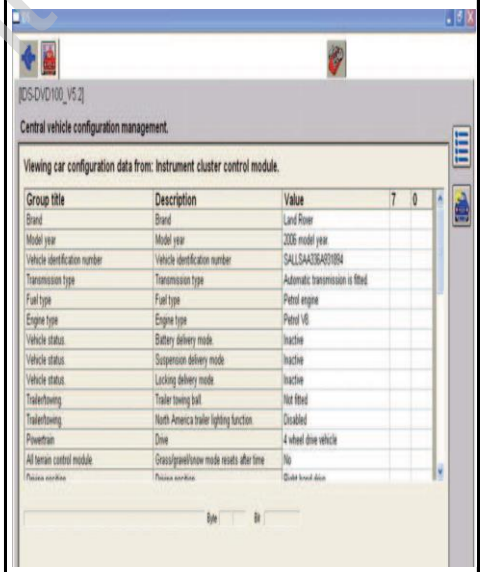
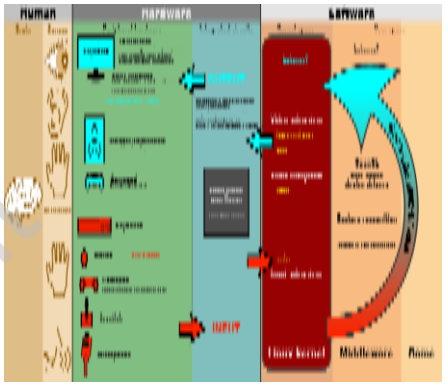
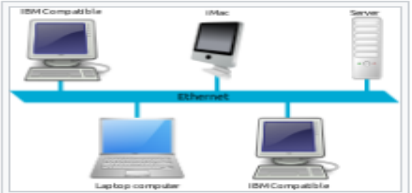
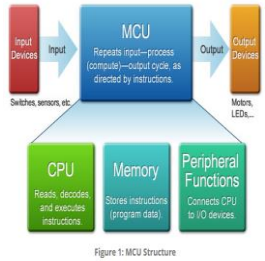
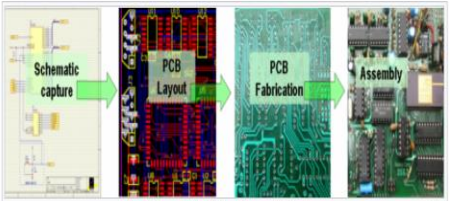
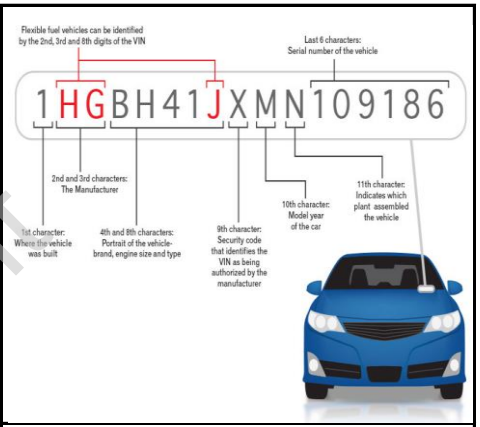
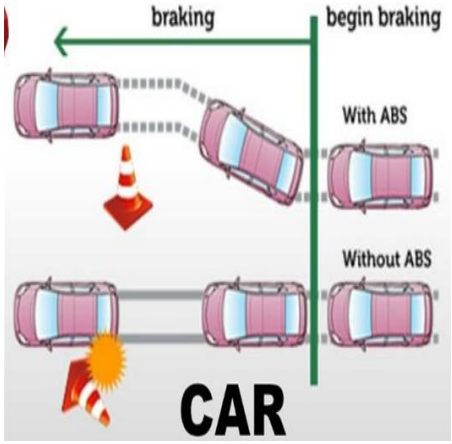
Domain	Module	Keywords	P	Stand for	Definition	How it work (English)	How it work (Vietnamese)	Image
Common	Audio	AMP	P0	**AMP**lifier	An amplifier, electronic amplifier or (informally) amp is an electronic device that can increase the power of a signal (a time-varying voltage or current).		Bộ âm li (bộ khuếch đại) là một thiết bị điện tử nhằm khuếch đại năng lượng của sóng	
Common	Audio	AUX	P0	**AUX**iliary	- It's also known as auxiliary jack/port/input or phone connector (audio), is a family of electrical connectors typically used for analog audio signals. - In your car, it is usually a 3.5mm jack - AUX sends sound to the multimedia system, enabling you to 'stream' music from a device through the car's speakers	The most common arrangement remains to have the male plug on the cable and the female socket mounted in a piece of equipment: the original intention of the design. Common case: vehicle has AUX female socket (AUX-IN), driver uses jack connector plug to connect music player to vehicle to use vehicle's speaker to play music.		
