

TELIT WHITE PAPER

ECALL: A CHALLENGE FOR TELIT

Cristian Vacchiano

Marco Radeticchio

In the near future every car will have an electronic safety system automatically calling emergency services in case of an accident. Telit decided to implement standardized eCall IVS modem and the 2.5G R&D won the challenge.

The scenario

eCall refers to an interoperable in-vehicle emergency call service which has to be introduced and operative across Europe.

During 2009 ETSI released the V9.0.0 of specification for the eCall in-band modem solution for reliable transmission of MSD (Minimum Set of Data) from IVS (In-Vehicle System) to PSAP (Public Safety Answering Point) via the speech channel of cellular networks.

Telit, understanding the importance of new standard, decided to try the implementation of eCall IVS modem on its products. The natural choice for this kind of implementation was the GE864-Automotive V2, that is the extra-rugged member of the GE864 product family incorporating quad-band, RoHS compliance, as well as very low power consumption.

01

The use of the GE864 sub-compact form factor allows the integration of

automotive and other applications requiring assured extended operating temperature range and mechanical ruggedness within the ever-shrinking space inside electronics bays in trucks, automobiles and other mobile platforms.

The challenge

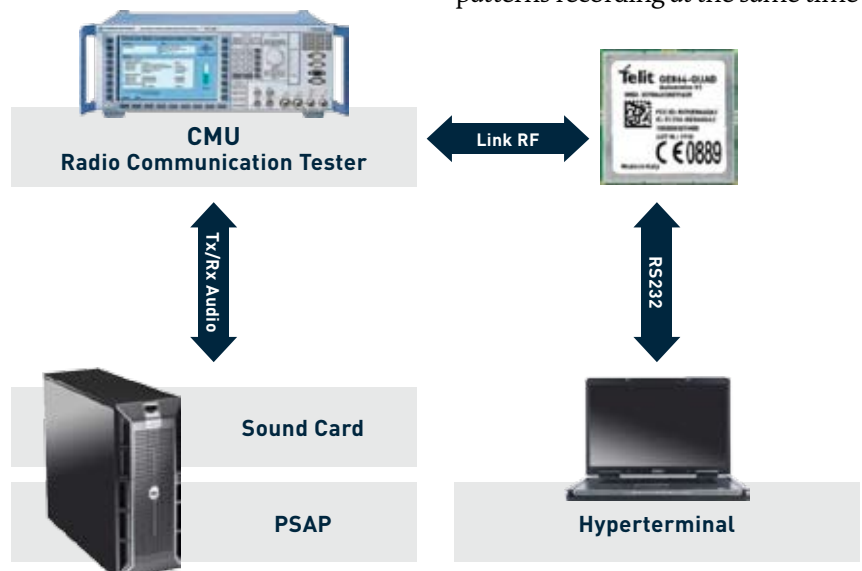
By using the state of the art programming techniques, the recognized skills and the deep knowledge

of the GSM/GPRS platform of its 2.5G R&D software engineers, today Telit has a completely embedded solution in the GE864-Automotive V2.

The testing environment

Since so far there is not test-bed for validation available, we developed an HW/SW architecture containing a PC connected to a network simulator through Audio Interface. Using a serial port interface we were also able to trace IVS modem behaviour.

In this way, we could send to the IVS modem audio standardized eCall patterns recording at the same time



as the feedback messages. GSM channel configuration was controlled through a network simulator user interface.

Next step was to implement a full eCall simulator; using the same HW architecture we developed a PSAP application (based on Reference Code) that replaced the test patterns and completed the eCall chain.

The critical point of this chain was the digital-to-analog/analog-to-digital conversions needed to send/receive patterns to/from network simulator through a PC soundcard.

To overcome these limitations and to enhance the overall system we decided to migrate from a simulated local test environment to a public environment. To achieve this milestone we built an architecture based on VoIP Technology.

We realized a new architecture with the PSAP connected to a Gateway interfacing TCP/IP with ISDN, while on the other side we had the IVS modem connected to the public GSM/GPRS network; in practice the in-band modem can be tested making a simple voice call to the PSAP phone number.

