Elektrische Signalverarbeitung Dr. Fischer GmbH

ESF News

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Editorial

Quo vadis - C-ITS?

In Europe, the period of the EC mandate M/453 on Cooperative ITS (C-ITS) has passed. CEN and ETSI presented a joint final report. Part of this report is the so-called Release 1 of standards needed for early procurement. It is interesting to see, that in this final report there is an ETSI Release 1 and a CEN/ISO Release 1, where

- the ETSI release 1 is limited to standards from ETSI TC ITS, i.e. communication protocols for GeoNetworking and ITS-G5 plus applications presented and developed by European car makers,
- the CEN/ISO Release 1 is complementing the ETSI Release 1 by standards developed by CEN and ISO with a global support of C-ITS, including also the business domain of use cases from ETSI.

On 10th October 2012, the twelve vehicle manufacturers organised in the CAR 2 CAR Communication Consortium signed a Memorandum of Understanding (MoU) to commonly bring cooperative Intelligent Transport Systems and Services (C-ITS) onto European roads. They claim to approve herewith to follow a joint guideline to make traffic and transport even safer, more sustainable and more comfortable in the near future.

This year Mercedes announced in the web at www.worldcarfans.com plans to become the first automaker to offer "Car-to-X" technology to consumers. The system will be offered as part of a "Drive Kit Plus" package that requires users to have a smartphone and the Digital DriveStyle app. This setup isn't ideal but Mercedes says they chose this route because it's the "quickest way to deploy the future technology and therefore also the quickest possible shortcut to unlocking the safety potential of Car-to-X technology."

On 5th December 2012 the six major infrastructure suppliers IMTECH TRAFFIC & INFRA, Q-FREE, SIEMENS, SWARCO, VIALIS and XEROX announced their joint work towards a common set of standards for Cooperative Mobility services. These standards are expected to be implemented in their future products

The cellular network operators so far were not very visible in the C-ITS standardization domain, but are very active on M2M (Machine-to-Machine), which provides similar functionality as C-ITS does.

There are these three giants, i.e.

- Road operators and city authorities
- Car makers
- Cellular network operators

involved in the reality of C-ITS. All of them have to meet in an in-vehicle ITS station unit. The problem for C-ITS is, how to align the different business interests of these three giants? This question cannot be answered here, and there is no intent to answer this question here, as these news focus on facts.

What are the facts that impact procurement of C-ITS?

The US and the EU have a common approach towards global C-ITS, and there are EU/US harmonization groups investigating in a common approach based on harmonized standards from different regions. One example will be discussed here, namely the attempt to merge IEEE WAVE WSMP/WSA with ISO FAST FNTP/FSAP standards such to end up with a single protocol set, where IEEE specifies this protocol set in the context of a WAVE device (IEEE set of 1609 standards), and ISO specifies the same protocol set in the context of an ITS station (ISO 21217, ISO 24102-5 and ISO 29281-1). This protocol set operated over an IEEE 802.11 channel is well suited for roadside to vehicle communications as needed by road operators and city authorities, and as well proven e.g. in the EC CVIS project and by trials in USA. The differences between the current ISO and IEEE version with respect of interoperability are very small, and can be eliminated easily (from a technical point of view), as both sets provide very similar functionality. WSMP and FNTP are extremely efficient single-hop communication protocols which do not risk to overload the narrowband 5 GHz channels. WSA and FSAP are service advertisement protocols with the same functionality, supporting non-IP based services and IP based services on the same radio channel or on alternative channels and radios.

ESF GmbH is involved in the standardization at ISO (with official position in ISO TC204 WG16 and as

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Geo-dissemination of information - a simplified presentation

Geo-dissemination is dissemination of information in a defined geographical area (destination area or target area). A predecessor of geo-dissemination is the well known route and station specific traffic information service provided via cellular networks.

The EC funded GeoNet project (http://www.geonet-project.eu/) investigated in basic aspects of geo-dissemination applicable for road safety. Safety applications, e.g. in vehicles, depend on reception of information gathered at different locations by different stations. These locations of source of information may be close to destination locations, or quite far away from them. Information to be disseminated in a target area may even originate from different applications, which is supported by the "cooperative feature" of ITS, i.e. the sharing of data between applications and stations. Sensor fusion may apply in central stations, at roadside units or even in individual vehicles.

