Connected and Automated Vehicle glossary

# 5

5G Cellular – 5th Generation of wireless technology. “5G delivers super-fast connectivity that can be used for many everyday tasks and it’s the area where driverless cars are being developed…” (source: <https://www.techradar.com/news/what-does-5g-mean-for-autonomous-vehicles>)

511 Traveler Information System (TIS) - The State of Minnesota’s 511 Traveler Information System ([https://hb.511mn.org](https://hb.511mn.org/%22%20%5Co%20%22511%20Traveler%20Information%20System%20)) provides real-time travel information including traffic speeds, CCTV camera snapshots, DMS messages, road weather information, and traffic alerts

# A

ADAS – Advanced Driver Assistance Systems - Systems developed to automate/adapt/enhance vehicle systems for safety and better driving. (Source: <https://www.autoconnectedcar.com/adas-advanced-driver-assistance-sytems-definition-auto-connected-car/>)

Advanced Transportation Management System (ATMS) - Systems of detection, communication, and software technologies that are aimed to reduce traffic congestion.

AASHTO – The American Association of State Highway and Transportation Officials – is a standards setting body which publishes specifications and tests protocols and guidelines which are used in highway design and construction throughout the United States. (Source: <http://www.maasto.net/aashto.html>)

American Wire Gauge (AWG) – US standard used by MnDOT to measure wire conductor sizes.

Architecture - The organizational structure of a system, identifying its components, their interfaces, and a concept of execution among them.

Automated Vehicle (AV) – those in which operation of the vehicle occurs without direct driver input to control the steering, acceleration, and braking. (source: <http://autocaat.org/Technologies/Automated_and_Connected_Vehicles/>)

# C

Closed Circuit Television (CCTV) - A video monitoring and security system used to provide continuous traffic monitoring by the facility operator along the length of the facility and particularly at points of entry and tolling locations.

Components - Components are the named "pieces" of design and/or actual entities [sub-systems, hardware units, software units] of the system/sub-system. In system/sub-system architectures, components consist of sub-systems [or other variations], hardware units, software units, and manual operations.

Concept of Operations (ConOps) – A foundation document that frames an overall proposed system and sets the technical course for a project.

CAV – Connected and Automated Vehicles -

CV – Connected Vehicle – vehicles that use any of a number of different communication technologies to communicate with the driver, other cars on the road (vehicle-to-vehicle [V2V]), roadside infrastructure (vehicle-to-vehicle [V2I]), and the cloud (V2C). (Source: <http://autocaat.org/Technologies/Automated_and_Connected_Vehicles/>)

# D

DSRC – Dedicated Short Range Communications – wireless technology designed to allow automobiles in the intelligent transportation system to communicate with other automobiles or infrastructure technology. (source: <https://whatis.techtarget.com/definition/dedicated-short-range-communication-DSRC>)

Department of Transportation (DOT) - A government agency, federal, statewide, or local, dedicated maintaining and developing transportation systems and infrastructure.

Design - Those characteristics of a system or components that are selected by the developer in response to the requirements.

Detector Loops - Consists of one or more turns of insulated loop wire installed in a shallow slot sawed in the pavement surface or installed in the subgrade that are can be used to determine traffic characteristic such as: count vehicles, measure traffic speed, and detect the presence of vehicles.

Django - A content management system created in Python that creates reports from IRIS and other databases. The system is used by MnDOT designers for a variety of reasons. A few examples are to review fiber schematics, search for past projects in an area, and identify MnDOT staff assigned to a particular project.

Dynamic Message Sign (DMS) - An electronic sign deployed on roadways to inform travelers of specific warnings including but not limited to congestion, special events, traffic incidents, and other emergency alerts. Most DMS can display one or more predefined messages automatically without user intervention. MnDOT most often uses the term DMS in ITS design although some use the term Variable Message Sign (VMS) and Changeable Message Sign (CMS) interchangeably. Portable Changeable Message Signs are trailer mounted signs that are used in work zones and as an incident management tool. Blank-Out Sign (BOS) are a specific type of DMS that have the capability to show a blank message or a fixed message(s).

# E

**EV – Electric Vehicles**: Many AVs are being built as electric vehicles, but the future is still unclear if the industry will broadly adopt electric vehicle technology. EVs use an electric motor to power the vehicle.

