Product Introduction

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VoLTE Test Solution

MD8475A Signalling Tester



VoLTE Test Solution - MD8475A Signalling Tester -

June 2012 Anritsu Corporation

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MD8475A-E-L-2



Slide 1

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Market Background

- The first LTE services supporting 100 Mbps max. high-speed large capacity communications were rolled out in 2010 in N. Europe followed by service build-out in N. America and Asia.
- Connectivity with IP-based core networks must be maintained to support multimedia applications and ubiquitous networks using the packet domain. A key network design feature is assuring high data-rate throughputs at 100 Mbps as well as low latency.
- Starting with content-rich entertainment access and high-speed data downloads, IP conversion of fixed and mobile networks is helping drive the convergence of multimedia services leading to future genuine IP Multimedia-based systems.



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Voice Service Transition

- LTE systems do not support circuit switching of 2G/3G mobile phone systems. All LTE services use IP-based technologies.
- Voice communications supported by circuit switching up to 3G will be replaced by VoLTE (Voice over LTE).
 Offering voice communications using VoLTE will require core networks to use an IMS Server (IP Multimedia Subsystem Server) configuration.
- On the other hand, IMS Server configuration will require large investment costs in network infrastructure at introduction, rollout of voice communications using VoLTE will be done in stages. In concrete terms, 3G circuit switching technology will be used at the same time.
- Due to the differences between LTE and shared 2G/3G systems as well as the differences in services offered by operators, it will be necessary to use CS Fallback developed for 3GPP Rel. 8 and SV-LTE for connecting 2G/3G and LTE voice services while connected over LTE.



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VoLTE Outline

- Centered on the 'One Voice Initiative' promoted by mobile carriers and communications equipment makers in November 2011, technology specifications called 'One Voice; Voice over IMS profile' have been gathered together to produce technical specifications for achieving voice and SMS services over LTE systems, generally called VoLTE. Currently, the GSMA (GSM Association) VoLTE Initiative promotes these specifications as 'IMS Profile for Voice and SMS.'
- VoLTE (Voice over LTE) also called Voice over IMS Profile and IMS VoIP is the standard to support voice communications on IMS and controls communications using SIP (Session Initiation Protocol).
- The OTT (Over The Top) IP phone using software on LTE service is also available, but the bandwidth allocation priority is lower than VoLTE, which is secured by QoS control.



Depiction of Mobile Terminal and Network Protocol Stacks in IMS Profile for Voice*

VoLTE – Example of IMS Registration Protocol Sequence

IMS registration required for IMS CN (core network) before using IMS service



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VoLTE Outline—Example of Protocol Sequence (Voice Call)



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VoLTE Commercial Mobile Terminal R&D and Validation

- Looking at future commercial services, it seems likely that VoLTE terminals will become mainstream.
- It is necessary to develop total function evaluation testing for commercial terminals, such as product QU, reduced feedback work burden, fault analysis, and subnormal and abnormal service verification, which is difficult on live networks. This requires a total test environment using a base station simulator supporting stable, high-reproducibility troubleshooting.



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Multi-System Platform for Commercial Mobile Terminal R&D

MD8475A Signalling Tester

- The MD8475A is a multi-system base station simulator supporting the next-generation LTE standard as well as major 2G/3G communication systems worldwide.
- Its SmartStudio state-machine based GUI supports a wide range of commercial terminal test environments for general function tests, including multi-system LTE smartphone call processing, service verification, performance, and mobility tests, required increasingly by mobile R&D labs.
- It helps increase the efficiency of general function tests and reduce the number of postverification bug fixes to improve the quality of commercial multi-system LTE smartphones.

Key Features

- One unit supports LTE and 2G/3G/3.5G systems
 LTE, W-CDMA/HSPA/HSPA Evo., GSM/(E)GPRS, CDMA2000 1X/1xEV-DO, TD-SCDMA*
- Supports simple operation without scenario
 - State-machine GUI: SmartStudio
- Provides total function tests for commercial mobile terminals, throughput evaluation (LTE 2x2 MIMO, Cat.3) and Interworking test environment
- Embedded Windows 7 supports end-to-end packet evaluation





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MD8475A Signalling Tester Outline

All-in One Multi-system Platform





- LTE system simulation for FDD and TDD (future)
- Multi-system platform
 - W-CDMA/HSPA/HSPA Evo
 - GSM/(E)GPRS
 - CDMA2000 1X/EV-DO
 - TD-SCDMA/HSPA
- Supports 100 Mbps throughput with 2x2 MIMO
- Easy operation with state-machine based GUI (SmartStudio)
- 2-cell IntraRAT/InterRAT platform
- Built-in PHY/IP layer throughput monitor
- Built-in PHY layer measure monitor
 - LTE: PHY/MAC(DL HARQ), PHY/MAC(UL HARQ), RLC(DTCH), PDCP(DTCH)
 - W-CDMA: Layer1 and Layer2
- RF power monitor for each channel
- Embedded Windows 7 OS for operation and application server
- Fading IO and GP-IB interface



