Position Paper Towards a Future Internet Public Private Partnership

Use case scenario mobile and adaptive connectivity

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Background/Motivation

The availability of broadband networks anywhere and anytime is vital for the success of a multitude of future applications. The large number of mobile services being offered will be characterized by the varying quality of service requirements. Users will be subscribed to many different services whose requirements need to be supported by the mobile network in parallel. Furthermore, services will be accessed using different devices and network technologies and network operators.
Applications are aiming at protecting life and property they need to provide an outreaching reliability. Ubiquitously available mobile broadband access can help offering an infrastructure and IP based service platform for handling traffic accident scenarios. However, the pure availability of physical-layer bandwidth is not sufficient, as service enablers in different network domains and network types have to cooperate to assure availability, reliability, and quality of service of the critical applications in this. Furthermore, additional challenges results, as such critical events like accidents on the road trigger a number of applications using the network infrastructures and service platforms; such applications include:

- A hazard warning will be issued to all vehicles in the area affected
- Vehicle drivers will inform about their delays by phone
- Emergency services will approach the location of the accident and exchange medical data and life video
- Emergency services will recommend correct behaviour to drivers, e.g. clear the way, detour
- Carriers and taxi fleets will re-route their vehicles

Technologies and functionalities provided by the Future Internet will enable wireless broadband networks to handle these kinds of situations. They will ease the development of applications on top by offering service enabler that can be reused by many different applications in other usage scenarios. For the present scenario makes amongst others use of enablers provided by the core platform such as:

- **Quality-of-Service** aware **reliable** message delivery
- Privacy-aware enablers for **identity management**
- **Cooperative billing and charging solutions**

Scenario Description

In this scenario we consider heavy car traffic on a road crossing a river. Cars are equipped with On-Board-Units (OBU) or personal mobile devices, which are in range of certain Road Side Units (RSU). Additionally, the region is covered by a public land mobile network (PLMN) offering 3G/LTE access. Some of the cars are equipped with a navigation system connected to the navigation system provider's traffic information centre.

Caused by heavy rainfall, the road gets flooded and cars cannot pass the river. In this case, the first car sends an emergency message to other cars in the immediate surroundings (C2C). Cars with a link to a RSU relay the emergency information to the road/highway operator's infrastructure. On the other hand, OBUs on cars, which are not connected to a RSU may send this information via 3G to the road operator or they may use short-range communication to personal devices of passengers on board to relay the information via other networks and communication technologies. In parallel, the vehicle drivers try to make calls in order to inform about their expected delay due to traffic congestion caused by the flood.

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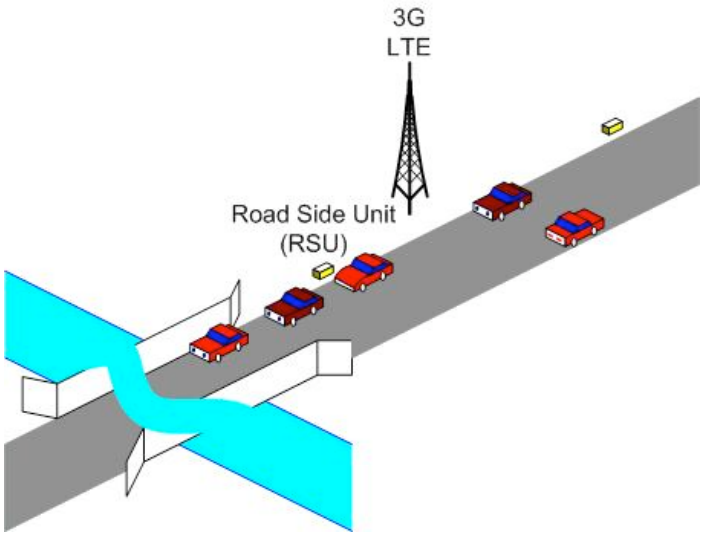
In the meanwhile a rear-end collision just next to the flooded area happened. This information is also automatically forwarded via all possible channels to inform police and ambulance. The police car is equipped with a camera that sends life pictures from the scene to the fire fighters. Watching the pictures enables fire fighters to assess the severity of the incident and to send the required equipment.

The Functionality provided by the Future Internet Core Platform like Identity Enablers, Dependability Enablers, and QoS Enablers guarantee the fast and reliable transport of the emergency messages. These enablers ensure that vehicles that are heading for the flooded area are reliably warned using the available network, while free of charge communication over RSUs is prioritized. Cars and drivers that receive the warning will generate an acknowledgement for the received warning. Both the OBU's of the cars and the personal mobile devices of drivers and passengers in the car will be used to reliably send the hazard warnings to the cars and passengers. The identification of the relevant personal terminals is done automatically via processing of context-information including geographic location and short-range communication technology neighbourhood relations (e.g. Bluetooth neighbourhood detection between mobile terminals and OBU/fixed installed infotainment equipment in the car).

