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Title: Maturity of Draft TR 22.885 Study on LTE support for V2X Services

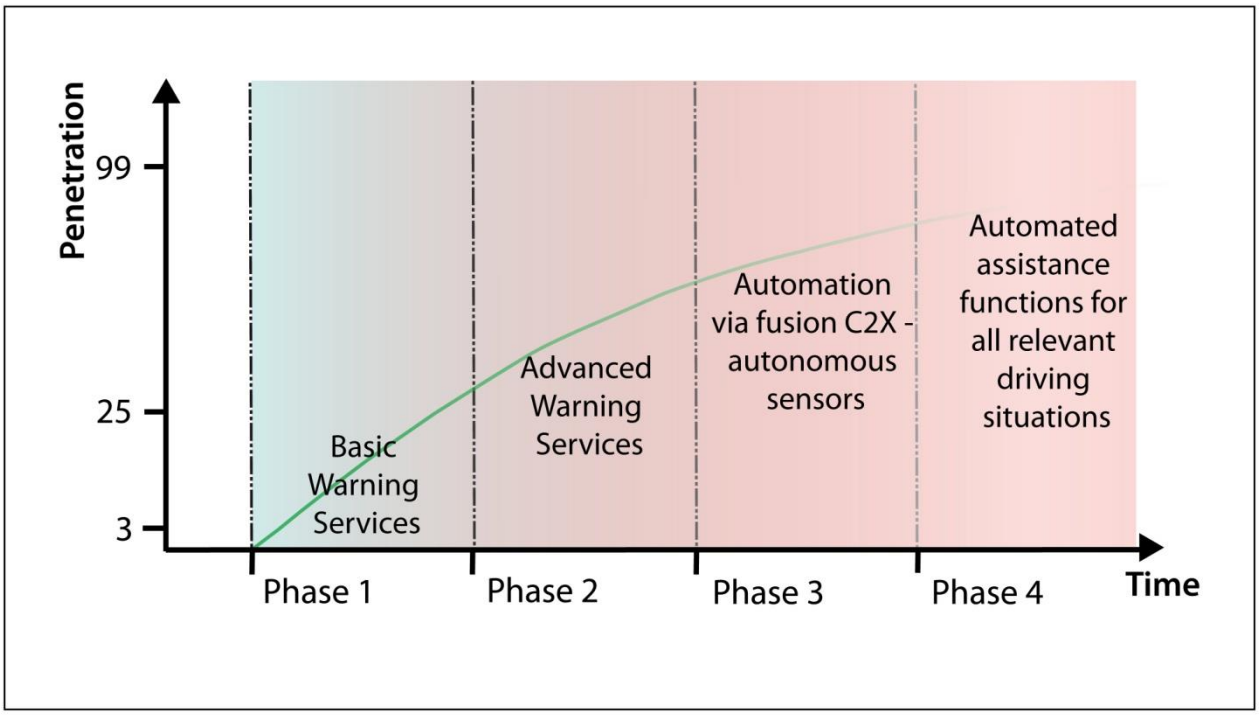
Agenda Item: 7.4

Source: Anemone Technology

Contact: Niels Peter Skov Andersen
npa(a)AnemoneTechnology.com

Reviewing the latest draft of TR 22.885 Study on LTE support for V2X services leads to a number of observation. This document focuses only on some of the high level issues there is with the current draft.

First let us try to put the V2X communication in a broader perspective. The TR with a couple of exceptions primarily focuses on different kind of information and warning services. These can undoubtedly also lead to improved safety as shown by several large research and pilot projects. But the goals from the Automotive sector do not stop with the wish to deploy warning and information services but as can be seen from the roadmap below this is only a first step towards Accident Free and Fully Automated driving



In the current version of the draft TR there is made no separation between Information Services, e.g., Warnings and Active Interaction with the vehicle functions, e.g., active breaking or acceleration. This is unfortunate as this clearly impacts the overall system requirements, and thus might lead to a system that might be usable for the Phase 1 but obsolete for the next stages of the development. These next stages of development are already ongoing in different fora, e.g. both ETSI TC ITS and SAE have ongoing work items on CACC and Platooning that both are services that will involve active intervention.

This separation is essential as the moment we move from Information Services to Active Interventions, the system will then from a legal point of view be a part of the vehicle which have to full fill the Functional Safety Levels as specified in ISO 26262. This means that the communication system will also have to fulfil the requirements as specified in ISO 26262. Currently the TR has no references Functional Safety Levels or the ISO standard.

It would appear essential to study the impact of fulfilling these functional Safety Requirements on the system, e.g. on items such as

- Design process for infrastructure equipment and Software
- Processes for Software updates
- Redundancy
- Operational procedures operators
- Requirement to reliability of equipment and connections etc.
- Cross carrier operational aspects
- …

Another aspect that requires more considerations is that in the TR 22.885 the Mobile Network Operators are part of the safety critical loop. This obviously becomes more important as moving forward from phase 1 towards the subsequent phases.

Taking the example of CACC (Cooperative Adaptive Cruise Control) covered in section 5.5 of TR 22.885. CACC uses Active Intervention. An open discussion is if it only provides lateral control or also e.g. lane changes, but this do not change the fact that it uses active intervention to accelerate/deaccelerate and brake. So clearly this section is lacking reference to an analysis of Functional Safety. Moreover, studies show that you can obtain a staple string of vehicles[1] when using CACC down to a spacing of cars at least down to 0.9 second. In the current description of the CACC is indicated a communication requirements are a maximum latency of 1 sec and a maximum message rate of 1 second without even providing an estimated payload requirement. *This is obviously not able to be used as control for CACC with a vehicle distance of 0.9 sec.* This will require at least a frequency that is a factor ten times higher and a much lower latency. With one message per second it might be possible to maintain CACC with a distance of approximately 10 seconds between the vehicles, which will significantly reduce road capacity. For reference it is worth noting that in many places the requirement for drivers are to keep a 2 seconds distance to the preceding vehicle, and that a stable string of vehicles can be obtained with traditional ACC and 2.8 seconds between vehicles. It should be noted that Platooning will allow for an even shorter spacing between vehicles and preliminary studies point at required message rates of 30 messages per second.

As it is not useful in this document to go through all use cases of the TR, this example of the lack of proper analysis of the true impact of CACC should be taken as a serious warning. It clearly illustrates a lack of understanding of the automotive applications and a lack of maturity of TR 22 885

Further the TR do not really analyse the important case of supporting the hybrid mode of traditional cellular and the direct mode, e.g. is a control plane integration needed, what is the impact of temporary out of coverage leading to varying latency between the different channels. Further the study do not look into how integration with already deployed or in deployment V2X systems such as WAVE in the US, ETSI G5 in Europe and the equivalent Japanese system in the 700 MHz band. A proper study an analysis of LTE V2X use in such hybrid systems, would help to understand the benefits and disadvantages of the different approaches.

It would appear that the section 6 do not offer a real analysis of the feasibility around security and privacy. As it is understandable that it has been chosen not to include this in this feasibility study it should be clearly indicated in the scope that this is not a part of the feasibility study and subject to separate work.

In conclusion the current version of TR 22.885 lacks maturity and needs more work, especially in areas of Functional Safety, defining requirements that allow for real automotive applications. Finally, more work into the needs of future applications toward fully automated driving is needed in order to ensure the capability of support for future applications.

[1] A string of vehicles is said to be stable if any disturbances introduced into the string is absorbed