTE Device L1, L2 and Protocol Test
Flexible Interface with 4 RF Capability

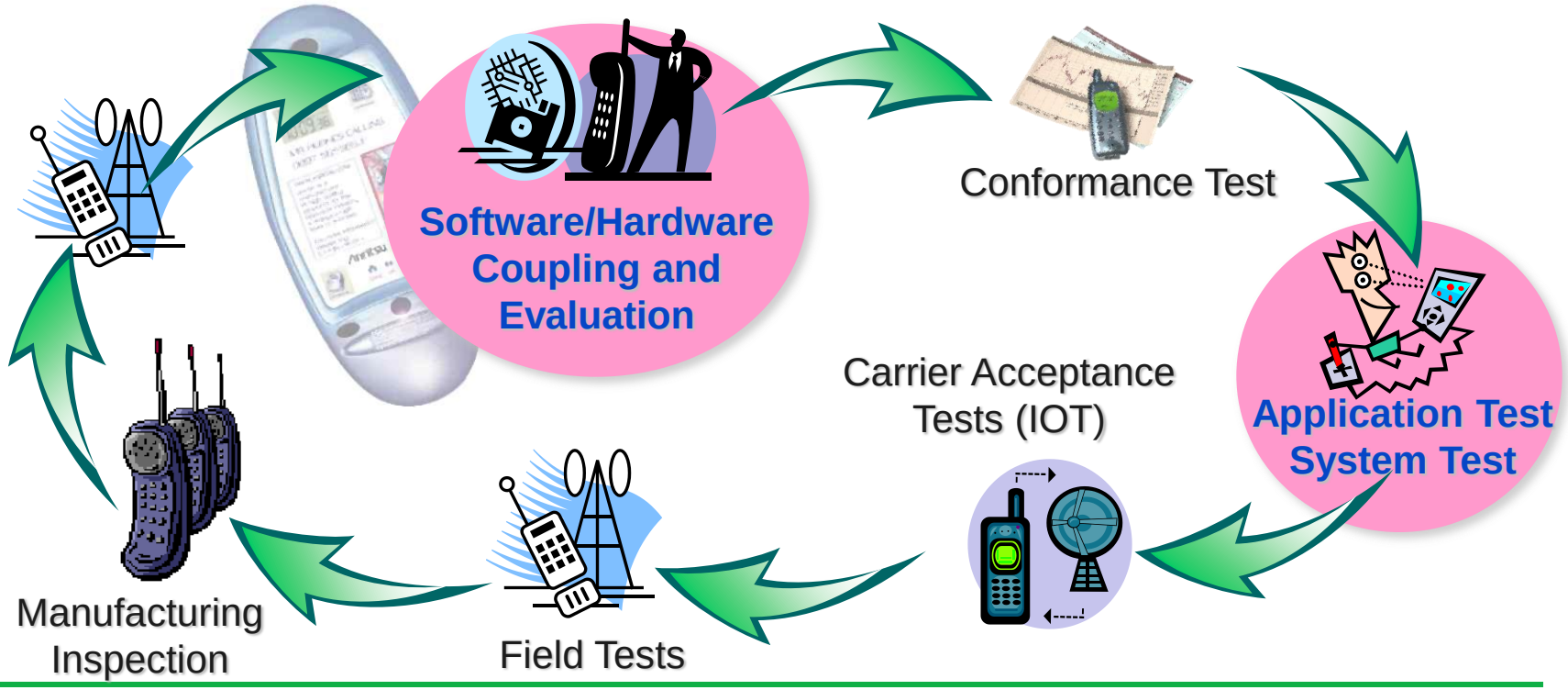
ME7834 Mobile Device Test Platform
LTE Device Operator Acceptance (IOT)
Device Certification/Pre-Certification (Protocol CT)
Inter-RAT LTE UTRAN/GERAN, LTE CDMA2000
3GPP TS36.523 (GCF)

ME7873L
TRX/Performance Test System
RRM Test System
Device Certification/Pre-Certification
Functional Verification (RF CT)
3GPP TS36.521-1/3 (GCF)

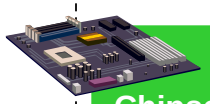
MT8820C Radio Communication Analyzer
LTE Device RF Development, Manufacturing
LTE+2G/3G Communication Standards

Commercial LTE Terminal Test Cycle

- LTE terminals have different requirements depending on the region and operator, and even the same terminal may require multiple tests depending on the different applications.
- To run the many test items for R&D and onsite evaluations, it is necessary to review the test configuration/procedures, and to establish a cost-effective test environment using automation, etc.



Provide Solutions for Terminal R&D Stage



Chipset Design / Core UE R&D

Integration / System Test

Conformance Test

Operator Acceptance Test (IOT)

Production

MD8430A
Signalling Tester

MF6900A
Fading Simulator

MS269xA
Signal Analyzer

MD1230B
Data Quality Analyzer

New !

MD8475A
Signalling Tester
(Functional Verification)

MT8820C
Radio Communication
Analyzer
(RF Parametric Test)

ME7873L
RF Conformance
Test System

ME7834L
Mobile Device Test
Platform

MT8820C
Radio Communication
Analyzer

MS2830A
Signal Analyzer

Contents

Bench-top Mobile Network Test System

For commercial terminal R&D and verification

- A unique feature of LTE is the 100Mbps high-speed packet communications, which is comparable to optical communications speeds. Various new services are expected to start when LTE terminals and Smart Phones reach the market.
- Terminal 3G/2G functions as well as LTE must be tested too. Tests validating LTE and conventional systems, such as voice call (CS fallback) during LTE and handover from MIMO are essential for quality evaluation and improvement.

Anritsu supports LTE/W-CDMA/GSM/CDMA2000 in one unit and provides a base station simulator supporting multiple system tests, such as scenario-less handover, to improve terminal quality and cut R&D time.

LTE+2G/3G UE

MD8475A Signalling Tester

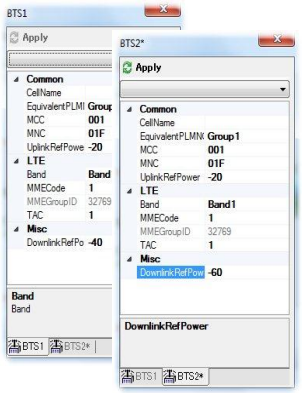
LTE FDD
W-CDMA/HSPA/HSPA Evolution
GSM/GPRS/EGPRS
CDMA2000/1xEV-DO

SmartStudio

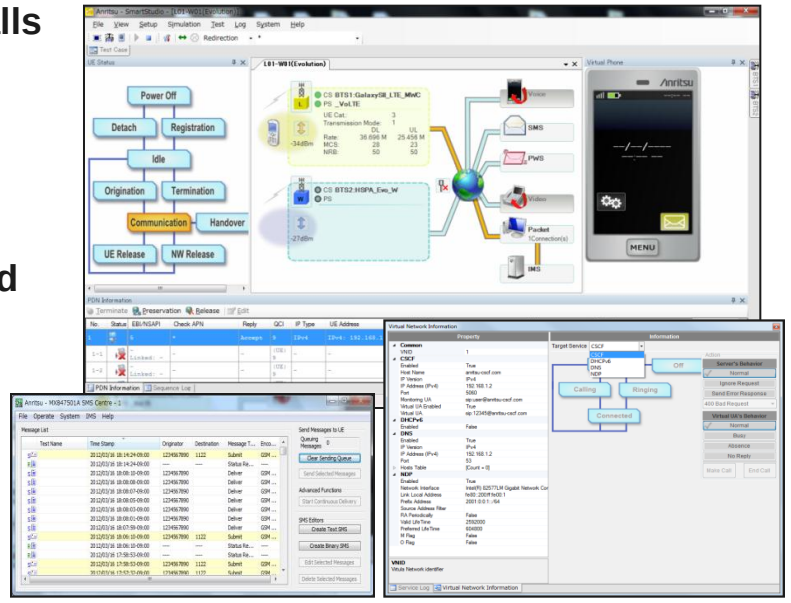
MD8475A User Interface

MX847570A SmartStudio

MD8475A offers the interactive examination environment which does not need a complicated scenario.

