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Kapsch TrafficCom

Connected Vehicles Q&A

Kapsch TrafficCom Connected Vehicles

Questions and Answers

Connected Vehicle solutions are enabling traffic authorities to collect, analyze, and act on real-time traffic and incident data to make roadways safer and greener. In this Q&A, Kapsch TrafficCom experts explain what Connected Vehicle solutions are, how they work, and how they bring together multiple hardware and software elements to improve real-time traffic perception, inform future traffic planning decisions, prevent accidents, speed up incident responses and support a wide range of other safety and mobility use cases.

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Q: What is a Connected Vehicle, what does it connect with, and how?

A: Connected Vehicles communicate with roadside infrastructure and vice versa, making real-time traffic and incident information available to the traffic management center. This allows for measures that reduce congestion and emissions, such as re-routing traffic; and can also help to increase road safety with real-time alerts that warn drivers about risks on the road, from roadworks and broken-down vehicles to emergency vehicles, pedestrians, and cyclists crossing the road, and much more.

In Connected Vehicle deployments, vehicles communicate with roadside infrastructure via onboard units (OBUs). These constantly share the vehicle's location, speed, direction of travel and a range of other useful information incl. onboard sensor results, which is relayed to authorities and traffic management centers in real time to inform traffic management and road-safety decisions.

Q: What are the different ways that a vehicle can connect to roadways and other infrastructure?

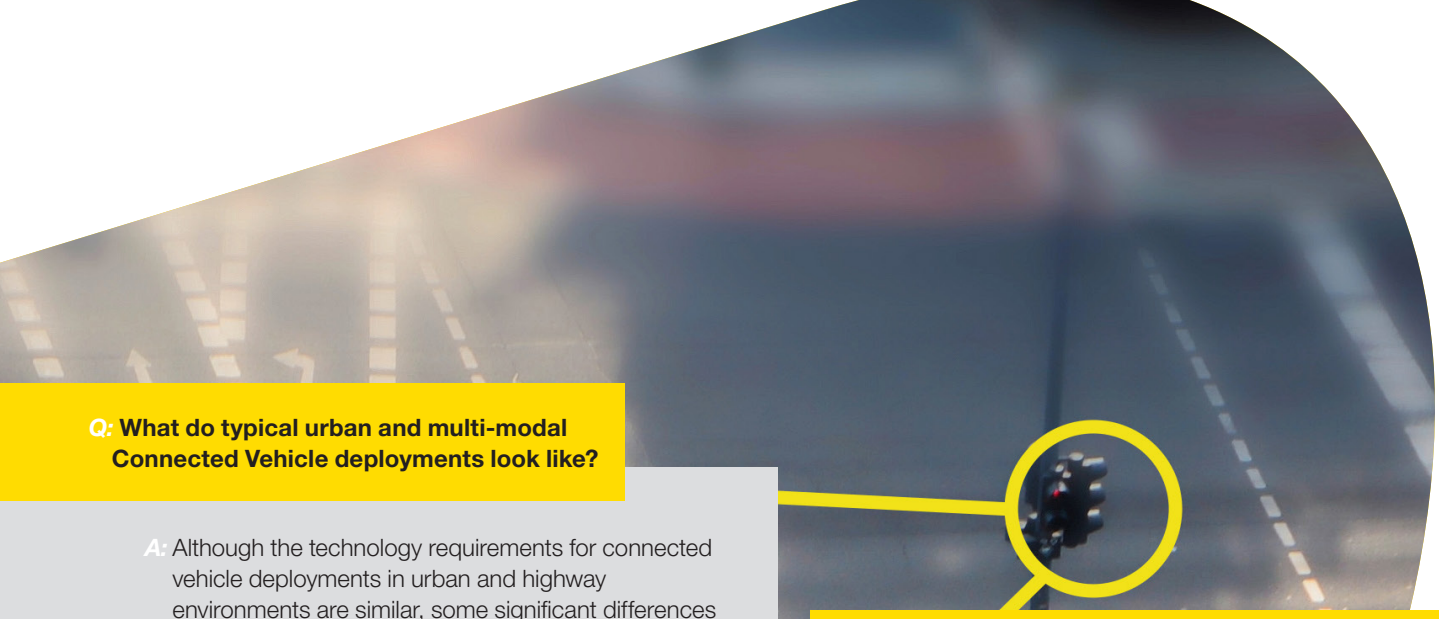
A: Connected Vehicle deployments generally rely on two kinds of connectivity: dedicated short-range connectivity, and cellular network connectivity.