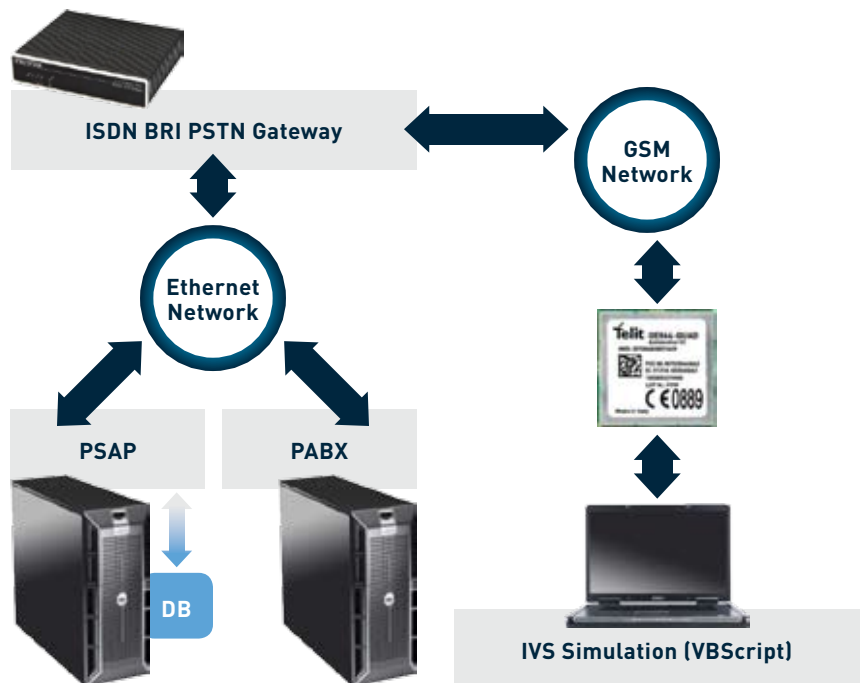
The advantage of this approach is that the eCall data is fully digital/numeric from the PSAP application to the GSM/GPRS network without any analog-to-digital conversion.

The new PSAP application is based on an open source SIP client and runs on a Linux PC System. Session Initiation Protocol (SIP) is an IETF-defined signalling protocol widely used for controlling multimedia communication sessions such as voice calls over Internet Protocol, namely Voice over IP (VoIP). The application sends/receives VoIP streams to/from ISDN BRI PSTN

Gateway and it is able to process real-time audio streams for encoding/decoding eCall messages.

This solution gave us the possibility to debug the IVS modem and at the same time to have a PSAP server working in a real world environment.

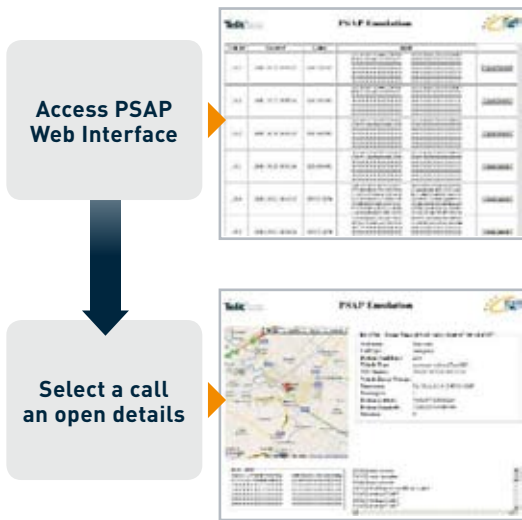
The interaction between eCall signals and Network Echo Cancellers are under investigation, because it leads to a loss of some frames during the call compromising synchronization mechanism. This behaviour is also reported by 3GPP eCall Working Group.



A service for all

We like sharing our competence with our customers, for this reason we decide to add a database to make logs for automatic tests and to give a simple web interface for browsing results. Using a simple interface it is possible to “read” the MSD coming from IVS visualizing position on a map and all information.

Our customers that want to debug their eCall applications can use our service simply by making a phone call to our PSAP phone number and access the website to see the logs.



Easy to use

Additionally an IVS interface is also available and it provides two features:

- Basically, the possibility to create a custom MSD
- Optionally, if the PC connected with the website is properly configured (Telit Module and EVK, VBScript and Telit proprietary libraries), the possibility to make an emergency call and send the MSD to Telit PSAP

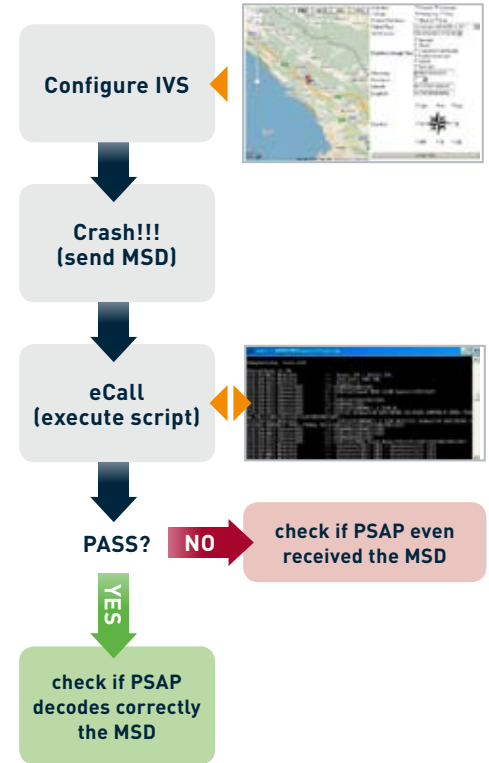
IVS modem is configurable through Telit AT interface with the following commands:

- AT#ECALL: it permits to enable/disable IVS modem
- AT#MSDSEND: it permits to send to module the MSD (AT interface goes from command to online mode and accepts 140 bytes)
- AT#MSDPUSH: it permits to IVS to issue the request for MSD transmission to the PSAP server.