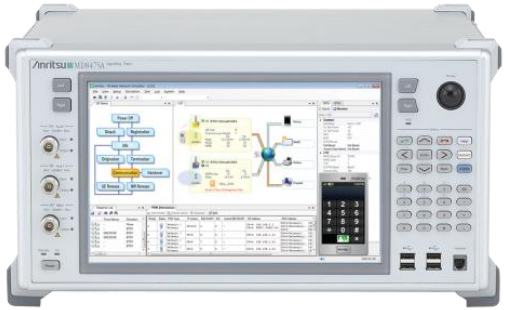


- **Handles base station handover request from terminal**
  - Checks terminal status on screen
  - Displays service status under test
- **Select base station matching customer's test environment**
  - LTE FDD, W-CDMA/HSPA/HSPA Evolution, GSM/(E)GPRS, CDMA2000/EV-DO
- **One button terminal tests, such as voice and packet calls**
  - LTE FDD: 2x2 MIMO, IPv4/IPv6, Multiple-PDP, etc.
  - W-CDMA/GSM: Voice call, packet call, SMS, etc.
- **Free SMS and MMS message sending/receiving**
- **Free ETWS message sending**
- **Supports complex two-cell tests, such as Handover and IntraRAT reselection/redirection without scenarios**
  - Change non-camping neighbor cell settings during tests
- **Provides End-End VoLTE and SMS over IMS test environment using built-in IMS service function**



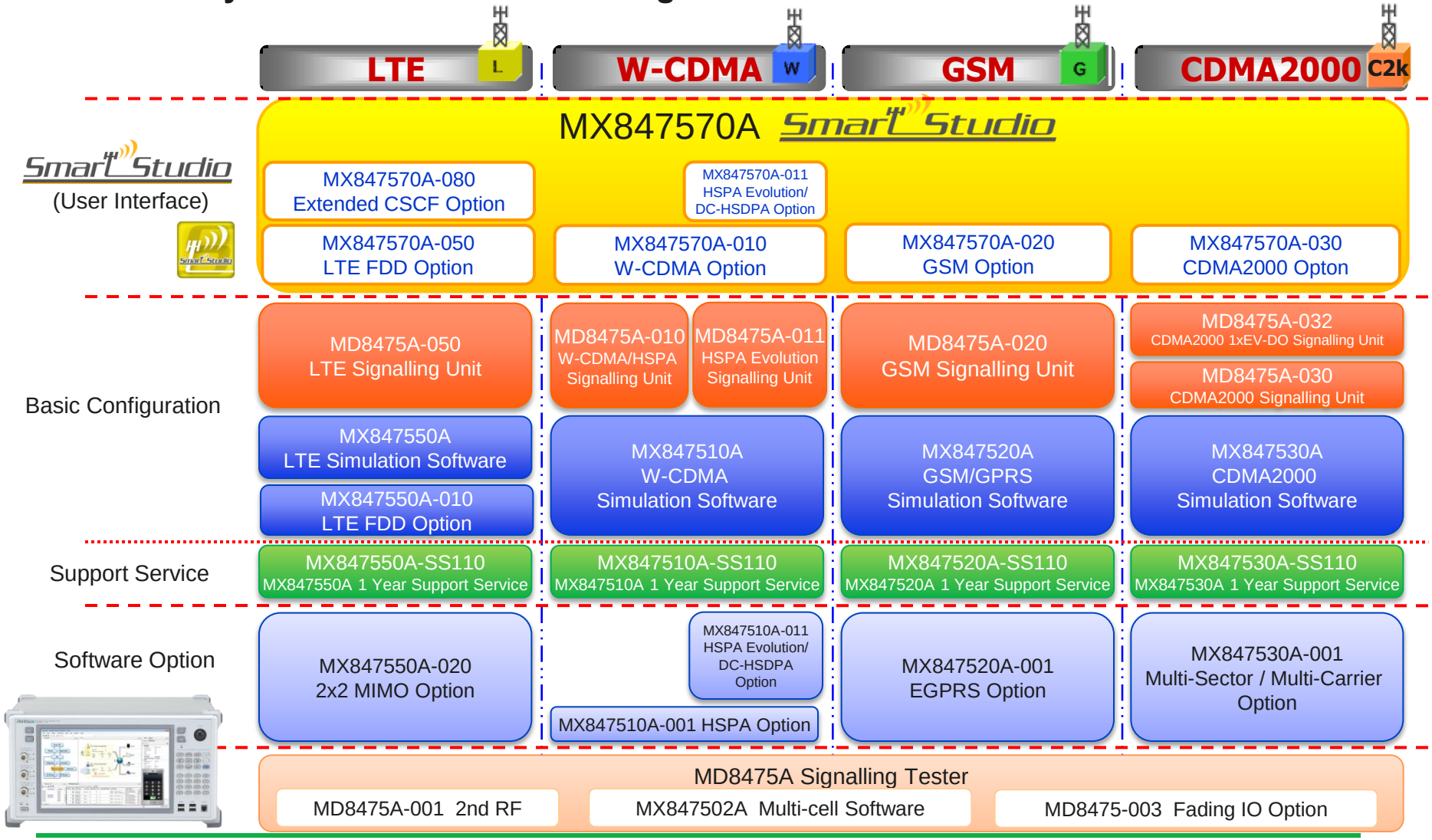
MD8475A Platform

- **Max number of system: 5 (some combination restrictions)**
  - LTE, W-CDMA/HSPA/HSPA Evolution, GSM/(E)GPRS, CDMA2000/EV-DO
- **Max. number of RF: 2 RF (option)**
- **Frequency**
  - Band: 350 to 3600 MHz
  - Tx power: –120 to –25 dBm
  - Rx power: –40 to 30 dBm
- **Built-in PC:**
  - CPU: Intel Core i7-620LE (Base: 2 GHz, Turbo boost: 2.8 G)
  - Memory: 8 GB
  - HDD: 320 GB
- **OS: Microsoft Windows 7 Ultimate**
- **Display size: 12.1-inch monitor**
- **Interfaces**
  - Ethernet 0/1 (10/100/1000BASE-T) for connection with server
  - Call Proc. Ethernet for signalling unit
  - USB2.0: 4 ports
  - Handset/earphones/microphone
  - ISDN (Option)
  - IEEE488 GP-IB I/F
  - Control port for MD8475A cascade (future release)
  - Fading IO (Option), etc.
- **Size: 426 (W) x 221.5 (H) x 398 (D) (mm)**



MD8475A Product Configuration

- **Flexible system combination matching customer's test environment**



Contents

Packet Communications Test (1/5)

Mobile communications are constructed from voice (CS) and packet (PS) systems. However, LTE uses PS only so evaluation during packet communications is most important. Various preparations have been required for packet communication tests.

- **Simulate base station behavior with scenario**
  - Setting base station using SmartStudio cuts setting times
- **Time consuming establishment of test environment for multiple systems**
  - One unit supports LTE, W-CDMA, GSM and C2k
  - Installing application server in MD8475A supports same test environment for multiple systems
- **Complex to install in existing test networks**
  - Setting up to 8 PDN supports installation in test networks with multiple servers

The packet communication environment including LTE is becoming complex. SmartStudio makes it easy to troubleshoot bottlenecks in complex packet communications networks, helping cut evaluation times.

Packet Communications Test (2/5)

Test preparation (1/2)

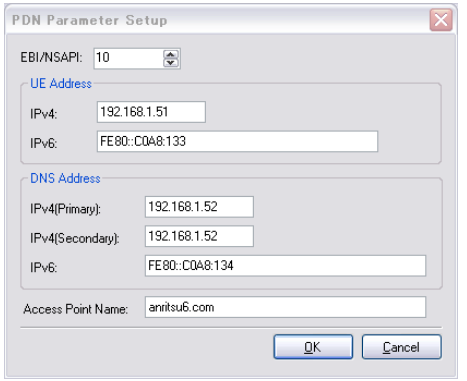
MD8475A standalone evaluation

- Installing an application server in the SmartStudio supports terminal application tests using packet communications in one unit.