Equity – the quality of being fair and impartial (source: <https://www.dictionary.com/browse/equity>)

Equality – the state or quality of being equal; correspondence in quantity, degree, value, rank or ability. (source: <https://www.dictionary.com/browse/equality?s=t>)

Ex-Officio – by virtue of office or official position. (source: <https://www.dictionary.com/browse/ex-officio?s=t>)

Express Lanes - A lane or set of lanes physically separated or barriered from the general-purpose lane capacity provided within major roadway corridors. Express lane access is managed by limiting the number of entrance and exit points to the facility. Express lanes may be operated as reversible flow facilities or bi-directional facilities. These can include High-Occupancy Toll lanes.

# F

Federal Aviation Administration (FAA) – A division of the USDOT that is responsible for the regulation and oversight of civil aviation within the United States.

Federal Communications Commission (FCC) – An independent agency of the United States government created by statute to regulate interstate communications by radio, television, wire, satellite, and cable.

Federal Highway Administration (FHWA) – A division of the USDOT that specializes in highway transportation.

FMVSS - Federal Motor Vehicle Safety Standards – A set of engineering standards that a vehicle must meet in order to be certified for import into the United States. The Federal Motor Vehicle Safety Standards are maintained by the National Highway Traffic Safety Association, an agency under the Executive Branch of the United States. (source: <http://www.businessdictionary.com/definition/Federal-Motor-Vehicle-Safety-Standards-FMVSS.html>)

Freeway Incident Response Safety Team (FIRST) - The FIRST program, formerly known as Highway Helper program, is tasked with minimizing congestion and preventing secondary crashes through the quick response and removal of incidents. The FIRST program is a key component of the Twin Cities Metropolitan Area Incident Management Program.

# G

Georilla - Georilla is an internal MnDOT web-map application that is currently being used by approximately 700 unique visitors per month to match-up asset, project, and activity information to make better data-driven decisions. The Asset Management Project Office Supports the development and direction of Georilla.

GNSS – Global Navigation Satellite Systems (GNSS) – an umbrella term that encompasses all global satellite positioning systems. (source: <http://www.terrisgps.com/gnss-gps-differences-explained/>)

Global Positioning System (GPS) – A satellite-based navigation system that provides geolocation and time information to a GPS receiver.

GuideStar

# H

Hardware - Articles made of material, such as tools, computers, vehicles, fittings, and their components [mechanical, electrical, electronic, hydraulic, and pneumatic]. Computer software and technical documentation are excluded.

HD maps – High Definition maps – maps built for self-driving purposes are usually called High Definition Maps or HD Maps for short. These maps specifically have extremely high precision at centimeter-level. This is because the robots need very precise instructions on how to maneuver themselves around the 3 dimensional space. (source: <https://www.geospatialworld.net/article/hd-maps-autonomous-vehicles/>)

High Density Polyethylene (HDPE) – A thermoplastic polymer used for many applications. In ITS design it us used for underground conduit systems.

High-Occupancy Toll (HOT) Lane – Managed, limited-access, highway lanes that provide free access to HOVs, and make excess capacity available to other vehicles not meeting occupancy requirements at a market price.

High-Occupancy Vehicle (HOV) – A passenger vehicle carrying more than a specified minimum number of passengers, such as an automobile carrying more than one or more than two people. HOVs include carpools and vanpools, as well as buses.

HOV Lane - An exclusive traffic lane or facility limited to carrying HOVs and certain other qualified vehicles.

# I

Incident Management - Managing forms of non-recurring congestion, such as spills, collisions, immobile vehicles, or any other impediment to smooth, continuous flow of traffic on freeways.

Infrastructure - Fixed facilities, such as roadway or railroad tracks; permanent structures.

Institute of Electrical and Electronics Engineers (IEEE) – A professional organization focused on advancing technology, comprised of electrical and electronics engineers.

Intelligent Roadway Information System (IRIS) – MnDOT’s Freeway Management System control software. IRIS is an open-source ATMS software project developed by MnDOT.

Intelligent Transportation Systems (ITS) – A broad range of diverse technologies which, when applied to our current transportation system, can help improve safety, reduce congestion, enhance mobility, minimize environmental impacts, save energy, and promote economic productivity. ITS technologies are varied and include information processing, communications, control, and electronics. Intelligent Transportation Systems facilitate providing real-time information on traffic conditions to travelers on roadways for which the technologies are deployed on.

