Simulates Controller Working Position and Ground Radio Station

Supports both ED137-B and ED137-C Volume 1 Versions

Emulates Air to Ground Calls

Multiple Radio Simulation

Real-time Session Supervision (R2S) as per ED-137/1B Standard

PTT Types and Radio Call Types

Radio Frequency, and Radio Maintenance Mode

Signal Quality Index and Radio Remote Control Header

Supports WG67 KEY-IN Event Package

QoS Monitoring, Load Testing, Functionality Testing

Color Codes for Sorting and Grouping Calls

Automation, Remote Access, and Schedulers

---

**Overview**

Recent advances in Air Traffic Management over IP network has opened up both opportunities for providing better services, and challenges to ensure reliability, and performance. Among many other solutions for testing Air Traffic Control network, GL offers MAPS™ (Message Automation & Protocol Simulation) can simulate both Air-Ground calls and Ground-Ground calls as per EUROCAE (European Organization for Civil Aviation Equipment) ED137 standards.

Among many other solutions for testing Air Traffic Control network, GL offers MAPS ED137 Radio to simulate the functions of Controller Working Position (CWP) and Ground Radio Station (or Radio Media Gateway) entities and generating bulk calls (load testing) on the network.

GL’s MAPS™ ED137 can simulate both Air-Ground calls (as per ED137_1B: Radio, ED137_1C: Radio) and Ground-Ground (as per ED137_2B: Telephone) calls as per EUROCAE (European Organization for Civil Aviation Equipment) standards. MAPS™ ED137 Radio supports both ED-137B Volume 1 Radio and ED-137C Volume 1 Radio versions. The software not only provides complete control over call scenarios to be tested, but also the ability to customize the network parameters for signalling and VoIP traffic. It has the capability of generating more than 500 simultaneous calls on a core i7 system.

MAPS™ ED137 Radio can be used to set up voice sessions over a network, then send and record test voice signals for assessing voice quality and performance. It simulates both Controller Working Position (CWP) and Radio Media Gateway System (RMG), with following important features required to maintain reliable communication over air traffic network. MAPS™ can support transmission and detection of various RTP audio traffic such as, real time audio, voice file, digits, single tone, and dual tones, with additional licenses.

## Main Features

### ED137 Signaling Simulation
- Fully integrated, complete test environment for Air Traffic Management
- Supports testing CWP, VCS, GRS (or RMG), and VRS elements
- Supports both ED-137B Volume 1 Radio and ED-137C Volume 1 Radio versions of Air-Ground call simulation
- Support for Multiple Radio Simulation (up to 200 Radios) within single instance of the software
- Supports hundreds of simultaneous calls and complete automation of bulk call generation with traffic
- IP Address Spoofing to automatically generate virtual IP address for a NIC
- Linked Session Management to group and identify all calls belonging to particular Radio
- Supports transport over IPv4, IPv6, UDP and TCP
- Depicts easy to understand call flow graphs of SIP message exchanges and message contents (SIP headers and SDP attributes)
- Supports multiple Profiles (Users/End points) from single node
- Allows to define DSCP (Differentiated Service Code Point) values for signalling and voice traffic
- ED-137B Volume 1 Radio
  - Support for user-events that can be applied dynamically on an established call (Re-Invite, PTT Priority, Signal Quality Information (SQI), CLIMAX Time Delay, Receive Traffic, Delay Compensation messages (RMM and MAM), Radio Remote Control, Impairments, Play to Speaker, RTP Audio/R2S-Keepalives
  - Supports simulation of Dynamic Delay Compensation messages - Request for Measurement Message (RMM) and Measurement Answer Message (MAM)
  - Supports sending simultaneous squelch on selected multiple Radios
  - Sample script provided to perform automated periodic Push-To-Talk (PTT) and Squelch (SQU) operations on Air-to-Ground (A-G) calls.
  - Option to define multiple traffic profiles for simultaneous simulation of various traffic actions
  - Supports sending audio using microphone and playing audio to speaker on multiple sessions
- ED-137C Volume 1 Radio
  - CWP and GRS nodes support Radio Receiver Multicast operation
  - Supports selective calling with SELCAL tone transmission
  - Simulates non-VOIP source PTT keying
  - WG67 KEY-IN event package includes frequency id (fid) parameter to inform the User Agent about the new Frequency ID (fid)
  - No disconnect of active sessions when GRS frequency id changes
  - Includes PTT type - Test PTT
  - All SIP requests and responses will have WG67-Version header updated to 'radio.02'

