

Connected Vehicle Demonstration at FDOT's TERL

By Derek Vollmer, FDOT Traffic Engineering and Operations, and Stephen Novosad, Atkins

As the Florida Department of Transportation (FDOT) continues its connected vehicle activities by expanding its regional test bed and investigating how autonomous and connected vehicle technology can integrate, it commissioned a series of connected vehicle demonstrations in August at the Traffic Engineering Research Laboratory (TERL). Connected vehicles involve vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications. Many different applications could be developed for connected vehicles and the demonstration at the TERL showcased a few applications to prove the concept.

The first demonstration uses V2V and V2I communications. The roadside unit (RSU) is configured with directional zones that can be used to detect a vehicle driving in the wrong direction. When a vehicle communicates with the RSU, the message includes the vehicle's location, direction of travel, and speed. From the information provided by the vehicle, the RSU will determine if the vehicle is traveling the wrong way within the configured zone. Once a wrong-way vehicle is detected, a message is sent to the wrong-way driver with a warning about traveling in the wrong direction. Messages are also sent to oncoming drivers warning them that a wrong-way driver was detected. The RSU will also send a message to the transportation management center (TMC), alerting the operators of the wrong-way driver.

The second demonstration involves V2I and V2V communications. In this demonstration, an over-height detector is used to determine if a vehicle is too tall to travel under an overpass. Once a vehicle triggers the over-height detector, a RSU will send a message to the driver indicating the vehicle is too tall for the overpass they are approaching. The driver will also be instructed to exit the freeway before the overpass. If the driver does not exit the freeway, another message is sent warning the driver of the impending collision and messages are sent to other vehicles approaching the overpass, warning of the impending collision. The TMC will also be alerted that an over-height vehicle is about to hit an overpass.

The third demonstration also involves V2V communications. This demonstration simulates a hard braking event. A vehicle will be traveling down the roadway with a couple of other vehicles traveling behind it. The first vehicle comes across something that requires the driver to suddenly apply their brakes. The equipment within the vehicle will detect this sudden braking and send messages to surrounding vehicles informing them of the braking event. The vehicles behind the vehicle that braked suddenly will receive messages informing the drivers that a vehicle ahead of them suddenly stopped. The message will also inform the drivers how far ahead the event occurred. For vehicles traveling in the opposite direction, no messages are received.

The fourth demonstration involves V2V communications where one vehicle simulates an emergency vehicle. When the emergency vehicle turns on their siren/light bar, the vehicle will transmit messages to other vehicles around it. Depending on where the other vehicles are located in relation to the emergency vehicle, different messages will appear informing drivers of the presence of the emergency vehicle.

Finally, the fifth demonstration involves both V2V and V2I. This demonstration shows how a message can be relayed from a disabled vehicle that is too far away to communicate with any RSUs. A vehicle will be parked out of range of the RSU. A switch will be activated to indicate the vehicle is disabled and the reason the vehicle is disabled. For example, the vehicle may have run out of fuel or have a flat tire. Another vehicle will pass by the disabled vehicle, and the disabled vehicle will transmit a "mayday" message to the passing vehicle. The

message will include the vehicle's location and information about why the vehicle is disabled. When the passing vehicle is within range of an RSU, it will transmit the "mayday" message. The RSU will then communicate this message to the TMC. The TMC can dispatch a Road Ranger to assist the driver with the disabled vehicle. The information in the message will include the vehicle's location and the reason the vehicle is disabled, so the Road Ranger will already be aware of the situation and can obtain any supplies needed prior to arriving on scene.

This series of connected vehicle demonstrations performed at the TERL showcases situations using V2V and V2I communications and how connected vehicle technology will benefit drivers and improve safety on Florida's roads.

For information, please contact Mr. Vollmer at (850) 410-5615 or e-mail to Derek.Vollmer@dot.state.fl.us.

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