

Keysight E6966B

IMS-SIP Network Emulator

Technical Overview

Conference Call Participant Info

URI	Contact Address	Call-ID	Call-State
*sip:ClientA@test.3gpp.com>	<sip:ClientA@192.168.26.1:5080;transport=tcp>	WBQVQlkoXv-QmT2JvRAXw..	Active
<sip:ClientB@test.3gpp.com>	<sip:ClientB@192.168.26.1:5081;transport=tcp>	ZyUgiU0ELBd8kGaNSQgJg..	Active

Time	Source	Destination	Method
0.000	sip:ClientA@test.3gpp.com	IMS-SIP Conference Server	INVITE
0.001	IMS-SIP Conference Server	sip:ClientA@test.3gpp.com	100 Trying [INVITE]
0.032	IMS-SIP Conference Server	sip:ClientA@test.3gpp.com	180 Ringing [INVITE]
0.112	IMS-SIP Conference Server	sip:ClientA@test.3gpp.com	200 OK [INVITE]
0.144	sip:ClientA@test.3gpp.com	IMS-SIP Conference Server	ACK
1.684	sip:ClientB@test.3gpp.com	IMS-SIP Conference Server	INVITE
1.685	IMS-SIP Conference Server	sip:ClientB@test.3gpp.com	100 Trying [INVITE]
1.717	IMS-SIP Conference Server	sip:ClientB@test.3gpp.com	180 Ringing [INVITE]
1.922	IMS-SIP Conference Server	sip:ClientB@test.3gpp.com	200 OK [INVITE]
1.954	sip:ClientB@test.3gpp.com	IMS-SIP Conference Server	ACK

Call Flow Log Detail Log Status Log Error Log

Activated Registered Established [WCF: 8245] [Detailed Logging State: ON]

Accelerate Performance Testing of Cellular User Equipment in an All-IP IMS-SIP Environment

Verify cellular UE services over all-IP networks

- UE registration and authentication with IMS-SIP server
- Bi-directional VoIP voice, video, and SMS communication
- Detailed application logging
- Test manually or automate using an API
- Supplementary service support
- IPsec support
- E.911 support
- Enhanced voice services (EVS)

Testing the functionality and performance of cellular user equipment (UE) is essential to achieving a good end-user experience. An IP multi-media subsystem (IMS) allows LTE networks to support voice. Session initiated protocol (SIP) provides the call set-up protocol for IMS-based VoLTE. The move to all-IP networks and new protocols necessitates additional requirements for UE designers and demands testing solutions to address the expanded capabilities of the newest generation of UE.

The Keysight Technologies, Inc. E6966B IMS-SIP client and server applications provide a controlled test environment and easy-to-use interfaces to verify performance of UE running multiple applications such as voice, video, and SMS on an IP-based network.

With Keysight's IMS-SIP implementation, you do not have to worry about coding a third party IMS-SIP server into your test plan—Keysight includes a verified and reliable PC-based server and client featuring manual or automated user control.

Meet increasing UE performance demands

Network operators are motivated to ensure that performance of UE on their network results in a positive end-user experience. While signaling conformance test addresses certain aspects of functionality, operators typically want to conduct more representative performance testing under different network conditions. Examples include verifying the UE behaves as expected after a base station signal is lost or when moving between different base stations, and in maintaining an active data connection through interRAT handovers such as LTE to 3G.

These real-world use scenarios supplement traditional conformance test and are commonly formalized into operator-specific test plans, requiring UE be subjected to demanding compliance testing before being approved for use on an operator's network.

Reduce design and compliance test cycles

Keysight offers a number of test solutions based on demands for functional test. Our measurement knowledge and testing experience is built into a range of test tools, so you can focus on verification

testing of your UE rather than having to develop in-house test tools. You can run tests manually or automate them for unattended testing; obtaining reliable, repeatable verification with logged results, and allowing you to progress rapidly to deployment.

Voice traffic on IP networks

Having a VoIP and an IMS-based core network is the goal for the majority of the industry, and migration to this solution is currently underway. As a result of this conversion a number of operators are placing new requirements on the network infrastructure and the UE.

For networks which do not support IMS, alternative technologies are in use, namely: circuit switched fall back (CSFB)/single radio approach, and simultaneous voice and data LTE (SV-LTE)/dual radio approach.

While these technologies are expedient, they represent an interim step in the migration to VoIP and IMS.

