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SIXTH FRAMEWORK PROGRAMME

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Executive Summary

The COMeSafety Specific Support Action has in its key objectives the creation of direct communication channels between the results produced by the European projects that are working on the design and development of cooperative systems for road safety and traffic efficiency based on vehicle to vehicle (V2V) and on vehicle to infrastructure (V2I) communication and the related standardisation bodies.

This role is conceived to enable solutions where on the one hand the standardisation bodies will benefit from the availability of relevant project activities and outcomes and on the other hand running projects will benefit from the possibility to directly communicate to the standardisation bodies.

Standardisation bodies currently addressed by the COMeSafety Specific Support Action are: ISO, CEN, ETSI and IEEE. The COMeSafety consortium has nominated specific COMeSafety liaison managers that have the task to address and to report to COMeSafety about the liaison established with the related working groups. As a platform for collection of standardization requirements for V2V and V2I the European project COMeSafety was also supporting the eSafety Forum WG Communication. Additionally COMeSafety is also activating a number of links between relevant running European projects and related initiatives in Europe (e.g. the Car to Car Communication Consortium, C2C-CC) and in the USA (e.g. Vehicle Safety Communication, VSC) as well as in Japan (e.g. Advanced Safety Vehicle, ASV).

1 Introduction

This deliverable is to be considered as an evolution of the deliverable D11 as it reports the status of running liaisons among COMeSafety and their related standardisation bodies.

A very crucial topic on which Europe joint its efforts is the realisation of a common European architecture for vehicle to vehicle and for vehicle to infrastructure communication. In this task COMeSafety is heavily involved in direct cooperation with the projects that are working on cooperative systems for road safety and traffic efficiency like SAFESPOT, CVIS or COOPERS. Additionally the availability of appropriate frequency spectrum with effective protection for safety related cooperative applications is of the highest importance. In USA a specific frequency band has been allocated by the Federal Communications Commission for vehicle to vehicle and for vehicle to infrastructure communication, while in Europe the design and development of communication based systems and applications have been started without the allocation of a frequency band. Today in Europe this problem is in its final phases to be solved.

It is for these motivations that the COMeSafety Specific Support Action has the task to establish the link between the OEMs (members of the C2C-CC), the other stakeholders, the European Commission, the eSafety Forum Working Group on Communications and the Standardisation bodies in order

- to promote the allocation of an appropriate frequency band,
- to support the running projects in their design of a common communication architecture and
- to bring to the standardisation bodies all the inputs from the running projects related to the communication system parameters, the distribution of data and priority management for messages for an efficient use of the radio resources.

The aim of the actions towards the different standardisation bodies is therefore to facilitate and support the cooperation of the C2C-CC and the running European projects on cooperative systems for safety and mobility with the standardisation bodies.

Available project results will be consolidated and prepared for the standardization and implementation process. This way they can be directly translated into technical decisions and standardization proposals. By feeding those proposals to open standardization groups and other relevant public bodies, they can be exploited by all European stakeholders. With the help of COMeSafety and its liaisons maintained, these proposals are submitted to the relevant standardization bodies. This includes the collaboration in the writing of ETSI standard documents related to the frequency assignment process and the communication system fulfilling formal and procedural requirements of the respective standardization bodies.

The work of relevant standardisation bodies is constantly monitored and is also included to the COMeSafety newsletters that are distributed to the user forum every six months.

Main actions from the COMeSafety Specific Support Action include:

- the cooperation in writing the ETSI standard documents related to the frequency assignment process and the communication system fulfilling formal and procedural requirements of the respective standardization bodies,
- feeding inputs to the ISO TC204 Transport Information and Control Systems in order to harmonize the European vehicle to vehicle and vehicle to infrastructure communication in a generic communication architecture.
- Development and maintenance of a common architecture document which is proposed to be the basis for all standardisation activities.

2 Standardisation process

When COMeSafety started in 2006, many European projects and activities were planned or already on their way dealing with different aspects of vehicle to vehicle and vehicle to infrastructure communication and cooperative systems. A European-wide process was missing to consolidate the results and to support the projects to introduce these results into the European-wide and world-wide standardisation process.

Rudy Mietzner (Cirquent), Timo Kosch (BMW Research and Technology), and Dieter Seeberger (Daimler) proposed a new consolidation process as one of the main guiding principles of COMeSafety (see Figure 2.1 below). The basic idea was to collect the requirements of the projects under consideration. These requirements needed to be consolidated. The results of the consolidation would provide a basis for the European-wide and world-wide standardisation and the frequency allocation process.

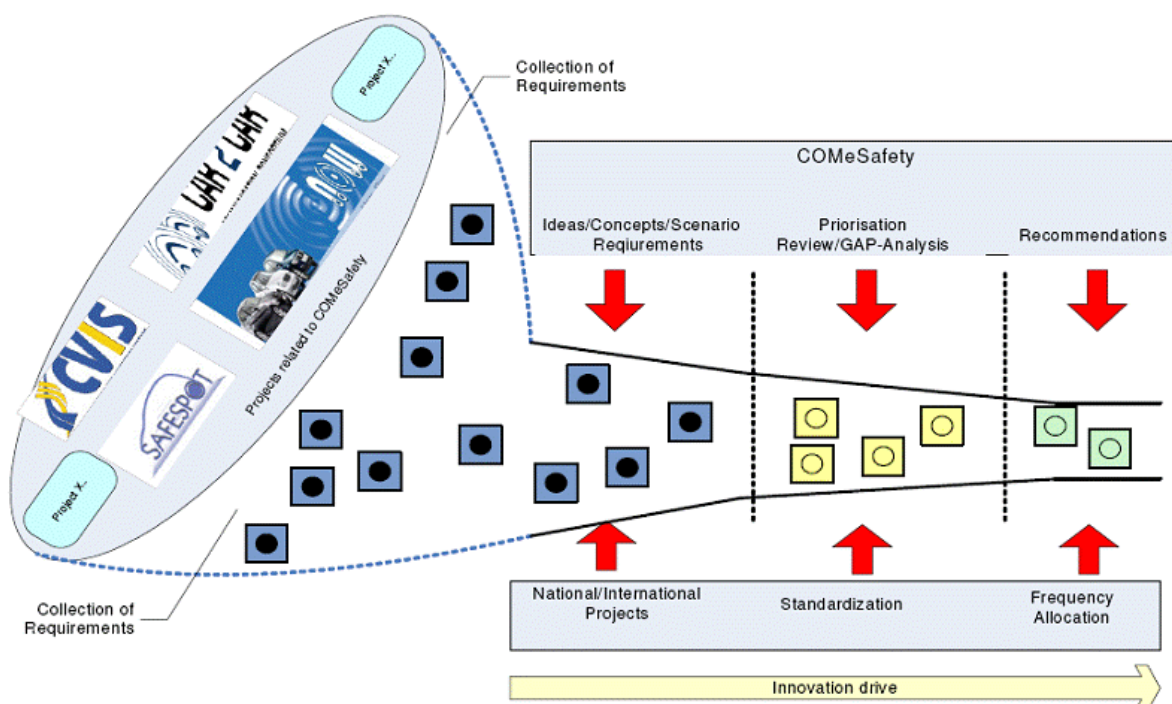


Figure 2.1: Aim of COMeSafety: New Consolidation Process

Now, two years later, the process is alive. COMeSafety is chairing an architecture task force that is both collecting and consolidating the requirements and defining an architectural framework. The three currently running big integrated projects dealing with cooperative systems, CVIS, COOPERS and SAFESPOT are all actively par-

ticipating in this work. Furthermore, members of these projects are also active in the C2C-CC, which provides industry-wide platform to develop and agree on the technical details and forward them to European standardisation in ETSI.

