

CONNECTED VEHICLE APPLICATIONS: SAFETY

Connected vehicle safety applications are designed to increase situational awareness and reduce or eliminate crashes through vehicle-to-infrastructure, vehicle-to-vehicle, and vehicle-to-pedestrian data transmissions. Applications support advisories and warnings as well as vehicle and infrastructure controls.

This resource includes a brief description as well as a cross reference of materials for each connected vehicle safety application. The end of this document provides detailed reference material information. For more information about each application, please visit the Connected Vehicle Reference Implementation Architecture website: http://www.iteris.com/cvria/html/applications/applications.html.

Vehicle-to-Infrastructure

Curve Speed Warning: Alerts drivers approaching a curve to slow down if their vehicle speed is too high to travel safely through the curve.^{1,2,3}

Oversize Vehicle Warning: Alerts drivers if their vehicle cannot clear a bridge or tunnel.^{1,4,16}

Pedestrian in Signalized Crosswalk Warning: Warns transit bus operators when pedestrians walking within the crosswalk of a signalized intersection are in the intended path of the bus.^{1,4,13,14,15,16}

Railroad Crossing Warning: Alerts drivers who are approaching an at-grade railroad crossing if they are on a trajectory to collide with a crossing or approaching train.^{1, 16}

Red Light Violation Warning: Broadcasts signal phase and timing and other data to the in-vehicle device, allowing warnings for impending red light violations.^{1, 2, 16}

Reduced Speed/Work Zone Warning: Broadcasts alerts to drivers to reduce speed, change lanes, or come to a stop within reduced speed/work zones.^{1,4,16,17}

Restricted Lane Warning: Provides drivers with travel lane restriction information (e.g., high occupancy vehicles, transit only, or public safety vehicles only).^{1, 4, 16}

Smart Roadside—Wireless Inspection: Uses roadside sensors to provide identification, hours of service, and sensor data directly from trucks to carriers and government agencies.^{4, 5, 6, 7, 8, 9, 10, 11, 12}

Smart Roadside—Smart Truck: Provides information such as hours of service constraints, location and supply of parking, travel conditions, and loading/unloading scheduling to allow commercial drivers to make advanced route planning decisions.^{4, 5, 6, 7, 8, 9, 10, 11, 12}

Spot Weather Impact Warning: Warns drivers of local hazardous weather conditions by relaying weather data from a management center and other sources to roadside equipment, which then re-broadcasts the data to nearby vehicles.^{1, 3, 4, 16, 17}



Vehicle-to-Infrastructure: Work Zone Warning



Vehicle-to-Vehicle: Emergency Electric Brake Lights Warning



Vehicle-to-Pedestrian: Pedestrian in Signalized Crosswalk



Stop Sign Gap Assist: Broadcasts traffic information from roadside equipment to warn drivers of potential collisions at stop sign intersections.^{1, 2, 16}

Stop Sign Violation Warning: Provides warnings to drivers approaching an unsignalized intersection when their speed and distance from the stop sign indicates they may not perform the required stop.^{1,4,16}

Warnings about Hazards in a Work Zone: Provides warnings to maintenance personnel within a work zone about potential hazards (e.g., a vehicle traveling at a high speed or entering the work zone).^{1, 4, 16}

Warnings about Upcoming Work Zone: Provides approaching vehicles with information about work zone activities, such as travel lane obstructions, lane closures, lane shifts, speed reductions, or vehicles entering/exiting the work zone.^{1, 4, 16}

Vehicle-to-Vehicle

Blind Spot/Lane Change Warning: Warns drivers attempting a lane change if the blind spot is or will soon be occupied by another vehicle traveling in the same direction.^{18, 22, 23, 24}

Control Loss Warning: Enables a vehicle to broadcast a selfgenerated notice that the driver has lost control, which the receiving vehicle can then evaluate to determine if an alert to its driver is appropriate.²³

Do Not Pass Warning: Alerts drivers prior to making a passing maneuver if potential exists for a head-on collision.^{22, 23, 24}

Emergency Electronic Brake Lights: Alerts downstream drivers that a vehicle ahead is hard braking, providing them with additional reaction time.^{22, 23, 24}

Emergency Vehicle Alert: Alerts surrounding drivers about the location and movement of public safety vehicles responding to an incident in the vicinity.¹⁸

Forward Collision Warning: Alerts drivers if there is a direct and imminent threat of a collision ahead, helping them to avoid or mitigate the severity of rear-end crashes with the upstream vehicle.^{22, 23, 24}

Intersection Movement Assist: Warns drivers when it is not safe to enter an intersection due to a high probability of a collision with other vehicles.^{22, 23,24}

Left Turn Assist: Alerts drivers attempting an unprotected left turn across traffic to a high probability of a collision with vehicles traveling in the opposite direction.^{22, 23, 24}

Pre-Crash Actions: Enables a vehicle to mitigate injuries in a crash by activating in-vehicle countermeasures when a crash is about to happen.¹⁸

Situational Awareness: Determines if the road conditions measured by other vehicles represent a potential safety hazard.¹⁸

Tailgating Advisory: Uses information from other vehicles to determine if a vehicle is too close to the vehicle in front of it.¹⁸

Transit Vehicle at Station/Stop Warning: Informs nearby vehicles of the presence of a transit vehicle at a station or stop, and also indicates whether the transit vehicle intends to pull into or out of the location.^{19, 20, 21}

Vehicle Emergency Response: Provides public safety vehicles with information from connected vehicles involved in a crash (e.g., HAZMAT data, air bag deployment, type of vehicle power systems).¹⁸

Vehicle Turning Right in Front of Transit Vehicle Warning: Determines the movement of vehicles near a transit vehicle at a stop and indicates that a nearby vehicle is pulling in front of the transit vehicle to make a right turn.^{18, 19, 20, 21}

Vehicle-to-Pedestrian

Transit Pedestrian Indication: Informs pedestrians at a station or stop of the presence of a transit vehicle and informs the transit vehicle operator of nearby pedestrians.^{25, 26, 27}

Reference Materials

Vehicle-to-Infrastructure

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- U.S. Department of Transportation, ITS Joint Program Office, Transit Safety Retrofit Package Development: Architecture and Design Specifications, FHWA-JPO-14-119 (Washington, DC: 2014). Available at: http://ntl.bts.gov/ lib/54000/54000/54071/14-119.pdf.
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Vehicle-to-Pedestrian

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For more information about this initiative, please contact:

Karen Timpone, Federal Highway Administration, Office of Safety (202) 366-2327 | karen.timpone@dot.gov | www.its.dot.gov

Jonathan Walker, Federal Highway Administration, Office of Operations (202) 366-2199 | jonathan.b.walker@dot.gov | www.its.dot.gov

Kevin Dopart, Intelligent Transportation Systems Joint Program Office, Vehicle Safety and Automation (202) 366-5004 | kevin.dopart@dot.gov | www.its.dot.gov