

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 will 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 in addition to vehicle sensors, thus eliminating common causes of failure for safety critical needs such as ‘seeing through’ big vehicles and non-line-of-sight objects. It also enables better situation assessment by using information on road and traffic conditions. 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 or other vulnerable road users (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 (currently using in the 5855-5925 MHz (ITS) band) and does not require any mobile network or subscription. Technologies enabling this mode of communication are expected to be available for deployment from 2019 as stated by the European Commission for Day-1 services in the C-ITS Communication.¹ The key technologies are the currently available ITS-G5 and the upcoming C-V2X.
- b) Vehicle-to-network (V2N) connectivity, is delivered over commercial mobile networks (3G, 4G or 5G) and bands.² V2N would comprise commercial services requiring a subscription with a mobile network operator.

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

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

The deployment of both short range and mobile broadband services would be beneficial for deployment of automated and connected vehicles. In addition, C-V2X will make use of existing 4G infrastructure and enable economies of scales.