Figure 2.2 shows the connection between projects and standardisation. The process is a sequence of collaboration, consolidation and harmonisation into standardisation, which is fostered by the support of COMeSafety (see Figure 2.3).

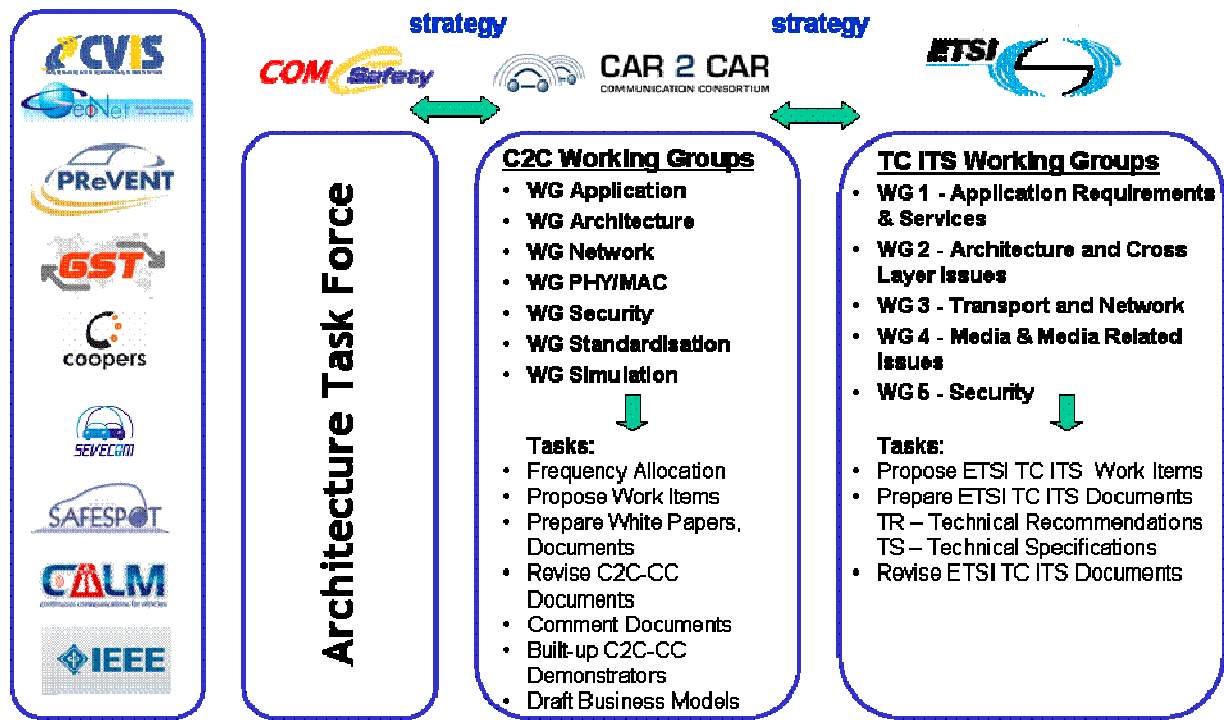


Figure 2.2: New Process: Actors and Tasks

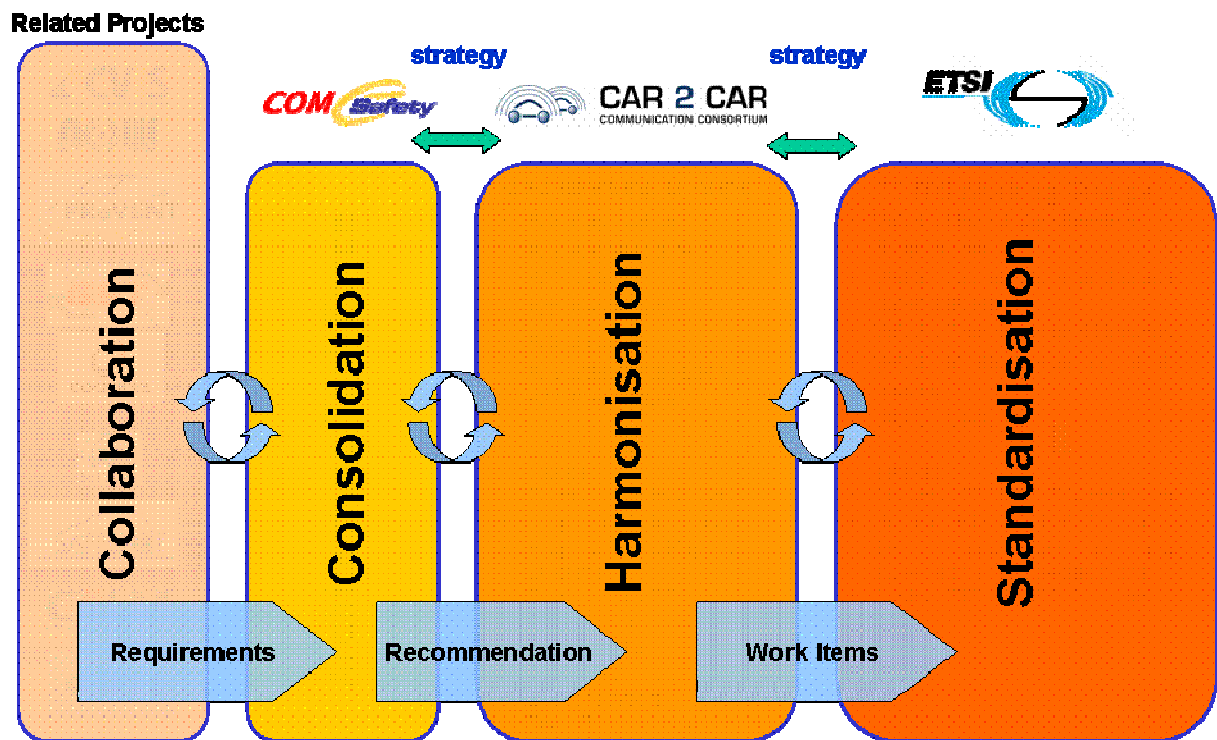


Figure 2.3: COMeSafety Process for Collaboration, Consolidation, Harmonisation and Standardisation

A key problem is finding the way of getting the best progress. For solving that problem a so called group of experts is established to coordinate all activities in a qualified way. Triggered by COMeSafety activities, the main tasks of the group of experts are amongst others

- the dialogue to the C2C-CC,
- the contact to the European-wide and world-wide standardisation bodies and
- the compensation of specifications and requirements between the involved European projects.

