3te Tagung, Aktive Sicherheit durch Fahrerassistenz.

Summary.

“GST and eCall – a contribution to pan-European standardization of the emergency call within the Intelligent Car Initiative”.

Autor:
Dipl.-Phys. Hans-Ulrich Michel

Firmenanschrift:
BMW Forschung und Technik GmbH
Hanauer Strasse 46
80992 München
Tel: 089-382-30136
Email: hans.michel@bmw.de
GST and eCall – a contribution to pan-European standardization of the emergency call within the Intelligent Car Initiative.

Summary

The i2010 Intelligent Car Initiative, which was launched in 2003, is intended to accelerate the integration of new, intelligent technologies in vehicles to make them safer, cleaner and more efficient. In this context the Integrated Project GST, Global System for Telematics, was co-funded by the European commission within the Framework Program (FP6). The project was driven by more than 50 key stakeholders in the European telematics industry with the goal of specifying an open end-to-end architecture for automotive telematics services. Because eSafety is one important driver harmonising technical solutions and ensuring interoperability across different European countries, safety related services, amongst others eCall, play a major role in the GST project. The presentation will focus on the eCall proof-of-concept demonstrations done by the GST Munich Test Site, which set up a test bed for validating safety services and GST core concepts.

In collaboration with the Bavarian Red Cross, Mondial-Assistance, T-Systems and Orange three different eCall solutions have been implemented as a prototype. The main characteristics are:

1. “Basic eCall”: In case of an accident the in-vehicle device will transmit an emergency call - generated either automatically or by one of the vehicle’s occupants pressing a button - which consists of a voice-call to the nearest emergency center (PSAP) and a data-transmission to a national eCall server. The PSAP will pull the dataset, called Minimum Set of Data (MSD), directly from the server. The data-transmission is done using the GSM signalling channel USSD.

2. “Premium eCall” (Pull): The first alternative “Premium eCall” can be subscribed to by the customer and allows him to enrich the dataset with personal information. The customer database will be administered from a Service Aggregator, who will receive the data-Call and add, by customer order, additional information. This Full Set of Data (FSD) will be forwarded to a national eCall server. At the same time the voice-Call will be received from a Service Provider which will serve the role of a mediator between vehicle and PSAP. The Service Provider is able to access the server-based eCall dataset. If the Service Provider judges the call as a real emergency call, it will unlock the data for PSAP access and call the PSAP or arrange a conference call with the vehicles’ occupants. The PSAP has to pull the data from the national eCall Server. WebService interfaces are used between all entities.
3. “Premium eCall” (Push) with “Last-Mile”-Integration: The last implementation is based on the same infrastructure as solution 2, but a push-solution for the dataset is implemented based on Java-Spaces technology. In addition a solution is implemented to push the dataset from the PSAP to a mobile device to realize continuous data transmission from the vehicle to the ambulance team. A mobile device based automatic route guidance provides directions to the scene of accident, using the GSP-data from the received dataset.

The prototypes implemented demonstrate different possibilities to harmonize an in-vehicle emergency call across Europe. In all implementations, the eCall server concepts are proven viable. USSD as a data-transfer channel has been successfully integrated but needs further investigation. The “Last-Mile”-solution was proven very valuable from the emergency center to avoid communication problems with the ambulance team. The solution is under further investigation from the Bavarian Red Cross. More detailed information and “Lessons Learned” are part of the presentation enclosed.
GST and eCall -
A contribution to pan-European standardization of the emergency call within the Intelligent Car Initiative.
eCall Standardization across Europe.

What is the scope?

Create a pan-European solution available to all vehicles and users
- Determine the complete emergency chain
- Cross-Border operation
- Automatic and manual call-activation
- Include a voice-call (112) and data-transmission (GPS-Position etc.)

- Reduction in traffic death rates (2500 p.a.*) and number of severe injuries (15%*) across Europe
- Reduce of response time 40-50%* („golden hour“)
- Reduce traffic congestion 20%*

* Based on E-MERGE project and Exploratory Study on the potential socio-economic impact of the introduction of Intelligent Safety Systems in Road Vehicles: SeiSS final report.
eCall Standardization across Europe. Who is driving this?

The i2010 Intelligent Car Initiative was launched on 23 February 2006. It will build on the work of the eSafety initiative and follows a three-pillar approach.
GST-Global System for Telematics.

Mission.

“Create an environment in which innovative telematics services can be developed”.

“Show technical feasibility of eSafety services, especially eCall”.

Avoid unduly high barriers of market entry

Freedom of choice in service consumption

„eSafety has potentially HIGH impact on the creation of the Telematics market“
GST-Global System for Telematics.

Organization.

