INFORMATION SOCIETY TECHNOLOGIES (IST)

PROGRAMME

AIDE

IST-1-507674-IP

Report on AIDE Nomadic Device Forum Activities

Deliverable No. (use the number indicated on technical annex)	**D3.2.3**		
SubProject No.	**SP3**	SubProject Title	**Design and development of an Adaptive Integrated Driver-vehicle Interface**
Workpackage No.	**WP3.2**	Workpackage Title	**Specifications and System Architecture**
Activity No.	**T3.2.4**	Activity Title	**Nomadic Device Forum**
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Status (D: draft, in progress, S: Submitted to EC, F: Final accepted by EC)	**F**		
File Name:	**AIDE D3.2.3 v1.0.doc**		
Project start date and duration	**01 March 2004, 48 Months**		

History table

Version No.	Date (dd/mm/yy)	Details
0.1	19 March 2006	Draft for review
0.2	4 April 2006	Review comments
0.3	18 April 2006	Incorporated review comments
1.0	28 July 2006	Incorporated EC comments from annual review

List of Abbreviations

AIDE	Adaptive Integrated Driver-vehicle Interface (FP6 integrated project)
GST	Global System for Telematics (FP6 integrated project)
ND	Nomadic Device
ESoP	European Statement of Principles for HMI
FP6	Sixth Framework Programme of Research & Technological Development
FP7	Seventh Framework Programme of Research & Technological Development
OEM	Original Equipment Manufacturer (vehicle manufacturer)
HMI	Human-Machine Interface
DRM	Digital Rights Management
DVD	Digital Video Disk
IVIS	In-vehicle Information System
ADAS	Advanced Driver Assistance System
PDA	Personal digital assistant
PND	Personal Navigation Device

Relevant terms from the AIDE Glossary

Term	Definition	Notes	Reference
Action	An event initiated by the driver or an application	Some examples of actions are: route guidance message from the navigation application, a warning from the ACC or an SMS from the phone. An action could also be a continuous output presented to the driver (e.g. the speedometer or output from the radio). The driver actions of interest here are those directed towards systems	Original definition
ADAS (Advanced Driver Assistance Systems	Systems that interact with the driver with the main purpose of supporting the driving task on the tactical and operational levels	This definition was discussed at the Soesterberg SP2 meeting 041122. Alternative definitions might be considered.	AIDE D2.2.1 [Johansson et al., 2004]
AIDE design scenario	A driving situation, specified by at least one action and one or more DVE state parameters, acted upon by the AIDE system.	AIDE design scenarios represent a problem scenario (conflict situation). A description of possible general solution is included. The scenario + solution represents a use case for AIDE meta-functions.	Original definition
AIDE meta-function	The response of the AIDE system to an AIDE design scenario.	Examples of potential AIDE meta functions are HMI I/O management, prioritisation, scheduling and warning adaptation	Original definition
AIDE system	The Adaptive Integrated Driver-vehicle Interface targeted by the AIDE IP, implementing the AIDE meta-functions	The AIDE system consists of a basic set of HMI management components, in particular the ICA and the DVE monitor. Thus, the AIDE system does not include a specific set of applications or HMI I/O devices. Rather, the AIDE	

		system should support different number of applications, I/O devices and configurations in a modular way.	
Application	A program (as a word processor or a spreadsheet) that performs one of the important tasks for which a computer is used	An application is a software component that fulfils a functional specification. Exchanges between application components are persistent or non-persistent information.	EAST-EAA (Webster)
Application Programming Interface (API)	A software interface that enables applications to communicate with each other. An API is the set of programming language constructs or statements that can be coded in an application program to obtain the specific functions and services provided by an underlying operating system or service program.	API represents a way to get application independence from the lower SW layer (namely operating system, drivers and other system service).	EAST-EAA (http://www-3.ibm.com/ibm/terminology/.)
Architecture	The fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution.	In EAST WP3, architectures denote system descriptions on different abstraction levels. For example, the same system has a sketchy architecture on a high level (the Functional Analysis A.) and a detailed architecture on a lower level (The Logical A.). The term "view" could be used, but does not catch the fact that the architectures are subject to design work on the respective level of abstraction.	EAST-EAA (IEEE Recommended Practice for Architectural Description of Software-Intensive Systems; IEEE Standard P1471, IEEE Architecture Working Group (AWG))
CAN Frame	Information on the bus sent in fixed format frames of different but limited length	A CAN Frame can have a wide range of lengths. A CAN Frame in Standard Format with zero data bytes has 47 bits. A CAN Frame in Extended Format with 8 data bytes can have up to 154 bits because of bit stuffing. Of course, the length is still defined – within a large range. The Data Link Layer adds more to the raw data than just some identification bits. In the case of CAN, it adds the Start-Of-Frame bit, the Arbitration Field, the Control Field, calculates the CRC and adds the CRC Field, the Acknowledge Field and the End-Of-Frame Field (see CAN Specification for details).	EAST-EAA (ISO 11898, section 4.1.)
Channel	I/O channels are linked to the output devices or part of them used to exchange information with the user.	In AIDE an output channel can be associated to a single device like a display, a buzzer, a telltale or a portion of them like a display area or a single indicator in the instrument panel.	
Configuration	The arrangement of hardware and/or software elements in a system.		EAST-EAA (Functional safety: safety instrumented

			systems for the process industry section; Part 1: Framework, definitions, system, hardware and software requirements; IEC2002.)
Class	A description of a set of objects that share the same attributes, operations, methods, relationships, and semantics. A class may use a set of interfaces to specify collections of operations it provides to its environment.		EAST-EAA (OMG)
Configuration	The arrangement of hardware and/or software elements in a system.		EAST-EAA (Functional safety: safety instrumented systems for the process industry section; Part 1: Framework, definitions, system, hardware and software requirements; IEC2002.)
Data	Data is the software implementation of an information. It can be exchanged between software components. A data is persistent. It is persistent in memory.		EAST-EAA (Webster)
Device	Functional unit of hardware or software, or both, capable of accomplishing a specified purpose.	Devices can implement a part of a function (more than one device could be necessary to fulfil a function – e.g. rear-view mirror inside and outside to provide for rear-viewing) or one device can implement more than one function (side rear-view mirror is a device that can include temperature captor, direction signalisation, etc)	EAST-EAA (Functional safety: safety instrumented systems for the process Industry section; Part 1: Framework, definitions, system, hardware and software requirements; IEC2002.)
Driving demand	The demands of the driving task	Demand is determined by the goal that has to be attained by means of task performance, and is, once the goal has been set, external and independent of the individual driver (c.f. mental workload). Used as a DVE state parameter in AIDE.	de Waard, D. (1996). The Measurement of Drivers' Mental Workload. ISBN 90-6807-308-7. Traffic Research Centre. University of Groningen.
Driver intent	The intention of the driver to	Actions of interest here are mainly	

	perform an action	those related to the primary task, e.g. overtaking.	
Driver distraction	Attention given to a non-driving related activity	Used as a DVE state parameter in AIDE	ISO TC22/SC13 WG8 CD 16673 (Occlusion Committee Draft)
Driver drowsiness	The physiological state preceding sleep onset.	Used as a DVE state parameter in AIDE	Original def
Driving task	All aspects involved in mastering a vehicle to obtain a certain goal (e.g. reach a destination). This corresponds to the primary task in a driving situation	The driving task can be described on different levels of abstraction. Michon (1985), proposed a widely adopted scheme where the driving task is considered on strategic, tactical and operational levels. The strategic level concerns behaviours directed towards more high-level goals, e.g. reaching a destination in time. The tactical level concerns behaviour on a shorter time frame, e.g. selecting headway and deciding when to change lane. Finally, the operational level concerns the moment-to-moment control of the vehicle. (Michon, J.A. (1985). A critical review of driver behaviour models: What do we know? What should we do? In L.A Evans and R.C. Schwing (Eds.) Human Behaviour AND Traffic Safety. (pp. 487-525). New York: Plenum Press.)	Original definition
DVE (driver-vehicle-environment) state	A set of dynamic parameters representing certain aspects of the driver, the vehicle and the environment	DVE state and DVE condition is used interchangeably in this deliverable. Personalization as a static characteristic is addressed separately (output of DC module).	Original definition
Element	A component of a system; may include equipment, a computer program, or a human.		EAST-EAA (IEEE Guide for Developing System Requirements Specifications; IEEE Standard P1233a, 1998.)
Embedded System	A small computer system that is generally hidden inside equipment (machine, electrical appliance, or electronic gadget) to increase the value of the equipment for better or more efficient functionality.	This kind of system always involves both the software and hardware co-development. Some embedded systems include an operating system, but many are so specialized that the entire logic can be implemented as a single program. Embedded systems in French are the „on-board“ systems, i.e. systems that run on mobile mechanics (airplanes, trains, etc.), so they need not be small and hidden, but there are generally constraints of size and robustness. It is also a common acceptance that this term also designates systems, which are small and hidden and	EAST-EAA

		robust.	
Feature	(A) User-visible aspects or characteristics of a system. (B) A feature is a functionality that is specifically perceptable by the customer/stakeholder. (C) A feature is a prominent or distinctive user-visible aspect, quality, or characteristic of the system.	Whereas requirement expresses only a wish, feature goes a step further in the sense it is a requirement that I am sure to find in my system. In other words features set results from filtering the requirements set. Feature is a characteristic, quality, property, behaviour, capability, functionality, etc, proper (related to) of a system that enables the users to better qualify (measure) that system. A feature is a perceptible quality or characteristic of a system. What is an electronic feature (as used in WP3)? An electronic feature could be defined as a desired functionality or quality, implemented by means of an electrical system. Electronic features bring added value to the user of a system (e.g. vehicle) and justify the electrical system. Climate control and navigation system are examples of electronic features.	(A) EAST-EAA (P. Clements; L. Northrop; Software Product Lines – Practices and Patterns; SEI series in software engineering; Addison-Wesley, 2002.) (B) EAST-EAA (P. Clements; L. Northrop; Software Product Lines – Practices and Patterns; SEI series in software engineering; Addison-Wesley, 2002.)
Function	A task, action, or activity that is accomplished to achieve a desired outcome (EAST-EAA).	Examples of Functions are: turn by turn navigation, voice call, incoming warning from an ADAS.	EAST-EAA (IEEE Guide for Developing System Requirements Specifications; IEEE Standard P1233a, 1998.)
Functionality	A synthesis of functions to provide a major functional entity of a unit.		EAST-EAA
Human Machine Interface (HMI)	All the input and output devices which permit the interaction between the user and one or more vehicle systems	The EAST definition considers only interaction with IVIS. The current definition comprise any device that mediates interaction with a vehicle system	EAST-EAA (slightly modified)
HMI strategy	The HMI strategy determines the behaviour of the system towards the user. It contains rules defining which adaptation function is used in which condition.	The HMI strategy is implemented in the ICA module.	
Interaction and Communicatio n Assistant (ICA)	The central component in the AIDE system responsible for managing the interaction between the driver and various applications.	The ICA has the main responsibility for implementing the AIDE metafunctions	
IVIS (In-vehicle Information Systems)	Systems that interact with the driver and induce tasks that are not directly related to the driving task on the tactical and operational levels. Such additional tasks are called secondary tasks and may interfere with the primary task.	This definition was discussed at the Soesterberg SP2 meeting 041122. Alternative definitions might be considered.	AIDE D2.2.1 [Johansson et al., 2004]
Mental	The specification of the	The effect that driving demand has	de Waard, D.

workload	amount of information processing capacity that is used for task performance	on the operator in terms of stages that are used in information processing and their energetic (c.f. driving demand)	(1996). The Measurement of Drivers' Mental Workload. ISBN 90-6807-308-7. Traffic Research Centre. University of Groningen.
Primary task	All interaction tasks which are driving related		AIDE Glossary
Real time	System that has to finish the processing within a specific time interval (deadline) dedicated by its environment.		EAST-EAA
Secondary Task	All interaction tasks which are not driving related, but refer to infotainment		AIDE Glossary
Service	A type of operation that has a published specification of interface and behaviour, involving a contract between the provider of the capability and the potential clients.	First a service could be seen as a functional feature. For example the middleware transmits the request of a client to the corresponding server. Another possibility could be that services are solutions (but don't mean implementation!) to fulfill features. [1..n] to [1..n] relation that is one service can be a solution for one or more features but also n services may be needed to fulfil a feature. Services could be solutions (not implementations!) to fulfill features. Services can be used to realize a feature; a service can be a feature. A service is the mean to satisfy a need.	EAST-EAA
Software Architecture	A software architecture is the structure or structures of a system, which comprise software components, the external visible properties of these components and the relationships among them.		EAST-EAA (L. Bass and P. Clements and R. Kazman; Software Architecture in Practice; Addison-Wesley, 1998)
Software component	A unit of composition with contractually specified interfaces and explicit context dependencies only. A software component can be deployed independently and is subject to composition by third parties.		EAST-EAA (Szyperski, Clements.; Component Software – Beyond Object- Oriented Programming; Addison-Wesley, 1997; P. Clements; L. Northrop; Software Product Lines – Practices and Patterns; SEI series in software engineering; Addison-Wesley, 2002.)
Specification	Precise (formal if possible) description of an object within		EAST-EAA (Safety terms for

	the scope of the task		automation systems reliability and safety of complex systems; VDI/VDE 2000.)
System	A collection of components organized to accomplish a specific function or set of functions.	Set of elements, which interact according to a design; an element of a system can be another system, called a subsystem, which may be controlling system or a controlled system and may include hardware, software and human interaction	EAST-EAA (IEEE Recommended Practice for Architectural Description of Software-Intensive Systems; IEEE Standard P1471, IEEE Architecture Working Group (AWG), 2000.)
Use case	An intended or desired flow of events or tasks that occur within the vehicle and are directed to or coming from the driver in order to accomplish a certain system-driver interaction.	Standard use case templates are mainly intended for individual IVIS/ADAS functions and include solutions. The "use cases" for AIDE meta-functions are called AIDE design scenarios	Original definition (based on existing definitions)

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Executive Summary

This report contains a summary of the first year's activity of the European Nomadic Device Forum (NDF) following its initial meeting that was described in AIDE Deliverable D3.1.1 of 15/02/2005. The principal activity comprised:

- a nomadic device workshop during the AIDE User Forum on 16/03/2005,
- the launch workshop of the NDF on 23/06/2005,
- workshop of Working Groups on 05/10/2005,
- workshop of Working Groups on 25/11/2006.

During the launch workshop, it was decided to establish a number of Working Groups to advance the work in specific areas. The following Working Groups (WG) were established during 2005:

- WG A: Definition of "Smart Vehicle-Device Gateway".
- WG B: Safety and HMI Issues.
- WG C: Business Case.