The group of experts can be seen as an information exchange and control centre between the involved European projects and standardisation bodies on the one side and the COMeSafety and C2C-CC on the other side. For example, the group of experts is also active in the COMeSafety Architecture Task Force. Figure 2.4 illustrates the role of the group of experts.

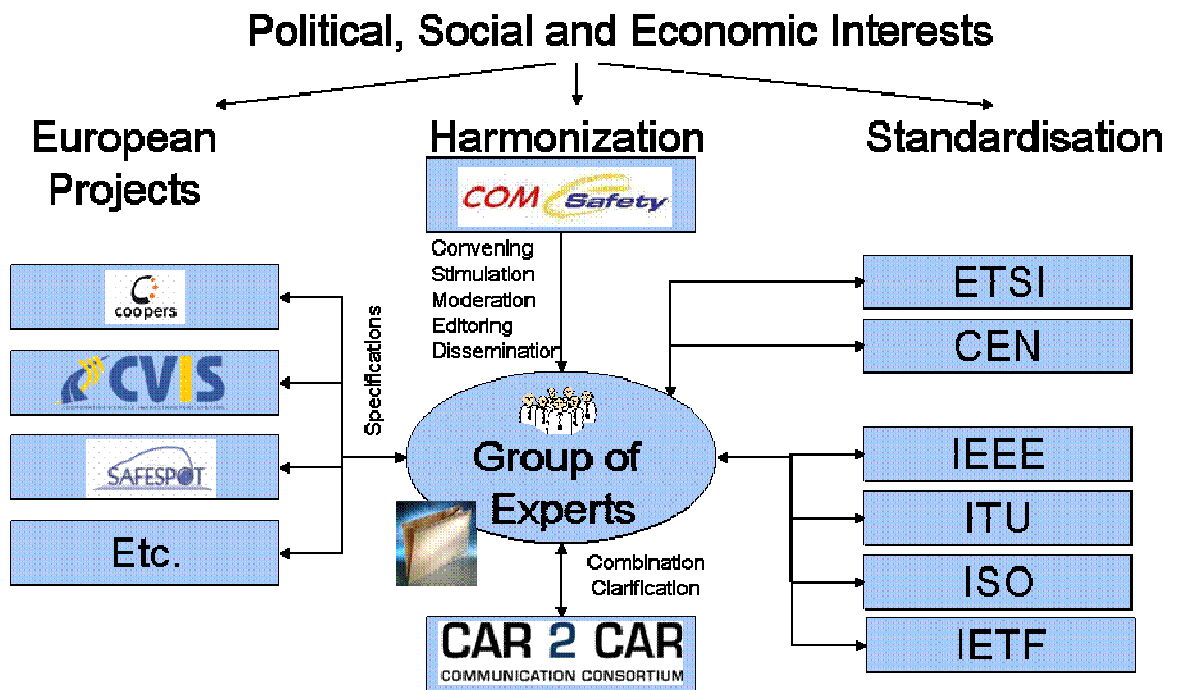


Figure 2.4: Role of the Group of Experts

In addition, COMeSafety itself has named so-called liaison managers for the five working groups in ETSI as well as for ISO CALM and IEEE 802.11p, 1609.2 and 1609.4. Ideally, the liaison managers themselves are part of the group of experts or have at least close contact to the group of experts. Figure 2.5 shows the assignment of the COMeSafety liaison managers. A guideline has been developed to define the work of the liaison managers.

ETSI ITS WG1:	RENAULT	IEEE 802.11p:	still in discussion
ETSI ITS WG2:	BMW Group Forschung und Technik	IEEE 1609.2:	BMW Group Forschung und Technik
ETSI ITS WG3:	DAIMLER	IEEE 1609.4:	DAIMLER
ETSI ITS WG4:			
ETSI ITS WG5:		ISO CALM:	CENTRO RICERCHE FIAT

Figure 2.5: Liaison Managers of COMeSafety

3 Liaisons to standardisation bodies

3.1 *Liaison Managers*

COMeSafety consolidated results and interests should contractually be submitted to the European-wide and world-wide standardization bodies. Especially the European frequency allocation process should be actively supported by participating in ETSI and CEPT technical groups. Relevant ISO, IEEE and IETF work should also be supported. To this aim the COMeSafety Support Action has established a team of liaison managers that are becoming active in this third year of COMeSafety activities as relevant outcomes and main topics of discussions are now becoming available.

COMeSafety liaison managers have been nominated as follows:

- ETSI WG1: Gerard.Segarra@renault.com
- ETSI WG2: Markus.Strassberger@bmw.de
- ETSI WG3: Dieter.Seeberger@daimler.com
- ETSI WG4: Andreas.Lübke@volkswagen.de
- ETSI WG5: Ingrid.Paulus@audi.de
- IEEE 802.11p: to be appointed
- IEEE 1609.2: Alexander.Busch@bmw.de
- IEEE 1609.4: Dieter.Seeberger@daimler.com
- ISO CALM: Danilo.Galgani@crf.it

Indications have been given to liaison managers, on how to proceed to fruitfully establish the contact and the information exchange with the different relevant entities and related working groups.

Main indications to liaison managers can be found in the following list:

1. Find out and share with COMeSafety the calendars of meeting of the different WGs where you are involved in: the meeting calendar has to be forwarded to the attention of Ilse.Kulp@bmw.de.
2. Reports at least every 3 months what is discussed and/or decided in the different WGs that is related to the different COMeSafety activities. Reporting on the different discussion can be done using this document as a base line and forward the updated document to Ilse.Kulp@bmw.de.
3. Participation of liaison managers to different working group meetings is not mandatory (especially to those meetings that

- are held outside Europe) but is recommended in Europe, however a direct link with the WG leader is recommended to propose him/her the relevant items of discussions.
4. In any case the task of liaison managers is to share with the WGs leaders the updated version of the COMeSafety document on the common architecture and/or point out in WG meetings all consistencies and inconsistencies of the activities of the WG with the common architecture under definition within the activity of the COMeSafety Support Action.
 5. The liaison managers have to be involved in periodic discussions (e.g. three monthly conference calls or meetings) with the COMeSafety consortium to support specific re-alignment of the COMeSafety common architecture document.

3.2 ETSI ITS Working Groups

ETSI collaborates with the European Conference of Postal and Telecommunications Administrations (CEPT) and the European Commission to secure the radio spectrum required for Intelligent Transport Systems. In 2007, ETSI has established a new Technical Committee on Intelligent Transport Systems (TC ITS).

Currently, there are in ETSI the following projects related to automotive ITS:

- Dedicated Short-Range Communications (DSRC) provide communications between vehicle and roadside infrastructure at specific locations (for example toll plazas). Applications such as Electronic Fee Collection (EFC) operate over DSRC.
- Wireless Communication Systems dedicated to Intelligent Transport Systems and Road Transport and Traffic Telematics will provide network connectivity to vehicles and interconnect them. Using radio bands requires adequate harmonized standards which are under development for the 5 GHz and 63 GHz bands.

These technological projects form part of wider initiatives on matters such as road safety (for example the European Commission's eSafety initiative) and road tolling.