Steering Committee
Core Team
Core Architecture Group

Management layers:

Key results:
1. Architecture & Interface specifications
2. Reference implementation
3. Test suite
4. Field trials
5. Validation results

Technology oriented subprojects:
- Open Systems Certification Security Service Payment
- Rescue Safety Channel Enhanced Floating Car Data

Service oriented subprojects:
- Open Systems Certification Security Service Payment
- Rescue Safety Channel Enhanced Floating Car Data

• GST was driven by 49 European companies

More information about GST: http://www.gstforum.org
The Goals of the Munich Test Site are:

• To implement, and validate a telematics approach based on open protocols, such as OMA DM, SAML and Web Services, and including end-to-end security and identity management to elaborate trustworthy personalization

• To prototype innovative safety telematics including, but not limited to emergency response: eCall, broadcast, vehicle-vehicle

Bayerisches Rotes Kreuz

Telcordia®

Allianz

ProSyst®

IRT

RSA SECURITY®

MINI
GST-Global System for Telematics.
High Level Architecture.
Seamless Service Scenario.
eCall, Safety-Channel and Car2Car.

Example:
In-Vehicle Warning Application based on Safety-Channel and Car2Car Communication
Emergency-Call today.
Example BMW Assist.

1. Speech
2. Data (SMS)

Vehicle

Call Center
Service Provider

Customer
Database

112

GPS

GSM

Speech

Public Safety Answering Point (PSAP 1)

Speech

Paramedic / Ambulance team (PSAP 2)

Flying Ambulance (PSAP 2)
Pan-European eCall.
European Commission Request.

Option*

* Discussed as possible option – „Third Party eCall“

Call Center Service Provider

Data

Speech

Public Safety Answering Point (PSAP 1)

Data

Speech

112 Speech

Data

Vehicle

Paramedic / Ambulance team (PSAP 2)

Flying Ambulance (PSAP 2)
Pan-European eCall. The Challenge.

- Standardization:
  - Manual or Automatic Activation
  - Establish voice-Call (via 112 with/without SIM)
  - Routing of voice-Call to PSAP
  - Specification of the Minimum Set of Data (MSD)
  - Data Protocol used (PSAP-interface)
  - Transmission Network
  - Data Routing to PSAP
## Pan-European eCall.

**Challenge – eCall Management chain across Europe.**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Example</th>
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<tbody>
<tr>
<td>Telco + PSAP1 + PSAP2</td>
<td><strong>UK</strong>, where <strong>BT</strong> is actually working as <strong>Telco</strong> and <strong>PSAP1</strong> as well.</td>
</tr>
<tr>
<td><strong>X</strong></td>
<td><strong>Sweden</strong>, where a national service provider (<strong>SOS Alarm</strong>) is in charge to handle <strong>112</strong> call by law.</td>
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<tr>
<td><strong>X</strong></td>
<td><strong>Italy</strong>, where, due to the fact that <strong>E-112</strong> and <strong>PSAP role</strong> are not defined yet, an <strong>Emergency Authority (Carabinieri)</strong> is handling <strong>112</strong>.</td>
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### Table

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<tr>
<th>Telco</th>
<th>PSAP1</th>
<th>PSAP2</th>
<th>Telco + PSAP1</th>
<th>PSAP1 + PSAP2</th>
<th>Telco + PSAP1 + PSAP2</th>
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</table>
eCall Munich Test Site – „Basic eCall“.  
Overview.

Main Characteristics

- No Call Centre / Service Provider
- One central eCall-Server per country which will be accessed from PSAP to get MSD information (Pull).
- A 112 substitute is used for test purpose.
- For MSD transport GSM signaling channel and USSD is used.
- Use ASN.1 BER for message description and encoding.
- Use TCAP to realize transaction between vehicle and eCall-Server; dialogue operations sendMSD, ackMSD, eosMSD
- PSAP has a web browser based interface (HTML over HTTP(S).
„Basic eCall“.
Data Flow Vehicle / Handset to USSD-Server.

- Trigger
- Get Data from VI
- MSD formatting (result: binary data)
  - Embed MSD in TCAP message (result: binary data)
  - TCAP (with embedded MSD)
    - Base64 coding (result: character string)
    - Transfer character string via USSD (AT+CUSD)

Establish voice call

- USSD Data Server
- PSAP

Phone number
“Basic eCall“.
Data Flow USSD- and eCall-Server, PSAP.

- MCC (Mobile Country Code) Identification
- Use MCC to identify destination eCall-Server
- Transmit data to destination eCall-Server
- Extract payload data
- Visualize data

Local eCall Server fits (HLR-Country = Accident-Country)

Foreign country eCall server fits (HLR-Country != Accident-Country)

- eCall Server - country of accident
- Extract payload data
- Visualize data
- ECall Database
- Look at data
- PSAP1
eCall Munich Test Site.
PSAP Viewer.