The achievements of the NDF in 2005 include the following:

- Establishment of an important European working forum of key stakeholders in the field of vehicle-portable device integration;
- Alignment and coordination of the separate work on nomadic device integration in the AIDE and GST integrated projects;
- Identification of the principal expected use cases for nomadic device integration;
- Beginning of the definition of system requirements for a vehicle-device gateway;
- Review of the applicability of the European Statement of Principles (ESoP) on HMI to nomadic device integration, and identify other safety-related issues;
- Identification of business scenarios and use cases for nomadic device integration;

description of first steps on "roadmap" towards automotive-portable device collaboration.

1. Introduction

Nomadic devices, or portable devices that are used or intended to be used by the driver for support, assistance, communication or entertainment, are in increasingly common use. The most common Nomad Devices are mobile phones used with a hands-free kit. Portable or personal navigation systems are growing rapidly as prices fall, sometimes even bundled with a new vehicle. Many drivers want to play their portable music player through the speaker system of their vehicle, and a number of manufacturers already offer the option of an interface to a portable player, such as the Apple iPod.

Increasingly, such portable devices are offered as original equipment or after-market options by both car manufacturers and by traditional navigation system suppliers. This growth is driven by customer demand, but it creates important issues for driver safety, for the human-machine interface (HMI) and for the integration of the devices into the vehicle. Specific points of concern include:

- the risk of driver distraction due to an unsuitable or poorly located nomadic device;
- the need for clear and agreed guidelines on the safe design, positioning, fixing and use of nomadic devices and their applications;
- the lack of agreed standards for the “docking” and integration of nomadic devices within the vehicle; and
- the uncertainty of a positive business model for all stakeholders, including vehicle manufacturers, in-vehicle system suppliers, portable device manufacturers, application developers, content and service providers and mobile communication operators.

Within the AIDE integrated project, nomadic device integration and safe use within the vehicle environment are treated as key issues, and the project is exploring a number of issues related to portable device use by drivers, namely:-

- Safety and HMI.
- Integration (concept of the gateway).
- Requirements set by OEMs but also by device manufacturers.

The European Nomadic Device Forum was set up in June 2005 by the AIDE project and ERTICO in order to address these issues, in addition to the research work undertaken within the AIDE project. The Forum aims to bring together all stakeholders in order to discuss issues arising from nomadic device implementation, to identify problems and user needs and finally to come to a consensus around this very complex and sensitive matter. The Forum is coordinated by ERTICO and ICCS (the AIDE SP3 Leader) and works mainly through workshops and technical meetings.

This report compiles the main results of the work during 2005 of the European Nomadic Devices Forum.

2. Nomadic Device Forum organisation

2.1. Objectives

The objectives of the European Nomadic Device Forum are set out in the Terms of Reference, as agreed at its launch meeting on 23 June 2005:

- act as European consensus platform to reach cross-sector agreement on issues relating to nomadic device safety, technical harmonisation, in-vehicle integration and deployment;
- define the principles for managing nomadic device-vehicle information exchange and integration via a "Smart Vehicle-Device Interface";
- address key issues for nomadic devices, including specifications for in-vehicle docking/integration and installation, standardisation of interfaces and guidelines for nomadic device HMI and safety;
- identify requirements for new work items in the appropriate standardisation bodies;
- act as a bridge between the eSafety research projects on nomadic device issues and also between Europe and the rest of the world;
- provide advice to the EC and support AIDE, GST and other projects' work on nomadic devices.

Subsequently, the following objective was added:

- define business use cases for a Smart Vehicle- Device gateway.

2.2. Organisation and working approach

The Forum has developed around a plenary group comprising around 75 individuals from a wide range of companies and organisations, and a number of dedicated Working Groups dealing with specific topics. Meetings typically comprise a plenary session with a mixture of presentations, panel discussions and breakout sessions, and a day of Working Group meetings.

The following Working Groups (WG) were established during 2005:

- WG A: Definition of "Smart Vehicle-Device Gateway"
- WG B: Safety and HMI Issues
- WG C: Business Scenarios and Models.

The first two met at the workshop on 5 October 2005, while WG C met for the first time at the 25 November 2005 meeting. Until now, no permanent leader has been found for any of the Working Groups, instead a leader and rapporteur have taken the role on an ad-hoc basis.

2.3. Membership

Annex A lists the members of the Forum who have participated either in one or more of the Working Groups or only in the plenary meetings. Some 9 OEM vehicle manufacturers are members, and around 13 companies that either develop portable devices or are involved in application development, device integration, content provision or service operation using portable devices.

An important issue raised by the vehicle OEMs is the need for a greater representation from the portable device industry, that would be a pre-requisite for their agreement to discuss a standardised vehicle-portable device interface.

3. Workshop Proceedings

This section summarises the results of the four workshops held during 2005, not including the initial workshop already reported in D3.1.1. Hereafter the term nomadic device is denoted by "ND"; the European Statement of Principles by "ESoP". Various workshop presentations may be found on the Nomadic Device Forum page of the AIDE project web-site, at link: http://www.aide-eu.org/for_nomadic.php.

3.1. Nomadic device workshop within Aide User Forum

Pat Robertson of Motorola presented at the workshop of 16/03/05 (at BASt, Bergisch Gladbach) the results of the first nomadic device workshop in January 2005. The main conclusions of the 3 working sessions from that day included:

3.1.1. Safety

- We have not got enough evidence to say if NDs pose extra risks (for certain functions); but safety should continue to be monitored; there may also be positive benefits;
- A cross-industry group should work together to assess these risks and work out solutions throughout the product life-cycle;
- The ESoP should be extended to address Product-Responsible Organisation responsibility; and extend to organisational, project-management aspects;
- There was a need to identify incentives for nomadic device Product-Responsible Organisations to apply revised ESoP.

3.1.2. Industry perspective

- It was not clear where intelligence/functions should lie between the car and the nomadic device.
- Car manufacturers want to keep control of safety issues & of the overall value.
- Industry prefers standardisation and (self-)certification to legislation or regulation by governments.
- Industry should come up with standards for ND-vehicle interfaces.
- Smaller working groups should be set up to work on definition of these requirements and standardisation.

3.1.3. Integration issues

- A good understanding was needed of market needs, and requirements should be defined.
- Work should focus on a few concrete examples and discuss the integration in detail:
  - Mobile phone;
  - Navigation;
  - Music players.
- Who is responsible for what?
  - The OEM is responsible for the "look and feel" of any integration in the vehicle;
  - Should the HMI and the functions should be standardised?
- It was a common responsibility to handle driver distraction.
- Workload management was too difficult for now to extend to ND.

Of these, the most important issues were:

- Who is responsible (legal, safety…) with numerous stakeholders involved (car manufacturers, system suppliers, software /application suppliers, service providers…)?
- Where should the "intelligence" or control reside (ND, car, ..)?
- Self certification/regulation was preferred by the industry rather than legislation.

There were two options for the nomadic device in the vehicle: “integration” and “installation”. “Integration” meant this was an “option” included by the car manufacturer with it fully integrated, and “installation” was after-market fitting with very little integration with in-vehicle facilities such as display, audio or controls.

The meeting discussed issues concerning the interface/architecture. The main ND services would be:

- Phone;
- Music;
    - Portable Storage.
- Navigation;
- Information;
- Personal Information Manager;
    - e.g. address book.
- Fleet Management Services.

The main stakeholders were identified as –

- Car Manufacturer.
- Phone Manufacturer.
- Telecom Provider.

The requirements for each stakeholder were then explored. It was agreed that it was necessary to examine the benefits for the different stakeholders that will arise from collaboration, to define a common vehicle-device interface.

3.2. Nomadic Device Forum launch workshop

Following the organisation of two successful workshops on nomadic devices in January and March 2005, the EU-supported “AIDE” project and ERTICO joined to launch the European Nomadic Device Forum at a successful workshop on 23 June 2005 at the Volvo AB premises in Brussels that was attended by over 30 delegates from a wide range of stakeholders.

The nominated Organising Committee met the previous day to approve the Terms of Reference and first tasks of the Forum. Wolfgang Reinhard of ACEA (Association of European Car Manufacturers) was confirmed as Chair of the Forum, and the other members include representatives of BMW, DaimlerChrysler, Opel, Renault, Volvo Technology, CRF, Motorola, Orange, Navigon, Swedish Road Administration, ICCS (Forum Vice-Chair) and ERTICO (Forum Manager).

While the vehicle manufacturers had started internal discussions to find a common position regarding co-operation with other stakeholders, two Working Groups were proposed to facilitate a professional dialogue among interested parties and agree on more standardised solutions. The first (WG “A”) should work towards the definition of a Smart Vehicle-Device Gateway and the second (WG “B”) should address HMI and safety issues. It was agreed that work in WG “A” would start as soon as possible, with the definition of scenarios and business- and use-cases for nomadic device integration in the car.

The workshop opened with a presentation by the Chair of the vehicle-makers’ view on nomadic devices. It was becoming increasingly difficult for OEMs to match the vehicle life-cycle with that of mobile communications and navigation devices, and their interest in finding a satisfactory way to integrate nomadic devices was growing. But any solution should respect the need that in-built and nomadic systems can co-exist and that an acceptable business case should be ensured for all stakeholders.

Pat Robertson of Motorola Global Software Group introduced the work on nomadic devices in the AIDE project. The focus was on the definition of an architecture and specification for an interface

between the vehicle and a nomadic device, for the use cases of mobile phone calls, personal navigation and personal organiser (PDA). This interface should allow the in-vehicle AIDE HMI manager system to register when a nomadic device is installed, to inform the device of the driver-vehicle-environment status and to "filter" and control access by the nomadic device to in-vehicle input-output resources.

Jochen Katzer of Navigon presented his company as a leading supplier of personal navigation software, in a market that was "exploding". Sales of personal navigation devices were expected to top 3 million units in Europe in 2005, against around half that number of built-in car navigation systems. Smartphones with GPS were expected on the market before the end of the year, and with their wireless connectivity could support both on-board (map in the device) and off-board (map at operator's navigation server) services.

Buyers were turning to personal devices because they could acquire most of the value of in-vehicle navigation at a small part of the price, and gain the advantage of portability as well. Vehicle manufacturers could take a share of this market by offering a harmonised device interface, providing access to vehicle data and perhaps a roof-mounted GPS.

The mobile operator's view was presented by Michel Fond of Orange. He saw mobile navigation services as an exciting opportunity for vehicle makers, a chance to solve the lifecycle problem – by relying on the user's mobile phone as the car's telematics modem. The customer wanted hands-free, easy-to-use and safe mobile phone and navigation services. The OEMs could offer these in partnership with operators, by agreeing "certified" – and perhaps even own-branded – applications that could be marketed through both the operator and the car dealer.

Orange saw a significant threat from "wild" nomadic devices – those installed in the car by the user – as posing both a safety and commercial risk. The eSafety Forum Working Group on HMI would release next week a revised draft of the "European Statement of Principles" that also covers nomadic devices. This draft would be further fine-tuned and forwarded to the political decision takers; consultation would be open until September 28, 2005. The work in progress concerns commercial vehicle needs as well as nomadic device requirements. There was a need for all the concerned stakeholders to work together to find safe and acceptable solutions.

The workshop plenary session concluded with a round table panel discussion on the reasons why carmakers should (or not) welcome nomadic devices. The panel included the earlier speakers from ACEA, Navigon and Orange, as well as Daniel Augello (Renault) and Johannes Dünnwald (Nokia Automotive).

For the car makers, Mr Augello expressed the view that nomadic devices would be part of the in-vehicle equipment of the future, but that it was essential that they make business sense and also not compromise safety. Competition with in-vehicle systems today was not fair, as the in-built systems had to comply with numerous and strict standards and regulations. The right response was not to ban nomadic device use, but rather to cooperate to define a smart vehicle gateway, offering nomadic devices a managed use of vehicle displays, audio channels and certain controls.

Mr Dünnwald referred to the history of telematics services to show that limited, individual business models were not the way to successful deployment, but that it was necessary to find common, shared models, while respecting that each player had his own market dynamics and business model to defend. As car electronics grew more and more complex, it was becoming ever harder to integrate independent devices into the car, so the challenge was how to prepare the car's user interface so it could accept both in-built and mobile devices. The first step should be the vehicle interface for a handsfree phone, comprising e.g. Bluetooth and cable connections.

A lively discussion ensued, around what the customer really wanted (and was willing to pay for), how the insurance industry might react to accidents associated with use of nomadic devices, and how

public authorities could help promote a "smart solution" for nomadic device integration that improved both road safety and market development.

The workshop continued with parallel breakout sessions on business and use cases for nomadic device integration, and on requirements and features of a harmonised interface. The day concluded with a call for those interested to take part in the proposed two Working Groups of the Forum that would be started up after the summer holidays.

3.3. Nomadic Device Forum workshop

This meeting, held on 05/10/05 at ERTICO, in Brussels, was the first working session of the two Working Groups to be established under the Nomadic Device Forum. After a short introduction, the two Working Groups worked in parallel, and rejoined at the end of the meeting to present their progress and agree on next steps. The results are summarised below.

3.3.1. Working Group A - Intelligent Vehicle-Nomadic Device Interface solution

The objective for WG A was defined as: Define a solution for a standardised intelligent interface between the vehicle and specific types of nomadic device (ND).

The following presentations were made:

a) Patrick Robertson (Motorola) - AIDE project and ND integration

- Emphasis was on Bluetooth (BT) integration. This was only due to "Polite phone" example. It was not the intention of the AIDE system, where the gateway will provide multiple options for connection (e.g. USB, serial, BT, Wi-Fi). The AIDE solution needed to be connection-independent (A question was addressed if–the Linux/USB "Gadget" specification could be used in this way?)
- Polite phone – what BT layer is used? There may be security issues depending on which layer is used. Is it RFcomm (does it have security issues)? Or L2 CAP (Motorola has a solution for that)?

b) Peter Van der Perre (ERTICO) - GST project and ND integration

- Standardisation – this could mean many things – need to agree on what we want to achieve (a roadmap?).
- The OEM is in charge of what ND application(s) can be used, and also the ND provider is in control of what can be used by the onboard telematics control unit (TCU).
- The GST ND architecture includes credential authorisation (e.g. diagnostics only available to authorised service centre).
- The presented solution was very similar to Bluetooth. There was a lot of difficulty agreeing on that protocol – it will take a long time to do this; this was a service framework so it shouldn't have the limitations of a BT profile.
- Life-cycle times of OEM vehicle and ND manufacturers are quite different – how would this be reconciled?

c) Stephan Reitzner (3SOFT GmbH) - overview of in-car integration experience

- Much experience of integrating devices in vehicles, e.g. DC "A-class online". PDA, phone integration. Problems: no standardisation, had to develop protocols – this is always the hard part due to lack of standardisation - some phones could only support one profile so if BT hands-free profile (HFP) was used, couldn't use another profile.
- Even with standardisation, it is difficult to find 100% implementation of the standard.
- Protocols focus on a particular use case, are too limited as a result (e.g. HFP doesn't give access to number list on phone).
- Need protocols that are 100% safe, stable and available for number of years, and implemented fully on both sides (vehicle & device); need to think of the processes behind this, rather than just focus on the technical solution.