For more information see

www.etsi.org/WebSite/Technologies/IntelligentTransportSystems.aspx

In ETSI ITS five working groups (WG) have been established to cover different aspects of ITS:

- WG1 – application requirements and services
- WG2 – architecture, cross layer and web services
- WG3 – transport, network
- WG4 – media and medium related issues
- WG5 – security

The working groups have been set up in spring 2008. COMeSafety has nominated liaison managers to these working groups. Though the ETSI ITS working groups as well as the liaison managers just have started their work, the first status reports are listed below.

One task of the liaison managers is to define work items for the specific working groups. Work Items typically describe ongoing active work in ETSI standardization supported by at least four ETSI members. Each technical committee establishes and maintains a work programme, consisting of work items. An ETSI work item is the description of a standardisation task, and normally results in a single standard, report, or similar document. The technical committee approves each work item, which is then formally adopted by the whole membership (via a web-based procedure). Collectively, the work programmes of all the technical committees constitute the ETSI Work Programme.

A technical committee usually gives responsibility for a work item to a small group of experts, led by a rapporteur. The document (standard, report etc.) resulting from the work item is referred to as an ETSI deliverable.

The working group meetings are also pronounced on the ETSI webpage (see <http://portal.etsi.org>). Agenda of the meetings will be available in due time on that ETSI server. Exceptionally, non ETSI members can be invited to meetings by the WG and TC chairmen upon request.

3.2.1 ETSI ITS WG1 – Application Requirements and Services

Terms of Reference of the Working Group

New WG1 terms of Reference have been proposed to the Technical Committee and agreed. In particular, WG1 will not only develop application requirements but will also standardize basic services supporting the applications. Two examples of basic services are:

- Co-operative Awareness basic service,
- Decentralized Environmental Notification basic service.

Moreover, WG1 will develop operational requirements and consider conformance testing and interoperability testing procedures.

Program of work and roadmap

A general program of work has been proposed to and agreed by the TC (see the proposed roadmap in Figure 3.1).

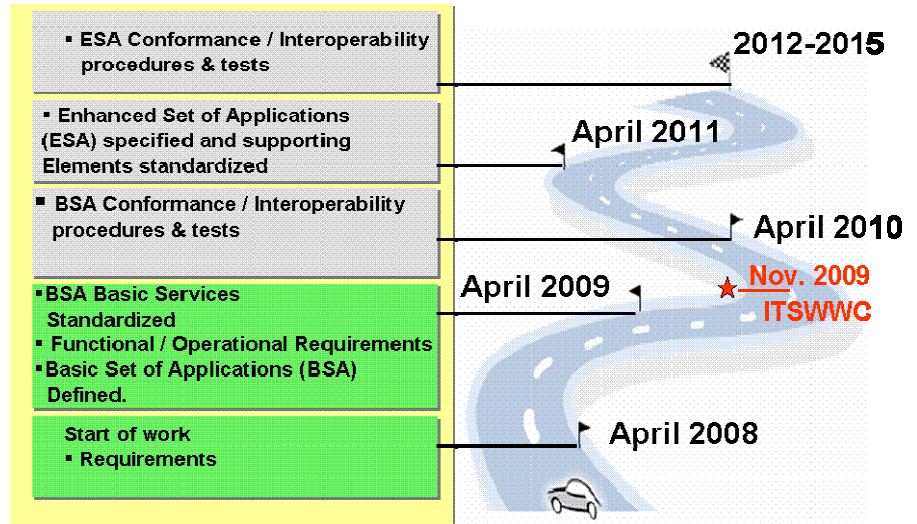


Figure 3.1: Proposed roadmap for ETSI WG1

During the two coming years (2008 – 2009), the work of WG1 has been scoped to define a Basic Set of Applications (BSA) which can be reasonably deployed around 2012 – 2013. This BSA shall be constituted of a set of applications / use cases (customers services) supporting the European Commission Societal policy (road safety, traffic management, environmental protection) while providing a viable business model to the involved private stakeholders. Then, an Enhanced Set of Applications (ESA) will be defined taking into account techno-economical progresses.

To support the short term WG1 work program, the five following items of work have been proposed and agreed by the ITS Technical Committee:

- Vehicular Communication, Basic Set of Applications – Definition (rapporteur: Renault SAS, delivery target: December 2008).
- Vehicular Communication, Basic Set of Applications – Functional Requirements (rapporteur: Hitachi Europe Ltd, delivery target: December 2008).
- Vehicular Communication, Basic Set of Applications – Specification of the Co-operative Awareness basic service (rapporteur: Daimler AG, delivery target: April 2009).

- Vehicular Communication, Basic Set of Applications – Specification of the Decentralized Environmental Notification basic service (rapporteur: Hitachi Europe Ltd, delivery target: April 2009)
- Vehicular Communication, Basic Set of Applications – Operational Requirements (rapporteur: Renault SAS, delivery target: April 2009).

Liaisons

Some important liaisons have been identified by WG1 and proposed to the Technical Committee. The following table summarizes the liaisons which have to be consolidated with the appointed contact points.

ORGANIZATION/ PROJECT	CONTACT POINTS
CVIS Project	RENAULT SAS
SAFESPOT Project	DAIMLER AG
COOPERS Project	Austria Tech
COMeSafety Support Action	DAIMLER AG
C2C-CC Application Working Group	HITACHI Europe Ltd
ISO TC 204	Bob Williams
CEN TC 278 WG15	RENAULT SAS
TISA	CONTINENTAL
GEONET Project	INRIA

Next meetings

The next three WG1 meeting are planned the:

- 04th of July in ETSI (Sophia Antipolis)
- 15th of October in ETSI
- 16th of January in ETSI

3.2.2 ETSI ITS WG2 – Architecture, Cross Layer and Web Services

At the moment, WG2 has started to define a reference architecture. In addition there is still legacy work inherited from ETSI ERM TG37.

Since the start of the TC ITS the following meetings of the ETSI WG2 took place:

1. 2008-02-27 in Mainz, 11 participants: during this meeting Mr. Knut Evensen from Q-Free was elected as chairman of the group. Hans-Dieter Fischer from ESF is vice-chairman.
2. 2008-04-08 in Sophia Antipolis, 16 participants
3. 2008-07-02 in Sophia Antipolis, 16 participants

Currently 12 work items exist, however some of them are from 2006 or earlier and might not be treated further on. Important and new work items are:

- Protocol conformance testing for the Service Access Points of a communication interface (CI) as provided by the Communication Adaptation Layer (CAL) for communication, and as provided by the CI Management Adaptation Entity (CMAE) for management of the communication interface as outlined in ISO 21218; rapporteur is Dr. Hans-Joachim Fischer from ESF
- Protocol conformance testing for the air interface manager that is part of the CALM management and that serves CALM communication interfaces via the M-SAP as outlined in ISO 24102.; rapporteur is Dr. Hans-Joachim Fischer from ESF.
- Definition of ITS Communications Architecture for Europe including the following views: Scenario description; Functional View and Information View; OSI reference model view including Application View, Security View, Network&Transport View, Interface View, Management view; Engineering view to support Implementation Guidelines for Interoperability; Enterprise/Organizational/Operational view.; rapporteur is Dr. Hans-Joachim Fischer from ESF.

