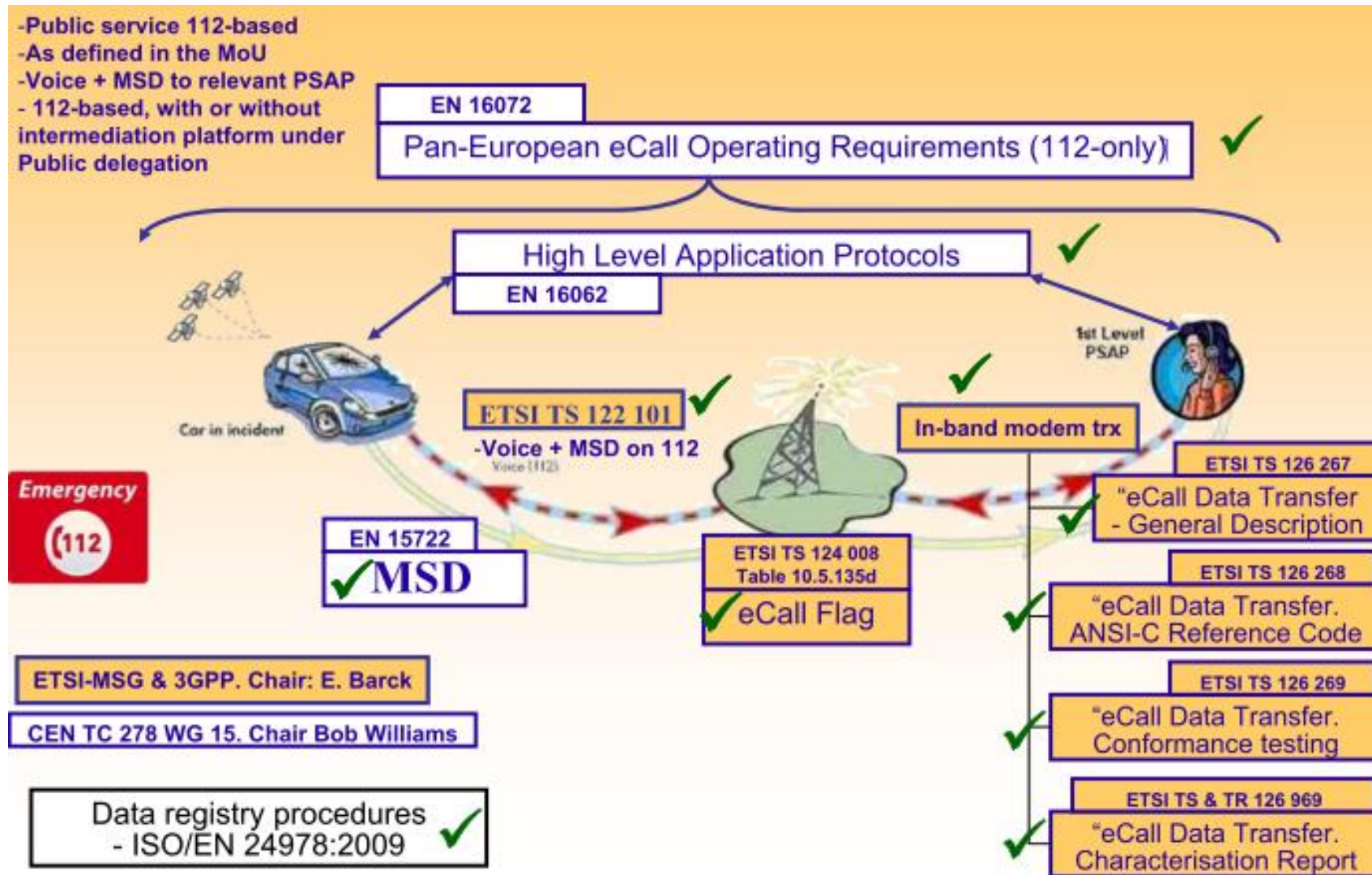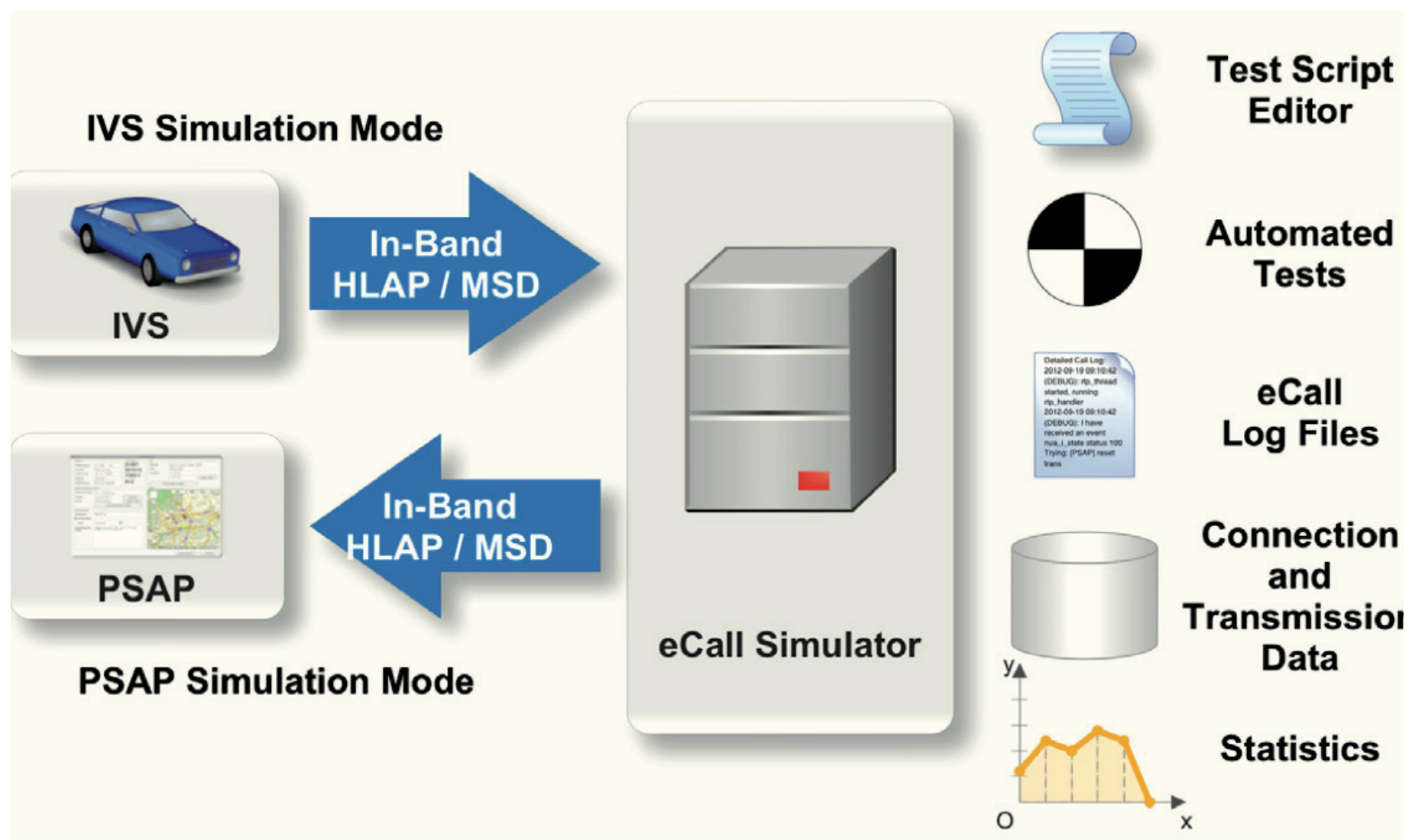# Testing Technologies

