

# Abstract all the electronic control units (ecus)

[Business](#), [Industries](#)



A new development within the internet of things is the development of connected cars. Vehicles developed lately have connected more than 150 small computers inside (ECUs), which are creating in-vehicle networks. These kind of vehicles have multiple connection points on the internet which offer a lot of online services to the users. Every device that is connected on internet is exposed to a lot of online threats, the same happens with the connected vehicle. Keywords: connected car, threat model, security embedded systems, protocols, etc. Introduction The world is getting interconnected every day.

The devices we are using are now smart devices, even the vehicles we are using are becoming smart. A recent development within internet of things are connected cars. Nearly every functionality within a car has its electronic control unit (ECU) running on its dedicated embedded controller with its own software. ECUs are used for many purposes such as safety, comfortableness, entertainment energy saving. Each car has approximately 100 to 150 ECUs which have more sensors and actuators attached.

One of the main parts of the vehicle is the internal vehicle network. This network connects all the electronic control units (ECUs) in the car and each ECU is responsible for a different car function. Internet vehicle network and the ECUs transform the car to work on drive by wire technology. Some of the systems are:- Intelligent parking assistance,- Lane keeping system- Blind spot warning All of these are part of Advanced Driver Assistance System. Recently, researches have shown that it is possible to hack vehicles even remotely and to control a variety of car

actuators. Background An embedded system is the electronic system which is created to access and to control the data in electronic systems.

The system includes a single chip microcontroller such as ARM, cortex and microprocessors. For the first time embedded systems in the automobile industry is used by Volkswagen in 1968. Automotive embedded systems are classified in some groups such as:- airbag system - GPS- Anti-lock braking system- Fuel injection controller devices The equipment in automotive industry are being changed from mechanic systems to electronic systems. Embedded system is the heart of the vehicle electronics systems because of its versatility and flexibility. Advanced usage of embedded systems in vehicle can help in controlling the pollution, increasing the facility to provide systems monitoring features that consumers demand. A typical vehicle nowadays contains around 25 to 35 microcontrollers. Automobiles have computer controlled electronic systems and the most commonly used embedded system include airbag, anti-lock braking systems, drive by wire, satellite radio, traction control, automatic parking, night vision, navigation systems, climate control, etc.

Connected Cars By the definition, a connected car is a vehicle equipped with internet access which allows to interact with other vehicles around it. When a connected car has the internet access than that vehicle is able to use information to drive the vehicle without human interaction. In the new vehicles there are a lot of new technologies installed but, the technologies cannot be used without the internet connection. Each car consists of 100 to 150 ECUs (Electronic Control Units) which are small computers that are

networked together and control most of the vehicle functions. Each ECU has a number of sensors and actuators attached to them. The ECU and internal vehicle network replace the mechanical connections with electrical systems and slowly transform the car to work on drive - by wire technology.

Today's vehicles are equipped with a number of new technologies and features that were not possible without an internet connection. Passengers now have the option to receive service information and traffic reports through the vehicle's dedicated cellular connection. They also have the option to connect their smart phone to the vehicle over the Bluetooth or Wi-Fi connection and use the smart phone's internet connection to enable some of the new features of the vehicle's entertainment center. This center enables web browsing, access to social networks, streaming of online content, and many other services depending on the vehicle type and manufacturer. In the very near future, vehicles will communicate with each other (V2V) and with the infrastructure around them. (V2I). This is going to reduce accidents and decrease gas consumption by letting vehicles communicate with each other and have more control.

Some of the major features of V2V technologies are to determine the speed limit and in order to collect information about traffic and road conditions the vehicles must be connected to the internet. Vehicle-to-vehicle (V2V) technology enables cars to wirelessly communicate with each other and to maintain temporary networks among themselves in order to prevent accidents. The information that is exchanged between two connected vehicles is related to traffic safety and security, keeping a safe distance

between the two cars for preventing accidents or any other data that is meaningful to the vehicles.

This technology is challenging because of its distributed nature and to implement V2V connection the car manufacturers need to agree on communication technologies and protocols that will be used. Otherwise without the mutual agreement between car manufacturers, the communication would be made only between cars from the same brand. V2I (Vehicle to infrastructure) are technologies where the car communicates with infrastructure environment around, which includes highways, road signs, traffic lights. Also, it is possible to get information from traffic jams and accidents. In the near future when most of the vehicles will be connected cars, the traffic can be regulated by one central authority by giving suggestions to all vehicles on the best route and speed, enabling an environment without traffic jams, accidents and with less fuel consumption. Abstract A new development within the internet of things is the development of connected cars. Vehicles developed lately have connected more than 150 small computers inside (ECUs), whose are creating in-vehicle network.