Dedicated short-range connectivity uses protocols such as 5.9GHz ITS G5 or C-V2X915Mhz RFID to support data transfer between multiple vehicles and roadside infrastructure simultaneously on a given stretch of roadway. As dedicated short-range communications technologies support instant, concurrent data transport to and from multiple vehicles to the roadside infrastructure, this is typically the connectivity technology of choice for time-sensitive connected vehicle applications such as hazard warnings, electronic emergency brake, traffic light signal status, enforcement applications, tolling applications, or assisted driving applications.

With cellular networks, data is also transported from each vehicle on the roadway, but in this case, in series – one after the other. Data from individual vehicles is delivered to the network base station and travels onwards to the wireless cellular network or multiple cellular networks operated by different companies, and on to its final destination – such as a cloud-hosted analytics platform in a remote data center. This connectivity option is typically more appropriate for less time-sensitive connected vehicle applications, such as warning drivers about traffic congestion, weather warnings, or obstacles in the road several kilometers ahead. Cellular networks may also be more appropriate for non-time-sensitive connected vehicle applications, such as route planning or multi-modal journey planning, where instant responses from applications are not required to ensure driver safety.

Q: What does a 'typical' Connected Vehicle deployment look like today? What technologies does it incorporate?

A: A combination of technologies is present in a typical Connected Vehicle deployment. These include but are not necessarily limited to roadside infrastructure, including cameras and Light Detection and Ranging (Lidar) sensors. There must also be fast communications links that are capable of transporting data from vehicles and sensors, via roadside infrastructure, to back-end systems and platforms where insights can be used to inform traffic management or road-safety decisions. Alerts and warnings can be delivered to drivers in real-time to drivers in their vehicles – either via the infotainment system or their mobile device, to reduce the risk of incidents and accidents. In vehicles, meanwhile, onboard equipment is needed to facilitate safety and traffic management applications. Typically, this will be in the form of a dedicated RFID V2X onboard unit (OBU) or a V2X-enabled SIM card cellular modem, or both. The V2X standard is making huge headway in the market, and today more than 50% of the number of new vehicles come equipped with this communications capability is increasing steadily.



Q: What do typical urban and multi-modal Connected Vehicle deployments look like?

A: Although the technology requirements for connected vehicle deployments in urban and highway environments are similar, some significant differences need to be considered. In both environments, it is especially important that the technological infrastructure can support short reaction times. In urban areas, although the driving speed is typically slow, the time available to react is short due to the close distance between vehicles, obstacles, pedestrians, cyclists, and other objects on the road. On highways, although distances between objects are typically greater, reaction times still need to be short due to the faster travel speeds. However, the different environments do require different sensors. In urban environments, sensors may be needed to identify pedestrians and cyclists. Highway deployments, on the other hand, may need sensors to identify certain types of vehicles and to support enforcement for violations, such as speeding and wrong-way driving.

Q: What are Orchestrated Connected Corridors (OCCs) – and how do they differ from other Connected Vehicle deployments?

A: In Orchestrated Connected Corridors (OCCs), data or information from Connected Vehicles is shared to a data hub or platform where it is analyzed in real-time. In this way, OCCs provide real-time traffic awareness, helping to identify safety risks and warn drivers to minimize accidents. Authorities can also use real-time traffic information to detect and reduce congestion, reduce the risk of an incident, or otherwise improve safety or the road user experience. OCCs also make it possible to share traffic information with first-response teams, traffic authorities, or others who contribute to the overall protection of road users. In other words, orchestration is often a joint task between multiple organizations and stakeholders who are responsible for traffic management and road safety, for example.

Q: What are the top benefits of OCCs for authorities and road users?