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Full Anritsu Solution Line-up for LTE Device Test Cycle



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Scenario-less Test Environment Cuts Validation Time

<u>Smart^wStudio</u>



MX847570A SmartStudio

Supports interactive test environment without scenarios

- Start bearers adaptively according to request from terminal
- Select any base-station parameter matching customer's test environment
- One button terminal tests, such as voice call and packet communications
- Free SMS and MMS message sending/receiving and end-to-end packet service environment in combination with application server
- Supports complex two-cell tests, such as Handover and IntraRAT reselection/redirection without scenarios
- Full real-time communication status analysis toolkit supports easy fault troubleshooting, including throughput bottlenecks



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Simple IMS Service Test Environment with Built-in Server



IMS Service Window

🗧 👘 Add 👷 Delete 📔	٧.				
VNID CSCF	DHCPv6		DNS	NDP	
1 192.168.1.2	-	1	192.168.1.2	fe80::200:ff:fe00:1	
2 -	Virtual Network Information				
	Prop				
3 - 4 -	Common VNID 1 CSCF Enabled Tr Host Name ar	ue ritsu-ract com	Target Service CSCF CSCF DHCPv6 DNS	• Off	Action Server's Behavior
rtual Network Information	IP Venion IP IP Address (IPv4) 15 Pott 55 Monitoring UA sis Virtual UA Enabled Tr Virtual UA, sis a DHCPv6	v4 2:168.1.2 60 puser@anitsu.cscf.com 1:2345@anitsu.cscf.com	Calling	Ringing	Ignore Request Send Error Response 400 Bad Request Virtual UA's Behavior
Common VNID	DNS Enabled Tr IP Version IP	ue 4		1	Busy
CSCF	IP version IP IP Address (IPv4) 19	2 168 1 2			No Beele
Enabled	Port 53				No Reply
Host Name	Hosts Table [C	ount = 0]			Make Call End Ca
IP Version	▲ NDP				
IP Address (IPv4)	Enabled Tr Network Interface Int Link Local Address fe Prefix Address 20 Source Address Filter RA Periodically Fa	ue el (R) 82577LM Gigabit Network Co 80::200#ffe00:1 01:0.0:1::/64 Ise	Я [.]		
Service Log 强 Virtual Ne	Valid LifeTime 25 Preferred LifeTime 66 M Rag Fa O Rag Fa	92000 4800 Ise Ise			

Virtual Network Information Window

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IMS Service Function

Built-in IMS Service function provides service test environment, such as VoLTE and SMS over IMS

- IMS Service function supports following environment:
 - <u>CSCF (Call Session Control Function)</u>: Supports standard server function for VoLTE and SMS over IMS tests as well as voice data loopback function
 - <u>DHCPv6 (Dynamic Host Configuration Protocol v6)</u>: Allocates IPv6 address and notifies DNS/SIP server address to network node
 - <u>DNS (Domain Name Server)</u>:
 Operates as DNS cache server
 - <u>NDP (Neighbor Discovery Protocol)</u>: Supports function to transmit RA (Router Advertisement) and regularly transmit RA to RS (Router Solicitation)
- Moreover, the extended CSCF option (MX847570A-080) supports subnormal and abnormal testing for VoLTE/SMS over IMS function.



•

MX847570A: SmartStudio (IMS Service)/MX847570A-080: Extended CSCF Option

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

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



VoLTE Test Configuration Example—Voice Communications Test/Function 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



MD8475A-E-L-2



CSCF (SIP) Server

Off

Server's Behavior Normal

Ignore Request

Send Error Response

sip:user@anritsu-cscf.com

SIP Idle

VoLTE Subnormal and Abnormal Tests (Server Behavior)

 MX847570A-080: Using extended CSCF option supports condition settings for VoLTE subnormal and abnormal tests (Server Behavior and Virtual UA's Behavior)



VoLTE Subnormal and Abnormal Tests (Virtual UA Behavior)



Summary

- LTE is a next-generation mobile technology offering the same high data speeds as optical networks to support rich-content distribution at the start, evolving to IMS-based services following network IP conversion.
- Voice services will be offered over LTE using VoLTE technology with IMS servers in the future after using interim CS-Fallback and SV-LTE systems.
- Anritsu has introduced the MD8475A for R&D into commercial LTE mobiles as well as for validating future VoLTE terminals with IMS functions.
- Anritsu is proactively helping development of LTE service by offering test solutions to increase test efficiency as well as by supporting new LTE standards.



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