Business Models and Technical Discussions for the implementation of the eCall Simulator

Berlin, 8. November 2012

System Overview

High-Level Product Description

High-Level Product Summary

- The eCall Simulator should have two modes
  - Testing the ISV and
  - Testing the PSAP

- The shipped version should contain only the Express version, as the test cases should only be executable

- Furthermore we must ensure that the shipped Express Version is only usable with the released, and signed test suite(s)

- An Upgrade option to Professional for modification etc. should be explicitly included in the marketing

- For additional information see: Product Flyer

Technical Specifications Standards Referenced

(taken from the HeEro Project)

- Relevant Standard for the application to be tested
- eCall minimum set of data - MSD (available as draft)
  - CEN EN 15722 Date: 2010-11
  - Road transport and traffic telematics – eSafety – eCall minimum set of data - Draft EN 081018
- Pan European eCall Operating Requirements (available as draft 02/10)
  - CEN EN 16072 Date: 2010-9
  - Intelligent transport systems – eSafety – Pan European eCall - Operating requirements
- High Level Application Protocols (available as draft (02/10))
  - CEN EN 16062 Date: 2010-9
  - Intelligent Transport Systems – eCall – High Level Application Protocols
- Data registry procedures (NOT AVAILABLE; REQUIRED???)
  - ISO/EN 24978:2009
  - Intelligent transport systems - ITS Safety and emergency messages using any available wireless media - Data registry procedures

Technical Specifications

- Additional Standards for Reference (eCall Flag and Inbound-Modem Standards)

- Can be found at http://www.etsi.org/deliver/etsi_ts/

- eCall requirements for data transmission (available)
  - 3GPP TS 22.101 10.0.0 ETSI TS 122 101
  - 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects Service aspects; Service principles (Release 10)
  - http://www.etsi.org/deliver/etsi_ts/ 122100_122199/122101/10.09.00_60/

- eCall Discriminator Table 10.5.135d (available)
  - 3GPP TS 24.008 10.0.0 and ETSI TS 124 008
  - 3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 (Release 10)
  - http://www.etsi.org/deliver/etsi_ts/ 124000_124099/124008/10.07.00_60/

Technical Specifications

- eCall Data Transfer - General Description (available; not downloaded)
  - 3GPP TS 26.267 10.0.0 ETSI TS 126 267
  - 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; eCall Data Transfer; In-band modem solution; General description (Release 10)

- eCall Data Transfer - ANSI- C Reference Code (available; not downloaded)
  - 3GPP TS 26.268 10.0.0 and ETSI TS 126 268
  - 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; eCall Data Transfer; In-band modem solution; ANSI-C reference code (Release 10)

- eCall Data Transfer – Conformance Testing (available)
  - 3GPP TS 26.269 10.0.0 and ETSI TS 126 269
  - 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; eCall Data Transfer; In-band modem solution; Conformance testing (Release 10)

Technical Specifications

- eCall Data Transfer – Characterisation Report (available; not downloaded)
  - 3GPP TS 26.969 10.0.0 and ETSI TS 126 969
  - 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; eCall Data Transfer; In-band modem solution; Characterisation Report (Release 10)

- eCall Data Transfer – Technical Report - Characterisation Report (available; not downloaded)
  - 3GPP TR 26.969 10.0.0 and ETSI TR 126 969
  - 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; eCall Data Transfer; In-band modem solution; Characterisation Report (Release 10)

Summary of Standards

- In generall we are testing the highl level application protocol of the eCall

- We do **not test** in our eCall simulator the correct signalling and routing of the GSM message through the Mobile Network Operator and the correct functionality of the modem!

- In other words we are not testing the 3GPP/ETSI standards but the CEN Standards