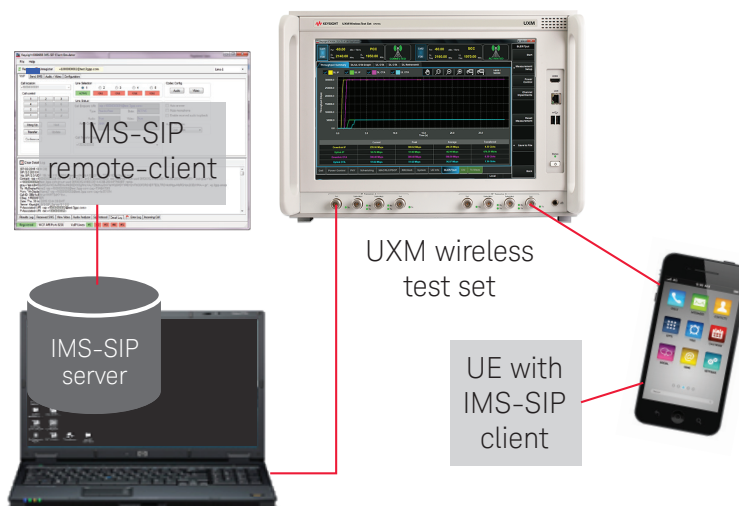


Figure 1. Typical configuration for LTE UE test

Voice, video, and SMS over IMS

The E6966B is designed specifically to test UE voice, video, and SMS services operating over an IMS core. It provides full client and server implementation, allowing you to perform end-to-end functional test.

While IMS-SIP is independent of any specific radio access technology, the E6966B IMS-SIP network emulator is intended for use with the Keysight E7515A UXM and E5515C/E 8960 Series 10 wireless communications test set acting as base station emulators. These test sets provide over-the-air network connection between the UE and the IMS-SIP infrastructure and have the flexibility to emulate a range of different network conditions, enabling UE performance to be verified in a controlled laboratory environment.

Already established in the world of 2G, 3G, and 4G performance and conformance test, these leading UXM and 8960 test sets now support IPv4 and IPv6 addressing and the required security configuration to implement functional test. The UXM includes an emulation of the evolved packet core (EPC)—an all-IP mobile core network required by 3GPP in the standards for LTE.

Key server features

- Establishes client-to-client connection
- 3GPP IMS extensions
- IMS AKA, AKAv2, and MD5 authentication
- IPv4 and IPv6 support
- IPsec support
- Supplementary service support
- Multi-party call support
- API for test automation
- E.911 support
- PRACK and preconditions

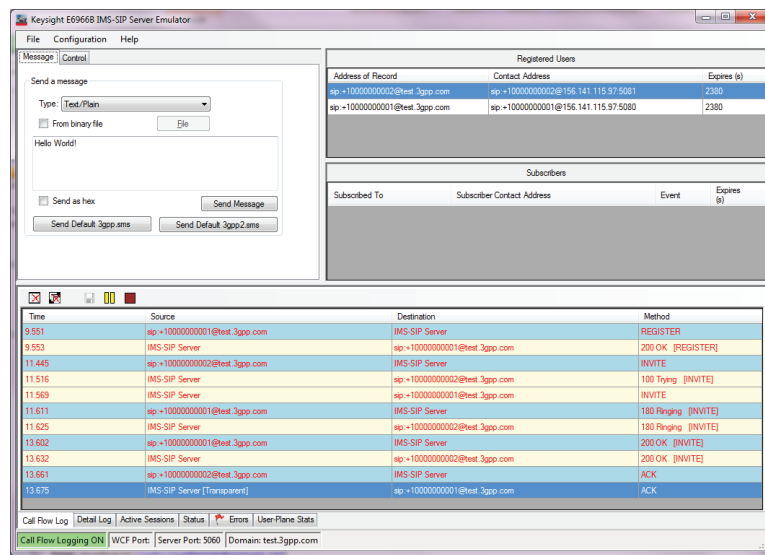


Figure 2. Keysight IMS-SIP server showing high level messaging

Keysight IMS-SIP server emulator

The IMS-SIP server responds to requests received from the UE and initiates SIP operations including: re-registration, de-registration, and SIP message transmission. Registration may be with or without authentication, PRACK, or preconditions.

The server can also be configured for alternative response testing. That is, it can respond in a specific manner that is atypical to a given SMS message received from the UE.