### Traffic Simulation
- Send and receive live speech, pre-recorded speech files, digits and tones
- Set impairments (Packet Loss, Packet Effects and Latency) in relevant profile in real time
- Provides aggregated voice quality statistics such as MOS/R-Factor, packet loss, duplicate and out of sequence packets
- Supports user-defined and automated traffic actions on the call
- Supports all standard codecs, including G.711 (mu-Law and A-Law) and G.729

### Applications
- On field testing and troubleshooting by technicians
- In-the-field installation, system configuration and commissioning
- Functionality testing of nodes in next generation VoIP ATM
- Load testing and background traffic generation
- QoS monitoring - analyze calls for voice quality (MOS), packet loss, jitter, latency, etc.
- Centralized monitoring of Air Traffic
- Real-time and/or historical data analysis
Configuration Scenarios

Scenario 1: MAPS™ acting as CWP and testing GRS
MAPS™ ED137 acting as CWP generates Radio calls to GRS.

Scenario 2: MAPS™ acting as GRS and testing CWP
MAPS™ ED137 can be configured to act as GRS to receive Radio calls from CWP or VCS.

Call Generation and Reception

In call generation, MAPS™ is configured for the outgoing messages, while in call receive mode, it is configured to respond to incoming messages.

The message flow between the configured entities are displayed in sequence. The message decodes for any particular selected message in the flow is also displayed. Once call is established between the two terminals ‘KeepAlive’ messages are exchanged between the terminals.

Many other Events can be applied at CWP/GRS over the established call such as User-defined Signal Quality Information (SQI), Play back the call on Speaker, Start/Stop sending RTP Audio/R2S-Keepalives, and Start/Stop Impairments.

Colour coding feature included in the configuration is used to sort and group all received calls related to individual radios as seen in the image below.

CWP/GRS Radio Call Profiles

ED-137B of EUROCAE (European Organization for Civil Aviation Equipment) standard option adds additional SDP Parameters and SIP headers while placing the calls which are required for generating R2S Keep Alive packets. These parameters for each profile (CWP/GRS) simulating a Radio call can be easily configured in the XML based configuration files. Similar to signaling, traffic configuration files allow users to customize the traffic parameters. At MAPS™ CWP, PTT types such as Normal, Priority, Emergency, and Coupling PTT ON are supported activating transmission over the air. The type of the call session can also be defined as Radio-Idle, Radio-RxOnly, Radio-TxRx or Radio, and Coupling types.

Configuration Scenarios

Scenario 1: MAPS™ acting as CWP and testing GRS
MAPS™ ED137 acting as CWP generates Radio calls to GRS.

Scenario 2: MAPS™ acting as GRS and testing CWP
MAPS™ ED137 can be configured to act as GRS to receive Radio calls from CWP or VCS.

Call Generation and Reception

In call generation, MAPS™ is configured for the outgoing messages, while in call receive mode, it is configured to respond to incoming messages.

The message flow between the configured entities are displayed in sequence. The message decodes for any particular selected message in the flow is also displayed. Once call is established between the two terminals ‘KeepAlive’ messages are exchanged between the terminals.

Many other Events can be applied at CWP/GRS over the established call such as User-defined Signal Quality Information (SQI), Play back the call on Speaker, Start/Stop sending RTP Audio/R2S-Keepalives, and Start/Stop Impairments.

Colour coding feature included in the configuration is used to sort and group all received calls related to individual radios as seen in the image below.

CWP/GRS Radio Call Profiles

ED-137B of EUROCAE (European Organization for Civil Aviation Equipment) standard option adds additional SDP Parameters and SIP headers while placing the calls which are required for generating R2S Keep Alive packets. These parameters for each profile (CWP/GRS) simulating a Radio call can be easily configured in the XML based configuration files. Similar to signaling, traffic configuration files allow users to customize the traffic parameters. At MAPS™ CWP, PTT types such as Normal, Priority, Emergency, and Coupling PTT ON are supported activating transmission over the air. The type of the call session can also be defined as Radio-Idle, Radio-RxOnly, Radio-TxRx or Radio, and Coupling types.
**Simulation Scenarios**

**Multiple Radio Simulation**

MAPS™ ED137 Radio is enhanced to support multiple radios (GRS) simulation within single MAPS™ instance, receiving Radio calls from multiple Controller Working Position (CWP) or Voice Communication Systems (VCS). It is possible to simulate multiple radios within single MAPS™ ED137 Radio instance using profile configuration.