The WG continued with the initial architecture figures from the last WG2 meeting. This is based on the input from the COMeSafety Architecture taskforce, and is now agreed in all working groups apart from WG5 Safety that did not meet this week. The architecture was discussed in detail and refined according to Figure 3.2.

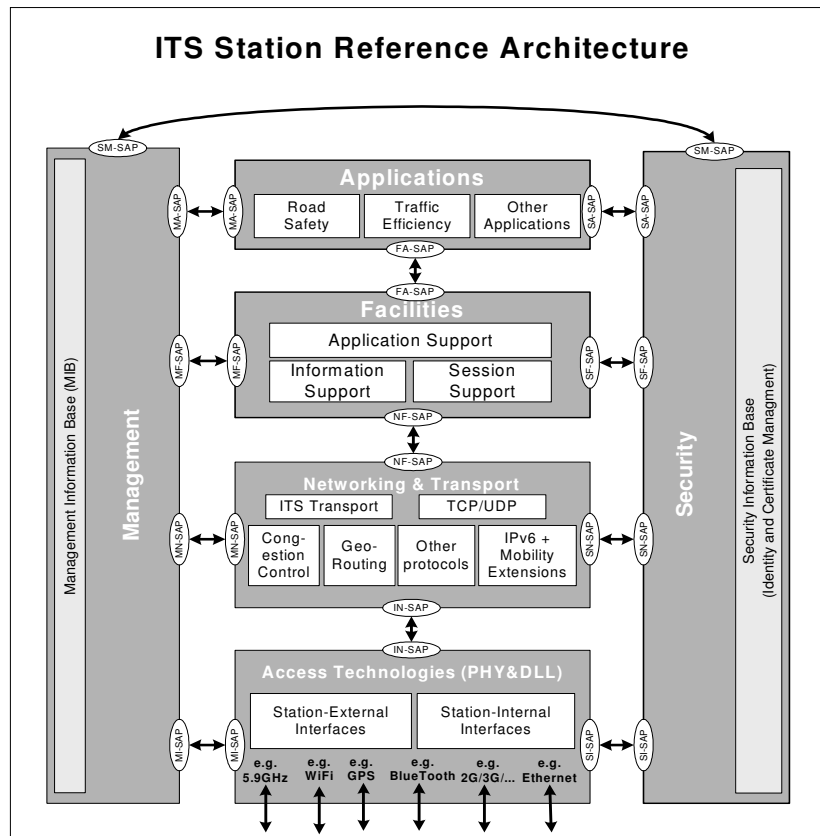


Figure 3.2: Reference Architecture

It is recommended to replace all instances in the COMeSafety Architecture draft with this new drawing since from a WG 2 point of view it reflects the best level of agreement across European actors at this time. The drawing will also be input to VII, CALM, C2C-CC and various other actors with the purpose of suggesting a common architecture.

However, the architecture is not completed yet and, if possible, the discussion should be continued at the next day's WG2 meeting.

In addition, the liaison with the IETF MEXT (Mobility EXTensions) working group was presented. MEXT works on mobility extensions for base IPv6 that can be important for future work within ITS group.

It has been considered to establish a new work item on lightweight transport protocols. A proposal for a new work item on this subject will be presented at the next meeting.

Further, a liaison with the WG ETSI ISO TC 204 WG16 on working group level has been established. However, a volunteer for the officer is needed. Mr. Fischer (ESF) volunteers but a person from C2C-C Consortium side is recommended.

The next WG2 meeting is planned for:

- 15th of October at ETSI (Sophia Antipolis)

3.2.3 ETSI ITS WG3 – Transport and Network

Terms of Reference of the Working Group

The ETSI TC ITS WG Transport and Network will develop ETSI deliverables for the data transport and network protocol layers and management of these layers.

In particular this includes:

- Development of a network layer which covers existing and future wireless and wired technologies and various application services for any kind of ITS users, including vehicle drivers and passengers, railway users, pedestrians, bicyclists and other;
- Harmonization of the network layer with the overall ITS system and protocol architecture;
- Development of novel networking protocols for ITS, such as ad hoc and multi-hop routing protocols, reliable transport protocols over multi-hop routing, and others;
- Integration of dedicated ITS network protocols and transport protocols with the Internet protocol suite and IP mobility extensions;
- Work out solutions for internetworking between access networks;
- Ensuring that the networking and data transport protocols and algorithms
 - Are efficient, scalable and reliable
 - Protect the user's privacy and ensure security

Program of work and roadmap

The WG's current work is defined by the Work Items, which are listed below together with some status information:

DTS/ITS-0030002 Intelligent Transport System (ITS); Vehicular Communications; Requirements for GeoNetworking and Data Transport Protocol

- First draft is available as a consolidated list of requirements. A stable draft is expected in October 2008.

DTS/ITS-0030003 Intelligent Transport System (ITS); Vehicular Communications; Scenarios for GeoNetworking

- First draft is available as a consolidated list of scenarios. A stable draft is expected in October 2008.

DTS/ITS-0030004 Intelligent Transport System (ITS); T Vehicular Communications; Network architecture

- No draft available yet. A stable draft is expected in October 2008. It is expected that the deliverable will be revised after

October 2008 in order to be harmonized with the overall ITS communication architecture.

DTS/ITS-0030001 Intelligent Transport System (ITS); Vehicular Communications; Geographical addressing and forwarding for point-to-point and point-to-multipoint communication – media independent functionalities

- No draft available yet. A stable draft is expected in October 2009.

DTS/ITS-0030007 Intelligent Transport System (ITS); Vehicular Communications; Geographical addressing and forwarding for point-to-point and point-to-multipoint communication – media dependent functionalities for 5GHz media (5.9 GHz)

- No draft available yet. A stable draft is expected in October 2009.

DTS/ITS-0030006 Intelligent Transport System (ITS); Vehicular Communications; Basic Transport Protocol for GeoNetworking

- No draft available yet. A stable draft is expected in October 2009.

DTS/ITS-0030005 Intelligent Transport System (ITS); Vehicular Communications; Integration of IPv6 and GeoNetworking

- No draft available yet. A stable draft is expected in October 2009.

It is expected that WG3 will work on following aspects at a later stage:

- GeoNetworking - Media dependent functionality 2.4GHz medium and 5GHz media (5.4GHz) and other media (for example IR and 63GHz)
- More advanced transport layer protocols
- IP mobility extensions for ITS (Mobile IPv6, NEMO, MONAMI6)
- Interoperation of IP version 4 and 6
- Network management

Next meetings

The two next WG3 meeting are planned the:

- 3rd of July in ETSI (Sophia Antipolis)
- one day in the week from 13th to 17th of October in ETSI

3.2.4 ETSI ITS WG4 – Media and Medium Related Issues

Since start of the TC ITS the following meetings of the ETSI WG4 took part:

1. 2008-02-28 in Mainz, 20 participants: during this meeting Mr. Thomas Weber from Bundesnetzagentur was elected as chairman of the group. Hans-Dieter Fischer from ESF is vice-chairman.
2. 2008-04-07 in Sophia Antipolis, 16 participants

In addition there was a meeting on DRSC Drafting, 2008-04-8 in Sophia Antipolis with five participants. The next meeting #3 is scheduled for 2008-07-01 in Sophia Antipolis.