Interface **-** The functional and physical characteristics required to exist at a common boundary - in development, a relationship among two or more entities [such as software-software, hardware-hardware, hardware-software, hardware-user, or software-user].

Internet Protocol (IP) – The method by which data is communicated between devices on the Internet

**Interoperability** is the ability of computer systems or software to exchange and make use of information.

**ICP –** Iterative Closest Point – is a popular algorithm employed to register two sets of curves, two sets of surfaces, or two clouds of points. The ICP algorithm is away to derimine the motion of a self-driving car by aligning point clouds from LIDAR or other sensors. (source: <https://www.coursera.org/lecture/state-estimation-localization-self-driving-cars/lesson-3-pose-estimation-from-lidar-data-XE9kZ>)

**ITS** – Intelligent Transportation Systems – technology that advances transportation safety and mobility and enhance American productivity by integrating advanced communications technologies into transportation infrastructure and into vehicles. (source: <https://www.its.dot.gov/factsheets/benefits_factsheet.htm>)

# L

**L0, L1, L2, L3, L4, L5** – Levels 1 through 5 are the levels of automation. L0 indicates the vehicle has not automation. L5 indicates the vehicle is fully autonomous.

LiDAR – the device that acts as an eye of the self-driving vehicles. Provides a 360-degree view of the surrounding helping them to drive themselves safely. (source: <https://www.geospatialworld.net/blogs/why-lidar-is-important-for-autonomous-vehicle/>)

Lane Keeping Assist – a function of the vehicle that alerts or self-corrects the car’s steering toward the center of the road. (source: <https://www.theglobeandmail.com/drive/culture/article-how-does-my-cars-lane-keep-assist-technology-work/>)

Legacy System - The existing system to which the upgrade or change will be applied.

Life-Cycle Maintenance - Concept of keeping a facility or system useable at least through its design life by conducting scheduled maintenance.

Light Emitting Diode (LED) – A type of light source illuminated by the movement of electrons.

Localization – the implementation of algorithms to estimate where the vehicle is with an error of less than 10 cm. (source: <https://towardsdatascience.com/self-driving-car-localization-f800d4d8da49>)

# M

Manual on Uniform Traffic Control Devices (MUTCD) – A document published by the Federal Highway Administration setting standards and providing guidance to ensure uniformity of traffic control devices across the United States.

Minnesota Manual on Uniform Traffic Control Devices (MnMUTCD) – A document published by MnDOT setting standards and providing guidance to ensure uniformity of traffic control devices across the state of Minnesota.

MAASTO – AASHTO divides its member departments into four geographical regions. The Mid America Association of State Transportation Officials (MAASTO) consists of 10 states primarily in the Midwest including Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Ohio and Wisconsin.

**MAAS - Mobility as a service** allows users to arrange for various modes of transportation in a single intermodal trip, such as a bike share to a public transit stop and then a rideshare to an ultimate destination.

Multimodal – Characterized by several different modes of activity or occurrence.

MPO – Metropolitan Planning Organization – the policy board of an organization created and designated to carry out the metropolitan transportation planning process. MPOs are required to represent localities in all urbanized areas with populations over 50,000, as determined by the U.S. Census. (source: <https://www.transit.dot.gov/regulations-and-guidance/transportation-planning/metropolitan-planning-organization-mpo>)

# N

NHTSA – National Highway Traffic Safety Administration – Under the US Department of Transportation is the responsible agency for carrying out safety programs under the national traffic and motor vehicle safety act of 1966 and the Highway safety Act of 1966. (source: <https://one.nhtsa.gov/About-NHTSA/Who-We-Are-and-What-We-Do>)

National Electrical Code (NEC) – A standard for the installation of electrical wiring and equipment that ensures safety, also known as NFPA 70.

National Electrical Manufacturers Association (NEMA) – A trade organization comprised of electrical equipment and medical imaging manufacturers that make safe, reliable, and efficient products and systems in seven markets, including transportation systems.

National Electrical Safety Code (NESC) - A standard that outlines methods for the safety of electric supply and public and private communication utility systems.

National Transportation Communications for ITS Protocol (NTCIP) – A group of standards that provides both protocols and vocabulary necessary to ensure consistency between ITS device manufacturers.

Non-Intrusive Detector (NID) - A vehicle detector that is not installed into the pavement. MnDOT currently utilizes side-fire, FMCW microwave vehicle detection to detect vehicles traveling along freeway mainlines.