Vehicle drivers start to make calls and the 3G networks get heavily loaded in the area. Using the QoS enabler it can be assured that hazard warnings are still send reliably over the different network types including the cellular network to new cars approaching the area. In addition a warning to all cars in the extended area a notification is send to bypass the congestion.

When the first emergency services arrive, they need to send status reports to their headquarters. It might also be necessary to establish a life video connection that reports ongoing activities that help succeeding rescue forces to get a realistic impression of the incident and get prepared accordingly.

In order to assure the communication of rescue forces in an overloaded wireless network their calls and data connections will be prioritized on the expense of other vehicles in the area.



Functionalities and Enablers

In order to support the envisioned use case scenario enablers in the different infrastructure networks and extensions to the end-device middleware will be required to provide a reliable and dependable infrastructure for such scenarios; this solution in particular will include:

- enablers for **quality-of-service** aware **reliable** message delivery using cooperation across different network domains (here the telematics network and the cellular network)
- privacy-aware enablers for **identity management** that allow to utilize personal devices, communicating vehicular on-board equipment and devices in the vicinity of the human users for communication in a unified framework
- privacy-aware **context enablers** across different network types that allow to gather and process the relevant information needed for the functionalities above

- **cooperative billing and charging solutions** for these scenarios. Such technological solutions should allow a variety of charging models to be applied.

Furthermore the integration with existing technologies and standards not only in the transport and mobility sector will be key aspects for the success of the platform. This includes in particular CALM, mobile phone platforms, IMS and other mobile operator platforms

Scenario Extensions

Other application areas that in some cases also require additional enablers can also use the platform and enablers, developed within the base scenario above.

Health infrastructure

A possible extension to the scenario described above is to automatically establish other communication paths to emergency organisations (e.g. ambulance, police, fire-fighters, etc.) to quickly forward detailed information, which helps to better coordinate. Such kind of extension allows for a better management and planning in such emergency cases, by making as much information available to all involved parties.

Fleet Management

A direct coupling of the accident management information with logistics systems of enterprises that operate large vehicle fleets is envisioned in these extensions. The technical challenges including the analysis of the business processes of such companies and the possibilities for efficient coupling of the real-time information of the accident management system to the enterprise based systems. As the information in the accident management system above is distributed over different network domains, this coupling to other external systems in a privacy-aware manner also poses technical challenges with respect to the distribution of the information processing and aggregation functions across the different domains.

Event Management

The system supports a large range of event types where a huge number of people meet at the same place for a sports event or a music festival – sometimes even targeting locations without any pre-existing infrastructure (Woodstock like).
Some visitors use public transport while others user their private vehicles to reach the festival area. Additionally the visitor traffic needs to be controlled in order to prevent traffic jam, including the allocation of parking lots and the assignment of travel slots.
During the event visitors are informed about the event program and changes, receive advertisements of the sponsors, or ask for the direction to the next caterer. They also can get in touch with each other using the social network platform provided by the organizer.
The event management platform will also provide the required functionality to identify and authorize festival staff and visitors.

Experimentation environment

- Urban area with motorway network and accurate and precise real time traffic information available for the whole area in order to serve personalised services
- Large public events as test cases for changing on demand services

Consortium partners:

- Highway or Road Infrastructure operator
- System integrators for road infrastructure
- Mobile Telecom Operator
- Mobile phone handset manufacturers

- Mobile network equipment integrators/vendors
- Broadcaster
- Logistic/Fleet management
- User Associations
- Navigation system providers
- Research Institutions
- Additional Partner for Event Management Scenario

The Role of AustriaTech and FTW in the FI-PPP

AustriaTech and the FTW Telecommunications Research Center are well positioned to ensure, in the FI-PPP, that a good balance between technology push and application pull will be developed and implemented successfully:

- AustriaTech - Federal Agency for Technological Measures Ltd. was set up in 2005 by the Austrian Ministry of Transport, Innovation and Technology (BMVIT). AustriaTech is opening up the optimum, non-profit-making benefits of telematics in the transport system and its aim is to stimulate the development of ITS ("Intelligent Transport Systems") in new areas of activity. What is involved is the development and deployment of suitable technologies to ensure efficient transport for the future, and - working alongside the infrastructure operators - the organisation of transport on an intermodal basis. For this reason, AustriaTech has close contacts with infrastructure operators.

- FTW Telecommunications Research Center Vienna is Non-profit R&D Center for research and development of technologies for future communication systems. FTW is a Competence Center for Excellent Technologies supported by the Austrian Government and the City of Vienna. The Center focuses on collaborative research and development along the value chain together with industrial and academic partners. FTW industrial members include large companies as well as SMEs in three FI technologies application fields: telecommunications, traffic and energy.

In particular, AustriaTech and FTW intend to contribute to the FI PPP by

- leveraging earlier and running work under the ICT and the intelligent transport programs

- involving key actors from new FI applications fields like traffic, energy or health, including infrastructure operators, SMEs, large companies, administrations, government institutions, and user groups
- bridging research and innovation along the value chain and ensuring a holistic approach towards the integration of different technologies needed in the different FI application fields