Common	Common	AUTOSAR	P0	**Aut**omotive **O**pen **S**ystem **Ar**chitecture	The AUTOSAR development partnership was formed in July 2003 by BMW, Bosch, Continental, Daimler, Chrysler, Siemens VDO and Volkswagen to develop and establish an open industry standard for automotive E/E architecture.	It pursues the objective of creating and establishing an open and standardized software architecture for automotive electronic control units (ECUs). Goals include the scalability to different vehicle and platform variants, transferability of software, the consideration of availability and safety requirements, a collaboration between various partners, sustainable utilization of natural resources, and maintainability throughout the whole "Product Life Cycle"		
Common	Common	Average fuel consumption	P0	N/A	Indicates the average fuel consumption since the function was last reset. It relates distance traveled by a vehicle and the amount of fuel consumed.	Consumption can be expressed in terms of volume of fuel to travel a distance (L/km or L/100km), or the distance travelled per unit volume of fuel consumed (km/L). Miles per gallon (mpg) is commonly used in the United States, the United Kingdom, and Canada (alongside L/100 km). Kilometers per liter (km/L) is more commonly used elsewhere in the Americas, Asia, parts of Africa and Oceania.	Lượng tiêu thụ nhiên liệu trung bình	

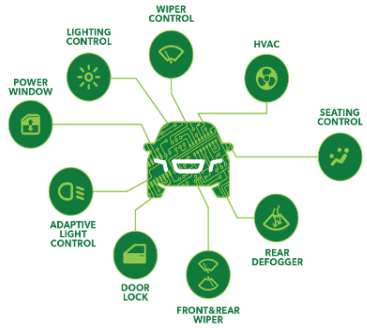
Common	Common	Average speed	P0	N/A	Indicates the average speed since the function was last reset. Press reset button to set to zero	Speed is expressed by the traveled distance in a unit of time as number of kilometers per hour (km/h) or number of miles per hour (mph)		
Common	Common	CCF	P0	Car Configuration File	The CCF on the vehicle uses to store the configuration parameters. Examples of data held in the vehicle parameters section are: • Vehicle Type • Brand • Model Year • VIN • Tyre Dynamic Rolling Radius • Brake System Type • Brake Disc size • Final Drive Ratio • Transmission Type • Hand of Drive • MOST configurations	Some of the CCF vehicle parameters can be altered by the customer as part of the personalization mode. Some of these parameters may be able to be changed by the driver. The CCF files are stored in several modules, one of which will be the master module. The other modules stores copies of CCF data which may be used when programming new modules. The car configuration file (CCF) may be thought of as the electrical make up (or electrical DNA) of the vehicle. Example: within the CCF will be codes relating to all aspects of the vehicles: the vehicle model, whether the vehicle is left or right hand, the wheel size, engine size and type of transmission and which electrical modules and features are installed to name but a few.		
Common	Common	CPU	P0	**C**entral **P**rocessing **U**nit	CPU is the electronic circuitry within a computer that carries out the instructions of a computer program by performing the basic arithmetic, logical, control and input/output (I/O) operations specified by the instructions			
Common	Common	Diag / Diagnostics	P0	Diagnostics	- It helps user to get a quick and reliable diagnosis of your car problems - Diagnostic tests can discover problems within a car's engine, transmission, exhaust system, brakes, ECU...	Using specialized software and hardware, car diagnostic tools quickly and accurately point to problem areas in a car's engine or elsewhere, thanks to built-in processors, microchips and sensors.		