Currently 15 work items exist, however some of them are from 2006 or earlier and might not be treated further on. Important and new work items are:

- Mitigation techniques to avoid interference between European CEN Dedicated Short Range Communication (RTTT DSRC) equipment and Intelligent Transport Systems (ITS) operating in the 5 GHz frequency range; rapporteur is Mr. Smely from Kapsch.
- Transmitter Power Control Mechanism for Intelligent Transport Systems operating in the 5 GHz range; rapporteur is Dr. Brakemeier from Daimler
- European profile standard for the physical and medium access control layer of Intelligent Transport Systems operating in the 5 GHz frequency band; rapporteur is Dr. Fischer from ESF.

It is planned to establish a close relationship between the ETSI TC ITS WG 4 and the working group Phy/Mac of the C2C-CC. The working group Phy/Mac is willing to give technical input to all items related to communication in the 5.9 GHz bands.

3.2.5 ETSI ITS WG5 – Security

Terms of Reference of the Working Group

Topics addressed in the ETSI WG5 are:

- Threat, vulnerability and risk analysis
- Objectives and functional requirements for security
- Security architecture and security mechanisms and architecture instantiation concerning use of 5GHz technology

Program of work and roadmap

The objectives of the WG5 are:

- Conducting studies leading to deliverables on Security;
- Assuring ITS solutions conform to regulatory requirements for privacy, data protection, lawful interception and data retention;
- Management and co-ordination of the development of security specifications for ITS communication and data;
- Investigation of security services and mechanisms required for providing ITS services over the Internet;
- Development of security analyses of candidate protocols and network elements to be used within the ITS framework to implement capabilities e.g., EMTEL aspects, IPv6 migration, keying strategies and methods;
- Tracking ongoing world-wide security activities of interest to ITS (notably in ISO TC204)

Based on these objectives, a program of work and a roadmap are still under construction. More details of work and roadmap of WG5 will be elaborated in the next meeting in September.

Work Items

Work Items typically describe ongoing active work in ETSI standardization supported by at least 4 ETSI members. Current work items within WG5 of ETSI are

1. Three work items focused on RFID (passive, active and battery assisted systems), supported by CSI (UK) Ltd; Q-Free; Band Sharing Forum; ESF
2. One work item focused on developing solutions for V2V and V2X (called "5GHz"), supported by Daimler AG. Fraunhofer FOKUS. NEC. Renault. Hitachi. DLR. Renesas. C3L. EFKON AG

Next meetings

The next WG5 meeting is planned the:

- 15th of September in ETSI (Sophia Antipolis)

3.3 ISO CALM

3.3.1 Introduction

Communication Architecture for Land Mobile (CALM) is an architecture providing continuous communications between a vehicle and the roadside using a variety of communication media, including cellular, 5 GHz, 63 GHz and infra-red links as illustrated in Figure 3.3 below. CALM will provide a range of applications, including vehicle

safety and information, as well as entertainment for driver and passengers. The CALM architecture includes both internet-based (IPv6) and non-internet types of applications.

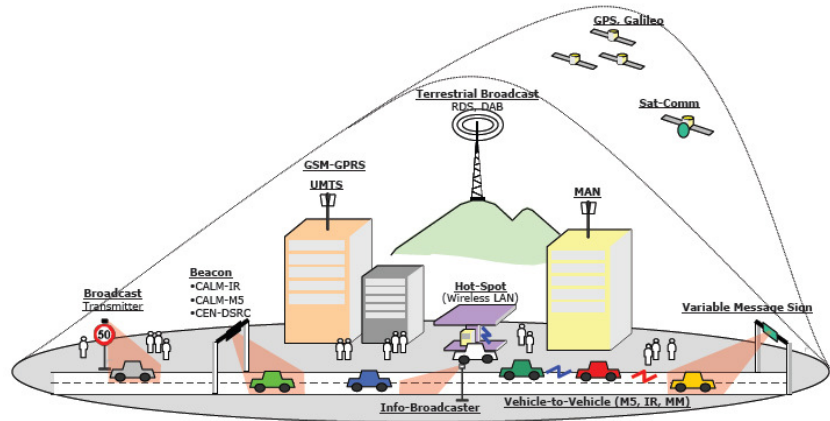


Figure 3.3: CALM environment

Some of the basic ideas are:

- seamless communication (cooperative concept)
- support of multiple media
- future proof (adaptable to latest communication technologies)
- applications are independent of communications
- support internet-based (IPv6) and non-internet types of applications

3.3.2 Architecture

An overall view of the CALM architecture is illustrated in Fig 3.3. It shows the CALM layers in relation to the OSI reference model together with the Service Access Points (SAPs).

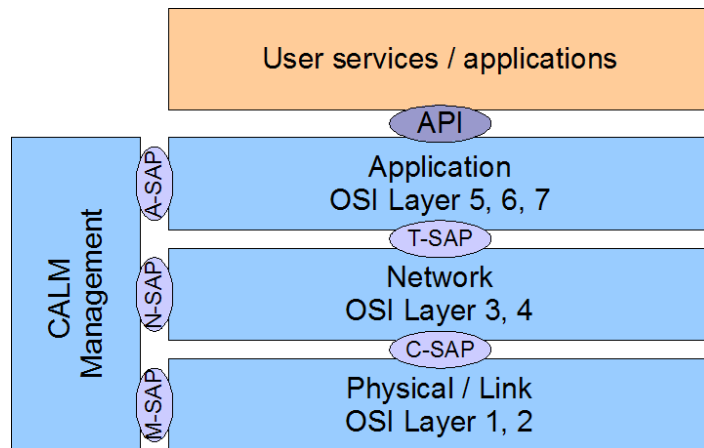


Figure 3.4: CALM layers

There are four major blocks:

1. The Application block provides a common API to applications that want to communicate using CALM. Applications could be IP-based (i.e. IPv6) or non-IP based and are ranged into categories “safety”, “non-safety” and “infotainment”. Legacy IPv6 applications can be deployed together with CALM-aware applications.
2. The Network block creates a relation between applications and communication media, isolating the upper OSI layers from the different technologies which actually perform communication. The network layer function may be performed by IPv6 or a dedicated protocol.
3. The Physical/Link block contains the different physical interfaces. It can contain several native CALM interfaces (CALM-IR, CALM-M5) or physical interfaces which have not been specifically been developed for CALM.
4. Finally the CALM management block resides outside of the communication stack and provides management functions.