ED137_Radio_GRS_Profiles is an XML configuration file that includes a set of multiple sub-profiles, which allows to configure multiple radios of similar capabilities with unique set of parameters such as Contact address, radio type, frequency-id, permitted user list for each profile. Colour coding feature is also included in the configuration which are used to sort and group all received calls related to individual radios.

**Simulation of Dynamic Delay Compensation Messages**

Enhanced MAPS™ ED-137B Radio adds Dynamic Delay Compensation as an additional feature in which specific RTP extension block used to introduce varying delay values at GRS in lab environment without actually making the real-time measurements.

Once the Air-to-Ground call is established, CWP can send Dynamic Delay Compensation messages such as RMM to GRS. GRS replies with MAM. Message for each RMM received. MAPS™ uses only relative time to calculate delay. After receiving the MAM message from GRS, delay is calculated and displayed in the message sequence graph along with RMM and MAM messages, as shown in the below image.

**Linked Session Management**

The Linked Session functionality provides to the GRS endpoint the opportunity to detect all SIP sessions which are coming from the same user but from different equipment (i.e. different IP Address) to guarantee higher service availability.

GRS can identify the calls coming with same User part in From Address but with different IP/host address and with 'ls-pl' SDP parameter included within the SIP headers. It will treat the linked sessions as one single logical session to radio.

The linked session functionality enables the GRS endpoint to support handling of redundant connections between VCS endpoint and GRS endpoint for all types of connections.

**Radio Receiver Multicast Operation**

In Multicast mode operation, multiple CWPs can send request to have multicast session with GRS to receive multicast RTP packets from GRS. CWP sends an INVITE request with SDP body containing multicast group address and TTL value to GRS. The GRS which supports multicast will extract the multicast address from SDP body in INVITE and starts sending the R2S/RTP packets to this multicast address. CWPs will send Internet Group Management Protocol (IGMP) join request to join the group and start receiving the multicast RTP packets. The router or switch with multicast feature will manage the subscription to multicast group and forwards the RTP packets received from GRS to all members of the group. The below image depicts the process.
Simulation Scenarios...

Selective Calling (SELCAL) Tone Transmission
SELCAL is a signalling method used to alert the aircraft crew members selectively to an incoming message from a ground station. The CWP endpoints simulated by MAPS™ ED137 Radio supports sending SELCAL tones to GRS using the SIP INFO method. SELCAL tone defined in CWP profile will be sent in the body of INFO message as shown in below image. GRS replies with 200 OK message to INFO request and sends Normal PTT_ON confirmation with PTT-ID=63 in RTP downstream header to CWP. PTT-ID=63 is reserved for SELCAL tone transmission at GRS. PTT priorities are handled at GRS as per ED137C for this transmission.

Simulates Non-VoIP source PTT keying
GRS endpoints simulated by MAPS™ ED137 Radio supports simulation of non-VoIP source PTT Keying. User can simply apply “Key non-VoIP PTT” event on the selected Radio call at GRS. This will trigger GRS to send Normal PTT_ON confirmation with configured PTT-Id (60, 61 or 62) in RTP downstream header to all CWPs indicating that PTT from a non-VoIP source is being transmitted at GRS. PTT-Ids 60, 61 and 62 are reserved for non-VoIP sources. The below image shows the non-VoIP source PTT ON/OFF confirmations on the call graph.

Buyer’s Guide
PKS118 - MAPS™ ED137 Radio (includes PKS107, & PKS102)
PKS119 - MAPS™ ED137 Telephone (includes PKS102)

Related Software
PKS102 - RTP Soft Core for RTP Traffic Generation
PKS107 - RTP EUROCAE ED137
PKS120 - MAPS™ SIP Emulator
PKS121 - MAPS™ SIP Conformance Test Suite (Test Scripts)
PKS126 - MAPS™ SIP I Emulator
PKS127 - MAPS™ SIP - IMS
PKS130 - MAPS™ SIGTRAN Emulator

For complete list of MAPS™ products, refer to www.gl.com/air-traffic-management-maps-ed137.html webpage.