These kind of vehicles have multiple connection points on the internet which offer a lot of online services to the users. Every device that is connected on internet is exposed to a lot of online threats, the same happens with the connected vehicle. Keywords: connected car, threat model, security embedded systems, protocols, etc. Introduction The world is getting interconnected every day. The devices we are using are now smart devices,

even the vehicles we are using are becoming smart. A recent development within internet of things are connected cars.

Nearly every functionality within a car has its electronic control unit (ECU) running on its dedicated embedded controller with its own software. ECUs are used for many purposes such as safety, comfortableness, entertainment energy saving. Each car has approximately 100 to 150 ECUs which have more sensors and actuators attached. One of the main parts of the vehicle is the internal vehicle network. This network connects all the electronic control units (ECUs) in the car and each ECU is responsible for a different car function. Internet vehicle network and the ECUs transform the car to work on drive by wire technology.

Some of the systems are:- Intelligent parking assistance,- Lane keeping system- Being spot warning All of these are part of Advanced Driver Assistance System. Recently, researches have shown that it is possible to hack vehicles even remotely and to control a variety of car actuators. Background An embedded system is the electronic system which is created to access and to control the data in electronic systems. The system includes a single chip microcontroller such as ARM, cortex and microprocessors. For the first time embedded systems in the automobile industry is used by Volkswagen in 1968. Automotive embedded systems are classified in some groups such as:- airbag system - GPS- Anti - locking braking system- Fuel injection controller devices The equipment in automotive industry are being changed from mechanic systems

to electronic systems. Embedded system is the heart of the vehicle electronics systems because of its versatility and flexibility.

Advanced usage of embedded systems in vehicle can help in controlling the pollution, increasing the facility to provide systems monitoring features that consumers demand. A typical vehicle nowadays contains around 25 to 35 microcontrollers. Automobiles have computer controlled electronic systems and the most commonly used embedded system include airbag, anti-lock braking systems, drive by wire, satellite radio, traction control, automatic parking, night vision, navigation systems, climate control, etc.

Connected Cars By the definition, a connected car is a vehicle equipped with internet access which allows to interact with other vehicles around it. When a connected car has the internet access than that vehicle is able to use information to drive the vehicle without human interaction. In the new vehicles there are a lot of new technologies installed but, the technologies cannot be used without the internet connection. Each car consists of 100 to 150 ECUs (Electronic Control Units) which are small computers that are networked together and control most of the vehicle functions. Each ECU has a number of sensors and actuators attached to them.

The ECU and internal vehicle network replace the mechanical connections with electrical systems and slowly transform the car to work on drive-by-wire technology. Today's vehicles are equipped with a number of new technologies and features that were not possible without an internet connection. Passengers now have the option to receive service information and traffic reports through the vehicle's dedicated cellular connection. They also

have the option to connect their smart phone to the vehicle over the Bluetooth or Wi-Fi connection and use the smart phone's internet connection to enable some of the new features of the vehicle's entertainment center. This center enables web browsing, access to social networks, streaming of online content, and many other services depending on the vehicle type and manufacturer. In the very near future, vehicles will communicate with each other (V2V) and with the infrastructure around them. (V2I).

This is going to reduce accidents and to decrease gas consumption by letting vehicles communicate with each other and have more control. Some of the major features of V2V technologies are to determine the speed limit and in order to collect information about traffic and road conditions the vehicles must be connected to the internet. Vehicle-to-vehicle (V2V) technology enables cars to wirelessly communicate with each other and to maintain temporary networks among themselves in order to prevent accidents. The information that is exchanged between two connected vehicles is related to traffic safety and security, keeping a safe distance between the two cars for preventing accidents or any other data that is meaningful to the vehicles.

This technology is challenging because of its distributed nature and to implement V2V connection the car manufacturers need to agree on communication technologies and protocols that will be used. Otherwise without the mutual agreement between car manufacturers, the communication would be made only between cars from the same brand. V2I (Vehicle to infrastructure) are technologies where the car communicates with infrastructure environment around, which includes highways, road signs,



trafficlights. Also, it is possible to get information from traffic jams andaccidents.

In the near future when most of the vehicles will be connected cars, the traffic can be regulated by one central authority by giving suggestions toall vehicles on the best route and speed, enabling an environment withouttraffic jams, accidents and with less fuel consumption.