# O

ODD – Operational Design Domains[[1]](#footnote-1) – Description of the specific domains in which an automated function or system is designed to properly operate, including but not limited to roadway types, speed range, environmental conditions (weather, daytime/nighttime, etc.), and other domain constraints. (source: <https://itlaw.wikia.org/wiki/Operational_Design_Domain> )

OEMs – Original Equipment Manufacturer – the company whose goods are used to as components in the products of another company, which then sells the finished item to users. (source: <https://www.investopedia.com/terms/o/oem.asp>)

# P

Plans, Specifications, and Estimates (PS&E) – A package for a project that includes the plans, specifications, and cost estimate for the project that is ready to be bid on by contractors.

Platoon – A group of vehicles that can travel very closely together, safely at high speed through connected vehicle technology. (source: <https://www.drivingtests.co.nz/resources/what-is-vehicle-platooning/>)

Polyvinyl Chloride (PVC) – A solid plastic that is often used to make pipes, including to construct underground conduit.

**P3 –** Private Public Partnership

Radio Frequency (RF) – The rate of oscillation or range of rates of electromagnetic radio waves used in telecommunications.

Ramp Metering - The electronically regulated flow of vehicles on highway entrance ramps and loops to reduce crashes, reduce congestion, and provide more reliable travel times.

Regional ITS Architecture – A specific regional framework for ensuring institutional agreement and technical integration for the implementation of ITS projects in a particular region.

Remote Weather Information System/Roadway Weather Information system (RWIS) – A system of sensors, communications, and data collection technologies to measure specific weather conditions including atmospheric, pavement and/or water level conditions.

RSU – Roadside Unit are the communicating nodes, providing each other with information, such as safety warnings and traffic information.\*[[2]](#footnote-2)

**Signal Phase and Timing (SPaT)**

Single-Occupancy Vehicle (SOV) – A passenger vehicle containing only a single occupant.

**SHARED MOBILITY:** Shared mobility is the idea that transportation services, such as transit, bike sharing, scooters, ridesharing, on-demand services, micro transit and other modes of transportation, could be shared among users.

Small Form-Factor Pluggable (SFP) – A compact, hot-pluggable network interface module used for both telecommunication and data communications applications.

Source of Power (SOP) – Electric utility transformer that provides power to a device or infrastructure.

Specification - A document that describes the essential technical requirements for items, materials or services including the procedures for determining whether the requirements have been met.

System - An integrated composite of people, products, and processes, which provide a capability to satisfy a stated need or objective.

Systems Engineering - An interdisciplinary approach and a means to enable the realization of successful systems. Systems engineering requires a broad knowledge, a mindset that keeps the big picture in mind, a facilitator, and a skilled conductor of a team

Traffic Management Center (TMC) – A location to collect real-time data on the surrounding transportation system to monitor conditions, manage the systems in the field, and provide traveler information.

Traffic Management System (TMS) – The development and application of network-wide data collection and sharing of traffic information system. The system can integrate data and control systems from freeways, arterials, and city streets to provide real-time proactive traffic information and control. Implementation of the system would facilitate congestion management over the entire network across multijurisdictional boundaries. The system could provide incident detection, transit and emergency vehicle priority, and advance traveler information.

Truck Mounted Attenuators (TMA)

Uninterruptible Power Supply (UPS) – A device that is used as emergency power when there's an interruption to the standard power.

Volts - Alternating Current (VAC) – A measure of circuit power pressure for alternating current.

Volts - Direct Current (VDC) – A measure of circuit power pressure for direct current.

Vulnerable Road Users

1. Definition of ODD taken from The IT Law Wiki - <https://itlaw.wikia.org/wiki/Operational_Design_Domain> [↑](#footnote-ref-1)
2. <https://www.google.com/search?rlz=1C1GCEA_enUS843US843&ei=ZhGuXOOdGse4sgXTrr2IDA&q=what+is+a+roadside+unit&oq=what+is+a+roadside+unit&gs_l=psy-ab.3..0i22i30.243901.258069..258166...7.0..4.495.5982.2j25j3j0j3....2..0....1..gws-wiz.......0i71j35i39j0i273j0j0i131j0i20i263j0i10j0i22i10i30j0i67.0BEyNISatC8> [↑](#footnote-ref-2)