Allocates IP address to terminal

- IPv4
- IPv6*1(supports dual stack)
- DNS address
- Access Point Name

*1: Only supports LTE

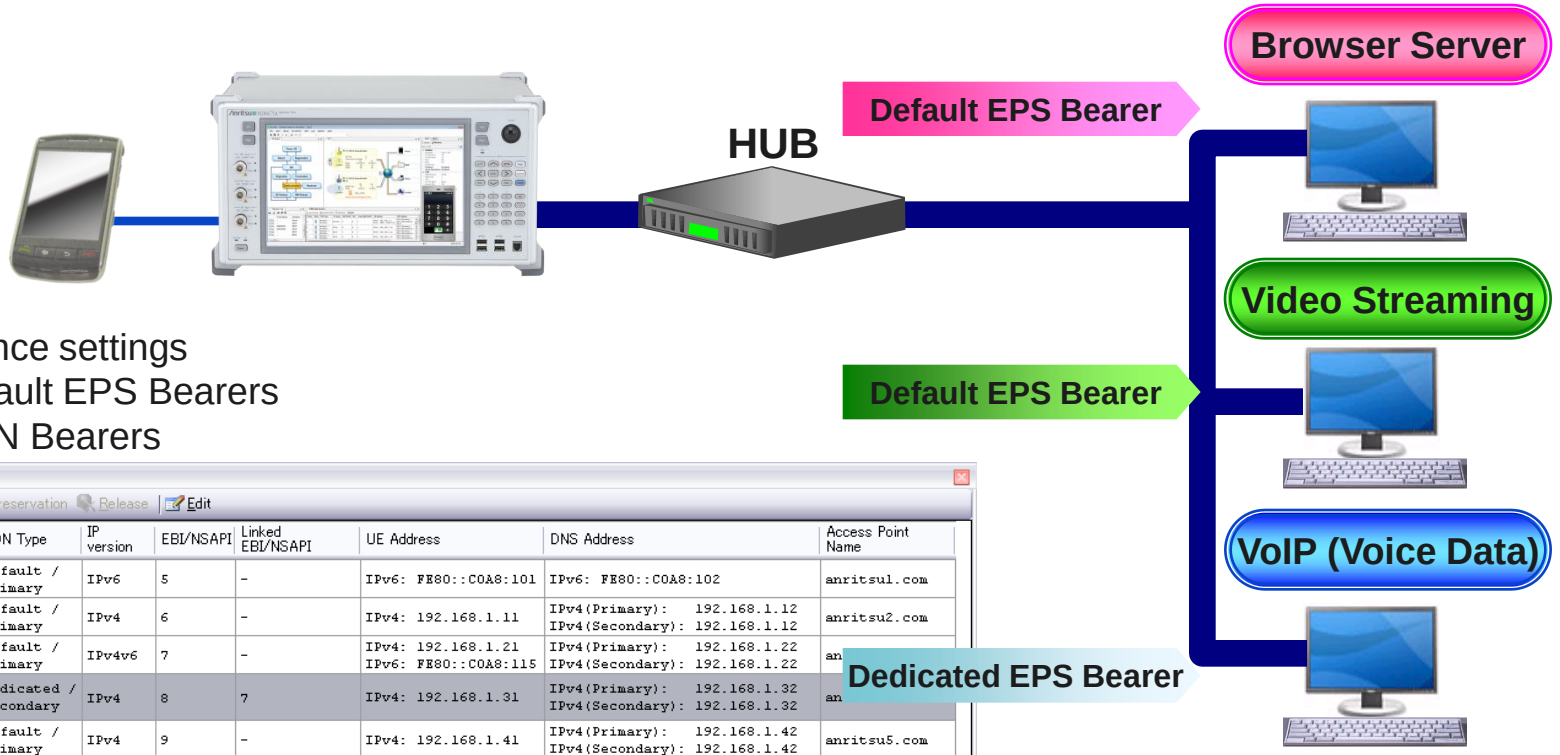


Packet Communications Test (3/5)

Test preparation (2/2)

Evaluation using multiple application servers

- SmartStudio can set up to 8 PDN*1, making it easy to create a multi-application test environment to cut terminal evaluation times.



Reference settings
- 8 default EPS Bearers
- 8 PDN Bearers

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	anritsul.com
2		Default / Primary	IPv4	6	-	IPv4: 192.168.1.11	IPv4(Primary): 192.168.1.12 IPv4(Secondary): 192.168.1.12	anritsu2.com
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	an
4		Dedicated / Secondary	IPv4	8	7	IPv4: 192.168.1.31	IPv4(Primary): 192.168.1.32 IPv4(Secondary): 192.168.1.32	an
5		Default / Primary	IPv4	9	-	IPv4: 192.168.1.41	IPv4(Primary): 192.168.1.42 IPv4(Secondary): 192.168.1.42	anritsu5.com

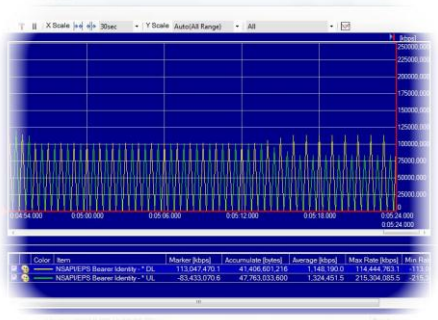
1: Only supports LTE. One W-CDMA, GSM settings. Not support CDMA2000.

Packet Communications Test (4/5)

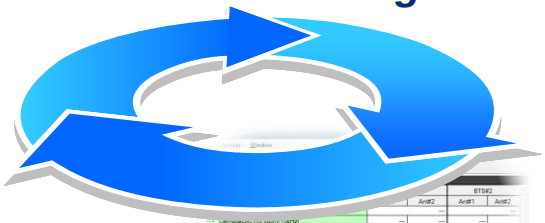
Communication status check*1

- **Supports full line of real-time communication status analysis tools**
  - Throughput monitor: Simultaneous display of IP communications and RF status
  - RF monitor: Displays physical channel status
  - Counter: Displays details for TRx PDU and ACK/NACK

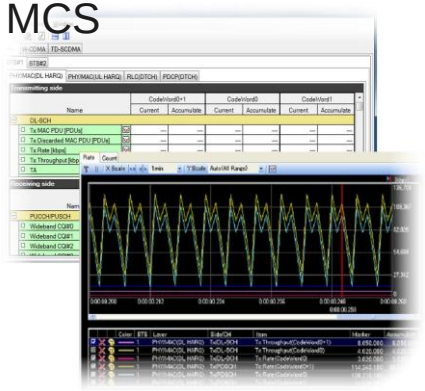
✓ **Throughput monitor**
Checks data communications between multiple base stations



Real-time monitoring



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



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

*1: Not support CDMA2000

Packet Communications Test (5/5)

HSPA Evolution/DC-HSDPA Option

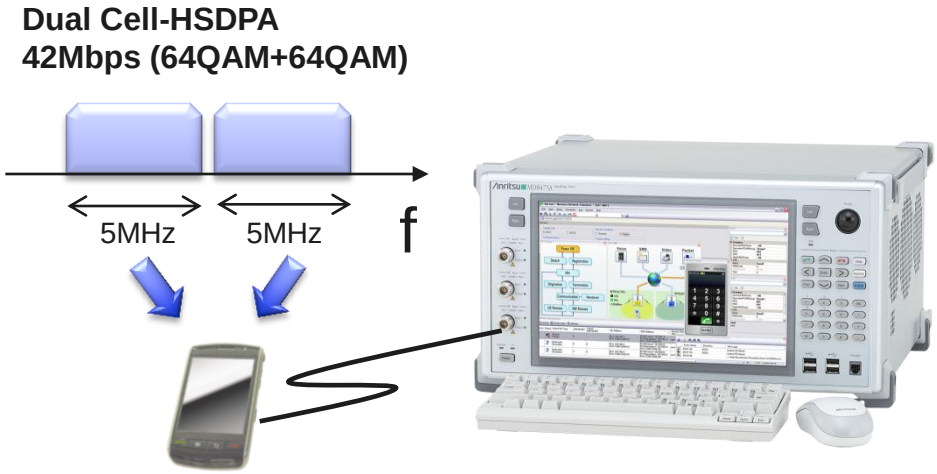
Throughput test capability in HSPA Evolution DL64QAM/DC-HSDPA

HSPA Evolution / DL64QAM

- Rel.7 Cat.13 (DL 18.0Mbps)
- Rel.7 Cat.14 (DL 21.6Mbps)

HSPA Evolution / DC-HSDPA

- Rel.8 Cat.23 (DL 36.0Mbps)
- Rel.8 Cat.24 (DL 43.2Mbps)



InterRAT between LTE and HSPA Evolution

LTE FDD ←→ HSPA Evolution InterRAT Handover in a Single Platform

- LTE FDD (SISO) ←→ HSPA Evolution (Rel.7 Cat.13) InterRAT Handover
- LTE FDD (SISO) ←→ HSPA Evolution (Rel.7 Cat.14) InterRAT Handover
- LTE FDD (SISO) ←→ HSPA Evolution (Rel.8 Cat.23) InterRAT Handover
- LTE FDD (SISO) ←→ HSPA Evolution (Rel.8 Cat.24) InterRAT Handover

(*): Additional hardware unit and software option must be required separately for HSPA Evolution function.