A: The great benefit of OCCs is that they provide a collective view of vehicles and traffic, which means that authorities can take measures rapidly to increase safety, reduce congestion, and improve road user experiences. Critically, OCCs can communicate risks such as obstacles in the road, road works, and the presence of emergency vehicles to drivers in real-time which, again, reduces the risk of accidents and incidents. More strategically, orchestration also helps to improve planning decisions by helping to ensure that road capacity remains aligned with demand. Finally, drivers can be advised – either using in-car messaging or roadside signage – on how to change their driving behaviors to reach their destinations faster, whether that means changing their driving speed, selecting a different lane, or even taking another, less congested route.

OCC creates the opportunity to equip critical arterials with the latest technology to improve traffic and safety situations on those roads in the short term. It is an effective deployment strategy with reasonable effort for the highest benefit both for result and experience.

Q: What are some of the top Connected Vehicle safety, mobility, efficiency, and sustainability use cases?

A: Connected Vehicle technologies combine real-time traffic, roadway, and incident information to increase road safety and improve drivers' experiences. This technology can be used to warn drivers about potential hazards on the road ahead, such as congestion, roadworks, lane closures, objects or stationary vehicles on the road, or emergency vehicles approaching. Such applications typically employ dedicated short-range communications and in-vehicle messaging or roadside signage.

The real-time traffic information from Connected Vehicles can also be used by authorities to tackle and ease congestion. It might be used to optimize signaling, for example, or to prioritize traffic lights in a particular direction to ease traffic flow, give priority to emergency vehicles, or keep buses or trams moving. For these kinds of applications, the traffic data is often signed with a digital certificate to prove that it is authentic and that it comes from an authorized source.

Other, less time-critical use cases use cellular network connectivity to inform drivers about changing road and traffic conditions. For example, it is possible to inform drivers about congestion several kilometers away, either using messages to their in-car systems (or mobile devices) or using roadside signage.

Q: How will data collected from Connected Vehicles impact the future of road travel and transport?

A: For car manufacturers, few metrics are as important as the safety ratings of their vehicles. In Europe, manufacturers pay extremely close attention to Euro NCAP safety guidelines and requirements; elsewhere in the world, other standards play a similar role.
The most recent evolution of vehicle safety is about building sensors and systems into vehicles to support assisted driving and other safety features. But simply adding cameras, Lidar, Radar, or other perception technologies to vehicles in an ad hoc way requires discreet in-depth technologies and safety assessments, separate software, and bespoke integration for each sensor or device added to the vehicle. It is an approach that is both inefficient and expensive. That is why manufacturers are turning to V2X technology. This provides a single platform and framework for deploying and integrating multiple perception technologies in vehicles, and for sharing information about traffic and road conditions to increase road safety. As V2X continues to make headway among manufacturers, the technology also promises greater data collection and sharing capabilities that enable data processing at the edge – in this case, at the roadside – which will ultimately support greater awareness of both connected and non-connected vehicles and support the next phase of automated driving capabilities.

Q: How will Connected Vehicle technology contribute to autonomous driving?

A: Connected Vehicle solutions that use dedicated short-range communications can support assisted driving features such as 'stay in lane-cooperative adaptive cruise control, CACC' or 'assisted braking' which represent the early stages of autonomous driving capabilities. However, making the vision of fully autonomous driving a reality is a significant challenge that involves a mix of connected and non-connected vehicles on the roads, as well as pedestrians, cyclists, obstacles, and many other elements. The good news is that a multitude of participants and standards are coming together to drive the next phase of assisted driving like level 3, and Connected Vehicle solutions and OCCs have a key role to play in terms of delivering real-time traffic awareness. As V2X technology is integrated into even more new cars, autonomous driving innovations will continue to accelerate, delivering major improvements in road safety and driver convenience.

To find out more about Connected Vehicle technology, Orchestrated Connected Corridors, and how **Kapsch TrafficCom** can help you use these kinds of solutions to increase real-time traffic awareness, improve capacity and traffic planning, reduce the risks of incidents and accidents, and address congestion and emissions challenges, **contact us today**.