- What devices are to be included in this set of ND? Need to agree on a list, e.g. would barcode reader be included as well as the usual devices?

d) Ralf Becker (Panasonic)
- Example for HD (high-definition) ready TV was given. He Suggests that there is a need for similar logo for this ND gateway standard.

e) Maria Farrugia (Vodafone Group R&D)
- Don't forget physical location and charging requirements (e.g. for PND); if wired then can get at other information (potentially); safety is an issue for device location.
- Noted that I-pod integration (BMW) was done very quickly (for a car manufacturer) – BUT this was only one supplier which simplifies the process. We are talking about many different manufacturers and hundreds/thousands of devices.
- Could OEMs not drive the standard (for integration)?
- Need to think of a standard that would enable the fitting of a cradle (and wire connection); car manufacturers are thinking of making the device "disappear" for safety/legislation reasons (e.g. phone in pocket/drawer in car or on person).

In the discussion it was agreed there were three main types of nomadic device of interest:
- Telephony.
- Mobile navigation.
- Entertainment devices, e.g. music player.

It was hoped that WG B (HMI) would identify the lower priority services that could be interrupted when necessary to avoid overloading the driver. The driver should have the capability to enable/disable services; others should be responsible for deciding what was allowed. If a safe and suitable solution was not found, then legislation might be brought in.

Future tasks were identified for WG A, as follows:
- Agree on definition of items in the objectives above.
- Define a list of requirements to be solved.
- Stakeholder analysis.
- Business case analysis.
- Define requirements from analysis of principal use cases.
- Define and evaluate main options (architecture, technology).
- Begin to define specifications for a harmonised intelligent Vehicle-Nomadic Device gateway.

The following members volunteered to work on these tasks:

- Telephony – 3SOFT, Vodafone, (Orange).
- Navigation – Navigon, Tele Atlas, Panasonic, 3SOFT.
- Entertainment – Panasonic, Vodafone, BMW.
- Data & text communication – ERTICO, Vodafone, Motorola.
- General requirements – ERTICO, Motorola.

The proposed timetable was as follows:

11/11/2005 – complete and distribute the above definition of tasks to ERTICO.
25/11/2005 – review meeting and next working group meeting.

3.3.2. Working Group B - Safety and HMI Issues

The meeting began with a tour de table, with members' expectations and motivation for attending the meeting.

All the five OEMs that were present expected that the discussion should focus on application of the European Statement of Principles (ESoP) to nomadic device safety issues; the work already done for the ESoP should not be repeated in this WG. The map provider that was present (Tele Atlas) was interested to see how map data is provided to nomadic devices, and how this might differ from "standard" (integrated) systems. That the ESoP should be the only basis for these discussions was questioned by Bipin Radia of EC DG TREN, who suggested that other results should be taken into account as well, such as the IVIS evaluation methodology and the results of the HASTE project.

Alan Stevens, co-chair of the expert group responsible for the ESoP update, raised issues that deserved further consideration, and could potentially be addressed by this group, including to what extent the ESoP covers nomadic device issues, definitions of key terms, the practical application of ESoP and the issue of product liability.

The discussion centred on the applicability of the ESoP to ND/vehicle integration. The individual principles were checked with respect to their applicability to nomadic devices; the conclusion was that the updated ESoP was generally applicable to nomadic devices (which was indeed a key objective of the update). The general design goals were so general that they apply to any type of system.

An attempt was made to identify which principles were relevant for which stakeholders. For the installation principles (2.X), this was quite straightforward (most concerned were hardware manufacturers, cradle manufacturers (if any) and installers (e.g. the driver or a fleet manager). However, for information presentation principles (3.X), the situation was more complex since the hardware suppliers in most cases had no control of the software and vice versa. The group concluded that further consideration of these issues was not meaningful without representatives of the nomadic device industry (both hardware and software developers) present. Actual implementation of the ESoP in this respect was more a task for the nomadic device industry (since the OEMs had already accepted and largely adopted the ESoP).

What were the requirements for new accident data? The group recognised that more empirical data was needed on the actual safety problems associated with nomadic devices. It was recommended that this be addressed in a new project, possibly in FP7. From the OEM perspective, identification of potential topics for common research was done in the EUCAR SGI group, and there was no need for parallel activities here; this could also be referred to ERTRAC (European Road and Transport Research Advisory Council).

There was a need to clarify legal and liability issues. However, it was not primarily an HMI issue and, since the current working group consisted mainly of HMI experts, this was not the right place to address it. It was proposed to invite a legal expert to the next general ND Forum workshop, maybe from the RESPONSE3 project.

How could the take-up of the ESoP be promoted in practice? Although the OEMs supported the wider promotion of the ESoP, this was mainly a responsibility for the EC and member states, especially for issues specific to nomadic devices. It was important that the ESoP was properly taken up in research projects such as AIDE.

The Working Group concluded with some recommendations. The ESoP was a good basis for addressing ND safety issues. Although there were some open issues with respect to the application to nomadic devices, this WG B as constituted was not the right place to further develop the ESoP. A number of issues needed further consideration, especially related to liability. However, it was not

meaningful to discuss this separately from WG A. Thus, it was proposed that the two working groups be merged in the next phase of work of the Nomadic Device Forum.

3.4. Nomadic Device Forum workshop

This workshop was held at ERTICO premises in Brussels, on 25/11/05. It was agreed to divide the workshop participants into two groups, the Working Group A that should continue to progress the work to define use cases and requirements for a vehicle-portable device gateway, and a new group, Working Group C, that should examine the business scenarios and business use cases for such vehicle-device integration, and how the Forum could promote a closer cooperation between the automotive and consumer electronics/portable device communities.

3.4.1. Working Group A – Interface specifications

WG A progressed its work to define the services, use cases and requirements. The services and use cases are listed in the table below. Annex B contains a provisional definition of use cases for a number of these services.

Table 1: Working Group A- services and use cases

Service	Use cases	Comments
Data communication	establish IP connection	general internet connectivity including browsing (note this may be needed to be filtered for safety)
Entertainment	audio transmission	digital streaming and download (or could be analogue) decoded only? May be limited by DRM requirements
Entertainment	browsing music titles	
Entertainment	controlling tracks	stop/start/pause etc
Entertainment	id3/cd tags	track information
Entertainment	purchase of mp3 tracks	
Entertainment	recording of tracks on ND(E.g. from radio, or voice notes)	
Entertainment	volume control	also includes mute
General	battery charging	
General	filtering of services on ND	e.g. due to road conditions
General	remote control of HMI of ND	could be other way?
General	restrict access to car infrastructure (authorisation required)	e.g. diagnostics in car, stop write access to can bus
General	safe installation	
General	status of dashboard illumination	to illuminate display (either by lights switched on, or automatic)
General	voice control	e.g. voice activated dialing, etc including Text to speech (TTS)
Navigation	address retrieval	e.g. vcard exchange
Navigation	mute radio to give voice instruction	and unmute
Navigation	share human readable traffic information	ie textual
Navigation	share raw traffic information	could be via broadcast (radio, dab etc) or IP
Navigation	sharing positioning information	
Navigation	sharing sensor information	can be both ways
Navigation	upload human readable map to ND	e.g. for last mile (after car parked)
Telephony	accept a call	

Telephony	conference call	e.g. 3 way calling
Telephony	eCall	
Telephony	external antenna	
Telephony	hands free telephony	voice only (low bandwidth only needed)
Telephony	limit incoming calls to phone list	
Telephony	limit outgoing calls to phone list	e.g. for taxi driver
Telephony	make a call	
Telephony	mute radio to for voice call	
Telephony	phone book sharing	
Telephony	Push to talk (PTT)	
Telephony	restrict access to phone services	
Telephony	telephone status	e.g. to cater for driver entering car while using phone
Telephony	terminate a call	
Telephony	where am I?	either to help GPS access, or coarse navigation (from CellID)
Textual communication	compose SMS/MMS/email	
Textual communication	receive SMS/MMS/email	
Textual communication	send SMS/MMS/email	

3.4.2. Working Group C – Business use cases

WG C held a first meeting and discussed the interests and/or problems of the key stakeholders involved in nomadic device integration. These are listed in the table below, together with some first definitions of business requirements for integration:

Table 2: Working Group C

Stakeholder	Notes	Interest/problem	Requirements
General (all)		target is safe use of devices while driving digital rights management for content	 this issue must be addressed for ND integration…
Telecom operator		sells services and (smart-) phones that users want to use inside the car	
OEM vehicle mfr		keep existing business with infotainment systems (phone, entertainment, nav) keep existing business for fleet management, other professional tools ensure safe use of devices in vehicles offer additional services/functionalities to customers keep OEM brand look and feel react to customer demand future-proofing the infotainment systems	 must be able to update the interface throughout the lifecycle of the car to support new devices/functions

		will incur liability if/when offer gateway	OEM to certify applications/services that are allowed to use gateway (filter by positive service list)
Service provider	any third party, e.g. motoring club, internet portals, e-call	want to sell driver services on NDs	filter by positive (approved) service list
Driver		wants seamless use of (all services from) mobile device on in-car environment drivers want good, safe HMI value function more important than safety (generally speaking) want cheap navigation, other services want cheap/free integration in the vehicle	gateway must lead to safer HMI (e.g. handsfree)
Passenger			
Employer	e.g. fleet operator		
After-market device mfr			
Application provider	e.g. Navigon, PTV	want access to data from car want OEM to take care of DRM	
System integrator	e.g. 3Soft,		
ND hardware providers		sell devices, don't (yet) care about vehicle integration	
ND parts mfr		?	
Governments		target is safe use of devices while driving Economic Advantage on a global scale	

3.4.3. Next steps

Meeting again in plenary, the workshop organisers agreed the following set of next steps and milestones, aiming at a major presentation of interim results during the ITS World Congress in London, in October 2006:

Meeting on February 23 2006 – have intermediate version of UC and requirements; verify those done, others need details; then start define requirements; circulate new document:
- questionnaire: by October 06 would like to get input from stakeholders not present now
- gather and compile before October;
- CeBit March 2006 - WGC to target strategic workshop on ND integration (providing ND mfrs have started participating already at February meeting).

Meeting on April 2006 – finalise first version UC and requirements, first version of an integration architecture
- select scenarios to present in October, with real user stories.

Meeting on June 2006 – final requirements document ready, it should be made stable until October:
- second version of architecture and design should be ready;
- first version of interface description (Java) should be done.

World Congress on October 2006- proposed final version of architecture:
- need to arrange special workshops at WC in London;
- WG C should look at emerging technical requirements and give feedback.

4. Conclusions

During the four Nomadic Device Forum workshop events that took place during 2005 following the initial workshop in January, considerable progress was made within Working Group A to define the key use cases for vehicle-nomadic device integration, and a start was made to define the system requirements for this gateway. A number of use cases were developed in substantial detail and their requirements elicited.

A meeting of Working Group B was held in October 2005, where the revised European Statement of Principles for HMI was carefully considered and it was concluded that this was generally adequately developed for nomadic device design, use and installation; however there was still a need to promote its uptake and routine use, especially within the nomadic device sector. There was also a need to gather evidence of the real risks associated with nomadic device use; this could be the subject of a future research project.

A new Working Group C was set up to investigate the business use cases for nomadic device integration; it started defining these use cases and the expected benefits for the various stakeholders.

The low participation by companies in the portable device market was seen by the automotive OEMs as a serious problem, and an obstacle to achieving a consensus amongst the OEMs to support the definition and implementation of a standard vehicle-device gateway. While there was a willingness to work towards a common interface to portable devices, this needed a corresponding commitment by the device industry to develop a common device interface.

A workplan was agreed to continue the definition of the gateway requirements and specifications, while highlighting the business benefits for all involved stakeholders and safeguarding user safety by appropriate system and interface design and HMI.

It was important to define clearly the next tasks for the different working groups, and to ensure that the goals of the Forum itself were shared by the largest majority of its members. These should be discussed and made more concrete during the next meeting of the Forum. The following points should be addressed:

- Increase participation of key stakeholders in the Forum, especially from portable device and application manufacturers
- Confirm the main use cases, possible architectures and outline specifications for a harmonised vehicle-device gateway
- Identify the possible conditions for a mutually positive business case for vehicle OEMs, portable device suppliers and operators/service providers
- Identify the obstacles for the vehicle OEM and portable device communities that could stand in the way of their agreement on a standardised vehicle-device gateway
- Identify a road map of steps towards overcoming these obstacles and working on an agreed solution.

5. Annex A: Nomadic Device Forum members

Note: WG A = ND gateway technical specification, WG C = business issues

Organisation/company	Name		WG A	WG C
3SOFT GmbH	Reitzner	Stephan		
ACEA	Reinhardt	Wolfgang		x
Alpine Electronics R&D Europe GmbH	Kueper	Thorsten		x
Alpine Electronics R&D Europe GmbH	Parlic	Novica	x	
ANWB	Van der Sanden	Monique		
BASt	Baumann	Martin		x
Blaupunkt GmbH	Eschke	Stephan		
BMW	Scholten	Joachim		x
BMW	Keinath	Andreas		
Bosch	Modler	Holger		
Carmeq GmbH, Berlin	Morich	Rolf		
CERTH	Kalogirou	Konstantinos		
Chalmers Technikpark	Chen	Fang	x	
CRF	Liberto	Carlo	x	
DaimlerChrysler	Kuhn	Friedemann		
DaimlerChrysler	Hess	Markus		
DaimlerChrysler	Buck	Manfred		
Delphi Grundig	Brandes	Rolf	x	
Delphi Electronics	Buchholz	Joachim	x	
Elesia	de Feo	Michele		
ERTICO	Kompfner	Paul		x
ERTICO	van der Perre	Peter		
ERTICO	Vermassen	Erwin	x	
ERTICO	Jeftic	Zeljko	x	
European Commission	Höfs	Wolfgang		x
European Commission	Radia	Bipin		x
FhG-First	Russeler	Herbert		
Ford Research Lab Aachen	Koch	Werner		
Ford Research Lab Aachen	Wiecker	Martin	x	
ICCS	Amditis	Angelos	x	
ICCS	Polychronopoulos	Aris	x	
ICCS	Bolovinou	Anastasia		
ICT Embedded B.V.	Kamps	Eddy		
Jaguar Cars	McCullough	Francis		
Motorola	Robertson	Patrick	x	
Motorola	Gardner	Mike	x	
Navigon	Perchina	Maria	x	
Navigon	Katzer	Jochen		
Navigon	Thomas	Bernd	x	
Nokia Automotive	Dünnwald	Johannes		
Opel	Berninger	Harald	x	
OrangeFrance	Fond	Michel	x	
Panasonic Automotive Systems Europe GmbH	Hohmann	Wolfram		
Panasonic R&D Center Germany GmbH	Becker	Ralf	x	
Paragon Fidelity	Asner	Alexander	x	
Philips Semiconductors	Daalderop	Gerardo		x
Philips Semiconductors	Frimout	Emmanuel	x	
PSA	Leman	Cyril	x	
Renault	Bouler	Yann		x
Renault	Pauchet	Mathieu	x	

Renault	Augello	Daniel		
SBD	Hart	Andrew		x
SEAT	Marina	Lourdes	x	
SEAT	Romera Rué	Maria	x	
Sepura	Thaxter	Rick	x	
Siemens VDO	Kamalski	Theo		x
Siemens VDO	Pu	Hongjun		
Siemens VDO	Grundlehner	Bernhard	x	
Swedish Road Administration	Patten	Chris		x
Tele Atlas	Bartels	Christine	x	
Tele Atlas	van Essen	Rob		
TRL	Stevens	Alan		
TWT	Geramani	Konstantina		
Vodafone Group Services Limited	Farrugia	Maria	x	
Volkswagen AG	Fesefeldt	Martin		
Volkswagen Liaison Office to the EU	Hoellermann	Joerg	x	
Volkswagen Liaison Office to the EU	Spell	Sabine		x
Volvo Technology	Arfwidsson	Jan	x	
Volvo Technology	Engström	Johan		
Volvo Technology	Pringle	Andreas		
Volvo Technology Corporation	Victor	Trent		x
VTT Technical Research Centre of Finland	Scholliers	Johannes		
VTT	Kauvo	Kimmo	x	

6. Annex B: Working Group A – Draft Use Cases

6.1. Use Case Model

6.1.1. Embedded (Client System) Application

Type: *public «internal worker»* **Actor**
Status: Proposed. Version 1.0. Phase 1.0.
Package: Use Case Model
Details: Created on 10/11/2005 15:32:20. Modified on 22/11/2005 11:43:16. Author: Erwin Vermassen

Application running on the in-vehicle, factory mounted computer wishing to communicate data over a wired or wireless connection to the nomadic system. The embedded, in-vehicle system is also referred to as a TCU or Telematics Computing Unit. Data must be seen as a very wide array of digitized information and includes sound (voice), music and video streams.