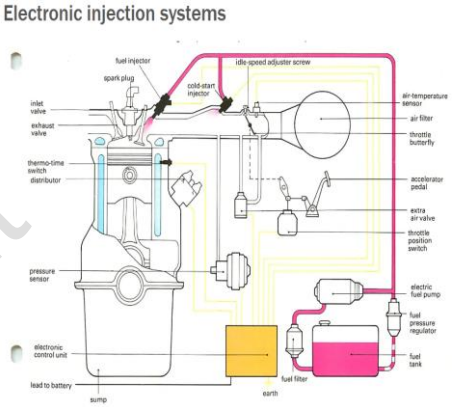
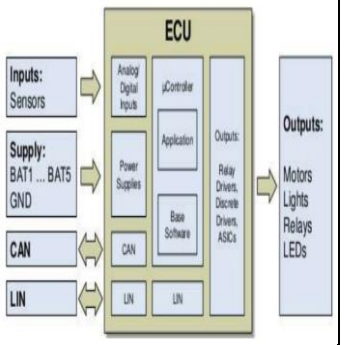
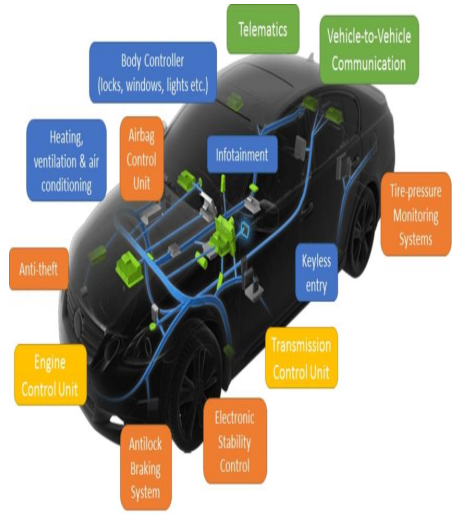
Common	Common	GUI	P0	**G**raphical **U**ser **I**nterface	Graphical User Interface is a form of user interface that allows users to interact with electronic devices through graphical icons and visual indicators such as secondary notation, instead of text-based user interfaces, typed command labels or text navigation.	A GUI uses a combination of technologies and devices to provide a platform that users can interact with, for the tasks of gathering and producing information. A series of elements conforming a visual language have evolved to represent information stored in computers. This makes it easier for people with few computer skills to work with and use computer software. The most common combination of such elements in GUIs is the windows, icons, menus, pointer (WIMP) paradigm, especially in personal computers.		
Common	Common	HMI / MMI	P0	Human - Machine Interface / Man - Machine Interface	The user interface is the space where interactions between humans and machines occur. (HMI) interfaces machines with physical input hardware such a keyboards, mice, game pads and output hardware such as computer monitors, speakers, and printers. A device that implements a HMI is called a human interface device (HID). Additional user interface layers may interact with one or more human sense, including: tactile UI (touch), visual UI (sight), auditory UI (sound), olfactory UI (smell), equilibrial UI (balance), and gustatory UI (taste).	Example: The driver can touch on the AVN's screen and listen music via AVN, AVN is a HMI of vehicle with the driver. The driver can turn on air conditioner by pressing AC button. That means AC button is HMI between the driver with air conditioner system inside vehicle.		
Common	Common	LAN	P0	Local Area Network	A local area network (LAN) is a computer network that interconnects computers within a limited area such as a residence, school, laboratory, university campus or office building. Ethernet and Wi-Fi are the two most common technologies in use for local area networks			 A conceptual diagram of a local area network.