Voice Call and Multi-call Test (1/4)

Voice is an essential application for mobile terminals. However, some voice call measurement items are not easy to test. In addition, it is best to perform a total evaluation that stress-tests the mobile by running other tests during voice tests.

- **Terminals under evaluation cannot be used on live network**
  - Support scenario-less tests with SmartStudio
  - Supports calls, such as Emergency calls, that cannot be used on live network
- **Must evaluate call blocking but cannot evaluate on live network**
  - Reproduces call blocking by setting with SmartStudio
- **Want simple multi-call test evaluation environment**
  - Supports multi-call environment that performs packet communications during voice call, cutting scenario creation and test times

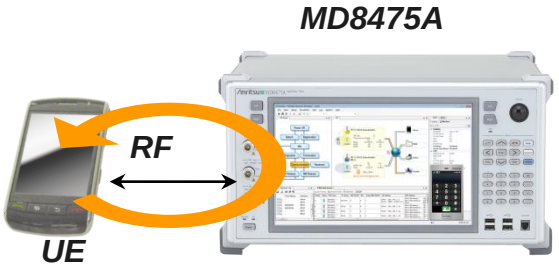
Voice test needs remain unchanged even with the spread of LTE terminals. The all-in-one SmartStudio supports both conventional and LTE test environments.

Voice Call and Multi-call Test (2/4)

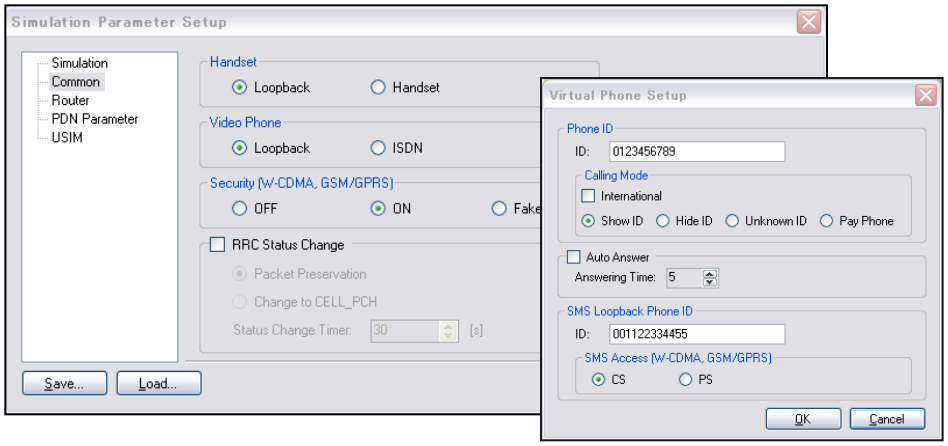
Voice call test

- Voice calls are a basic function of mobile terminals. Connecting the MD8475A with handset to a mobile using an RF cable supports simple evaluation using actual voice calls. In addition, voice loopback supports a simple test system without handset.

Test system using handset(*1)



Test system using loopback(*1)



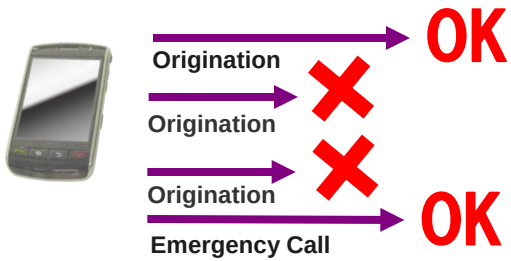
Phone ID Setting	
ID	Sets Virtual Phone number
International	Sets international phone calling
Show ID	Sets caller ID notification
Hide ID	Sets hide caller ID
Unknown ID	Sets unknown caller ID
Payphone	Sets payphone calling

*(*1): CDMA2000 supports loopback only*

Voice Call and Multi-call Test (3/4)

Call blocking

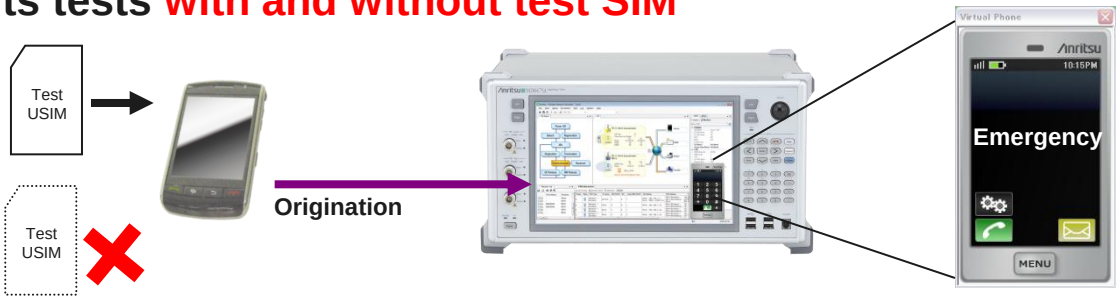
- Network controls calls from mobile by setting control information at broadcast information
- Supports call blocking control tests that are difficult to evaluate on live network



System	Access Class Control
W-CDMA/GSM	Normal
	Barred
	Emergency
CDMA2000/EV-DO	PSIST
	ACCT

Emergency call

- Makes emergency call from mobile, executes emergency call sequence and displays “Emergency”(*1) on Virtual Phone
- Supports tests with and without test SIM

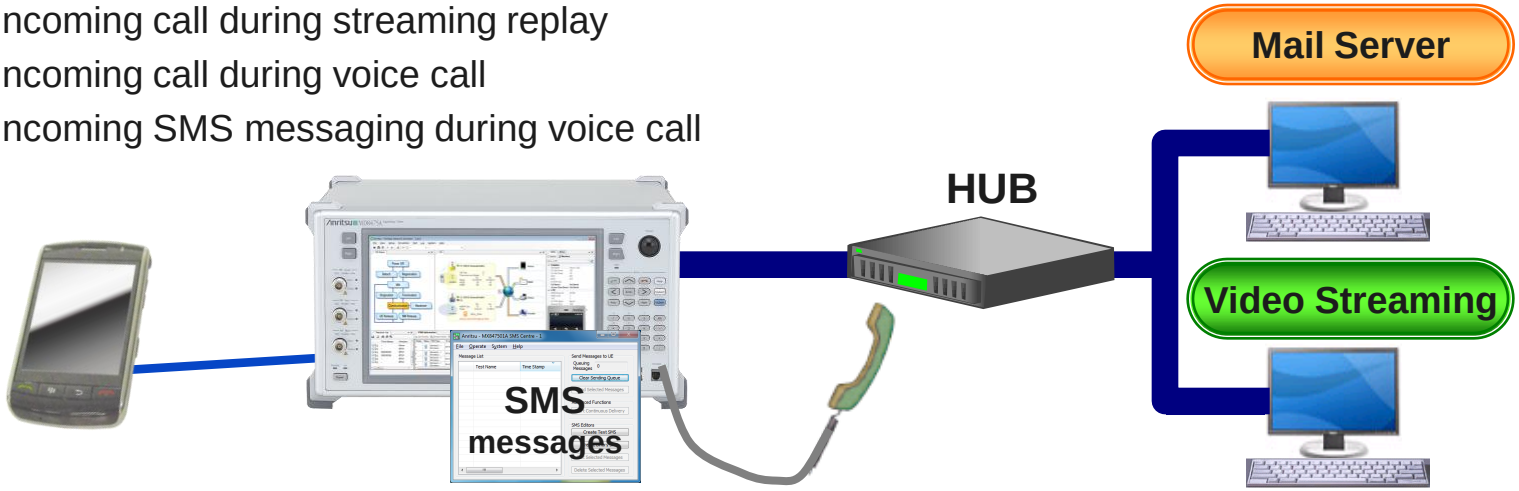


*(*1): CDMA2000 does not display*

Voice Call and Multi-call Test (4/4)

Supports multi-call test environment

- **Easy evaluation of multiple calls, which is a standard function for current mobile terminals, such as incoming call during packet communications and receiving messages during call.**
  - Incoming call during streaming replay
  - Incoming call during voice call
  - Incoming SMS messaging during voice call

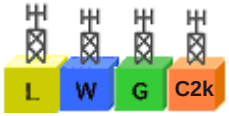


Test in multi-call environment

- **Ideal environment for high-load multi-call stress tests**
  - Temperature test
  - Current consumption test
  - Shockproof test

System	Config \ Interruption	Voice Call Interruption	SMS Interruption	MMS Interruption	Video call Interruption
W-CDMA/ HSPA	Voice Call		✔	✔	
	Packet Communication	✔	✔	✔	✔
	Video Call		✔	✔	
GSM/GPRS	Voice Call		✔	✔	–
	Packet Comunication	✔	✔	✔	–
CDMA2000/ EV-DO	Voice Call	✔	✔	✔	–
	Packet Comunication	✔	✔	✔	–

Inter-system Tests (1/4)



SmartStudio

Inter-system tests are essential for mobile communications. Usually, a test environment is established by combining multiple simulators.