Internal Requirements

- Data communication between an embedded application and a nomadic device should include all possible types of data. (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
  All possible types of data includes streaming data such as voice, video, music and batched data such as traffic information, data synchronization, application upload/download, etc.

Connections

- Association link to usecase *UC-NDI-0002-7 - Voice Control<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0001-1-4 - IP connection not authorized<UC-NDI-0001-1 Establish an IP Connection>*
- Association link to usecase *UC-NDI-0001-1-3 - Initiate IP Connection via Preferred Channel<UC-NDI-0001-1 Establish an IP Connection>*
- Association link to usecase *UC-NDI-0001-1-2 - Initiate IP Connection via nomadic device<UC-NDI-0001-1 Establish an IP Connection>*

6.1.2. End User

Type: *public «worker»* **Actor**
Status: Proposed. Version 1.0. Phase 1.0.
Package: Use Case Model
Details: Created on 10/11/2005 15:58:32. Modified on 14/11/2005 16:15:53. Author: Erwin Vermassen

The end user actor creates an SMS/MMS or E-Mail message.

Connections

- Association link to usecase *UC-NDI-0002-5 - Safe installation<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0002-1 - Battery Charging<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0001-2-1 - Compose and Send message without transmitter<UC-NDI-0001-2 - Non IP Communication>*

6.1.3. Nomadic Device

Type: *public «internal worker»* **Actor**
Status: Proposed. Version 1.0. Phase 1.0.
Package: Use Case Model
Details: Created on 10/07/2005 22:40:06. Modified on 22/11/2005 11:52:09. Author: Erwin Vermassen

A nomadic device represents a mobile computing and/or telecommunication device able to communicate data with the TCU (embedded) device.

Connections

- Association link to usecase *UC-NDI-0003-1 - Authenticate and Authorization<UC-NDI-0003 - Initalization and Service Consumption>*
- Association link to usecase *UC-NDI-0003-8 - eCall discovery and initialization<UC-NDI-0003 - Initalization and Service Consumption>*
- Association link to usecase *UC-NDI-0003-3 - Service Consumption<UC-NDI-0003 - Initalization and Service Consumption>*
- Association link to usecase *UC-NDI-0003-7 - Vehicle Status Service Discovery and initialization<UC-NDI-0003 - Initalization and Service Consumption>*

6.1.4. Nomadic Device Application

Type: *public «internal worker»* **Actor**
Status: Proposed. Version 1.0. Phase 1.0.
Package: Use Case Model
Details: Created on 09/11/2005 13:58:10. Modified on 22/11/2005 11:51:05. Author: Erwin Vermassen
Tag: Application

Application running on the Nomadic Device and needing network access.

Connections

- Association link to usecase *UC-NDI-0002-7 - Voice Control<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0002-6 - Status of dashboard illumination<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0002-4 - Restrict access to car infrastructure<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0002-3 - Remote control of HMI of ND<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0002-2 - Filtering of Service on Nomadic Device<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0001-2-1 - Compose and Send message without transmitter<UC-NDI-0001-2 - Non IP Communication>*
- Association link to usecase *UC-NDI-0001-1-4 - IP connection not authorized<UC-NDI-0001-1 Establish an IP Connection>*
- Association link to usecase *UC-NDI-0001-1-3 - Initiate IP Connection via Preferred Channel<UC-NDI-0001-1 Establish an IP Connection>*
- Association link to usecase *UC-NDI-0001-1-1 - Initiate IP Connection via Embedded System<UC-NDI-0001-1 Establish an IP Connection>*

6.1.5. OEM

Type: *public «external»* **Actor**
Status: Proposed. Version 1.0. Phase 1.0.
Package: Use Case Model

Details: Created on 14/11/2005 16:04:40. Modified on 22/11/2005 14:01:12. Author: Erwin Vermassen

The OEM authorizes the in-vehicle services available to a specific user. Where mobile service provision is concerned, the service provider authorizes the use of services available to the user based on subscription.

Connections

- Association link to usecase *UC-NDI-0002-5 - Safe installation<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0002-4 - Restrict access to car infrastructure<UC-NDI-0002 - General>*

6.1.6. Remote Application

Type: *public «external»* **Actor**
Status: Proposed. Version 1.0. Phase 1.0.
Package: Use Case Model
Details: Created on 10/11/2005 16:07:32. Modified on 22/11/2005 14:01:02. Author: Erwin Vermassen

An Application which initiates an SMS, MMS, USSD etc message. For instance a remote organization who wishes to immobilize the car by means of an SMS (theft control, etc.)

Connections

- Association link to usecase *UC-NDI-0001-2-2 - Recieve message (M2M)<UC-NDI-0001-2 - Non IP Communication>*

6.1.7. TCU (embedded device)

Type: *public «internal worker»* **Actor**
Status: Proposed. Version 1.0. Phase 1.0.
Package: Use Case Model
Details: Created on 10/07/2005 22:37:34. Modified on 14/11/2005 16:32:13. Author: Erwin Vermassen

Connections

- Association link to usecase *UC-NDI-0003-1 - Authenticate and Authorization<UC-NDI-0003 - Initalization and Service Consumption>*
- Association link to usecase *UC-NDI-0003-8 - eCall discovery and initialization<UC-NDI-0003 - Initalization and Service Consumption>*
- Association link to usecase *UC-NDI-0003-3 - Service Consumption<UC-NDI-0003 - Initalization and Service Consumption>*
- Association link to usecase *UC-NDI-0003-7 - Vehicle Status Service Discovery and initialization<UC-NDI-0003 - Initalization and Service Consumption>*

6.1.8. Vehicle

Type: *public «internal worker»* **Actor**
Status: Proposed. Version 1.0. Phase 1.0.
Package: Use Case Model
Details: Created on 14/11/2005 13:01:15. Modified on 22/11/2005 14:07:39. Author: Erwin Vermassen

The vehicle provides infrastructure and services to the devices brought into its realm (charging batteries, providing diagnostics and probe information etc.) Services in this context must be seen as information and applications provided by the vehicle itself. This could for instance be an interface to the CAN and MOST busses or in the case of "non" communication Nomadic Devices, access to the communication infrastructure of the car.

Connections

- Association link to usecase *UC-NDI-0003-4 - On eCall<UC-NDI-0003 - Initalization and Service Consumption>*
- Association link to usecase *UC-NDI-0003-6 - Vehicle Status Change<UC-NDI-0003 - Initalization and Service Consumption>*
- Association link to usecase *UC-NDI-0002-7 - Voice Control<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0002-6 - Status of dashboard illumination<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0002-3 - Remote control of HMI of ND<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0002-2 - Filtering of Service on Nomadic Device<UC-NDI-0002 - General>*
- Association link to usecase *UC-NDI-0002-1 - Battery Charging<UC-NDI-0002 - General>*

6.2. UC-NDI-0001 - Data Communication

Data Communication in the context of Nomadic Device Integration, refers to the sending and receiving of binary data between a Nomadic Device and an in-vehicle TCU. Data can be communicated over a wired or wireless connection. Both streaming and non-stream data communications are implied.

6.3. UC-NDI-0001-1 Establish an IP Connection

This set of Use Cases describes three main scenarios when setting up IP Connections. In each case it is assumed that the Nomadic Device and peer embedded system are authenticated against each other and recognized. This pre-condition is introduced by some of the security issues induced by the use of foreign devices (nomadic devices) into cars. The three main cases described in this section are:
- The nomadic device has a long range (to the external world) wireless connection interface on board (GSM/GPRS/UMTS, WiFi, WiMax ...), the embedded system (TCU) does not have such an interface - UC-NDI-0001-1-2.
- The nomadic device does not have a long range wireless connection interface. The embedded device (TCU) contains such an interface - UC-NDI-0001-1-1.
- Both devices have a long range wireless connection interface - UC-NDI-0001-1-3.

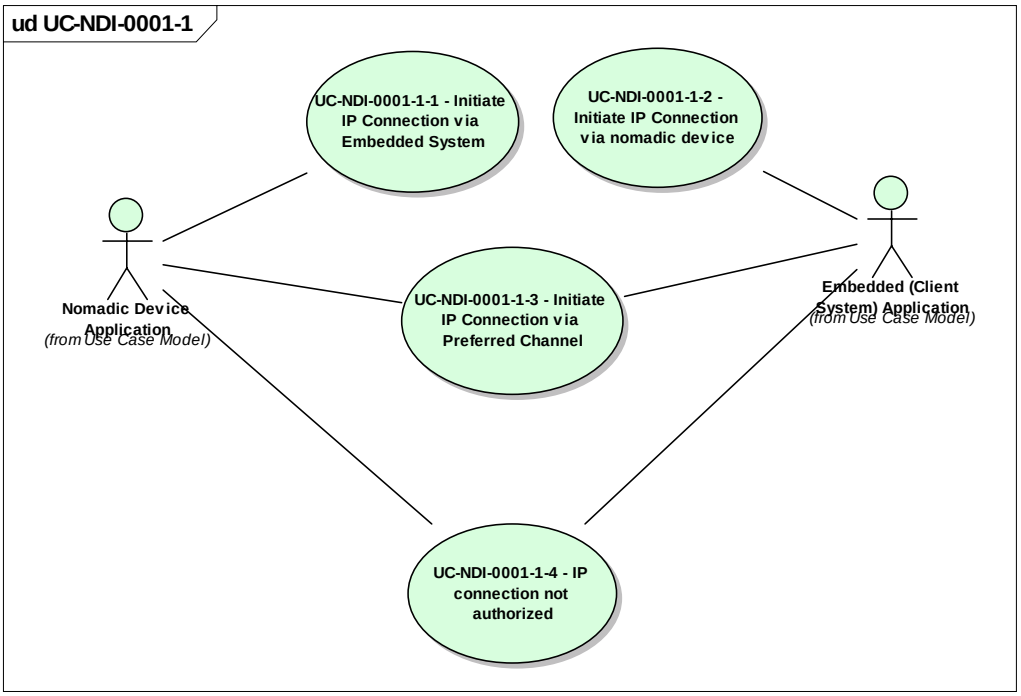

Figure 1 : UC-NDI-0001-1

6.3.1. UC-NDI-0001-1-1 - Initiate IP Connection via Embedded System

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0001-1 Establish an IP Connection
Details: Created on 10/11/2005 10:32:35. Modified on 22/11/2005 14:22:41. Author: Erwin Vermassen

The embedded system (TCU) has the ability to connect to the internet, the nomadic device has no long range communication facilities on-board.

Internal Requirements

- Embedded system supports IPv4/IPv6 connection. (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium)
  The embedded system supports a long range (to the external world) IPv4 or IPv6 compliant connection hardware on board.
- Nomadic Device has no IPv4/IPv6 interface. (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium)
  The Nomadic device does not possess a long range communication interface.

Constraints

- *Proposed Pre-condition* . Nomadic Devices are Authenticated.
- *Proposed Post-condition* . IP Connection is established.
- *Proposed Post-condition* . Nomadic Device receives a message indicating a failed IP connection initiation.
  This is the failure case and should be handled gracefully.

Connections

- Association link from actor *Nomadic Device Application <Use Case Model>*

Scenarios

Failed initiation {Alternate}.

1. An application running on the Nomadic Device needs an IP connection
2. The application checks for the availability of an IP connector proxy (stub on the Nomadic Device allowing it to access an IP connection service running on the Nomadic Device)
3. If such a proxy is available, the Nomadic Device calls into the remote IP connection service.
4. The IP connection service tries to connect via the underlying infrastructure available on the TCU.
5. On a failed initiation the IP connection service returns a null handle to the Nomadic Device proxy.
6. The Nomadic Device Proxy returns a null handle to the calling application.
7. The application recovers from the failed attempt gracefully

Successful initiation {Basic Path}.

1. An application running on the Nomadic Device needs an IP connection.
2. The application checks for the ability of an IP connector proxy (software or hardware component on the Nomadic Device allowing it to access an IP connection service running on the Nomadic Device).
3. If such a proxy is available, the Nomadic Device calls into the remote IP connection service.
4. The IP connection service connects to the internet via the underlying infrastructure available on the TCU.
5. On a successful initiation the IP connection service returns a handle to the Nomadic Device proxy.
6. The Nomadic Device Proxy returns a communication handle to the calling application.
7. The application sends and receives data from a remote peer.

6.3.2. UC-NDI-0001-1-2 - Initiate IP Connection via nomadic device

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0001-1 Establish an IP Connection
Details: Created on 10/11/2005 10:33:09. Modified on 22/11/2005 14:29:46. Author: Erwin Vermassen

In this USE case the Nomadic Device serves as the communication device towards the external world.

Internal Requirements

- The nomadic device (which will be charged by the IP provider for the connection) needs to authenticate the embedded device (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
  This is described by Authenticate and Authorize Use Case provided by package UC-NDI-0003.

Connections

- Association link from actor *Embedded (Client System) Application <Use Case Model>*

Scenarios

Failed Init {Alternate}.