Regarding network signalling level the module will declare eCall support during the call setup.

The following PSAP Application parameters are configurable from command line:

- “Push” or “pull” mode
- Database enabling or disabling
- “Delay” to change the timings of PSAP audio streams (useful during testing)



Our next steps

The results of this project are a big success for the further development of eCall systems – and are once again a proof for Telit’s competence in R&D. Since we never rest, the next milestone is already at hand: The alignment of the current implementation with the last eCall Software Reference code released by 3GPP Working Group in June.



The **GE864-QUAD Automotive V2** is the extra-rugged member of the GE864 product family incorporating quad-band, RoHS compliance, as well as very low power consumption. The use of the GE864 sub-compact form factor allows the integration of automotive and other applications requiring assured extended operating temperature range and mechanical ruggedness within the ever-shrinking space inside electronics bays in trucks, automobiles, and other mobile platforms.

Moreover, GE864-QUAD Automotive V2 embeds eCall interface. eCall provides reliable full-duplex data communications between vehicles involved in a collision, anywhere in EU, and emergency agencies (E112) in addition to emergency voice call.

With its low profile design, extended temperature range, ESD and EMC compliance, the GE864-QUAD Automotive V2 is the ideal and complete hardware platform for all automotive m2m markets, both OEM and after-market.

Product features

- Quad-band EGSM 850 / 900 / 1800 / 1900 MHz
- GSM/GPRS protocol stack 3GPP Release 4 compliant
- Control via AT commands according to 3GPP TS 27.005, 27.007 and Telit custom AT commands
- Serial port multiplexer 3GPP TS 27.010
- SIM access profile
- SIM application toolkit 3GPP TS 51.014
- Supply voltage range: 3.25 – 4.5 V DC (3.8 V DC recommended)
- TCP/IP stack access via AT commands
- Unified Telit AT command interface
- Control via Remote AT commands
- Power consumption (typical values)
 - Idle (registered, power saving): < 1.5 mA
- Sensitivity:
 - 107 dBm @ 850 / 900 MHz
 - 106 dBm @ 1800 / 1900 MHz
- Dimensions: 30 x 30 x 2.8 mm
- Weight: 4.2 grams
- Extended temperature range
 - -40°C to +85°C (operational)
 - -40°C to +90°C (storage temperature)
- DARP/SAIC support
- e-Call compliant according to 3GPP TS 26.267

Interfaces

- 9 I/O ports maximum
- Analog audio (balanced and unbalanced)
- 2 A/D converters
- Digital audio interface
- Buzzer output
- ITU-T V.24 serial link through CMOS UART:
 - Baud rate from 300 to 115,200 bps
 - Autobauding up to 115,200 bps

Approvals

- Fully type approved conforming with R&TTE directive
- CE, GCF, FCC, PTCRB, IC, Anatel Environmental tests
- ISO 16750-1:2006
- ISO 16750-3:2007
- ISO 16750-4:2010

Additional Features

- Jamming detection
- Embedded TCP/IP stack, including TCP, IP, UDP, SMTP, ICMP and FTP protocols
- PFM (Premium FOTA Management)
- Remote AT Commands
- Event Monitor

PIN Protection

- ESD protection level 4
 - Contact up to +-4kV
 - Air up to +-8kV
 - Contact antenna pin up to +-15kV
- EMC protection
 - All pins have HBM filtering

Telit's EASY features

- EASY SCAN[®] automatic scan over GSM frequencies (also without SIM card)



VISIT TELIT WIRELESS SOLUTIONS ON THE WEB:

www.telit.com

www.telit.com/ebook

www.telit.com/twitter

www.telit.com/facebook

EMEA

Telit Communications S.p.A.

Via Stazione di Prosecco, 5/B

34010 Sgonico (Trieste), Italy

Ph: +39 040 4192 200, Fax: +39 040 4192 289

TelitToMarket@telit.com, www.telit.com

Northamerica

Telit Wireless Solutions Inc.

3131 RDU Center Drive, Suite 135

Morrisville, NC 27560, USA

Ph: +1 888 846 9773, Fax: +1 888 846 9774

northamerica@telit.com, www.telit.com

Latinamerica

Telit Wireless Solutions Inc.

Rua Cunha Gago, 700 - cj 81, Pinheiros

São Paulo - SP, 05421001, Brazil

Ph: +55 11 2679 4654, Fax: +55 11 2679 4654

latinamerica@telit.com, www.telit.com

APAC

Telit Wireless Solutions Co. Ltd.

12th floor, Shinyoung Securities Building

34-12, Yeouido-dong, Yeongdeungpo-gu

Seoul, 150-884, Korea

Ph: +82 2 368 4600, Fax: +82 2 368 4606

TelitAPAC@telit.com, www.telit.com