

WG2 conclusions/recommendations on Connectivity for automation:

- 1. Connectivity can enhance the effectiveness of automated systems to improve road safety and traffic efficiency by allowing better perception (tactic and strategic decisions) and communication with the environment. For perception, automated systems to be launched until 2020 will rely mostly on on-board sensors. Connectivity is therefore not a strict prerequisite for automation for 2020 systems except for platooning.**

Although automated driving can initially rely on car sensor information, without cooperation amongst road users, vehicle-to-everything (V2X) connectivity can enhance autonomous driving by providing more sensory resources and a complete different level of redundancy, thus enabling collective perception and prediction with non-line of sight sensing and coordinated resolution of complex decisions. Indeed, V2X contributes to many operational use cases compared to cameras and radars, thus eliminating common causes of failure for safety critical needs such as ‘seeing through’ big vehicles and non-line-of-sight objects. It also allows for better localisation by using information from road infrastructure. This level of redundancy will further benefit from high penetration of V2X technology in both vehicles and infrastructure, which will require time and investments.

- 2. The type of connectivity technology needed (e.g. short range, mobile network) and the related performances (e.g. spectrum, latency, bandwidth, coverage) depend on the automation use case (e.g. V2V for platooning).**

The type of V2X connectivity needed can be grouped under two distinct families – each of which has different characteristics and can respond, alone or in combination, to different use cases:

- a) Vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I) and vehicle-to-pedestrian (V2P) connectivity, which relies on short-range, ad-hoc connectivity for time-critical safety applications (e.g. autonomous emergency braking in low visibility conditions). This type of connectivity is based on standardised protocols and data sets in a licence-exempt regulatory framework, would be operated in the 5855-5925 MHz (ITS) band and does not require any mobile network or subscription. Technologies enabling this mode of communication need to be available and tested on a large scale in 2019 as highlighted by the European Commission for Day-1 services in the C-ITS Communication.¹ The key technologies are the current ITS-G5 and the upcoming C-V2X (V2V ad-hoc mode 4) nearing completion in March 2017 and targeted for testing by carmakers in 2017 before future 5G evolutions.
- b) Vehicle-to-network (V2N) connectivity, which can be delivered over commercial mobile networks and bands, e.g. the 3.5 GHz band identified as offering high potential to become a strategic band for 5G launch in Europe (e.g. for high-definition

¹ A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility, COM(2016) 766 final, 30 Nov. 2016

map updates).² V2N would comprise commercial services requiring a subscription with a mobile network operator.

While the applications and use cases for the two different families of connectivity would be conducted in separate frequency bands, the infrastructure (i.e. road infrastructure for V2I and telecoms infrastructure for V2N) may be shared, for example on traffic lights. Such joint deployment would be beneficial for the fast and sustainable deployment of both ITS and 5G mobile broadband services, while safeguarding the benefits of ad-hoc connectivity for all.

² Communication from the EC, 5G for Europe Action Plan, COM(2016) 588 final, 14 Sept. 2016