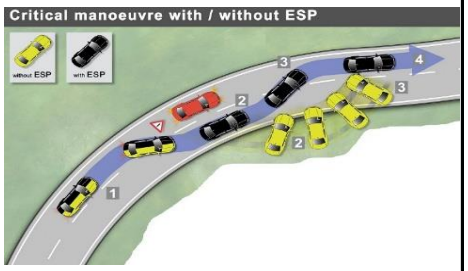
Common	Common	MCU	P0	**M**icro **C**ontroller **U**nit	Micro Controller Unit (MCU) is a small chip used as an embedded system. In automotive projects, MCU is a common name for a chip which is responsible for processing vehicle signals	It's controlling the hardware that implements the device's operation. The MCU receives inputs from buttons, switches, sensors, and similar components; and controls the peripheral circuitry—such as motors and displays—in accordance with a preset program that tells it what to do and how to respond.		 Figure 1: MCU Structure
Common	Common	OEM	P0	**O**riginal **E**quipment **M**anufacturer	The OEM is the original producer of a vehicle's components, and so OEM car parts are identical to the parts used in producing a vehicle. Aftermarket parts are produced by other vendors and do not necessarily have a consistent level of quality or compatibility with the vehicle.			
Common	Common	PCB	P0	**P**rinted **C**ircuit **B**oards	A printed circuit board (PCB) mechanically supports and electrically connects electronic components or electrical components using conductive tracks, pads and other features etched from one or more sheet layers of copper laminated onto and/or between sheet layers of a non-conductive substrate.		Bảng mạch in hay bo mạch in, đôi khi gọi tắt là mạch in, là bảng mạch điện dùng phương pháp in để tạo hình các đường mạch dẫn điện và điểm nối linh kiện trên tấm nền cách điện. Chế tạo bảng mạch in là công đoạn quan trọng trong quá trình chế tạo bảng mạch điện tử. Trước đây việc làm bảng mạch in tách rời với công đoạn lập sơ đồ mạch điện. Ngày nay hệ thống thiết kế và sản xuất hỗ trợ bằng máy tính (CAD-CAM) đảm bảo tự động liên hoàn từ thiết kế sơ đồ mạch điện đến lắp ráp, giảm nhẹ sự can thiệp của con người và cho ra sản phẩm giá thành hạ.	 Các giai đoạn chính chế tạo bảng mạch điện tử.

Common	Common	VIN	P0	**V**ehicle **I**dentification **N**umber	The car's vehicle identification number (VIN) is the identifying code for a SPECIFIC automobile. The VIN serves as the car's fingerprint, as no two vehicles in operation have the same VIN. A VIN is composed of 17 characters (digits and capital letters) that act as a unique identifier for the vehicle. A VIN displays the car's unique features, specifications and manufacturer.	A number to identify one vehicle		
Common	Driving Mode	DM	P0	**D**riving **M**ode	Driving modes or drive modes allow a vehicle to have multiple personalities or characteristics in the way that it drives, rides and handles as opposed to a single set of characteristics	Due to each kind of car, will have different type of driving mode clasification such as : 1. Based on type of driving: Normal, Comfort, Economy (Eco), Sport , Race, Off-road/Winter mode, Custom ... 2. Based on operator : Teen Driver, Valet Mode... Depend on each kind of car, user can select mode by hard key near by driver area or select option for setting Driving mode on Head Unit	Chế độ lái Driving Mode / Environmental Factors 0 – Unrestricted mode, vehicle is "Parked" 1 – Vehicle stopped (e.g., vehicle speed = 0 mph/kph) or PCM 2 – Moving at Low Speed (e.g., vehicle speed < 5 mph / 8kph) 3 – Moving at Medium or High Speed (e.g., vehicle speed > 5mph / 8 kph) 4 – vehicle is NOT "Parked" and the driver is a Teen 5 – Reserved 6 – Reserved 7 – Restrictions NOT applicable mode	
Common	Driving Mode	Gear Position	P0	N/A	Change position of gear box. Here are the list of common gear position: - P: Park - N: Neutral - R: Reverse - D: Driver Some cars support S (Sport) and L (Low) gears also. In manual transmission vehicle, the gear position is represented by number from 1 to 6 and Reverse position.	- Park: In an automatic transmission there is a ring with teeth on the output shaft of the transmission. When the transmission is shifted into park, a lever called the parking pawl is lowered against the ring. If the parking pawl did not land squarely into an opening in the ring the car will roll slightly and there will be a usually an audible click. The parking pawl now holds the output shaft from turning. - Neutral: Shifting to the neutral gear in an automatic transmission will cut off the connection between the engine and the wheels. So, no power will be transmitted to the wheels when you press the pedal. This allows the wheels to rotate freely without drawing much action from the engine, but you will still have some control over the car.		