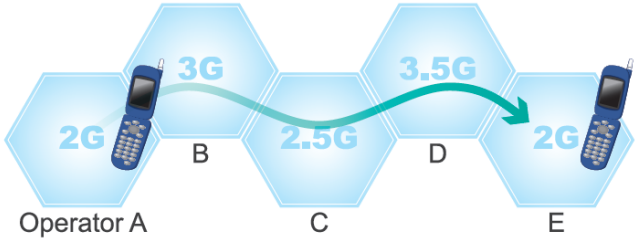
- **Complex test environment configuration**
  - One unit simulates all major communication systems
  - SmartStudio supports communication system settings
- **Inter-system tests have multiple steps and difficult to reproduce**
  - Procedures simplified by selecting presetting for any of 32 base stations
  - Change settings during tests
- **Multiple logs make test results difficult to check**
  - Select and save logs when terminal moves between systems
  - Easy to check move times and sequence

Multiple instruments and difficult scenario creation have been required for tests of LTE terminals moving between systems. SmartStudio simple scenario-less test environment cuts test times and increases productivity.

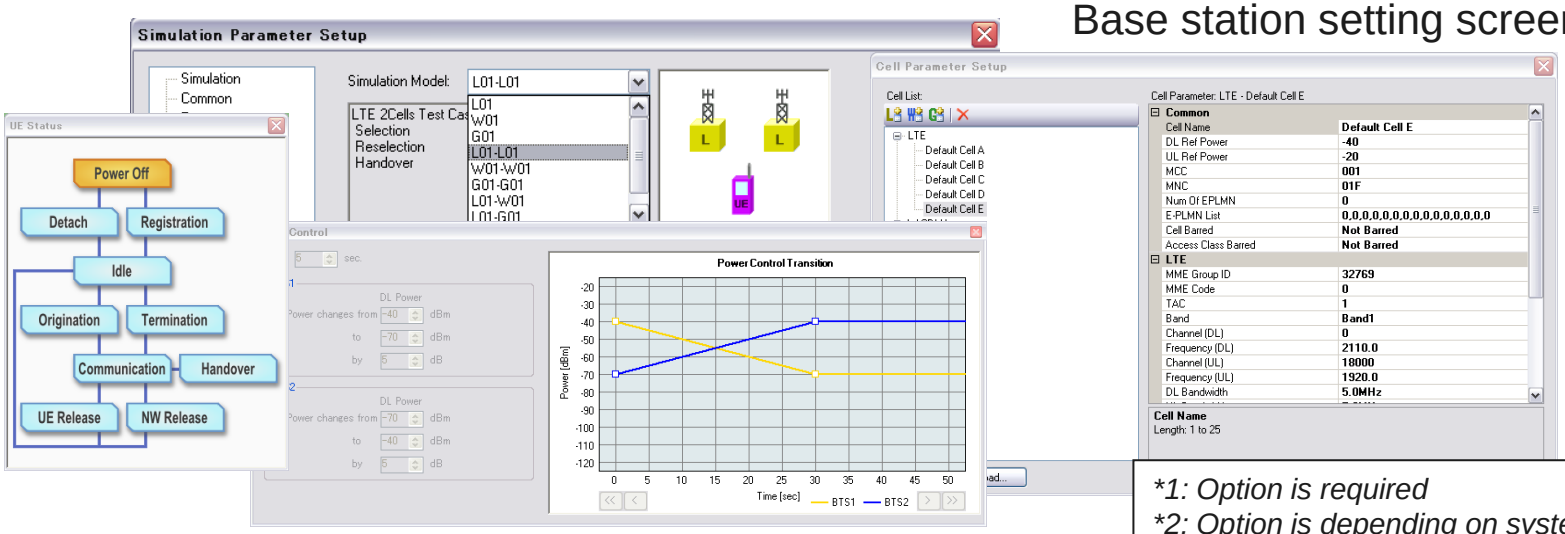
Inter-system Tests (2/4)

Simple test environment

- SmartStudio runs two cells simultaneously*1 ; allocation of these two cells can be freely configured by the option combination.
- Checks following inter-system test items:
  - Cell selection/re-selection test
  - Network service selection test
  - Handover test*2



Base station setting screen

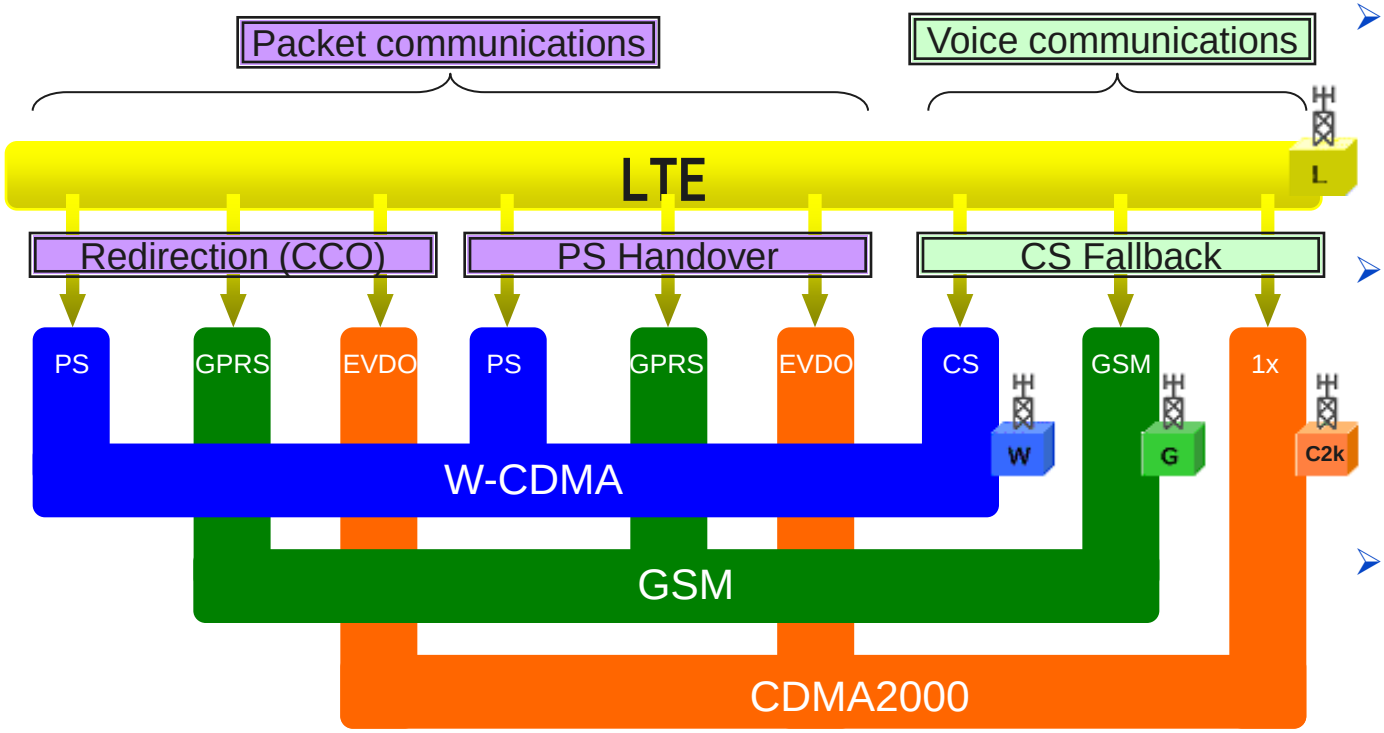


*1: Option is required
*2: Option is depending on system combination

Inter-system Tests (3/4)

Types

- Tests between LTE and W-CDMA/GSM/CDMA2000*1 require multiple tests.