1. An application running on the Embedded Device needs an IP connection
2. The application checks for the availability of an IP connector proxy (stub on the Embedded Device allowing it to access an IP connection service running on the Nomadic Device)
3. If such a proxy is available, the Embedded application calls into the remote IP connection

service.
4. The IP connection service tries to connect via the underlying infrastructure available on the device.
5. On a failed initiation the IP connection service returns a null handle to the Embedded proxy.
6. The Proxy returns a null handle to the calling application.
7. The application recovers from the failed attempt gracefully.

Successfull Initiation {Basic Path}.
1. An application running on the Embedded Device needs an IP connection.
2. The application checks for the ability of an IP connector proxy (Software or Hardware on the Embedded Device allowing it to access an IP connection service running on the Nomadic Device).
3. If such a proxy is available, the embedded application calls into the remote IP connection service.
4. The IP connection service connects to the internet via the underlying infrastructure available on the device.
5. On a successful initiation the IP connection service returns a handle to the embedded device proxy.
6. The Proxy returns a communication handle to the calling application.
7. The application sends and receives data from a remote peer.

6.3.3. UC-NDI-0001-1-3 - Initiate IP Connection via Preferred Channel

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0001-1 Establish an IP Connection
Details: Created on 10/11/2005 10:35:32. Modified on 22/11/2005 14:43:03. Author: Erwin Vermassen

In this case both the Nomadic Device and the Embedded system have the ability to setup an IP Connection. This Use Case describes a possible alternative for setting up this communication. Some of the criteria which determine who will act as the modem are:
- Customer preference.
- Priority (first try local modem).
- Best quality of Service (this involves a secondary service allowing for a Nomadic Device to get the QoS reported by the communication device).
As an example:
A smartphone without a WiFi capability connected to an embedded system with WiFi capabilities but no UMTS.
First Case: WiFi hotspot not present, an application running on the embedded device needs to send out information to a Service Centre and uses the smartphone because UMTS is available and the smartphone supports UMTS.
Second Case: the car enters and are with a WiFi hotspot, the application does not connect to the net via UMTS but uses the nearby WiFi hotspot over its local WiFi interface instead.

Internal Requirements

- The nomadic device (which will be charged by the IP provider for the connection) needs to somehow authenticate the embedded device. (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium)
  See also UC-NDI-0003, Authentication and Authorization

Connections

- Association link from actor *Nomadic Device Application <Use Case Model>*
- Association link from actor *Embedded (Client System) Application <Use Case Model>*

Scenarios

Selection of channel according to best QoS {Basic Path}.

1. An application running on the embedded device needs an IP connection
2. The application checks its local communication manager for the QoS available. If the QoS is satisfactory the embedded device connects via the local communication manager.
3. If the "local" QoS is not satisfactory the embedded device retrieves the supported QoS from the Nomadic Device.
4. If the QoS is better than the QoS supported by the embedded device the embedded device tries to retrieve a Connection Proxy.
5. If such a proxy is available, the Nomadic Device calls into the remote IP connection service.
6. The IP connection service connects to the internet via the underlying infrastructure available on the device.
7. On a successful initiation the IP connection service returns a handle to the Nomadic Device proxy.
8. The Nomadic Device Proxy returns a communication handle to the calling application.
9. The application sends and receives data from a remote peer.

Selection of channel according to Machine Preference {Basic Path}.

1. An application running on the embedded device needs an IP connection
2. The application checks the preferred channel from the Machine settings.
3. If a local "connection is preferred" the application connects via the local communication infrastructure.
4. If a connection via a "remote" device is preferred the system continues as described for UC-NDI-0001/1.

Selection of channel according to User Preference {Basic Path}.

1. An application running on the embedded device needs an IP connection.
2. The end-user configures an application to either use the local communication infrastructure or connect over a peer device. This configuration can be done either on the application level or system wide.
3. The system continues as described by UC-NDI-00001/1 if the user configured a remote communication method.

6.3.4. UC-NDI-0001-1-4 - IP connection not authorized

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0001-1 Establish an IP Connection
Details: Created on 10/11/2005 15:19:07. Modified on 22/11/2005 14:46:25. Author: Erwin Vermassen

In this scenario, the authentication process did conclude successfully but the Nomadic Device is not authorized to use the IP Connection Service of the Embedded device or, the embedded device is not authorized to use the IP Connection service provided by the Nomadic Device.

Linked (System) Requirements

- Embedded systems should be able to restrict usage of services (*Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
  This is a general requirement and makes it possible for an OEM to restrict Service usage. See also UC-NDI-0003, Authentication and Authorization.
- Nomadic Devices should be able to restrict usage of services (*Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
  This is a general requirement and makes it possible for a Telecom operator to restrict Service usage. See also UC-NDI-0003, Authentication and Authorization.

Constraints

- *Approved Invariant*. Nomadic device and Embedded device are authenticated against each other.

Connections

- Association link from actor *Nomadic Device Application <Use Case Model>*
- Association link from actor *Embedded (Client System) Application <Use Case Model>*
- Realize link to requirement *Nomadic Devices should be able to restrict usage of services<Overall Requirements (external)>*
- Realize link to requirement *Embedded systems should be able to restrict usage of services<Overall Requirements (external)>*

Scenarios

Peer IP Connection Service not available {Basic Path}.

1. An application running on the Nomadic Device needs an IP connection.
2. The application checks for the availability of an IP connector proxy (stub on the Nomadic Device allowing it to access an IP connection service running on the Nomadic Device).
3. The IP Connector is not present on the Nomadic Device.
4. The application receives a null handle as a return value.
5. The application deals with the failed attempt gracefully.

6.4. UC-NDI-0001-2 - Non IP Communication

Non IP communication is about composing, sending and receiving messages which do not use an IPv4 or IPv6 transport layer but are transmitted over other protocols such as SMS, MMS, UDDS etc. These Use Cases are very similar to the once explained for the IP Connection except the Service rendered by either the embedded system or Nomadic device do not link to the IP stack but use a different set of protocols.

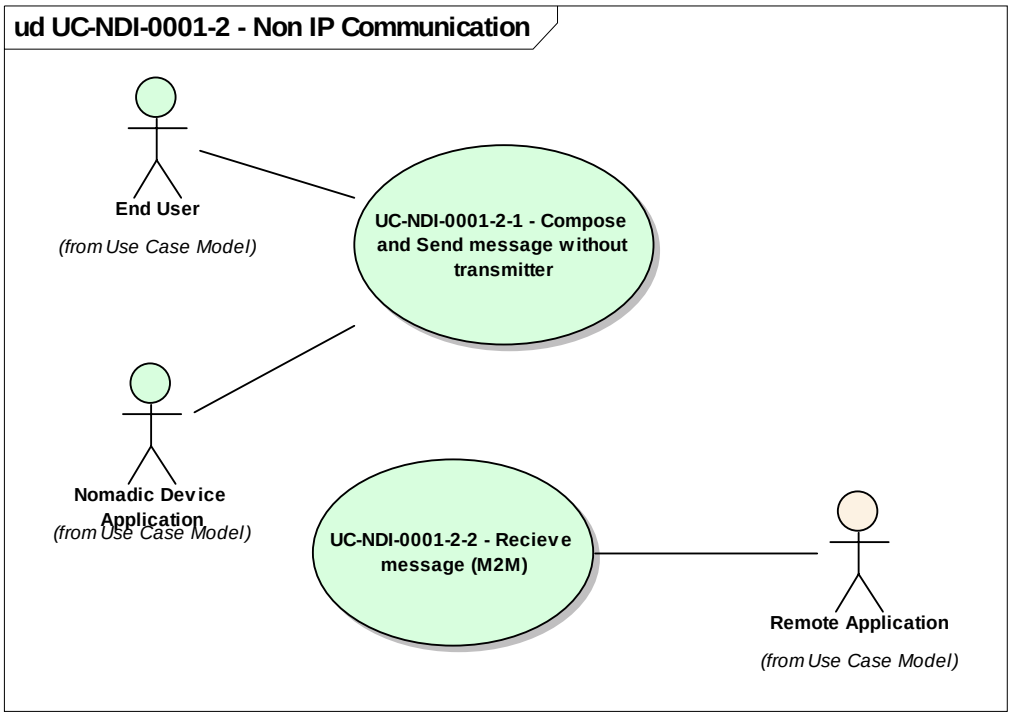

Figure 2 : UC-NDI-0001-2 - Non IP Communication

6.4.1. UC-NDI-0001-2-1 - Compose and Send message without transmitter

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0001-2 - Non IP Communication
Details: Created on 10/11/2005 16:11:25. Modified on 22/11/2005 14:51:32. Author: Erwin Vermassen

For this Use Case the device which composes the message does not have a message transmission facility on board. Instead the editor uses a Service Proxy to send the message to a Service provided by the end point which supports message transmission over a non IP channel.

Here is a possible User Story:

A user bought a contract from a roadside assistant company for a 24/24, 7/7 car malfunction assistance. The user runs a fish delivery company and needs to visit his customers frequently and on time.
A car malfunction, even the slightest one might result in tons of unsold fish and a huge loss of money.

The end-user drives his truck to the harbour early in the morning to collect a stock of fish. While on the road the in-vehicle computer detects an error. The fish salesman has a smartphone compliant to the Nomadic Device Standard and is connected via USB with the trucks in-vehicle computer. The application running on the embedded device automatically compiles a message with an error code and sends this message via the smartphone to the road assistant company.
The road side assistance organization alerts the nearest available repair engineer and calls the end user. The end user gets the voice call over his hands free telephony system

Internal Requirements

- The editor has access to the transmission service proxy (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
- The transmission end-point runs a message transmission server (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
  The entity which has a message transmitter on board, makes this facility available by means of a service running on its software platform.

Linked (System) Requirements

- Communication between ND and Embedded Device uses a Standardized protocol, tied to the application. (*Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).

Constraints

- *Proposed Pre-condition* . Devices are authenticated against eachother.
- *Proposed Pre-condition* . Connection between a Message Send Service Proxy and Server exists.

Connections

- Association link from actor *Nomadic Device Application <Use Case Model>*
- Association link from actor *End User <Use Case Model>*
- Realize link to requirement *Communication between ND and Embedded Device uses a Standardized protocol, tied to the application.<Overall Requirements (external)>*

Scenarios

End User entered Message, transmission succeeds {Basic Path}.

1. End User enters a message by means of an appropriate message editor (How exactly and via what means the user enters this message still needs to be researched and is part of the HMI issues related to NDI).
2. The User provides the addressee data.
3. The User hits the send button.
4. The Editor application searches for the availability of a Message Service Proxy.
5. If found the Editor forwards the data to the Message Service Proxy.
6. The Message Service Proxy connects to the Message Server.
7. The Message Server queues the message for transmission over the desired communication channel (SMS, MMS, USSD ...).
8. The Message Server returns an acknowledgement to the Message Service Proxy.

Machine Compiled Message, transmission succeeds {Basic Path}.
1. Either the Nomadic Device or the Embedded Device creates an automated message
3. The application searches for the availability of a Message Service Proxy.
5. If found the application forwards the data to the Message Service Proxy.
6. The Message Service Proxy connects to the Message Server.
7. The Message Server queues the message for transmission over the desired communication technology (SMS, MMS, USSD ...).
8. The Message Server resturns an acknowledgement to the Message Service Proxy.

6.4.2. UC-NDI-0001-2-2 - Recieve message (M2M)

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0001-2 - Non IP Communication
Details: Created on 10/11/2005 16:57:17. Modified on 14/11/2005 15:59:44. Author: Erwin Vermassen

This is a rather complex Use Case. One of the entities, Nomadic Device or Embedded system receives a message from a remote transmitter but is not the final destination of the message. The message needs to be forwarded to either a Nomadic Device (PDA) or an embedded system. Possible solutions might be rather proprietary and difficult to capture in a standardized way.

Internal Requirements

- Communication between ND and Embedded Device uses a Standardized protocol, tied to the application (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
- The recieving end-point runs a message forwarding server (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).

Connections

- Association link from actor *Remote Application <Use Case Model>*

6.5. UC-NDI-0002 - General

A set of General Use Cases which do not strictly belong to any other category (Communication, Navigation, Telephony, ...).