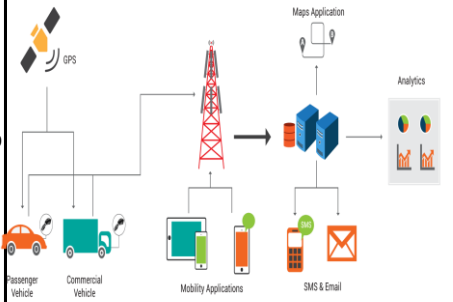
Common	Driving Mode	Valet Mode	P0	N/A	Valet Mode is a function in vehicles that allows you to effectively "turn off" the ability to use some of the technologies until the mode is deactivated. With this mode, you can prevent others, such as your valet driver, from using your phone, navigation system, or other system. There are many ways you can customize your settings and ensure your safety.			
Common	ECU	ABS	P0	**A**nti-**L**ock **B**raking **S**ystem	Anti-Lock Braking System is: - A safety system in cars and other automobiles that keeps their wheels from locking up and helps their drivers to maintain steering control. - It enables the wheels of a vehicle to maintain tractive contact with the ground so that they don't go into an uncontrolled skid.	ABS uses wheel speed sensors to determine if one or more wheels are trying to lock up during braking. If a wheel tries to lock up, a series of hydraulic valves limit or reduce the braking on that wheel. This prevents skidding and allows you to maintain steering control. The system has four main components that all work in unison to keep your car's wheels from skidding while you slow down. -Speed Sensors. Each of your car's wheels have a speed sensor that relays information back to the ABS. -Valves. The ABS controls a small valve located within the brake line. This valve works to open, block, and release pressure on the brake line. -Pump. The pump works alongside the valve. If the valve releases pressure on the brakes, then the pump serves to re-apply pressure to the brake line. -Controller. This is the computer that monitors the rest of the components and ensures that each system fires at the precise moment it is needed in order to stop the vehicle. It also works to control the valves and speed sensors.	ABS là hệ thống chống bó cứng phanh. Khi thực hiện phanh lúc xe đang di chuyển, hệ thống phanh bó chặt vào bánh xe dẫn đến hiện tượng xe không thể đánh lái hay còn gọi là bó cứng và gặp tình trạng bánh xe bị trượt (skid) dài trên mặt đường. Điều này sẽ rất nguy hiểm khi phía trước của xe đang có vật cản. ABS là hệ thống được sinh ra để tránh việc bó cứng bánh xe trong lúc phanh, giúp xe vẫn có thể điều hướng được. Các thiết bị chống bó cứng phanh ABS hiện đại gồm một controller, 4 cảm biến tốc độ (speed sensor) trên từng bánh và các van thủy lực (hydraulic valves). Khi controller nhận thấy một hay nhiều bánh có tốc độ quay chậm hơn mức quy định nào đó so với các bánh còn lại, nó sẽ tự động giảm áp suất tác động lên phanh. Tương tự, nếu một trong các bánh quay quá nhanh, Chíp điện tử cũng tự động tác động lực trở lại, đồng thời tạo độ rung ở bàn đạp phanh để báo cho người lái biết ABS đang hoạt động. Khi hoạt động, ABS nhả - nhấn piston khoảng 15 lần mỗi giây. Nhờ đó khi xảy ra các tình huống khẩn cấp hệ thống ABS sẽ giúp người lái có thể kiểm soát quá trình chuyển động trong suốt quá trình phanh.	

Common	ECU	AVN	P0	**A**udio **V**ideo **N**avigation	AVN is a device which is installed inside vehicle to mainly support entertainment applications such as media, radio, connectivity (bluetooth, usb, aux..), navigation, news... Some types of AVN also provide vehicle's status or vehicle information and allow driver to perform some remote functions inside vehicle like climate or heating. Same functions as **head unit**	AVN includes both hardware and software. Driver or passenger can interact with AVN via buttons or touch screen.		