Typical Call Setup (EN16062)
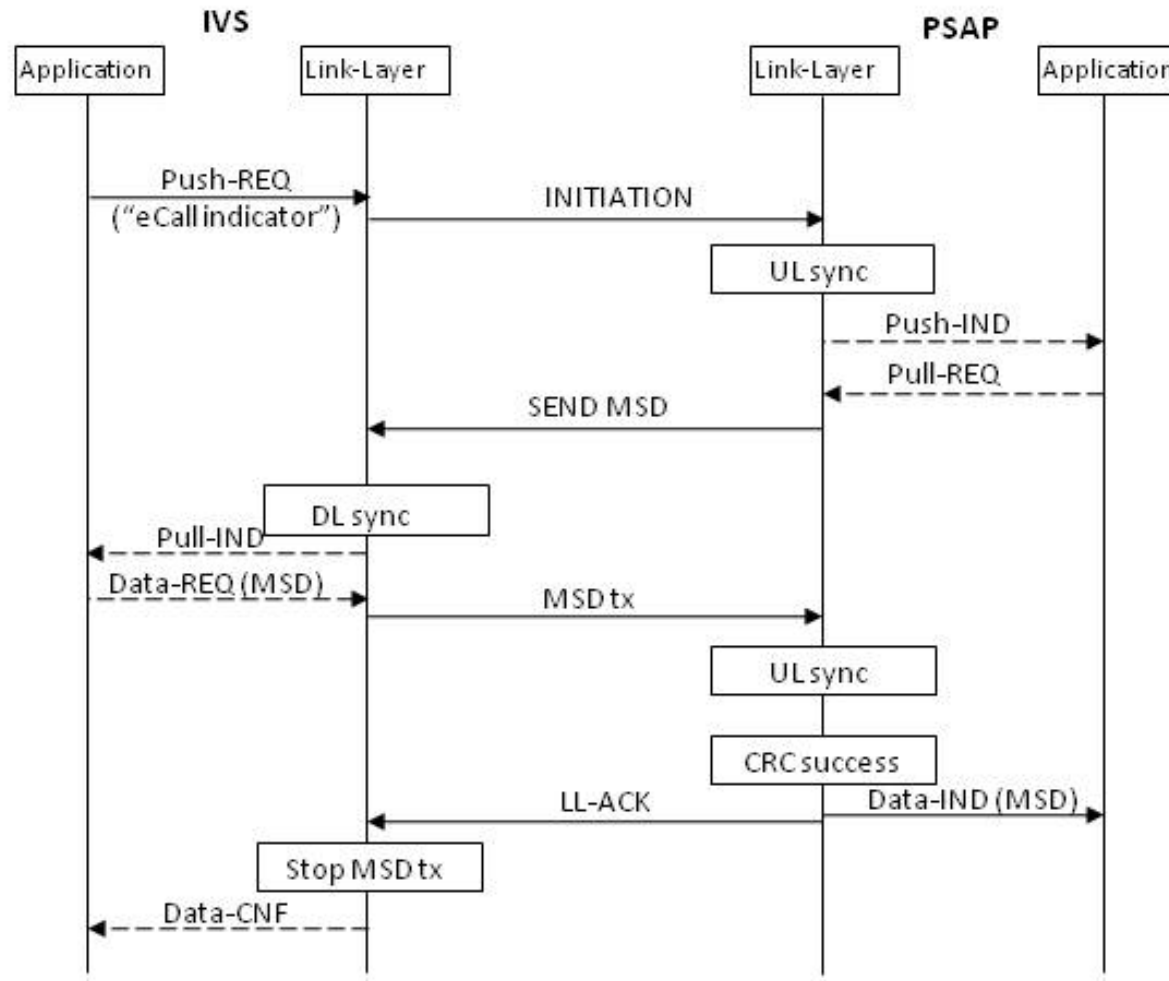