In the uppermost urgent case, the source of information may e.g. be just a vehicle or roadside sensor next to a destination vehicle, such that simple single-hop communications based on the port mapper protocol FNTP (ISO 29281-1) is favourable. FNTP's big advantage is the extremely small protocol overhead which makes it best suited for narrowband communication channels such as those at 5,9 GHz.

Relaying of information via roadside units may be a means to reach recipients at medium distance, and to keep messages alive for a defined time.

Reaching far away destinations beneficially may use central stations, cellular network services and Internet.

GeoNet did intensive work on usage of IPv6. The key idea is to map a geographic area to an IPv6 multicast group. Details will be further developed in standardized protocols.

In addition to the location (centre) of the information destination area, its shape, size and orientation may be important, e.g. to distinguish intersections (square target area) from lanes (thin rectangle or ellipse).

To have a harmonized standardized approach serving the various scenarios of geo-dissemination of information, a geo-dissemination protocol designed as an ITS-S facility seems to be essential, which fits perfectly to the concept of a BSMD (ISO 21217) and to C-ITS. This approach enables usage of the best communication technology possible for a specific scenario and the capabilities of an ITS station.

ISO TC204 WG16 prepared to develop a facility protocol for geo-dissemination of information.

ETSI follows the approach to implement geo-dissemination functionality as the "GeoNetworking protocol" at the ITS-S networking & transport layer which is linked to 5,9 GHz narrow-band communications. Even in case of single-hop communication GeoNetworking requires a large unused protocol overhead, also applied for the transmission of every "Cooperative Awareness Message" (CAM) - "here I am message". Consequently there is a high risk to flood the 5,9 GHz communication channel such that almost no message can be delivered properly in due time. A new attempt at ETSI by cellular network experts is to investigate in the usage of cellular networks for geo-dissemination at remote locations. However this would open two "silo" geo-dissemination stacks which can hardly work together in a reasonable way.

Please present your technical questions to the experts on geo-dissemination, e.g. to Dr. Thierry Ernst at Mines Paris Tech (thierry.ernst@mines-paristech.fr).

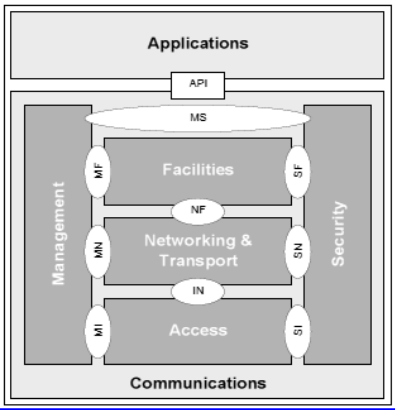
Cooperative Intelligent Transport Systems (C-ITS)

The term C-ITS was introduced in the context of the EC mandate M/453. Below some reasoning on the technical meaning of C-ITS.

Cooperative ITS (C-ITS) is a functional subset of ITS in which ITS station units (ITS-SUs) communicate and share information among themselves and other devices to offer advice and/or facilitate actions with the objective of improving safety, sustainability, efficiency and comfort above and beyond that which can be achieved by stand-alone transport related communication systems. C-ITS is best described in terms of ITS services and applications rather than the hardware or software used to instantiate them. The essential attribute of C-ITS is that information is shared between different applications providing ITS services in a single ITS-SU and with different applications running in different ITS-SUs. The ITS station architecture described in ISO 21217 is designed to support download and execution of these applications via different access technologies that will enable the provision of services in a manner similar to that used in smart phones.

C-ITS has the following features:

- a common reference architecture;
- the sharing of information between any instance of ITS station (e.g. Vehicle, Roadside, Central and Personal);
- the sharing of information between applications in a single ITS-SU;
- the sharing of resources (communication, positioning, security,…) by applications in an ITS station;
- the authorized use of information for purposes other than the original intent; and
- the support of multiple applications running simultaneously.



The ITS station architecture described in

ISO 21217 as a Bounded Secured Managed Domain (BSMD) is ideally suited to the development and deployment of C-ITS applications and services, many of which can beneficially exploit functionality available in the ITS-S facilities layer, e.g. a Local Dynamic Map (LDM).

Obviously from a communications point of view, there is no difference between C-ITS and ITS, as both C-ITS and ITS share the same communication architecture.