Unfalldaten:
- Rufnummer: 33607705174
- Zeitpunkt: 13.01.2006 14:46:57
- GPS-Koordinate: Länge: 11.5886, Breite: 48.1606
- Ort: 80992, München, Hansauer Straße
- Art der Auslösung: Manuell
- Ausgeloste Sensoren: 
- Fahrtrichtung: 

Fahrzeugdaten:
- Marke: BMW
- Modell: 530d Limousine
- Farbe: 
- Kennzeichen: M-3V4260
- Land: Deutschland
- Fahrgestellnummer: X12345

Diensteanbieter:
- Rufnummer: 
- IP-Adresse: http://munich.gstproject.org/axis/services/ECallService

Zusätzliche Daten des Diensteanbieters
eCall Munich Test Site.
Minimum Set of Data (MSD).

MSD : ASN.1 BER encoded data.

„When“ - via timestamp.
„Where“ - via GPS/Heading.
„Who“ - via CLI and vehicle
**eCall Munich Test Site – „Basic eCall“**

**Lessons Learned.**

- eCall USSD protocol stack has been successfully integrated. USSD was shown in a cross border scenario.
- eCall server concept proven viable.
- USSD requires further harmonization among telco operators across Europe.
- Different routing of voice and data could cause problems in worst case situation.
- There was none or only a small delay between PSAP receiving voice call and eCall server data availability.
- Direct PSAP access from vehicle could generate false call and language problems. Use of SIM-card could reduce this problem.
- The Pull-solution minimize the investment on PSAP-level (web Browser based interface). It could create problems if the customer is not able to speak after the accident.
- With the examined infrastructure it is not necessary to standardize the PSAP interface.
eCall Munich Test Site - “Premium eCall”.
Subscription and Personalization.
eCall Munich Test Site - “Premium eCall” (Pull).

Overview.

Main Characteristics (check text!)

- Use of an extended dataset called FSD (Full Set of Data), MSD enriched with user specific information.
- A Service Aggregator has the customer database and is responsible to create the FSD.
- Service Provider / Call Center takes the role of a mediator between vehicle and PSAP.
- One central eCall-Server per country which will be accessed from PSAP to get FSD information (Pull).
- SOAP 1.2 over GPRS is used to transmit the FSD (FSD-Request, FSD-Reply – Interface 3), web-Services also used for Interface 1, 2.
- PSAP (IF 4) has a web browser based interface (HTML over HTTP(S).
eCall Munich Test Site.
Domain View of “Premium eCall” (Pull).

European Mobile Network
- Visited PLMN
- Home PLMN

Vehicle Domain
- Mobile Phone
  - GSM Modem

Telco Domain
- USSD-Centre
- E-Call Server
- PremiumAssist Manager

Service Provider-1: Mondial
- GST PremiumAssist (Backend)
- GST Infrastructure
- Provider Backend

Vehicle Domain
- E-Call HMI
  - Basic E-Call
  - Vehicle API

PSAP1 MUC
- MUC Testsite purposes only

Bayerisches Rotes Kreuz

Pull/Push MSD or FSD

Voice Call to SP

Update FSD via SOAP

Voice Conference Call to PSAP

FSD Request via SOAP

AT Commands

MSD:= Minimum Set of Data
FSD:= Full Set of Data
PLMN:= Public Land Mobile Network
„Premium eCall“.
Vehicle FSD-Request.

```xml
<FullSetOfDataRequest>
  <Version>0</Version>
  <SequenceNumber>550184856750781001</SequenceNumber>
  <TimeStamp>2005-10-25T08:35:27Z</TimeStamp>
  <Vehicle>
    <MCC>262</MCC>
    <MNC>01</MNC>
    <MSISDN>33607705174</MSISDN>
    <VIN>X12345</VIN>
  </Vehicle>
  <Status>
    <ManuallyActivated>true</ManuallyActivated>
  </Status>
  <Waypoint>
    <TimeDifference>0</TimeDifference>
    <Location>
      <Latitude uncertaintyEstimate="10.0">50.7324</Latitude>
      <Longitude uncertaintyEstimate="10.0">7.097</Longitude>
    </Location>
  </Waypoint>
  <CustomerIdentifier>michel</CustomerIdentifier>
  <PassengerIdentifier>6</PassengerIdentifier>
</FullSetOfDataRequest>
```
„Premium eCall“.
Data Flow.