- **Redirection** (Cell Change Order)
  In this method, when a terminal on an LTE network moves to another network, it cuts the LTE network connection and reconnects to the other system
- **PS Handover**
  In this method, when a terminal on an LTE network moves to another network, reconnection is established after having first performed the processing for moving to the other system.
- **CS Fallback**
  In this method, when making a voice call from a terminal on an LTE network, the voice call is made by the other system.

**1: 2 sets MD8475A are required*

Inter-system Tests (4/4)

CSFB(CS Fallback) test

- One MD8475A supports InterRAT tests between LTE and W-CDMA
- SmartStudio setting eliminates complex scenarios

Step1: Sets BTS#1: LTE(SISO)
BTS#2: WCDMA

Step2: Sets BTS#1→BTS#2

Step3: Start test

Step4: Operate test terminal for LTE connection

Step5: Make (receive) call

SMS, MMS Message Test (1/3)

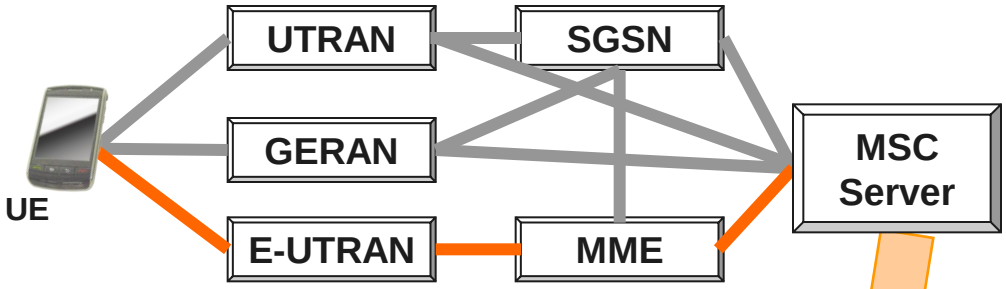
SMS and MMS are global message services. In addition to handshaking between terminals, previous testing required increasing numbers of test items to control terminals directly.

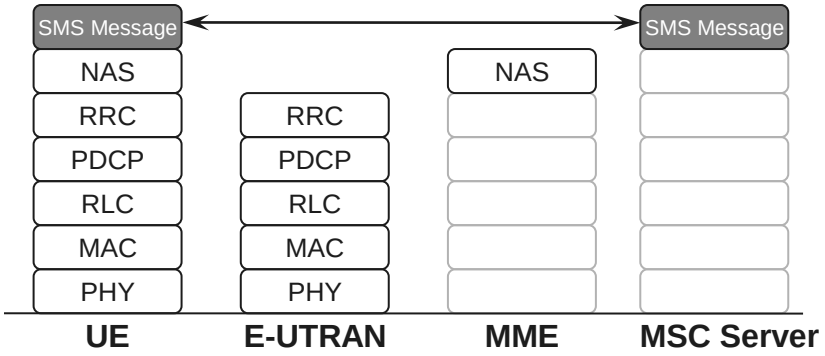
- **Difficult to evaluate on live networks**
  - Send and receive SMS by specifying PS domain and CS domain
  - Checks terminal behavior by receiving bulk messages at once
- **Need to send previous SMS messages**
  - Interface for sending SMS message from external application
- **Need to send and receive SMS messages during voice and packet communications**
  - Supports multi-call environment without complex scenarios, cutting scenario creation times and test times

Establishing an SMS test environment for LTE terminals is time consuming. SmartStudio scenario-less dedicated SMS server supports efficient SMS evaluation.

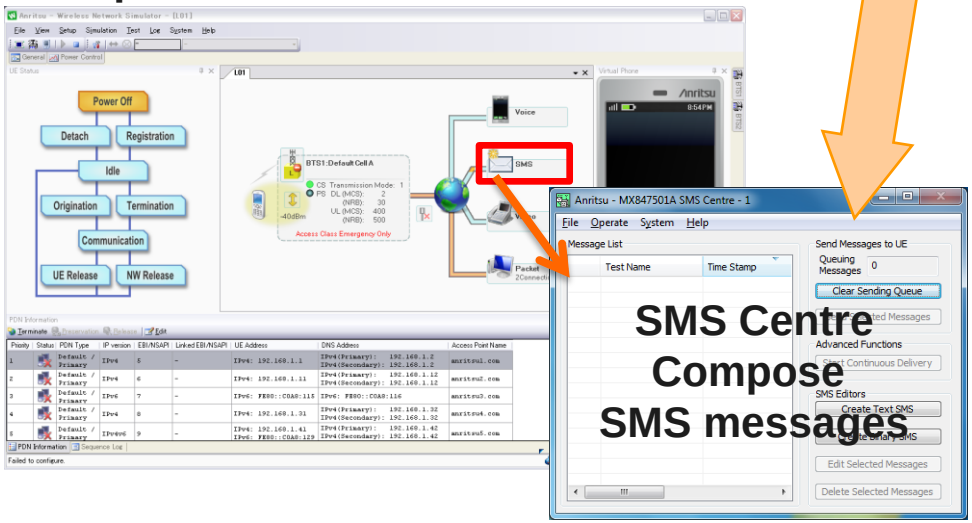
SMS, MMS Message Test (2/3)

Sending and receiving SMS message





Operate from SmartStudio



STEP1:
Set test target base station using GUI

STEP2:
Operate terminal

STEP3:
Send: Send SMS messages from terminal
Receive: Send messages from SMS Centre

STEP4:
Check sent and received messages

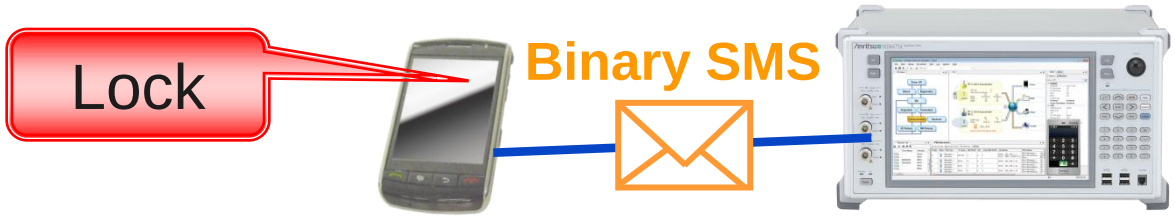
SMS, MMS Message Test (3/3)

MMS test

- Installing MMS server in SmartStudio supports MMS evaluation in compact test environment

Control SMS message from terminal

- MD8475A sends binary message with SMS to terminal for remote control
- Overall evaluation, such as behavior when receiving SMS messages during call prevent field problems



*1: Requires separate MMS Server

IMS Service Test (1/5)

With the start of LTE high-speed data services, new applications are expected to appear, such as VoLTE and SMS over IMS based on IMS integrated multimedia services using IP technology on fixed and mobile networks.

- **VoLTE Tests Require IMS Server Configuration**
  - Standard built-in IMS Server for easy IMS service configuration
  - Simple configuration of personal, benchtop, end-to-end IMS service test environment (VoLTE, SMS over IMS)
- **Mobile Verification Difficult at Network Subnormal and Abnormal Status**
  - Simulate no network response, server error status, etc.
- **Need VoLTE Tests under Various Called Mobile Conditions**
  - Intentionally create conditions such as communicating, not present, no response, etc., for called mobile to configure high-reproducibility VoLTE test environment

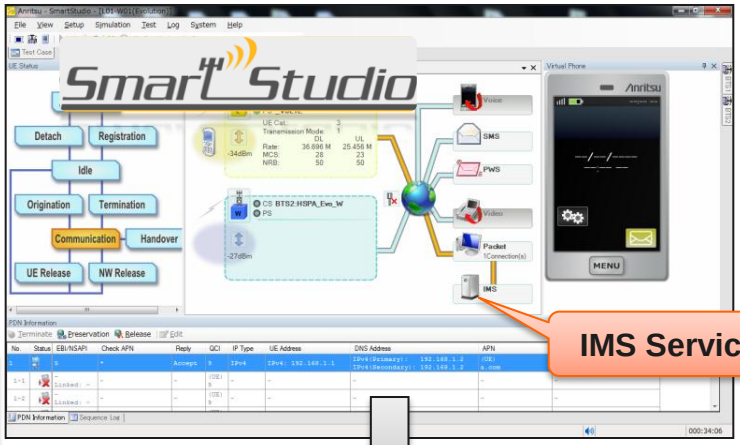
The SmartStudio IMS service function is an all-in-one, end-to-end test solution for VoLTE, SMS over IMS, etc., service tests. With built-in PC, engineers can configure an efficient, personal, benchtop test environment.