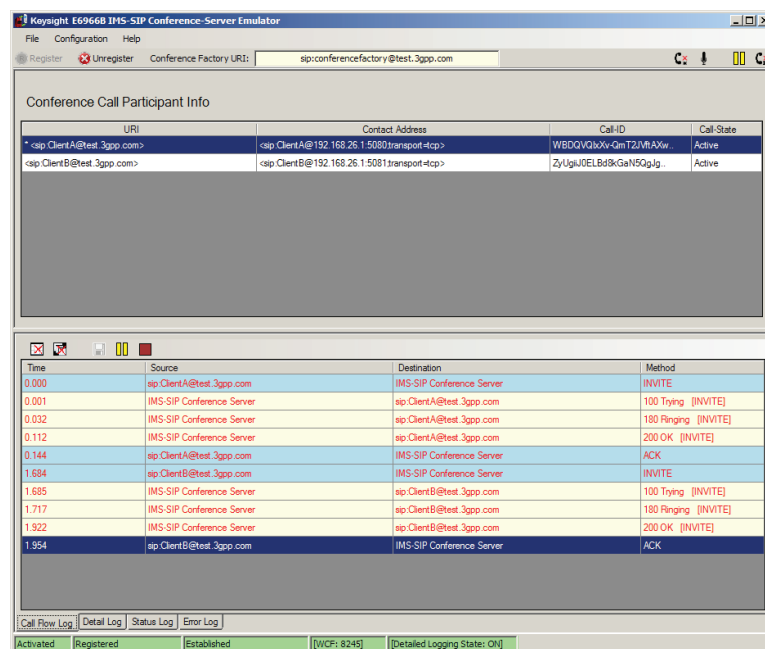


Figure 3. Keysight E6966B IMS-SIP conference server emulator

Keysight IMS-SIP client emulator

The SIP software may be used in two separate applications:

1. As a remote client to communicate with the UE via the server
2. As a PC-based client for the UE (where the UE functionality allows)

Run multiple clients on any appropriately-licensed PC.

Key client features

- Send, receive: Voice, video, and SMS
- IPv4 and IPv6 support
- Plain, 3GPP, and 3GPP2 encoded SMS messages and pre-coded binary format SMS
- Multiple audio codecs including: AMR and AMR-WB
- Settable AMR/AMR-WB rates
- Octet aligned and bandwidth efficient modes
- Audio level calibration features
- Multiple video codecs including: H.263, H.263-1998, and H.264 QoS for voice and video
- API for test automation
- Enhanced voice services (EVS) codec

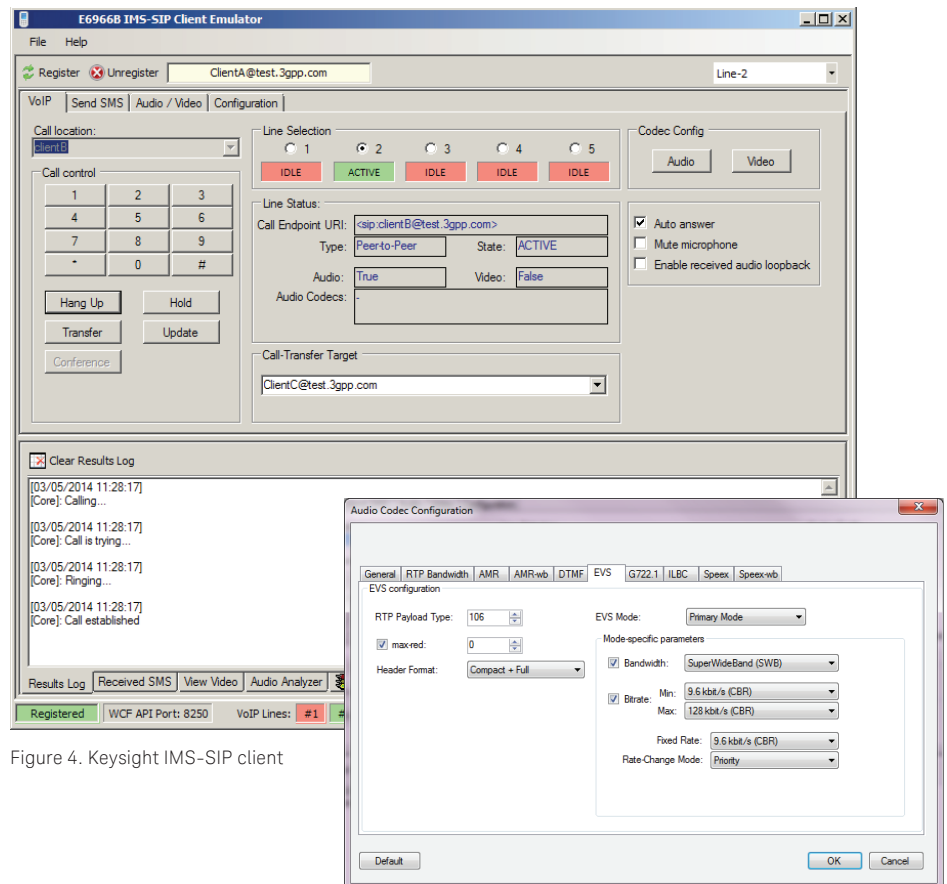


Figure 4. Keysight IMS-SIP client

Configuration information

For full functionality, a test configuration requires

- UE client
- IMS-SIP server
- Remote client
- Keysight UXM or 8960 Series 10 wireless communications test set

The UE requires a client in order to connect to the server. The UE native client requires a compatible ISIM application (on UICC). An additional remote client is required to allow end-to-end functional testing. Keysight's PC client software may be used as client and remote client. Alternatively, a third-party client application can be used, if preferred.