Get Data from VI

Send FSD Request

Vehicle Interface

Establish voice call

Service Provider

Aggregator

Passenger ID’s

Phone Number, MCC
Establish voice call

Service Provider

Examine Data, change or add additional information

Establish conference call

Send FSD Request

Receive FSD

Add Customer Data

Use MCC to identify destination eCall server

Send FSD

Vehicle Data

Customer Data

E-Call Server

eCall Database

Visualize Data

PSAP1

Look at data
### Proposal for Additional Emergency Data DGAI and BÄK*

- Diagnosis.
- Allergy / Drug Intolerance.
- Surgery.
- Last Immunisation Tetanus / Hepatitis B.
- Current Medication.
- Contact Information (Doctor, Emergency Contact Person).
- Existing Living Will.
- Existing organ donation pass.
- Other medical information.

Other possibleoptional FSD-Data: Number-of-Passengers, Passenger-ID (used in GST Munich test-site) Crash-severity, Vehicle-Roll-Over etc.

*DGAI – Deutsche Gesellschaft für Anästhesiologie und Intensivmedizin  
BÄK – Bundesärztekammer
eCall Munich Test Site – „Premium eCall“ (Pull).

Lessons Learned.

- The Service Provider is able to take the role of a “clearing instance” and avoid false calls to the PSAP.
- The Service Provider is able to avoid language problems.
- The Premium eCall allows personalization, e.g. by creating passenger id’s which will be transferred via the FSD to identify the passengers. To add customer specific information, i.e. medical data, is valuable for PSAP and ambulance team.
- Medical Data must be created in an own database on service aggregator level with customer authorization. In this context privacy is a big topic.
- webService Interfaces are a reasonable option if data volume across GPRS (FSD-request) is limited.
- PSAP to ambulance team communication based only on voice can produce delays in response time.
Main Characteristics

- Use of an extended dataset called FSD (Full Set of Data), MSD enriched with user specific information.
- The FSD-transfer is extended via a “Last-Mile Implementation” using a Mobile Device. The PSAP pushes the data to the Mobile Device which will be used from the emergency personal/doctor. An automatic route-guidance is included.
- The Push-solution is based on an eCall Push-Server using Java-Spaces technology to store, notify and forward eCalls to the Service Provider*, PSAP or Mobile Device.
- Service Provider and PSAP, and Mobile Device are running a Java-Application using the Java Spaces Client interface.

*Service-Provider Interface not implemented in Test-Site
“Premium eCall” (Push).

eCall Push-Server.

1. Send FSD
   - Acknowledge
   - Parse FSD
   - Create Entry-object

2. Transaction

3. PSAP

4. Ambulance Team

Web-Service

Java Space

- Write (t,"SP")
- Notify on entry template (t,"SP")
- Event, readAllIfExist
- Take (Template with id)
- Write (t,"PSAP")
- Notify, event
  - ReadAllIfExist
  - Read (template with id)

Service Provider
"Premium eCall" (Push).
"Last Mile" - Integrated Route Guidance.

PSAP

Ambulance Team

Push Data from PSAP

Use GPS-Position from FSD to start route guidance
eCall Munich Test Site – „Premium eCall“ (Push). Lessons Learned.

- A Push-Solution is the PSAPs preference.
- Java-Spaces technology was proven viable for the eCall implementation. The upper protocol layer supports the remote invocation of the operations of the space API and the delivery of remote events from the space to the clients.
- The upper protocol uses a binary coding to reduce the amount of transmitted data (compared to XML coding used e.g. in web services). This enables the protocol to use slow GPRS communication links.
- SSL protocol was used successfully to ensure confidential data communication and a closed user group based on a private/public key mechanism.
- The Push-solution increases complexity on PSAP level.
- “Last-Mile integration was proven valuable to avoid communication problems between PSAP and emergency personal. The solution is under further investigation from Bavarian Red Cross.
- The use of FSD GPS-data to generate an automatic route guidance could save time.
**eCall Munich Test Site. Wrap Up.**

- Proof of Concept with different technical implementations was done.

- In all test-cases data availability on the eCall-Server didn't take longer than establishing the voice call connection. Time needed to determine PSAP based on national database may delay data availability.

- There was no significant problem with positioning accuracy and voice call establishment.

- eCall-Server and Service Provider concept could reduce complexity on PSAP-level which is important to get a fast European rollout.

- The communication channel needs further examination and standardization. Other transport channels (SMS, inband, DTMF) have not been evaluated.

- eCall vehicle integration was done using a mobile device as GSM/GPRS-modem. However this topic was not a main GST focus – other (embedded) solutions are possible.
Pan European eCall.
Current Standardization Activities.

- Standardization of Minimum Set of Data (MSD)
- Standardization of transport channel, Field test
- eCall Certification – conformance test specification
- Operational requirements for eCall / Third Party eCall
Questions?
hans.michel@bmw.de