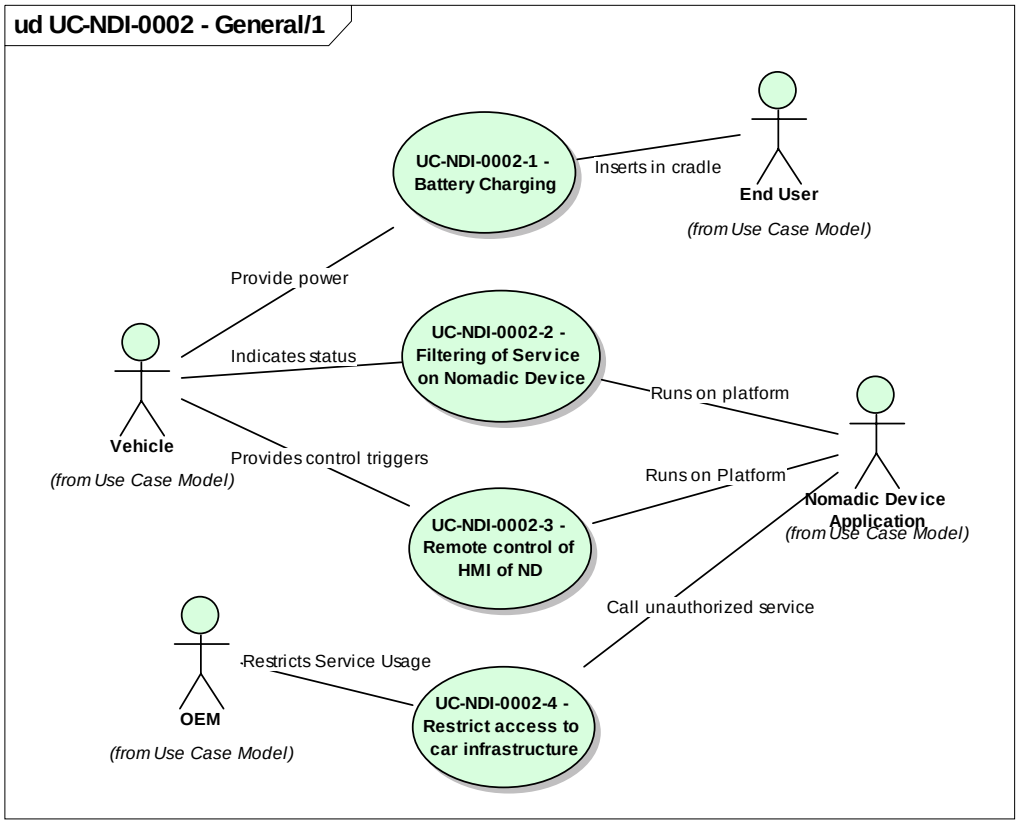

Figure 3 : UC-NDI-0002 - General/1

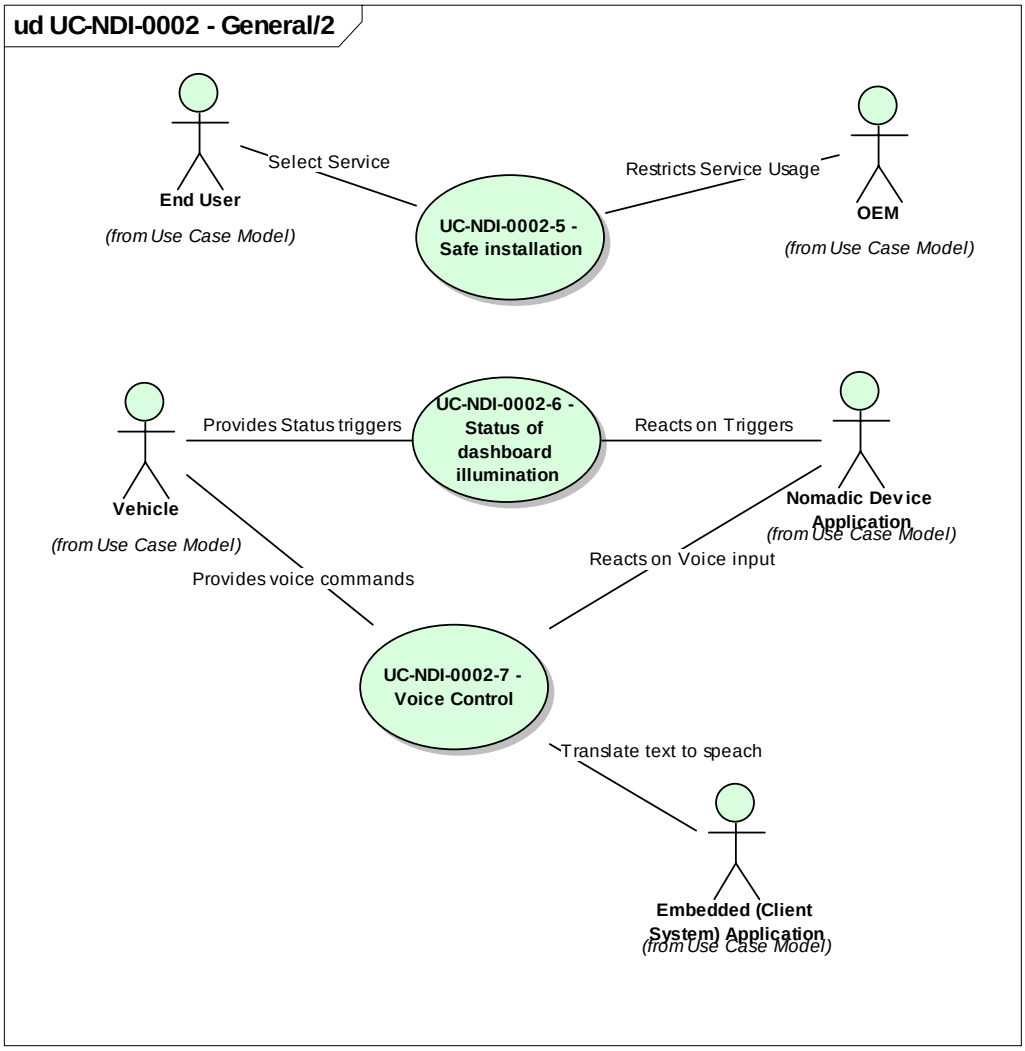

Figure 4 : UC-NDI-0002 - General/2

6.5.1. UC-NDI-0002-1 - Battery Charging

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0002 - General
Details: Created on 14/11/2005 13:03:04. Modified on 22/11/2005 14:56:49. Author: Erwin Vermassen

The usefullness of Nomadic Devices depend for a large part on the ability of the batteries to keep the device functioning over a reasonable length of time. This will not change in the future. It is therefore wishful to foresee a charging function when the Nomadic Device is used in the car.

Linked (System) Requirements

- The Nomadic Device Compliant with the "Nomadic Device Forum" standards requires a standardized connector (*Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium). This connector allows a Nomadic Device to connect to any peer connector inside a vehicle or elsewhere.
- The vehicle should provide a possibility to charge the Nomadic Device when this device

is used in the vehicle (*Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
This might lead to the installation of a standardized connection into the vehicle.

Connections

- Association link from actor *End User <Use Case Model>*
- Association link from actor *Vehicle <Use Case Model>*
- Realize link to requirement *The Nomadic Device Compliant with the "Nomadic Device Forum" standards requires a standardized connector.<Overall Requirements (external)>*
- Realize link to requirement *The vehicle should provide a possibility to charge the Nomadic Device when this device is used in the vehicle.<Overall Requirements (external)>*

Scenarios

Connecting the device {Basic Path}.
1. The User enters the vehicle.
2. The User puts the Nomadic Device in a cradle with standardised. port/interconnection and by doing this connects it to the cars power supply.
3. The Nomadic Devices battery gets charged while in place.

6.5.2. UC-NDI-0002-2 - Filtering of Service on Nomadic Device

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0002 - General
Details: Created on 14/11/2005 13:20:29. Modified on 22/11/2005 15:03:15. Author: Erwin Vermassen

Depending on the condition of the car the Nomadic Devices enables or disables certain services.

Internal Requirements

- A Service Application running on a NDF compliant Nomadic Device must be able to react to triggers provided by the vehicle (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
  In general this means that Service Applications running on a Nomadic Device AND certified to run in a vehicle should be implemented according to a standardized contract.

Connections

- Association link from actor *Nomadic Device Application <Use Case Model>*
- Association link from actor *Vehicle <Use Case Model>*

Scenarios

Vehicle status information {Basic Path}.
1. During the setup of the Nomadic Device/Embedded System communication a mandatory vehicle status listener service is initiated.
2. A service application, for instance an MP3 player, is initiated by the user.
3. The MP3 player registers a listener with the Vehicle Status Service.
4. The car is in a stationary state.
5. The Service Applicatin runs as expected and communicates with the user by means of a Graphical User Interface. The user is able to select songs from its playlist.
6. The vehicle starts to move.
7. The Service Application gets informed and acts to the trigger. In the case of an MP3 player the Service Application just closes the graphical User Interface. The User is now not able to select a different song or playlist by means of the Graphical User Interface but is limited to the back- and forward buttons to scroll to a playlist.

6.5.3. UC-NDI-0002-3 - Remote control of HMI of ND

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0002 - General
Details: Created on 14/11/2005 13:34:12. Modified on 22/11/2005 15:01:23. Author: Erwin Vermassen

This Use Case is very similar to UC-NDI-0003/2 except for the fact that the Service Application should listen to other external triggers. What could be useful is the use of up/down, confirm buttons on the steering wheel. This allows the user to operate the Nomadic Device without influencing his or her driving capabilities.

This technology is very similar to what already exists when using headsets or virtual keyboards with Nomadic Devices. In the case of input devices, such as switches and knops, the signals are probably handled by a embedded device and forwarded to the correct Nomadic Device. This requires a facility to identify the Nomadic Device which will accept these external triggers.

Internal Requirements

- A Nomadic Device must be able to accept remote control triggers (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
  The abilitiy of the operation system to accept external triggers and channel them to the appropriate message queue.
- The Nomadic device and TCU should filter the available services depending on the driving conditions (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
  See also UC-NDI-0002-3.

Constraints

- *Proposed Pre-condition* . The Nomadic Device and Embedded device are authenticated to each other.
- *Proposed Pre-condition* . The Nomadic Device runs a Service allowing it to recieve control triggers from the embedded device.
- *Proposed Post-condition* . A new service, item, address ... is selected.
- *Approved Pre-condition* . The Nomadic Device is registered by the embedded device as THE listener for control triggers (up/down/confirm buttons).
- *Proposed Pre-condition* . Proposed Pre-condition. The nomadic device and embedded device support a standardized protocol which enables the embedded device to access content stored on the phone (e.g. addresses, music tracks, etc).
- *Proposed Pre-condition*. The user is not driving.

Connections

- Association link from actor *Nomadic Device Application <Use Case Model>*
- Association link from actor *Vehicle <Use Case Model>*

Scenarios

User selects a phone number on the Nomadic Device {Basic Path}.
1. The User wants to select a phone number from the list of addresses stored by the Nomadic Device.
2. With the up/down and confirm buttons on the steering wheel, the user selects the address book on the ND.
3. The user scrolls through the list of addresses and picks the correct address by hitting the confirm button.
4. The user scrolls through the phone number and initiates the call by hitting the confirm button.

5. After the call the user hits the confirm button to terminate the connection.

User selects an MP3 file from a play list {Basic Path}.
1. The User wants to listen to some music over the car audio system.
2. The User scrolls through the list of services by means of the up/down buttons and selects the MP3 player by means of confirm button.
3. The User is now presented with a list of songs from his or her favourite play list and scrolls through the list to select the desired song.
4. The User hits the confirm button to start the song.
5. The Nomadic Device streams the MP3 file over the MP3 Player Proxy to the embedded system.

6.5.4. UC-NDI-0002-4 - Restrict access to car infrastructure

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0002 - General
Details: Created on 14/11/2005 14:23:53. Modified on 14/11/2005 16:08:50. Author: Erwin Vermassen

In this approach the embedded device remains in control and only allows a Nomadic Device to use "authorized" services. These authorized services are setup remotely from the OEMs portal. In GST the idea is to "initial provision" a new car with the initial service and parameters. Setting the list of authorized services could be part of this provisioning.

Constraints

- *Approved Pre-condition*. The embedded device knows in one way or another about the credentials of the end-user.
  This can be achieved by means of a smartcard, smart id card, etc.
- *Approved Pre-condition*. An End User provides its credentials to the Nomadic Device on forehand.
  These credentials can be tied to the users pin code. However, in that case the OEM needs to keep track of Users and Pin codes in one or the other way. One could think about a system.

Connections

- Association link from actor *Nomadic Device Application <Use Case Model>*
- Association link from actor *OEM <Use Case Model>*

Scenarios

Normal end-user tries to "chip-tune" his car. {Basic Path}.
1. The end-user installs a "hobby" application on a Nomadic Device with the intention to chip tune his car.
2. The end user starts the chip tune application.
3. The chip tune application tries to the connect to the Vehicle Interface service on the embedded system.
4. When authenticating the Nomadic Device the embedded system did not add the Vehicle Interface service to the list of allowed services and refuses the connection.
5. The chip tune application on the Nomadic Device receives a failure messages and shuts down.

Road side engineer obtains error code from vehicle {Basic Path}.
1. The car breaks down with the MIL lit.
2. The end-user calls the road side assistant service.

3. The road side assistant uses a PDA type smartphone.
4. The PDA connects to the embedded system and authenticates with a proper set of OEM registered capabilities.
5. The road side assistant starts a diagnostics application on the PDA.
6. Via the diagnostics proxy the application connects to the diagnostics service running on the embedded device.
7. The embedded device authorizes the use of the diagnostic service and accepts the connection.
8. The road assistant retrieves the error code from the vehicle and sends this information to the road assistant organization backend.
9. The road assistant receives the necessary documentation in order to solve the problem.
10. The road side assistant solves the problem.

6.5.5. UC-NDI-0002-5 - Safe installation

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0002 - General
Details: Created on 14/11/2005 15:05:27. Modified on 22/11/2005 15:16:32. Author: Erwin Vermassen

It is not clear what exactly this means. The discussed Use Case assumes the ability to remotely install Services on either a Nomadic Device or an embedded system. In both cases the interface between ND and embedded systems restricts services only to those authorized.

The installation of software from either the Nomadic Device and embedded system might be an ideal way to "initial provision" new devices.

In general the type of software should be restricted to the "client" part, also called proxy part of a service. This could be the case where a Nomadic Device does not have an MP3 proxy on board and the end-user wishes to stream MP3 over the car audio system. In that case, and if authorized, the proxy is downloaded from the embedded device whereafter the streaming can start.

Internal Requirements

- A client role should be able to get provisioned with the necessary proxy in order to consume a new service from the server side (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
- The client role can only dowload and install proxy applications for authorized Services. (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium)
  A client part (proxy) can only be downloaded if the peer authorizes the use of a service.
- The communication between Nomadic Device and a TCU should run over a standardized wired/wireless connection technology (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
  Comment from Maria Farrugia, Vodafone:
  In my opinion this use case covers the need for a standardized wired/wireless connection between the nomadic device and the car. Currently this is most commonly achieved via Bluetooth, however there are a number of interoperability issues that need to be resolved with Bluetooth. Also Bluetooth does not support (not yet at least) the streaming of audio from the nomadic device to the car audio system.

Constraints

- *Proposed Pre-condition* . The Server role, should have a suitable client available for download and install.
- *Proposed Pre-condition* . The Nomadic Device and Embedded device are authenticated to

each other.

Connections

- Association link from actor *OEM <Use Case Model>*
- Association link from actor *End User <Use Case Model>*

Scenarios

User subscribed to a new service (example MP3 Player) {Basic Path}.

1. The user subscribed to a new Service available on his embedded system, an MP3 player.
2. The user starts his car and the Service Application bundle, containing both Server and Client part is downloaded from the remote Control Centre.
3. The user discovers new services available on the embedded system.
4. The embedded system returns a list of available and authorized services including any newly subscribed service.
5. The user selects according to UC-NDI-0003/3 the MP3 Service.
6. The system detects the missing client part (proxy) and initiates the download form the embedded system.
7. The Nomadic Device installs the client part and runs the MP3 Service Application.
8. The user can now selected the desired MP3 file and run the file over the car audio system.

6.5.6. UC-NDI-0002-6 - Status of dashboard illumination

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0002 - General
Details: Created on 14/11/2005 15:30:06. Modified on 14/11/2005 16:18:04. Author: Erwin Vermassen

This Use Case seems fairly identical to the Filtering of Service on Nomadic Device. The dashboard illumination status in just another value provided by the vehicle status.

Internal Requirements

- The vehicle status should include the status of vehicle systems (dashboard illumination, windscreen wipers) (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).

Connections

- Association link from actor *Vehicle <Use Case Model>*
- Association link from actor *Nomadic Device Application <Use Case Model>*

Scenarios

Reaction on vehicle status change (example switching on lights) {Basic Path}.

1. During the setup of the Nomadic Device/Embedded System communication a mandatory vehicle status listener service is initiated.
2. The screen illumination screen driver registers itself as a listener to the Vehicle status service.
3. The driver switches on the lights.
4. The Vehicle Status Service forwards the trigger to the listeners.
5. The screen illumination of the Nomadic Device is switched to a night state.

6.5.7. UC-NDI-0002-7 - Voice Control

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0002 - General
Details: Created on 14/11/2005 15:43:02. Modified on 22/11/2005 15:27:03. Author: Erwin Vermassen

In this case the embedded system captures voice commands and forwards these as control statement to the Nomadic Device. These commands could be about the initiation of a phone call, the selection of a service like and agenda, etc.

In the other direction, the Nomadic Device could use the TTS infrastructure of the embedded system to translate otherwise visual and textual information into audio.