Interaction (EN16062)
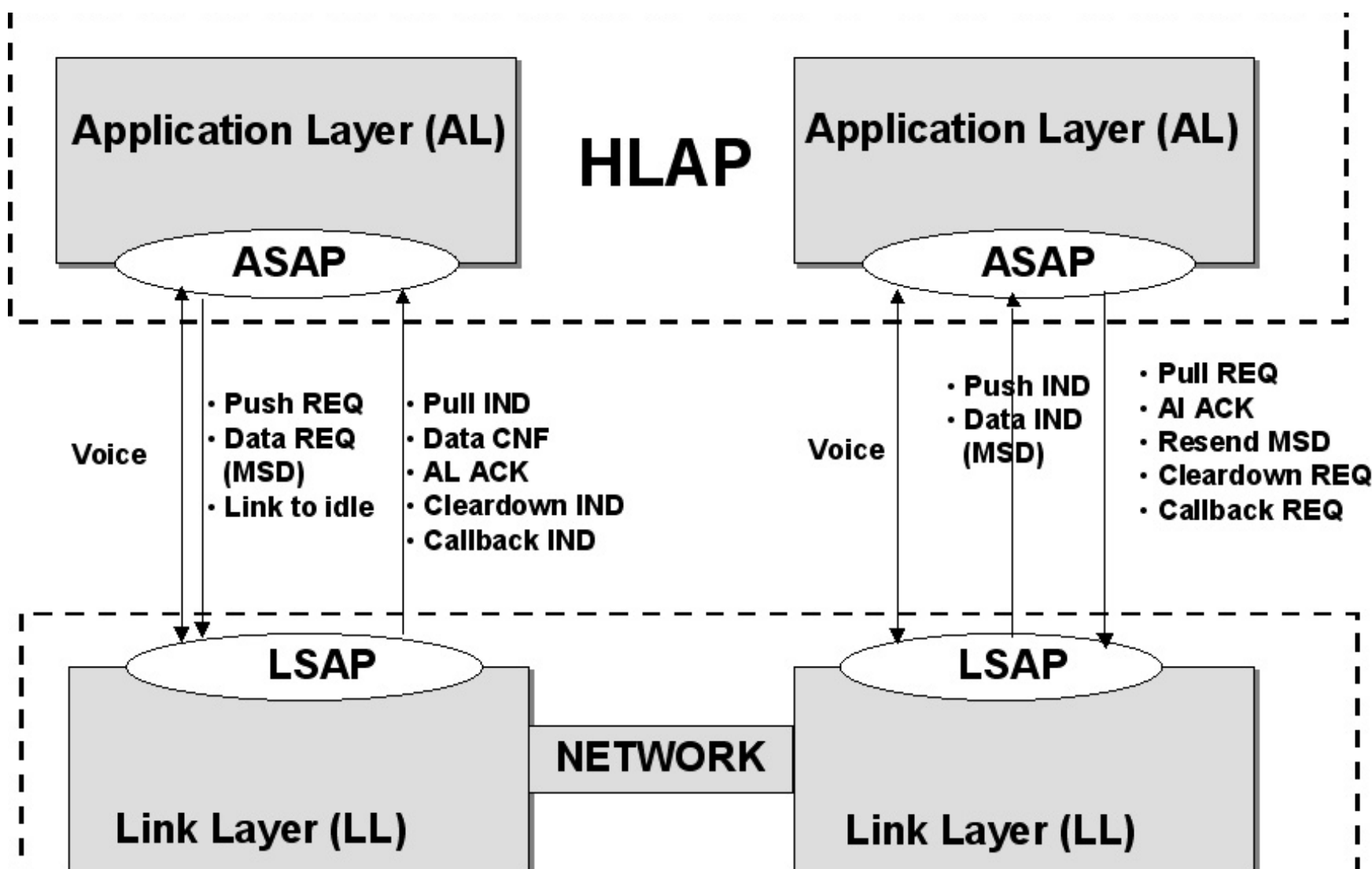
Conformance Testing