3.3.3 Current work

Current work from CALM includes the following Work Items that are expected to be voted in the forthcoming period:

- NP 11915: CALM Using 802.11 – A standardized set of protocols and parameters for high speed communications in the ITS sector using WLAN Communications, including specifications for both Master/Slave and Peer to Peer Communications (Excluding IEEE802.11p/WAVE).
- CD 21215 (WG 16) – M5: Medium and long range, high speed, air interface parameters and protocols for broadcast, point-point, vehicle to vehicle, and vehicle to infrastructure

communications in the ITS Sector using microwave communications at 5.8 GHz – 5.9 GHz, including specifications for Master/Slave and Peer to Peer communications (CALM-M5 = Communications Air interfaces-Long and Medium Range – Microwave 5.8-5.9 GHz).

- DIS 21217 – Definition of the architectural framework within which the CALM network protocols and CALM communications interface definition International Standards are required to operate.
- DIS 24103 (WG16) – Media Adapted Interface Layer (MAIL): definition of a common architecture, network protocols and air interface definitions for wireless communications using cellular 2nd generation, cellular 3rd generation, mobile wireless broadband, microwaves, millimeter waves, infra-red communications and so on, with other air interfaces that may be added at a later date.
- DIS 21210 – IPv6 Networking: This document list the IPv6 protocols used at the network layer and defines how they are used in order to comply with the CALM architecture (DIS 21217).

3.4 IEEE

The IEEE Standards Association (IEEE-SA) is a leading developer of industry standards in a broad-range of industries. Globally recognized, the IEEE-SA has strategic relationships with the IEC, ISO, and the ITU and satisfies all SDO requirements set by the World Trade Organization, offering more paths to international standardization.

For the topics covered by COMeSafety the following working groups are relevant and were assigned to liaison managers:

- IEEE 802.11p
- IEEE 1609.2
- IEEE 1609.4

The IEEE 802 LAN/MAN Standards Committee develops Local Area Network standards and Metropolitan Area Network standards. The most widely used standards are for the Ethernet family, Token Ring, Wireless LAN, Wireless PAN, Wireless MAN, Bridging and Virtual Bridged LANs. An individual Working Group provides the focus for each area. The 802.11™ Working Group (WG) is responsible for developing Wireless Local Area Network (WLAN) standards under the auspices of the IEEE® Project 802 LAN/MAN Standards Committee (802 LMSC).

The IEEE 1609 Family of Standards for Wireless Access in Vehicular Environments (WAVE) completely address the lack of ho-

homogeneous communications interfaces between different automotive manufacturers, and provide a sufficient foundation regarding the organization of management functions and modes of operation of system devices to address the the lack of ubiquitous high-speed communications between vehicles and service providers. The WAVE standards define an architecture and a complementary, standardized set of services and interfaces that collectively enable secure vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) wireless communications.

Together these standards provide the foundation for a broad range of applications in the transportation environment, including vehicle safety, automated tolling, enhanced navigation, traffic management and many others. The IEEE 1609 Family of Standards for Wireless Access in Vehicular Environments (WAVE) consists of four standards, two of them are relevant to the topics covered by COMeSafety:

- IEEE P1609.2 - Standard for Wireless Access in Vehicular Environments (WAVE) - Security Services for Applications and Management Messages defines secure message formats and processing. This standard also defines the circumstances for using secure message exchanges and how those messages should be processed based upon the purpose of the exchange.
- IEEE P1609.4 - Standard for Wireless Access in Vehicular Environments (WAVE) - Multi-Channel Operations provides enhancements to the IEEE 802.11 Media Access Control (MAC) to support WAVE operations.

Since spring 2008 there is a new IEEE 1609.5 standard "Communications Manager". The purpose of this standard is to define communication management services in support of wireless connectivity among vehicle-based devices, and between fixed roadside devices and vehicle-based devices for Wireless Access in Vehicular Environments (WAVE). If COMeSafety will nominate a liaison manager for IEEE 1609.5 is not decided yet.

In the following the status reports of the liaison managers are listed.

3.4.1 IEEE 802.11p

When the US decided to establish a Dedicated Short-Range Communication (DSRC) system for the vehicular environment and to provide the necessary spectrum, the American Society for Testing and Materials (ASTM) was requested to develop the Physical Layer (PHY) and the Medium Access Control (MAC) specifications. With the goal to speed up the standardization process it was decided to take the IEEE 802.11a standard as a basis. The result is the ASTM 2213 standard for telecommunications and information exchange between roadside and vehicle systems in the 5.850-5.925 GHz band,

which is now referenced in the U.S. Federal Communications Commission's (FCC) ruling on DSRC spectrum usage rules.

In 2004 the ASTM 2213 was absorbed into the IEEE 802.11 task group p to amend the overall standard, considering the vehicular environment and to provide the WAVE (Wireless Access in Vehicular Environments) mode for the US DSRC system (i.e. 10 MHz channels, modified MAC without traditional IEEE 802.11 setup overheads).

In May 2008 the IEEE 802.11p standard, broadened to cover international usages, achieved a major milestone when it was accepted by the full IEEE 802.11 working group in a letter ballot. It is the 4th draft which passed the required 3/4 threshold with 78.61% approval rate. Still 500 comments were collected, which all are expected to be resolved in the next few months. The result will then undergo recirculation ballots as needed. The sponsor ballot will be in 2009, in order to be finalized as an amendment to the IEEE 802.11 when approval rate is substantially improved.

3.4.2 IEEE 1609.2

It describes the authentication of WAVE messages and the encryption of messages to a known recipient and also the circumstances for using secure message exchanges. But there is no support for anonymous inter-vehicular safety messages yet.

So far, there are many open points in IEEE 1609.2. It is accepting submissions and comments through November 2008.

3.4.3 IEEE 1609.4

This standard represents the upper MAC Layer to enable operation of upper layer across multiple channels, without requiring knowledge of the parameters of the PHY Layer. In the current version the regular time division channel switching scheme is probably less than optimal.

3.5 IETF

The ITS architecture under specification in Europe includes many standard building blocks specified by the IETF, at the application layer, transport layer and networking layers. IPv6 standards and security standards are particularly important. The ITS architecture may require extensions of these standards or the specification of additional protocols that would better be standardized at the IETF in order to ensure backward compatibility and interoperability with other use cases. At first, a liaison between COMeSafety and the

IETF would be useful to share information and give the opportunity to respective organizations to raise specific issues related to IETF standards that may affect the work underway in ITS organizations. Note that a liaison between TC204 WG16 and the IETF is currently under process at ISO.

4 Results of current activities: frequency allocation in CEPT

As the liaison managers have just started their work and the ETSI working groups have just been established, there are no standardisation results achieved so far.

Amongst others driven by COMeSafety activities, the frequency allocation in CEPT has been quite successful.

ITS eSafety communication systems have strong needs for protected spectrum to provide a reasonable service quality and it is beyond all questions that such a spectrum is required on a pan-European basis to allow free movement of the communicating vehicles across borders.

COMeSafety took actively part in the European frequency allocation process for spectrum for communication between vehicles and between vehicles and roadside units. The focus was on spectrum for road safety and traffic efficiency applications, which often cannot be separated.