Internal Requirements

- The embedded system should have a speech recognition and TTS interface build in (*Type:* Functional; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).
  As an alternative, the TTS could be embedded in the Nomadic Device and the audio signal output could be rendered through the car audio system.

Constraints

- *Proposed Pre-condition*. The embedded device has speech recognition and TTS software.
- *Proposed Pre-condition*. The connection between the Nomadic Device and the embedded system needs to support the transfer of voice commands and audio information from the TTS output.

Connections

- Association link from actor *Embedded (Client System) Application <Use Case Model>*
- Association link from actor *Vehicle <Use Case Model>*
- Association link from actor *Nomadic Device Application <Use Case Model>*

Scenarios

Audible Trafic information by TTS {Basic Path}.
1. The Nomadic Device runs a traffic information service.
2. In the moving vehicle the Nomadic device receives traffic information.
3. According to UC-NDI-0003/3 the ND is informed about the status of the car.
4. The Nomadic Device connects to the TTS interface of the embedded system.
5. The Nomadic Device output the traffic information over the TTS interface to the cars audio system.

Nomadic Device operated by Voice {Basic Path}.
1. The user wants to setup a call.
2. The user selects the contact person by a Vocal command.
3. The embedded system repeats the contact persons name.
4. The user acknowledges the contact person proposed by the embedded system.
5. The embedded system sets up the voice call with the smartphone as discussed by UC-NDI-0003/3.

6.5.8. UC-NDI-0002-8 - Restrict access to Nomadic Device infrastructure

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0002 - General

Details: Created on 22/11/2005 15:04:44. Modified on 22/11/2005 15:07:00. Author: Erwin Vermassen

Depending on the capabilities of the user authenticated by the TCU some services are available while others are simply restricted. This use case is fairly identical to UC-NDI-0002-4 and is also described by UC-NDI-0003, authentication and authorization.

6.5.9. UC-NDI-0003 - Initialization and Service Consumption

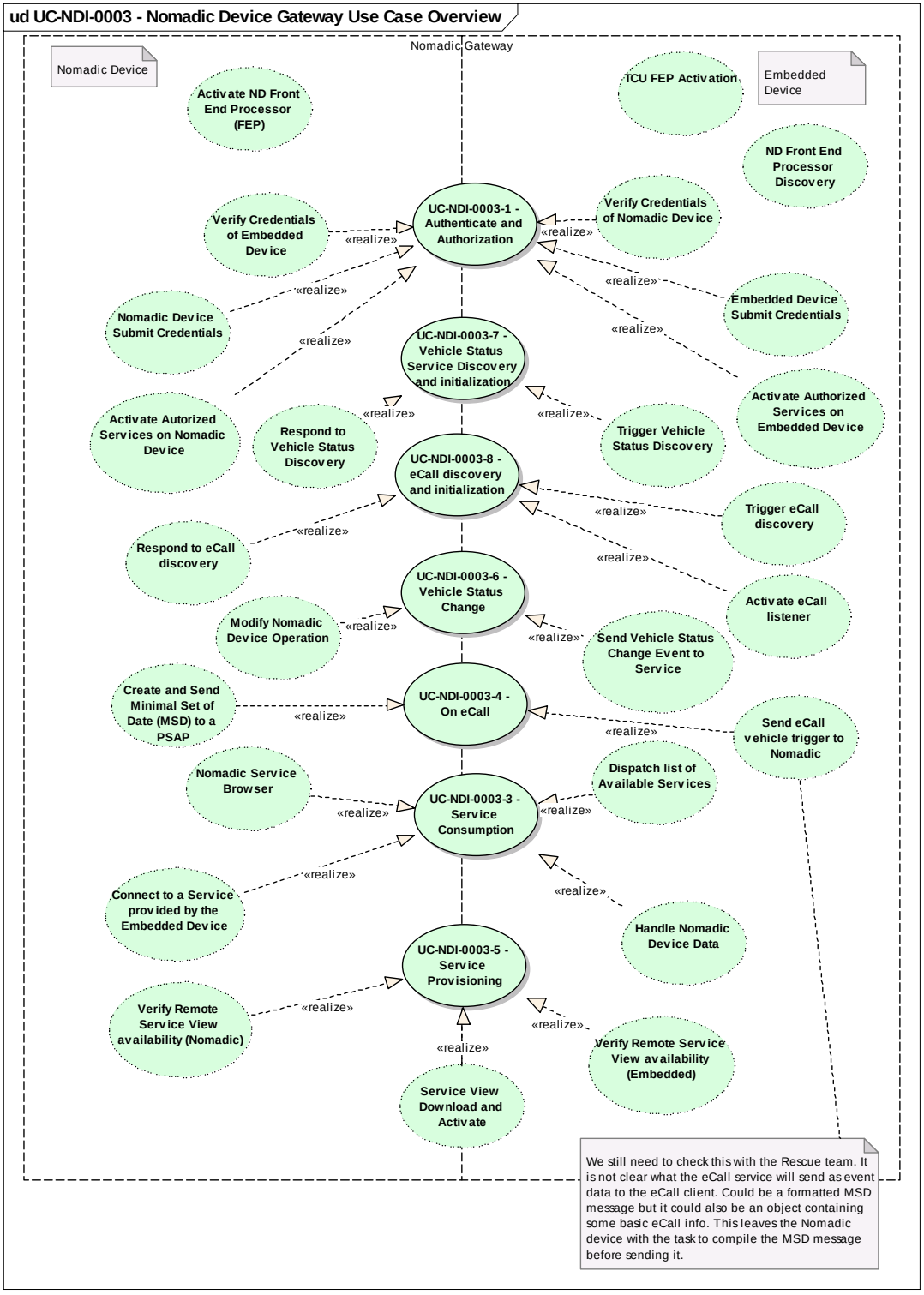

Figure 5 : UC-NDI-0003 - Nomadic Device Gateway Use Case Overview

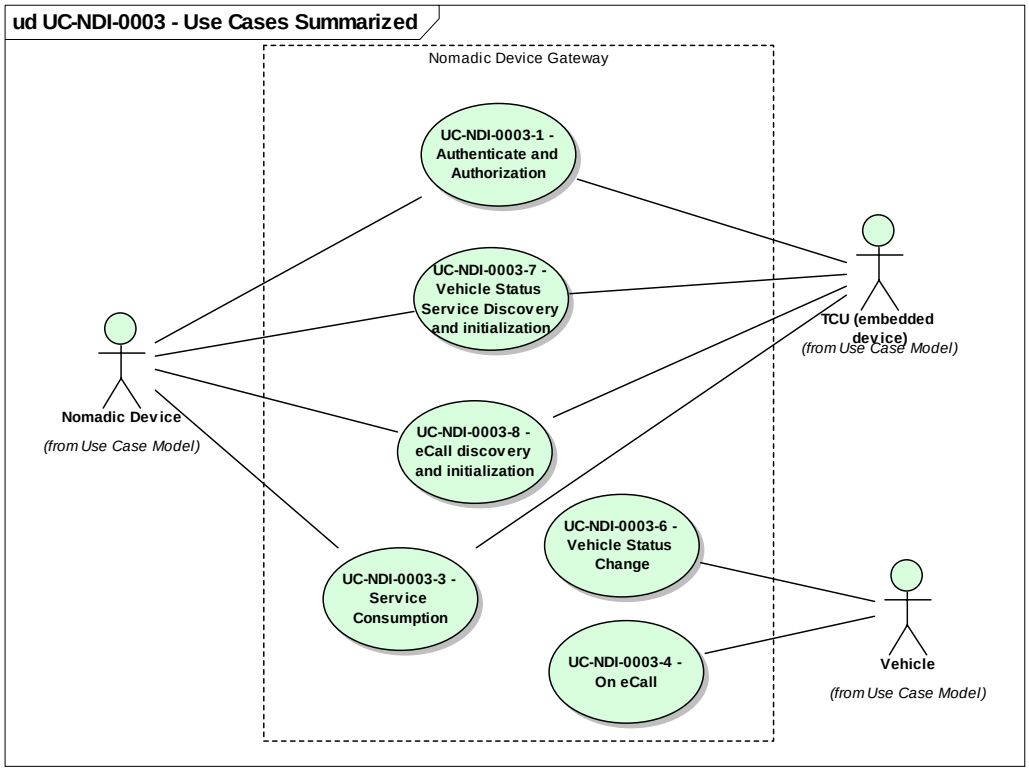

Figure 6 : UC-NDI-0003 - Use Cases Summarized

6.5.10. Activate Authorized Services on Embedded Device

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initalization and Service Consumption
Details: Created on 05/07/2005 15:42:34. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

Connections

- Realize link to usecase *UC-NDI-0003-1 - Authenticate and Authorization*

6.5.11. Activate Autorized Services on Nomadic Device

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initalization and Service Consumption
Details: Created on 05/07/2005 15:43:35. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

Once authenticated the Nomadic Device activates those services which are authorized to the embedded device.

Connections

- Realize link to usecase *UC-NDI-0003-1 - Authenticate and Authorization*

6.5.12. Activate eCall listener

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initalization and Service Consumption
Details: Created on 05/07/2005 15:47:29. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

Register an eCall listener to the eCAll service running on the embedded device.

Connections

- Realize link to usecase *UC-NDI-0003-8 - eCall discovery and initialization*

6.5.13. Activate ND Front End Processor (FEP)

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initalization and Service Consumption
Details: Created on 05/07/2005 15:31:37. Modified on 22/11/2005 15:28:39. Author: Erwin Vermassen

The FEP of the Nomadic Device connects to the FEP of the embedded device. In a Bluetooth context this is indeed a real connection to a bluetooth service. The front end processor is a piece of software which acts as the access point for the remote device.

6.5.14. Authenticate Nomadic Device

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initalization and Service Consumption
Details: Created on 03/07/2005 13:51:27. Modified on 22/11/2005 15:32:29. Author: Erwin Vermassen

The authentication of the Nomadic Device is done by means of the received credentials (e.g. PIN code). The authentication and authorization component of the TCU has access to a list of credentials and checks whether the credentials received are present in this list. If so the TCU sends back an acknowledgement message to the Nomadic Device.

Connections

- Include link from collaboration *Validate Connection of Nomadic Device*

6.5.15. Connect to a Service provided by the Embedded Device

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initalization and Service Consumption
Details: Created on 10/07/2005 22:27:45. Modified on 22/11/2005 15:36:18. Author: Erwin Vermassen

A Service in this context must be understood as the application provided by the TCU. In general the TCU implements such a service by means of a Server part which is accessed by the client, being the software client running on the Nomadic Device. Once a Service is selected by the Nomadic Device user the Service Client connects to the Server part (identified as the model) running on the embedded system.

Internal Requirements

- Services should not be selectable from the Nomadic Device while driving. (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).

Connections

- Realize link to usecase *UC-NDI-0003-3 - Service Consumption*

6.5.16. Create and Send Minimal Set of Date (MSD) to a PSAP

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initalization and Service Consumption
Details: Created on 10/07/2005 22:21:11. Modified on 22/11/2005 15:39:16. Author: Erwin Vermassen

The minimal set of data is the basic information specified by the GST rescue project. Triggered by an accident this information is sent out to a Public Safety Answering point or PSAP. Depending on the decision taken the Nomadic device forwards the MSD message to the PSAP or compiles the MSD message from the received information and sends the MSD message to the PSAP.

Connections

- Realize link to usecase *UC-NDI-0003-4 - On eCall*

6.5.17. Dispatch list of Available Services

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption
Details: Created on 10/07/2005 22:27:03. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

Connections

- Realize link to use case *UC-NDI-0003-3 - Service Consumption*

6.5.18. Embedded Device Submit Credentials

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initalization and Service Consumption
Details: Created on 05/07/2005 15:35:30. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

Connections

- Realize link to us ecase *UC-NDI-0003-1 - Authenticate and Authorization*

6.5.19. Handle Nomadic Device Data

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption

Details: Created on 10/07/2005 22:26:24. Modified on 22/11/2005 15:41:26. Author: Erwin Vermassen

The Service running on the embedded device, communicates with the client part on the embedded device. For instance the Service could be an embedded MP3 player and accept an MP3 stream over the communication link and next forward this stream to the sound board of the TCU.

Linked (System) Requirements

- The ND Forum needs to define standardized communication links and also protocols for interconnection and data stream transfer (*Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium).

Connections

- Realize link to usecase *UC-NDI-0003-3 - Service Consumption*
- Realize link to requirement *The ND Forum needs to define standardized communication links and also protocols for interconnection and data stream transfer.<Overall Requirements (external)>*

6.5.20. Modify Nomadic Device Operation

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption
Details: Created on 10/07/2005 22:23:51. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

Check with AIDE about what exactly needs to happen

Connections

- Realize link to use case *UC-NDI-0003-6 - Vehicle Status Change*

6.5.21. ND Front End Processor Discovery

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption
Details: Created on 05/07/2005 15:28:48. Modified on 22/11/2005 15:49:04. Author: Erwin Vermassen

This Use Cases polls the Connection Manager for the availability of a GST Compliant Nomadic Device.

6.5.22. Nomadic Device Submit Credentials

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption
Details: Created on 05/07/2005 15:33:27. Modified on 22/11/2005 15:44:43. Author: Erwin Vermassen

Probably in the form of a PIN code. This means that the credentials of the embedded device and nomadic device should be known.
How exactly the credentials of the connecting Nomadic Device are entered into the TCU is depending

on the implementation. Some OEMs might prefer to use a Service Portal where the user is able to change its credentials or the end-user can do this from an Graphical interface in the car.

Connections

- Realize link to use case *UC-NDI-0003-1 - Authenticate and Authorization*

6.5.23. Nomadic Service Browser

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption
Details: Created on 10/07/2005 22:24:53. Modified on 22/11/2005 15:48:52. Author: Erwin Vermassen

The nomadic service browser is an additional service on top of the Nomadic gateway. This application uses the Remote FEP to retrieve a list of available, authorized services and, on selection, allow the user to consume those services.

In the case of GST for instance this list could be stored by the OMA Device Management Tree, some kind of a registry which can be synchronized with a back-end Control Centre. In general I do not believe that the exact implementation is important. Maybe we could have look at how GST defines remote management of Client System and apply the same architecture.

Connections

- Realize link to usecase *UC-NDI-0003-3 - Service Consumption*

6.5.24. Respond to eCall discovery

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption
Details: Created on 05/07/2005 15:45:54. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

If the eCall service model is activated the eCAll Service Module should send out an acknowledgment

Connections

- Realize link to use case *UC-NDI-0003-8 - eCall discovery and initialization*

6.5.25. Respond to Vehicle Status Discovery

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption
Details: Created on 10/07/2005 22:19:33. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

Accept the connection from the Embedded Device

Connections

- Realize link to use case *UC-NDI-0003-7 - Vehicle Status Service Discovery and initialization*

6.5.26. Send eCall vehicle trigger to Nomadic

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption
Details: Created on 05/07/2005 15:49:04. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

Connections

- Realize link to use case *UC-NDI-0003-4 - On eCall*

6.5.27. Send Vehicle Status Change Event to Service

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption
Details: Created on 10/07/2005 22:22:15. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

The Vehicle status change event is triggered when the vehicle starts moving.