- Is defined in EN16062-HLAP;§11

- There have been test cases defined for
  - IVS in 11.2 and
  - PSAP in 11.3

- IVS – Testing
  - 14 Test Purposes with
  - 17 (19) Conformance Requirements

- PSAP – Testing
  - 8 Test Purposes with
  - 10 Conformance Requirements

Example of Test Purposes (I)

Testing Technologies

- Test Purpose:

IVSTP01: To verify that the e-Call equipped IVS has the capability to be initiated via an external interface with the fix data values required for the building of the MSD (RIVS 01a and RIVS 01b).

_ RIVS 01a:
Providing that:
The eCall function has not been disabled
The eCall IVS is not functioning properly (detectable hardware errors are present)
Upon:
Vehicle ignition being switched on
Expected result:
Test that the IVS performs a self-test and that the human machine interface of the in-vehicle system informs the driver that the "eCall" system is not functioning properly.

_ RIVS 01b:
Providing that:
The eCall function has not been disabled
The eCall IVS is functioning properly (no detectable hardware errors are present)
Upon:
Vehicle ignition being switched on
Expected result:
Test that the human machine interface of the in-vehicle system does NOT inform the driver that the "eCall" system is not functioning properly.
Test that the IVS switches to an eCall service idle state (shall not register with the mobile network).

Example of Test Purposes (II)

- **IVSTP05**: To verify that the e-Call equipped IVS has the capability to generate a well formatted MSD in conformity to EN 15722 (RIVS 08).