In the first step, the European industry in ETSI developed a System Reference Document (SRDoc) to describe the requirements and basic system parameters for European-wide harmonisation of spectrum to the European Conference of Post and Telecommunications (CEPT). For safety and non-safety applications a bandwidth of 70 MHz was identified in the 5.9 GHz band. The same spectrum was already available in the US and other countries like Japan assigned spectrum already in the 5 GHz band for the same purpose. Considering the existing European spectrum allocations, the frequency band 5.875-5.925 GHz was identified for the deployment of safety related applications and the frequency band 5.855-5.875 GHz for non-safety related applications. The safety related spectrum requires low latency communication and therefore needs a predictable sharing situation and protection against interference from other services. The non-safety applications can be operated on a non-protected/non-interference basis as given in the ISM band. The proposed maximum transmission power for the whole frequency range is 33 dBm e.i.r.p. in a 10 MHz channel.

Within the CEPT extensive compatibility studies followed with the result, that within the 30 MHz of spectrum in the frequency band 5875-5905 MHz, ITS applications will not suffer from excessive interference resulting from other services/systems. However in that frequency range ITS cannot claim protection from FSS earth stations but the usage of those stations is very limited. In the remaining 20 MHz of spectrum in the range from 5.905-5.925 GHz ITS may suffer interference from the Fixed Service above 5925 MHz.

In the whole band from 5.855 – 5.925 GHz ITS is compatible with all other services providing that the unwanted emission levels are:

- less than -55 dBm/MHz below 5850 MHz in order to protect the Radiolocation Services;
- less than -65 dBm/MHz below 5815 MHz in order to protect the RTTT applications;
- less than -65 dBm/MHz above 5925 MHz in order to protect the Fixed Service.

In addition a mitigation technology like Transmitter Power Control (TPC) is requested below 5.875 GHz to avoid interference with existing Broadband Wireless Access Systems.

These results lead to the conclusion, that ITS can achieve a predictable sharing situation and protection against interference from possible new systems and applications of the Fixed and Mobile Service within the band 5875-5905 MHz.

CEPT has also studied the required spectrum bandwidth for safety related ITS applications based on realistic traffic scenarios and confirmed that 30 to 50 MHz would be needed in the 5.9 GHz band.

Based on the results of the studies the CEPT developed the ECC Decision on the harmonised use of the 5875 5925 MHz frequency band for Intelligent Transport Systems (ITS) (ECC/DEC/(08)01) that designates the sub-band 5.875-5.905 GHz to ITS road safety applications on a European basis immediately and considers the sub-band 5905-5925 MHz for future extension. It is agreed that both in-vehicle and roadside units will be subject to free circulation and use all over CEPT. On-board units will be exempted from individual licensing and even if authorisation of roadside units is technically not necessary it may be considered by administrations to ensure that different ITS operators can coexist.

Additionally the ECC Recommendation on the use of the band 5855-5875 MHz for ITS (ECC/REC (08)01) suggests the CEPT administrations to make these 20 MHz of spectrum available for non-safety ITS applications on a non-protected/non-interference basis.

Frequency designation is subject to national legislation and ECC Decisions are on a voluntary basis, but administrations have to commit themselves to its implementation and consideration in the national regulation. ECC Recommendations guide administrations to a certain use of spectrum and are less binding without commitment.

While the implementation of CEPT regulations is voluntary for its 48 members, a frequency decision developed in the EU regulatory framework is binding for the 27 EU member states. Because ITS for road safety have a strong political importance in Europe the European Commission (EC) mandated the CEPT to provide technical information about the spectrum requirements and compatibility issues. Based on this information the **Radio Spectrum Committee of the EC developed the Commission Decision on the harmonised use of radio spectrum in the 5875 - 5905 MHz frequency band for safety related applications of Intelligent Transport Systems**

(ITS), which is in the meantime finally approved and expected to be published soon. By this EC Decision EU member states are forced to designate the considered 30 MHz of spectrum not later than six months after entry into force of this decision and as soon as reasonably practicable following such designation, to make that frequency band available on a non-exclusive basis. The CEPT and as well the EC limited the maximum transmission power of ITS in the whole band from 5.855 – 5.925 to 23 dBm/MHz e.i.r.p, but absolutely not more than 33 dBm e.i.r.p..

5 Further Steps

As the liaison managers have just been established, COMeSafety expects more and better information exchange between COMeSafety and the standardisation bodies for the future. The process for consolidation and standardisation as described in Figure 2.1, which is already alive, will now leverage.

The document on “European Cooperative Systems Communication Architecture”, which will be delivered this year, will give a common view on architecture and technique of cooperative systems. This is an additional step towards standardisation of architectural topics of the cooperative systems.

The liaison with IETF has to be enforced and some new liaison managers will be nominated soon.

References

- Contact Points:
- CEN TC278: www.nen.nl/cen278
- ISO TC204: www.isotc204.com
- ETSI: www.etsi.org
- CALM: www.calm.hu
- IETF: www.ietf.org
- IEEE: www.ieee.org
- Chairman ISO TC204 Michael Noblett, Michael.Noblett@SEICCS.com
- Chairman CEN TC278 Henk Stoelhorst, h.j.stoelhorst@avv.rws.minvenw.nl
- Chairman ETSI TC ITS Sören Hess, soeren.hess@daimler.com

Annex 1 Acronyms

API	Application Programming Interface
ASTM	American Society for Testing and Materials
BSA	Basic Set of Applications
C2C-CC	Car-to-Car Communication Consortium
CAL	Communication Adaptation Layer
CALM	Communication Architecture for Land Mobile
CEN	European Committee for Standardisation
CEPT	Conference of European Postal & Telecommunications
CI	Communication Interface
CIMAE	CI Management Adaptation Entity
CVIS	EU project: Cooperative Vehicle-Infrastructure Systems
COOPERS	EU project: Co-operative Systems for Intelligent Road Safety
DSRC	Dedicated Short Range Communication
EC	European Commission
ECC	Electronic Communications Committee
ERM	Electromagnetic compatibility and Radio spectrum Matters
ESA	Enhanced Set of Applications
ETSI	European Telecommunications Standards Institute
EU	European Union
FCC	Federal Communications Commission
FS	Fixed Service
FSS	Fixed Satellite Service (Earth-to-Space)
IEEE	Institute of Electrical and Electronics Engineers
IETF	International Engineering Task Force
IP	Internet Protocol
IPv6	Internet Protocol version 6
ISM Band	Industrial, Scientific and Medical Band
ISO	International Organisation for Standardisation
ITS	Intelligent Transport Systems
ITU	International Telecommunication Union
MAC	Medium Access Control

MAIL	Media Adapted Interface Layer
MEXT	Mobility Extensions for IPv6
MONAMI6	Mobile Nodes and Multiple Interfaces in IPv6
NEMO	Network Mobility in IPv6
OSI	Open Systems Interconnection
RTTT	Road Transport and Traffic Telematics
SAFESPOT	EU project: Cooperative vehicles and road infrastructure for road safety
SAP	Service Access Point
SRDoc	System Reference Document
TC	Technical Committee
TG	Technical Group
TPC	Transmitter Power Control
V2I	Vehicle to Infrastructure
V2V	Vehicle to Vehicle
VII	Vehicle Infrastructure Integration
WAVE	Wireless Access in Vehicular Environments
WG	Working Group
WLAN	Wireless Local Area Network