Major standardized protocols and procedures in support of the cooperative feature in ITS station units are under development and to be developed in the future at CEN TC278 WG16 / ISO TC204 WG18 in cooperation with ISO TC204 WG16 and other WGs / other SDOs, e.g.

- Common LDM data object dictionary;
- Access to standardized data elements by authorized protocols;
- Download and activation of new application software and the update of installed software (ITS application shop);
- Cooperative message sets (BSM, CAM, DENM, MAP, SPaT, PVD, PDM, ...);
- Facility layer message handling for dissemination of messages to registered facilities and applications inside an ITS-SU.
- Relevance checking of received information.

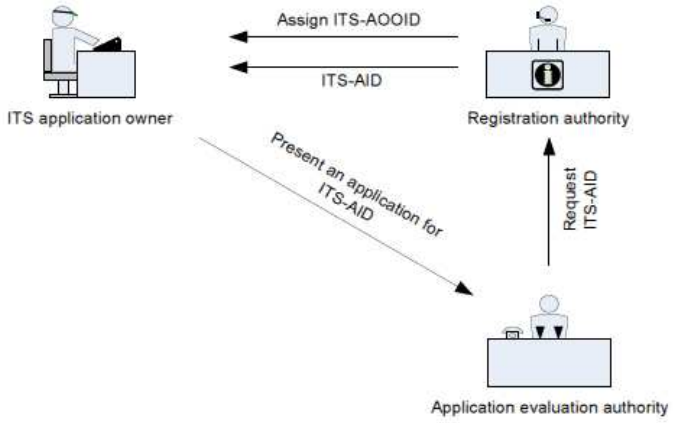
Application Management

A salient feature of the ITS-S architecture that distinguishes it from the concept behind traditional communication systems is that applications are abstracted from both the access technologies that provide the (wireless) connectivity and the networks that transport the information from the source to the destination(s). ITS-SUs are not limited to either a single access technology, or to a specific networking and transport protocol. ITS-SUs can implement any of those technologies that are supported through appropriate adaptation specifications.

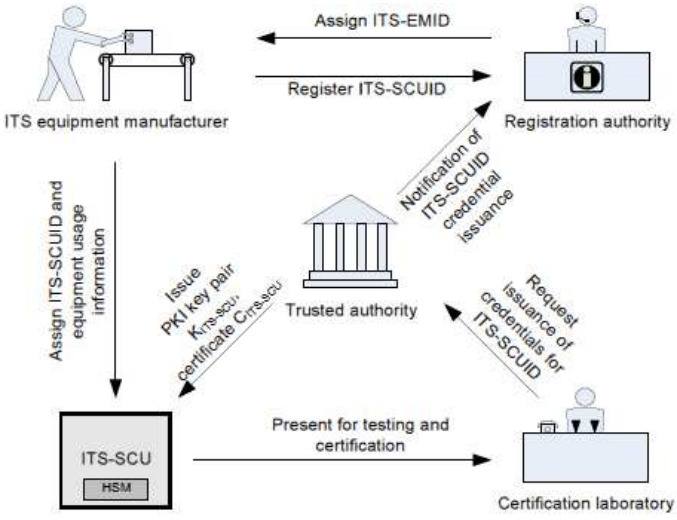
Funded under EC mandate M/453, Project Team CEN TC278 PT1601 develops TS 17423 *Intelligent Transport Systems — Cooperative Systems — Application requirements for selection of communication profiles*. PT1601 reports to CEN TC278 WG16 / ISO TC204 WG18. TS 17423 identifies and specifies those parameters which can be used by ITS-S applications to present online their communication needs. These needs primarily are presented in functional terms. However for applications being subject to regulation, e.g. road safety, the requirements can also explicitly select specific communication protocols and parameter settings.

Application management refers to objects and procedures, both internal and external to the platforms on which the applications are installed, which are used to ensure the efficacy and authenticity of these applications and these platforms. The platforms are ITS-SUs and the applications are ITS-S applications as specified in ISO 21217. These application management procedures involve protocols for exchanging information between the various entities involved in application management and are to be used for authorizing and authenticating the use of ITS-S applications over the ITS communications network.