IMS Service Test (2/5)

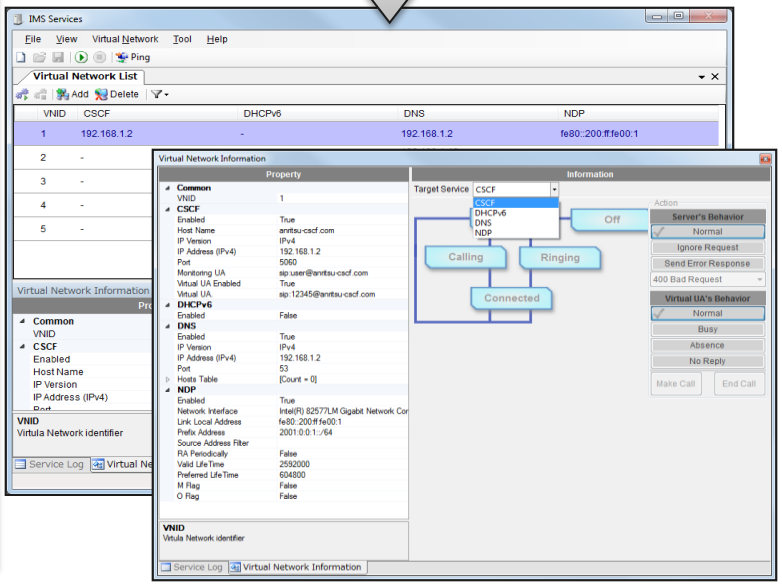
IMS Service Function

IMS service function is standard-installed in SmartStudio from MD8475A V2.00. Built-in IMS Service function provides service test environment, such as VoLTE and SMS over IMS.

- IMS Service function supports following environment
  - CSCF (Call Session Control Function) :
    Supports standard server function for VoLTE and SMS over IMS tests as well as voice data loopback function.
  - DHCPv6 :
    Allocates IPv6 address and notifies DNS/SIP server address to network node
  - DNS :
    Operates as DNS cache server
  - NDP (Neighbor Discovery Protocol) :
    Supports function to transmit RA (Router Advertisement) and regularly transmit RA to RS (Router Solicitation)



IMS Service Window



Virtual Network Information Window

IMS Service Test (3/5)

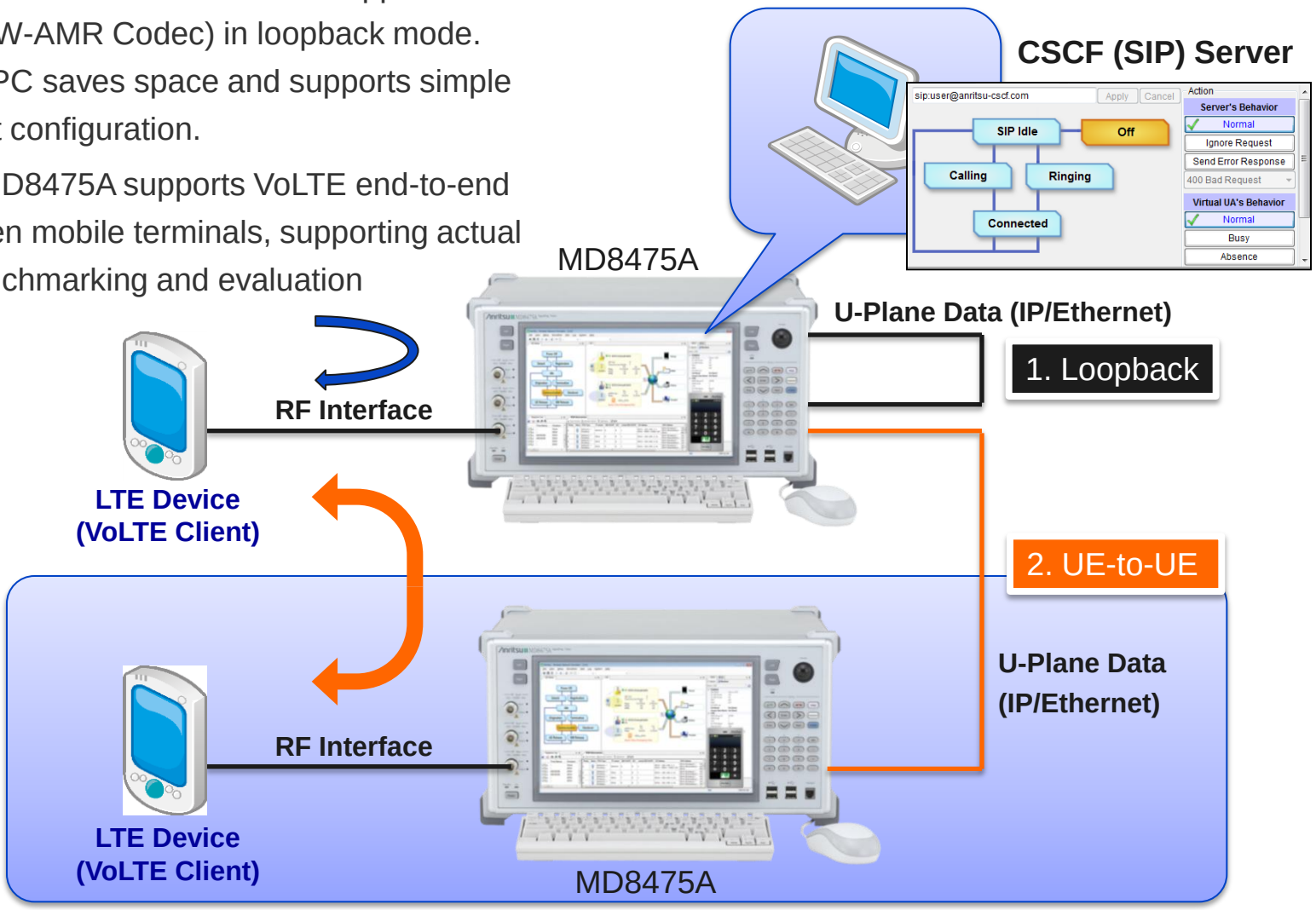
- Function overall for IMS service tests
- Moreover, the **Extended CSCF option (MX847570A-080)** supports subnormal and abnormal testing for VoLTE/SMS over IMS function.

Segment	Function	Outline	Supported Coverage	
			MX847570A	MX847570A + MX847570A-080
VoLTE	SIP REGIST Test	Check Bind/Unbind behavior at CSCF server.	✓	✓
	Mobile Originated Call Sequence Test	Check call-out sequence from UE.	✓	✓
	Mobile Terminated Call Sequence Test	Check call-out sequence to UE.	*1	✓
	Voice Call Loopback Test	Loopback UL voice data and DL and check voice at UE side.	✓	✓
	Call Release Sequence Test (UE Release)	Check disconnect sequence from UE.	✓	✓
	Call Release Sequence Test (Network Release)	Check disconnect sequence from network side.	*1	✓
	Server (Network) No Response Test	Check behavior when no response due to fault at server or in network.		✓
	Server Error Occurrence Test	Check behavior when server error received due to fault at server.		✓
	Simulate the other party is talking	Check operation when other party talking.		✓
	Simulate the other party is not available	Check operation when other party not exists.		✓
	No Response from the other party	Check operation when no response from other party.		✓
SMS over IMS	SMS Message Transmission Test	Check UE SMS message sending function.	✓	✓
	SMS Message Reception Test	Check UE SMS message receiving function.	✓	✓
	Server (Network) No Response Test	Check behavior when no response due to fault at server or in network.		✓
	Server Error Occurrence Test	Check behavior when server error received due to fault at server.		✓
IPv6 addressing	IP Address Assignment Test (Router Advertisement)	Check IP address setting function when RA received.	✓	✓
	IP Address Assignment Test (DHCPv6)	Check IP address setting function allocated from DHCPv6.	✓	✓

*1: MX847570A-080 is not required when two sets MD8475A are used as end-to-end VoLTE testing.