- **RIVS 08:**
  Providing that:
  An eCall has been triggered
  The IVS has set up a call
  The call has been connected to the destination (eCall equipped PSAP)
  Upon:
  A link layer "SEND MSD" request being received.
  Expected result:
  Test that an MSD (generated according to [Ref 1]) is transferred via the modem link layer to the PSAP. Test that each field of the received MSD contains consistent values.

Things to Define

- Annex C of EN 16062 outlines possible test strategies
  - C.2 Laboratory setup with mobile network simulation
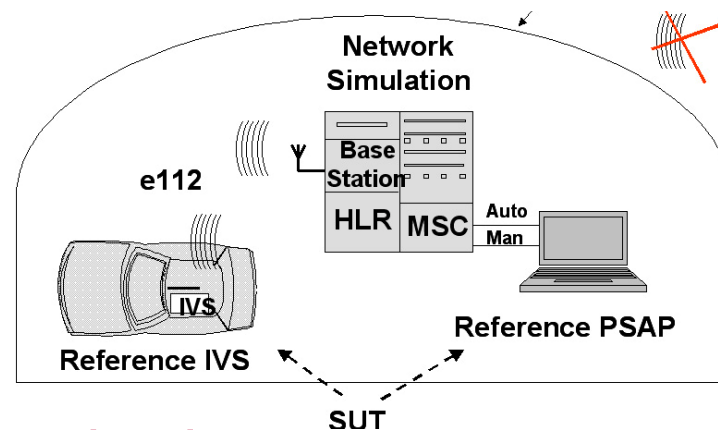
  - C.3 OEM or third party test systems (in the live network)
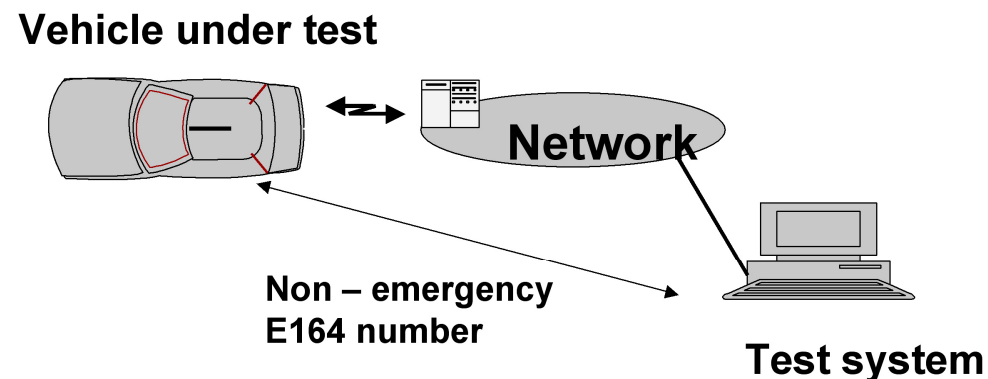
TestingTech Assumes That ...

- Conformance Tests of 16062 should be implemented
  - Alternative: To derive additional test cases from specification if possible.
  - OECON to confirm

- Test Strategy C.3 should be used
  - OECON to confirm

- How are the test defined for the plugtest influence the conformance tests?
  - TT/OECON to discuss

- It is still unclear to which degree a full test automation can/ should be achieved.
  - TT assumes that where are no defined AccessPoints are available semi-automatic test execution will be offered. (For example: Set IVS to test mode; Ignition On; etc)

Necessary Developments

- Codec implementation

- TTCN-3 Port implementation

- TTCN-3 Script Implementation

I.) Codec Implementation for MSD

- ASN.1 is being used

- Standard PER encoding is being used

- Optional XML encoding is present

- It should be validated whether for (future extensions an XML encoded version could be provided)

- More or less ready to use by using TestingTech ASN.1 tooling

II.) Port Implementation

- Here the ASPs have to be defined

- §11 defines the abstract model

- However we believe that we have to clearly define the API towards the modem control

- OECON to provide more information on API

III.) TTCN-3 Implementation

- TTCN-3 Implements the test logic as defined in the conformance test case

- Automation via the ASPs possible

- Manual interaction and inspection is triggered via GUI elements

- We should check whether there are (defacto) standard APIs available for better automation