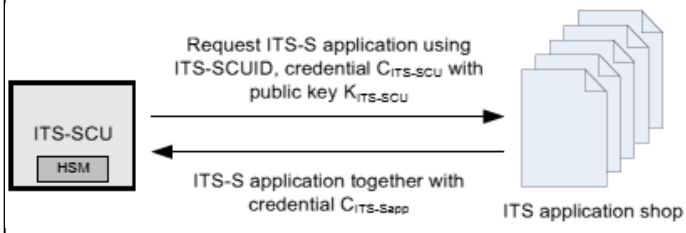
PT1601 develops also TS 17419 *Intelligent Transport Systems — Cooperative Systems — Classification and management of ITS applications in a global context*. TS 17419 describes and specifies globally unique addresses and identifiers which are both internal and external to ITS-SUs and are used for ITS station management. Further on TS 17419 describes how ITS object identifiers and related technical parameters are used for classification, registration and management of ITS applications and ITS application classes. Examples of procedures are registration of ITS-AIDs and ITS-MsgSetIDs,



certification of ITS-SCUs and ITS-S applications,



and the download of ITS-S applications from an ITS application shop.



Please visit the web site of PT1601 at http://pt1601.its-standards.info/, read the draft standards and provide your valuable feedback.

The globally applicable Local Dynamic Map (LDM)

Content:

Funded under EC mandate M/453, Project Team CEN TC278 PT1604 develops TS 18750 *Intelligent Transport Systems — Cooperative Systems — Definition of a global concept for local dynamic maps*. PT1604 reports to CEN TC278 WG16 / ISO TC204 WG18. TS 17423. This joint CEN/ISO standard will be upgraded to an EN/IS.

An LDM is a means in support of the cooperative feature of sharing of data objects between different applications. Another means is a real-time subscribe / publish mechanism specified in CEN/ISO TS 17429.

TS 18750 illustrates usage of an LDM for global applicability considering a range of requirements for “local” and “dynamic” as given by quite diverging requirements from application domains. It describes the LDM as a trusted facility, where trust is build on the trust provided by an ITS station operated as a Bounded Secured Managed Domain. TS 18750 supports any kind of implementation architecture, i.e.

- ITS station units consisting of a single physical box (ITS-SCU), or consisting of serveral ITS-SCUs interconnected with an ITS station internal network.
- One or more LDM instantiations in a single ITS-SCU
- ITS-S application processes (users of an LDM) located anywhere in an ITS station, e.g. in the ITS-S facilities layer, the ITS-S applications entity, the ITS-S management entity, ...

TS 18750 specifies the interfaces of an LDM as functions of the service primitives of service access points of the ITS station (see also ISO 21217, ISO 24102-3). This approach allows for different implementations of the LDM functionality including an implementation which partly uses the ETSI LDM standard EN 302 895 which is restricted in functionality in order to optimize operation for road safety applications developed at ETSI.

In order to allow efficient queries of an LDM by ITS-S application processes, and in order to support also existing message sets, e.g. DATEX, TPEG, PT1604 started to develop the concept of an LDM Data Object Dictionary which enables fusion of data objects from different sources into a common standardized format.

Please visit the web site of PT1601 at http://pt1604.its-standards.info/, read the draft standards and provide your valuable feedback.

Editorial

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editor of several communication protocol standards including those discussed her) and is supporting occasionally the development at the IEEE 1609 WG. ESF GmbH was also involved in two EU/US harmonization task groups, and has official positions in CEN TC278 WG16 / ISO TC204 WG18 on C-ITS applications, Further on ESF GmbH is engaged at ETSI TC ITS in an official position with a focus on test suites for ISO standards. A current standardization project of ESF GmbH at ETSI is the Specialist Task Force (STF) 455 funded by the EC under mandate M/453 (details to be found on the ETSI portal). This logo here is not an ETSI or EC logo. It is an expression of support for

- the work done at ETSI STF 455, which is implementing the test suites for ISO FNTP and FSAP, and other ISO standards,
- the set of ITS and C-ITS standards from ISO TC204, and CEN TC278, especially FNTP and FSAP.

The vision of ESF GmbH is to achieve quickly consensus on how to merge IEEE WSMP/WSA and ISO FNTP/FSAP into a single set of protocols given in two different contexts, and to run plug tests for the merged protocol set in 2014 to support system specifications, e.g. in the EU Corridor Project (The Netherlands, Germany Austria) with a focus on the needs of road operators. It is to be noted that this merged protocol set is also very valuable for car-to-car single hop communications for road safety applications. However the issue of liability first needs to be resolved before communications (never reliable in this context) is used in real life with the aim to increase road safety. See also http://release1.its-standards.eu/

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