PC requirements for running IFT server and client

- Hardware/Operating system
- 1.8 GHz Pentium dual core processor or better
 - Windows 7 Professional or Windows 7 Enterprise
 - 2 GB RAM
 - 2 GB of available hard disk space
 - LAN port
 - Audio interface (optional)
 - Webcam (optional)

Wireless communications test set

- E7515A UXM
- E5515C/E 8960 Series 10

Miscellaneous

- Gigabit LAN router supporting IPv6 stateless auto-configuration
- LAN cables
- RF cables

The API supplied for test automation requires communication via the Windows Communication Foundation (WCF), Microsoft's unified programming model for building service-oriented application.

Option	License type	Description
E6966B-1TP IMS-SIP Server emulator	Transportable, perpetual	Enables the use of a server and remote client(s) on a single PC
E6966B-2TP IMS-SIP Client emulator	Transportable, perpetual	Client software for a standalone PC. (Alternatively a third-party client application may be used in conjunction with the Keysight server)
E6966B-3TP IMS-SIP conference server emulator	Transportable, perpetual	Enables multiparty call server on a PC
E6966B-5TP Enhanced voice services (EVS) codec	Transportable, perpetual	Enables EVS codec on Keysight remote client on a single PC

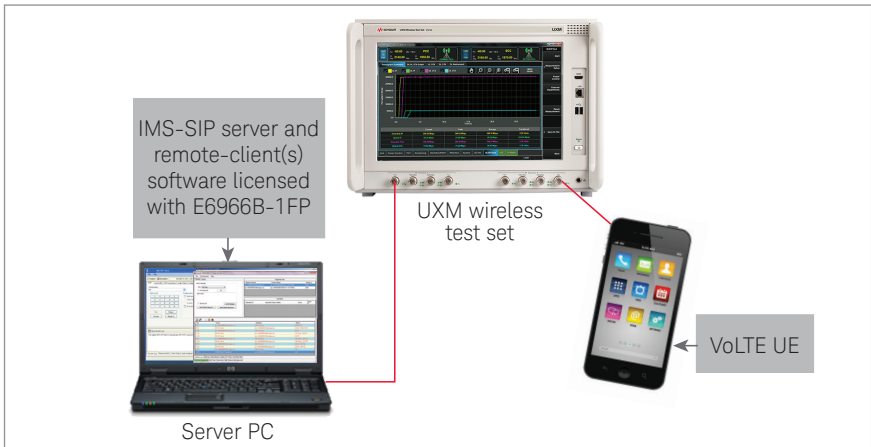


Figure 5. Example test configuration for UE with native client, connecting with an Keysight IMS-SIP server and remote-client software on server PC

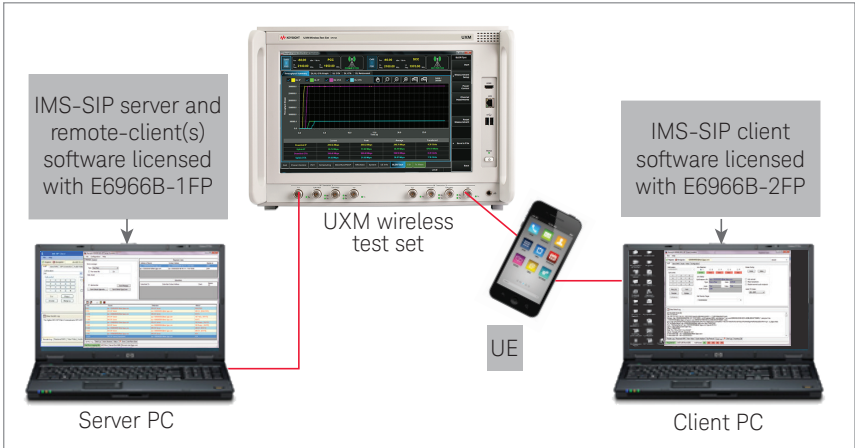


Figure 6. Example test configuration for UE without a native client (requires the addition of a client PC running Keysight IMS-SIP client software)

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