IMS Service Test (4/5) – VoLTE Test

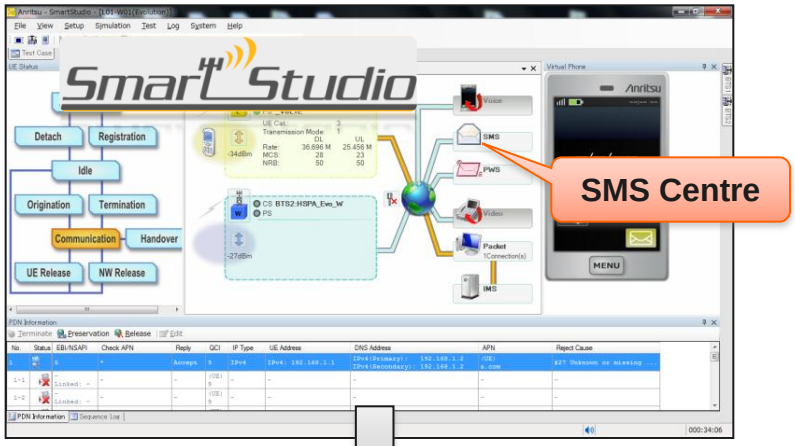
- Built-in IMS Service CSCF function supports VoLTE tests (AMR/W-AMR Codec) in loopback mode. Embedded PC saves space and supports simple environment configuration.
- Using two MD8475A supports VoLTE end-to-end tests between mobile terminals, supporting actual terminal benchmarking and evaluation



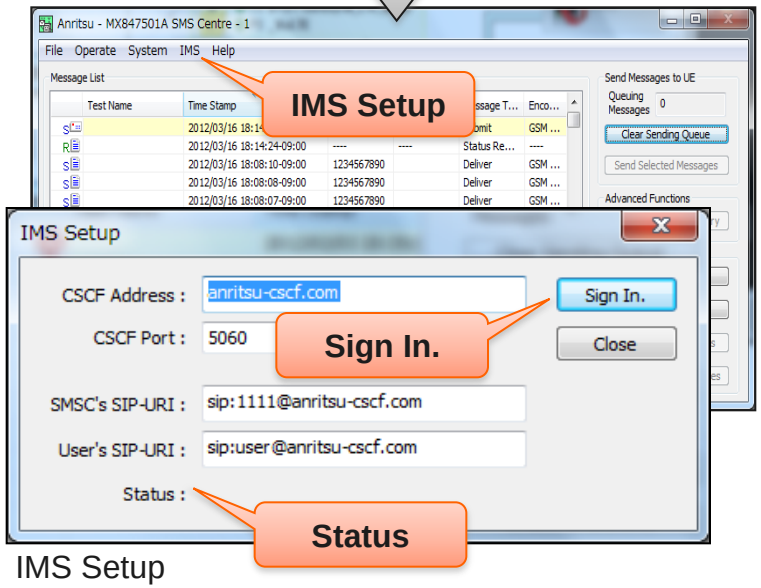
IMS Service Test (5/5) – SMS over IMS Test

- Confirm SMS sending/receiving via built-in IMS server
- Send and receive SMS as SIP messages via IMS service

- IMS Setup
  - Set SMS over IMS and register at CSCF server using IMS setting window
  - Register at CSCF server using [Sign In] button; CSCF server registration status displayed at [Status] field as one of following five:
    - Off : Not registered
    - REGISTER : Registering
    - REGISTER Fail : Registration failed
    - REGISTER Timeout : Registration timed out
    - REGISTER Idle : Registration completed
  - At CSCF registration, SMS sent/received via IMS server



SMS Centre



IMS Setup

ETWS Test (1/2)

The Earthquake and Tsunami Warning System (ETWS) issues rapid advance warning of impending disasters. Test needs for these types of function are expected to increase in the future.

- **Live Networks Cannot Run ETWS Tests as Necessary**
  - ETWS messages can be sent intentionally at any timing using the built-in PWS (Public Warning System) Centre application.
- **ETWS Messages Cannot be Edited on Live Networks**
  - The Primary Notification as well as the Secondary Notification settings and Secondary Notification repeat time and message can be edited.
- **Need to Send EWTS Messages used at Previous Tests**
  - The Import and Export functions supports saving and reloading of created ETWS messages.

The SmartStudio PWS Centre function supports ETWS function tests at any user timing, which is impossible on a live network. Each message variation can be edited with an easy-to-use GUI for configuring an efficient test environment.

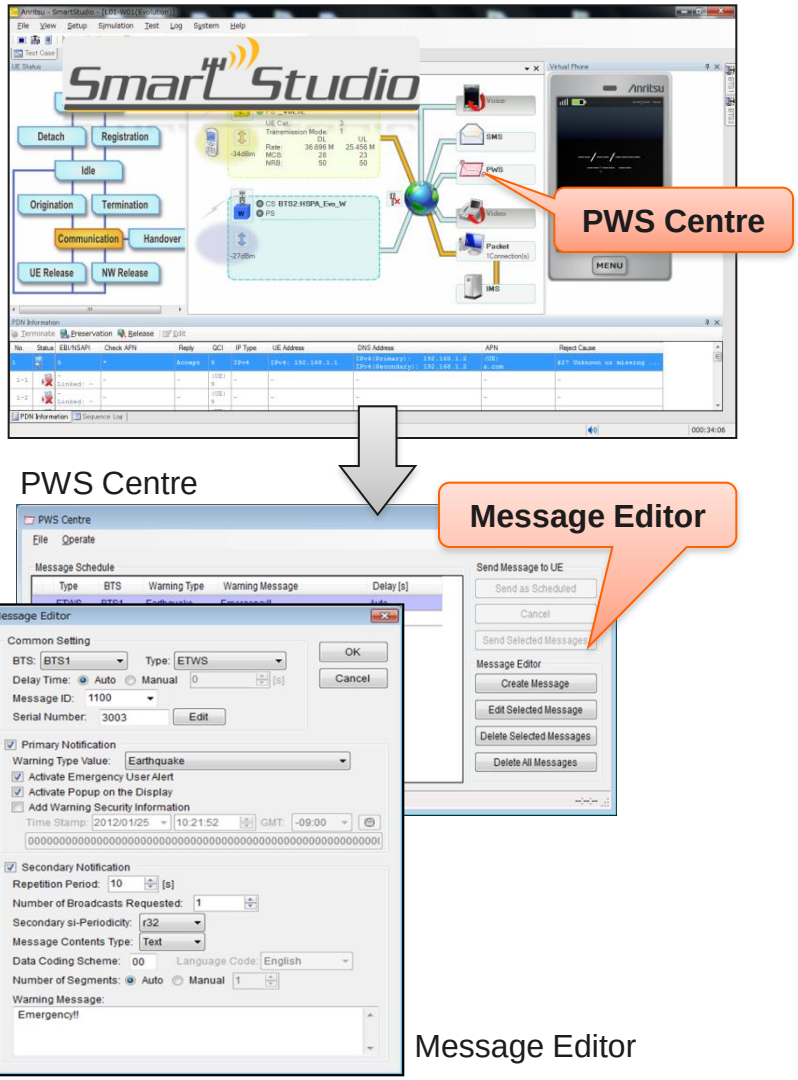
ETWS Test (2/2)

- The built-in PWS Centre sends earthquake and tsunami alerts to mobiles*.

  *Only supported by LTE

- ETWS messages are sent at any timing just by selecting the created/edited message.

- ETWS Message Editor
  - Message Editor creates and edits ETWS messages.
  - The Primary Notification and Secondary Notifications messages and timing can be set.
  - The Primary Notification Warning Type Value can be selected as follows:
    - Earthquake
    - Tsunami
    - Earthquake and Tsunami
    - Test, Other
  - The Secondary Notification repeat time and repeat times can be set.
  - Messages can be edited freely at the warning message input field. Both Text and Binary data input is supported.



SmartStudio Test Solution

- **No complex test scripts required**
- **One unit simulates LTE FDD, W-CDMA, GSM and CDMA2000**
  - Supports multi-system tests, such as PS handover
  - Supports packet communication environment without configuring multiple environments
  - Supports voice call and multi-call tests
  - Supports test environment for conventional mobile terminal functions, such as SMS and MMS
- **Interfaces matching customer test environment**
  - Remote control using Ethernet and GP-IB to expand evaluation environment

Although LTE terminal has many test items, the SmartStudio realizes compact and simple terminal tests.

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Specifications are subject to change without notice.

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