Connections

- Realize link to use case *UC-NDI-0003-6 - Vehicle Status Change*

6.5.28. Service Browser

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption
Details: Created on 17/06/2005 08:50:44. Modified on 03/07/2005 14:18:37. Author: Erwin Vermassen

Connections

- Include link to collaboration *Service Startup*

6.5.29. Service Consumption

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 03/07/2005 14:01:55. Modified on 22/11/2005 16:06:08. Author: Erwin Vermassen

Once the initialization process is finalized the user may select additional services from the service browser. In general a service needs two parts.
1. On the Nomadic Device a proxy object which translates calls from a client application running on the Nomadic Device to the communication protocol and visa versa . This proxy object also includes the ND part of the Service (Rendering of the Service in one way or another to the end-user).
2. A Server side application which provides the real logic and communicates with the client side proxy over the established connection.
For instance, in the case of a Bluetooth connection, the server side service is bound to the BT stack as a discoverable service and communicates with the ND over a Serial Connection.

In general two scenarios are possible. In the first case the service proxy is available on the ND and can be started by the service browser.
In the second case the service proxy is not available on the ND but could be downloaded either from a GST Control Centre or the Nomadic Gateway.

Internal Requirements

- The format of the service output needs to enable the user to consume the service in a safe and legal manner. (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium)

6.5.30. Service Discovery

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 03/07/2005 13:54:07. Modified on 22/11/2005 15:59:55. Author: Erwin Vermassen

The service discovery process uses a Device Policy File. This device policy file contains a list of services available to the connecting device. Theoretically a file needs to be present for each PIN code registered in the Device list. However, if this file does not exist the available services simply defaults to the eCall service, if supported by the embedded device.

Constraints

- *Approved Pre-condition*. Services Available.
  The services listed by the Device Policy file should be available to the connected device.
- *Proposed Pre-condition*. The Nomadic Device and Embedded device are authenticated to each other.

6.5.31. Service Startup

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 03/07/2005 14:13:58. Modified on 03/07/2005 14:18:37. Author: Erwin Vermassen

Starts the proxy part of the service. This could be a very simple service application which simple receives location information from the Nomadic Gateway and initializes a Navigation system. But it could also be a more complex service which feeds MP3 files to the remote MP3 player running on the nomadic device.

Connections

- Include link from collaboration *Service Browser*

6.5.32. Service View Download and Activate

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 13/07/2005 14:53:52. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

If a Service View could be found, download the software and activate

Connections

- Realize link to use case *UC-NDI-0003-5 - Service Provisioning*

6.5.33. Sollicit eCall

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 17/06/2005 08:50:27. Modified on 03/07/2005 12:54:31. Author: Erwin Vermassen

Once the connection between Nomadic Device and Nomadic Gateway is established and the embedded system provides an eCall service, the Nomadic Gateway verifies if a compatible eCall system is available on the Nomadic Device. If so the Nomadic Gateway connects to this eCall service on the Nomadic Device. In general, this connection will send over the MSD to the Nomadic Device were after the Nomadic Device initiates an eCall as described by the Rescue Sub-Project.

6.5.34. TCU FEP Activation

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 05/07/2005 15:29:55. Modified on 14/07/2005 12:30:03. Author: Erwin Vermassen

Front end Processor activation for instance as a Bluetooth Service

6.5.35. Trigger eCall discovery

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 05/07/2005 15:44:23. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

Trigger eCall discovery on eCall Service View. This results in a discovery action toward a Service model on the Nomadic Device

Connections

- Realize link to use case *UC-NDI-0003-8 - eCall discovery and initialization*

6.5.36. Trigger Vehicle Status Discovery

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 10/07/2005 22:18:39. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

After the initial phase, the FEP initiates the discovery of the availability of a Vehicle Status Service on the Nomadic Device. This service running on the Nomadic Device, accepts Vehicle Status information

from the embedded device (running/not running, speed, location) and reacts appropriately to it. What the exact reaction should be is the subject of the AIDE project.

Connections

- Realize link to use case *UC-NDI-0003-7 - Vehicle Status Service Discovery and initialization*

6.5.37. Validate Connection of Nomadic Device

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption
Details: Created on 17/06/2005 08:49:43. Modified on 03/07/2005 12:51:20. Author: Erwin Vermassen

The Nomadic Gateway verifies the credentials provided by the Nomadic Device and identifies the services available for these credentials.

Connections

- Include link to collaboration *Authenticate Nomadic Device*

6.5.38. Verify Credentials of Embedded Device

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 05/07/2005 15:41:16. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

Once the Nomadic device is authenticated, the embedded device should reversely get authenticated on the nomadic device.

Connections

- Realize link to use case *UC-NDI-0003-1 - Authenticate and Authorization*

6.5.39. Verify Credentials of Nomadic Device

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 05/07/2005 15:32:49. Modified on 22/11/2005 16:01:56. Author: Erwin Vermassen

The TCU needs to Verify the credentials of the Nomadic Device. This is a rather implementation depending issue. I suggest to provide an abstract architecture for this collaboration and rather specify the authentication algorithm itself.

Connections

- Realize link to use case *UC-NDI-0003-1 - Authenticate and Authorization*

6.5.40. Verify Remote Service View availability (Embedded)

Type: *public* **Collaboration**

Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 13/07/2005 14:52:42. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

Connections

- Realize link to use case *UC-NDI-0003-5 - Service Provisioning*

6.5.41. Verify Remote Service View availability (Nomadic)

Type: *public* **Collaboration**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 13/07/2005 14:02:52. Modified on 13/07/2005 14:58:52. Author: Erwin Vermassen

Before allowing the user to consume a selected service from the remote side, the Nomadic device needs to verify if a Service View exists which matches the remote Service Model.

Connections

- Realize link to use case *UC-NDI-0003-5 - Service Provisioning*

6.5.42. UC-NDI-0003-1 - Authenticate and Authorization

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 05/07/2005 14:46:54. Modified on 22/11/2005 16:18:29. Author: Erwin Vermassen

Authentication of the nomadic device and embedded system and activation of the authorized Services. We might try to run this phase in a parallel processing thread.

The two described scenarios are rather identical. Activation of the authorized services makes these services "connectable" by service clients running on the embedded device. In general a service contains two main parts:
- The Service View or also data producer.
- The Service Model or data handler.

I still need to find a better description for the Service parts

Connections

- Association link from actor *Nomadic Device <Use Case Model>*
- Association link from actor *TCU (embedded device) <Use Case Model>*
- Realize link from collaboration *Nomadic Device Submit Credentials*
- Realize link from collaboration *Verify Credentials of Embedded Device*
- Realize link from collaboration *Activate Authorised Services on Nomadic Device*
- Realize link from collaboration *Activate Authorized Services on Embedded Device*
- Realize link from collaboration *Verify Credentials of Nomadic Device*
- Realize link from collaboration *Embedded Device Submit Credentials*

Scenarios

Embedded Device Authentication {Basic Path}.
1. Connect to Physical Interface of Nomadic Device.
2. Send credentials to FEP of Nomadic Device.
3. FEP calls on Authentication and Authorization component to validate credentials.
4. Nomadic Device sends back an acknowledgment or access denial message to embedded device.

Nomadic Device Authentication {Basic Path}.
1. The Nomadic Device sends credentials to the Embedded FEP (Front end Processor)
2. The FEP calls on the Authentication and Authorization component and verifies the credentials.
3. The FEP sends back an acknowledgement or access denial message to nomadic device.

6.5.43. UC-NDI-0003-2 - Nomadic Gateway Initialization

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 03/07/2005 12:56:31. Modified on 22/11/2005 16:18:42. Author: Erwin Vermassen

This scenario explains what happens when the Nomadic Gateway is initiated.

6.5.44. UC-NDI-0003-3 - Service Consumption

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 05/07/2005 15:02:35. Modified on 22/11/2005 16:18:56. Author: Erwin Vermassen

What's a Service in the context of the integration of Nomadic Devices.
The distinction between the Service View and Service Model is rather arbitrary. In many cases the Service View will not be restricted to the mere rendering of received information but rather produce the information to be handled by the Service Model. Here are a few examples:
1. The Service Client receives Safety and Traffic messages via SMS and forwards this information to the handling Service Model. The Service Model makes this information available to the navigation system or renders this information in a safe way.
2. The Service View streams MP3 files to the Service Model which transfers these files to the in-car audio system.
3. Video communication, the Service View forwards the video stream to the Service Model which forwards this data to the in-car video player.

Internal Requirements

- Displaying information during driving should be done in a safe way. (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium)

Connections

- Association link from actor *Nomadic Device <Use Case Model>*
- Association link from actor *TCU (embedded device) <Use Case Model>*
- Realize link from collaboration *Dispatch list of Available Services*
- Realize link from collaboration *Handle Nomadic Device Data*

- Realize link from collaboration *Connect to a Service provided by the Embedded Device*
- Realize link from collaboration *Nomadic Service Browser*

Scenarios

Service not available and not downloadable {Alternate}.
1. User initiates Service Browser.
2. Get authorized Service list from FEP.
3. Returns list of authorized Service (models).
4. Show list of Services.
5. Activate a Service Exception.
6. Check for downloadable Service View.
7 Service View not available - Error message to the end-user.

Service View available on Nomadic Device {Basic Path}.
1. User initiates Service Browser.
2. Get authorized Service list from FEP.
3. Returns list of authorized services (= Activated Service models).
4. Show list of Services.
5. Activate a Service.
6. Consume a Service over a Stream Connect.

Service View not available but downloadable {Alternate}.
1. User initiates Service Browser.
2. Get authorized Service list from FEP.
3. Returns list of authorized Service (models).
4. Show list of Services.
5. Activate a Service - > Exception.
6. Check for downloadable Service View.
7. Download Service View.

6.5.45. UC-NDI-0003-4 - On eCall

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 05/07/2005 15:02:00. Modified on 22/11/2005 16:19:12. Author: Erwin Vermassen

If the eCall discovery described by the initiate eCall Use Case succeeds the eCall system client running on the embedded system is listening to triggers from the eCall service running on the embedded system.

Connections

- Association link from actor *Vehicle <Use Case Model>*
- Realize link from collaboration *Send eCall vehicle trigger to Nomadic*
- Realize link from collaboration *Create and Send Minimal Set of Date (MSD) to a PSAP*

Scenarios

On eCall, basic scenario {Basic Path}.
1. eCall trigger forwarded to the Nomadic Device.
2. Transmit MSD to PSAP.

6.5.46. UC-NDI-0003-5 - Service Provisioning

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 13/07/2005 14:05:49. Modified on 22/11/2005 16:19:27. Author: Erwin Vermassen

In those cases where the Service View is not available, the Service Browser might decide to poll the remote side for the availability of such a Service View. This Use Case has a big resemblance to the provisioning Use Case of the Deployment and Provisioning work item.

Connections

- Realize link from collaboration *Verify Remote Service View availability (Nomadic).*
- Realize link from collaboration *Service View Download and Activate.*
- Realize link from collaboration *Verify Remote Service View availability (Embedded).*

6.5.47. UC-NDI-0003-6 - Vehicle Status Change

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 10/07/2005 22:21:45. Modified on 22/11/2005 16:19:42. Author: Erwin Vermassen

The Vehicle status service SHOULD be implemented on a GST compliant device. This is primordial because the device should have a means to react to driving conditions. For instance, no fancy MP3 graphics or video playing while driving. No access to E-Mail or locking the keyboard while driving etc.
As a minimum the Vehicle Status service should provide on a timely basis:
- Speed of the vehicle
- GPS position of the vehicle

Connections

- Association link from actor *Vehicle <Use Case Model>*
- Realize link from collaboration *Send Vehicle Status Change Event to Service*
- Realize link from collaboration *Modify Nomadic Device Operation*

6.5.48. UC-NDI-0003-7 - Vehicle Status Service Discovery and initialization

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialization and Service Consumption
Details: Created on 05/07/2005 15:02:00. Modified on 22/11/2005 16:19:56. Author: Erwin Vermassen

The Vehicle status service SHOULD be implemented on any NDF compliant device. This is primordial because the device should have a means to react to driving conditions. For instance, no fancy MP3 graphics or video playing while driving. No access to E-Mail or locking the keyboard while driving, etc.
If the Vehicle Status is not available on a Nomadic Device the discovery process should be aborted and the FEP should be brought back to the initial stage.

Internal Requirements

- The TCU should as a minimum provide information about the state of the car (running/not running) by means of the Service "server" running on the Nomadic Device. (*Type:* ; *Status:* Proposed; *Difficulty:* Medium; *Priority:* Medium)
  Perhaps there are other ways to determine whether the car is moving. But we should assume that the Nomadic Device has not always a navigation system on board or any other means to detect movement.

Connections

- Association link from actor *TCU (embedded device) <Use Case Model>*
- Association link from actor *Nomadic Device <Use Case Model>*
- Realize link from collaboration *Trigger Vehicle Status Discovery*
- Realize link from collaboration *Respond to Vehicle Status Discovery*

Scenarios

On eCall, basic scenario {Basic Path}.
1. eCall trigger forwarded to the Nomadic Device.
2. Transmit MSD to PSAP.

6.5.49. UC-NDI-0003-8 - eCall discovery and initialization

Type: *public* **UseCase**
Status: Proposed. Version 1.0. Phase 1.0.
Package: UC-NDI-0003 - Initialisation and Service Consumption
Details: Created on 05/07/2005 14:59:30. Modified on 22/11/2005 16:20:12. Author: Erwin Vermassen

Once the connection between nomadic device and embedded system is established, the embedded system initiates the eCall discovery on the Nomadic Device. In other words, the embedded FEP tries to connect to the eCall service model activated on the nomadic device.

This Use Case will only happen if the embedded system has been authenticated by the nomadic system and the eCall service model has been activated by the nomadic device.

Connections

- Association link from actor *TCU (embedded device) <Use Case Model>*
- Association link from actor *Nomadic Device <Use Case Model>*
- Realize link from collaboration *Trigger eCall discovery*
- Realize link from collaboration *Activate eCall listener*
- Realize link from collaboration *Respond to eCall discovery*

Scenarios

Initiate eCall, eCall service model not activated {Failure}.
1. (Embedded device authenticated by Nomadic Device).
2. Trigger eCall Discovery on Nomadic Device.
3. Discovery fails.
4. abort eCall discovery (do not annunciate eCall to the end user).

Initiate eCall, Embedded system not authenticated {Failure}.
1. Embedded System authentication not accepted by Nomadic Device.
2. Don't trigger eCall discovery.

Initiate eCall, successful discovery {Basic Path}.
1. Trigger eCall discovery on Nomadic Device.
2. Discover eCall on Nomadic Device.

3. Confirm eCall available by Nomadic Device.
4. Connect to eCall service model.
5. Embedded system listen to eCall trigger.