Common	ECU	BCM	P0	**B**ody **C**ontrol **M**odule	Body Control Module: In automotive electronics, body control module or 'body computer' is a generic term for an electronic control unit responsible for monitoring and controlling various electronic accessories in a vehicle's body. Typically in a car the BCM controls the power windows, power mirrors, air conditioning, immobilizer system, central locking, etc.	The BCM communicates with other on-board computers (like ECU) via the car's vehicle bus, and its main application is controlling load drivers – actuating relays that in turn perform actions in the vehicle (actuators) such as locking the doors or dimming the salon overhead lamp.		
Common	ECU	CID	P0	**C**entral **I**nfo **D**isplay	Central Info Display: is the graphic display unit for the user interface of all convenience functions and some vehicle functions	CID is the LCD usually located in the upper middle of the dashboard of the car CID can display informations such as navigation, audio/video, climate control and communications systems		
Common	ECU	Cluster	P0	N/A	Cluster (Instrument Clusters) is a control panel located directly ahead of a vehicle's driver, displaying instrumentation and controls for the vehicle's operation. In an automobile, an electronic instrument cluster, digital instrument panel or digital dash for short, is a set of instrumentation, including the speedometer, that is displayed with a digital readout rather than with the traditional analog gauges. Many refer to it simply as a digital speedometer.	Instrument Clusters ensure that the driver is comprehensively and reliably informed at all times. They provide basic driving information like speedometer, tachometer, temperature, fuel, telltales, and warnings. Additional information is presented via display, e.g. radio, on-board computer, internet, navigation, telephone, rear/front view camera and driver assistance systems information		

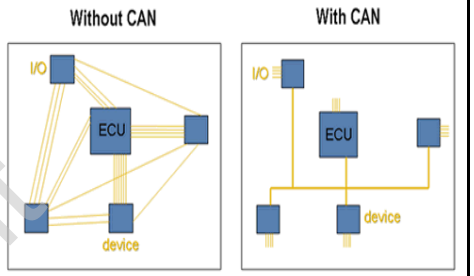
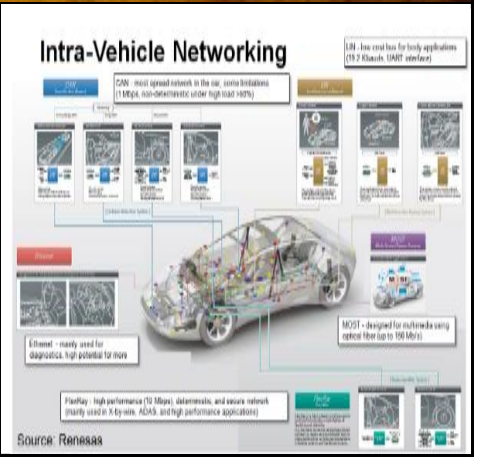
Common	ECU	ECM	P0	**E**ngine **C**ontrol **M**odule	Engine Control Module An engine control unit (ECU), also commonly called as an engine control module (ECM), is a type of electronic control unit that controls a series of actuators on an internal combustion engine to ensure optimal engine performance. It does this by reading values from a multitude of sensors within the engine bay, interpreting the data using multidimensional performance maps (called lookup tables), and adjusting the engine actuators accordingly. Before ECUs, air-fuel mixture, ignition timing, and idle speed were mechanically set and dynamically controlled by mechanical and pneumatic means.	It's basically an on-board comptuter in a car with sensors and actuators to control operation of engine to produce demaned power as rotary force. In case of combustion engine, sensors read environment parameters like air pressure, density of oxigen, temperature and internal parameters like fuel level, position of piston, combustion chamber... Actuators such as fuel injector, spark plug, valves and pumps. Sensors provide data input to ECM and actuator receive command from ECM to control the fuel firing. ECM is an special kind of ECU (Electronic Control Unit)		
Common	ECU	ECU	P0	**E**lectronic **C**ontrol **U**nit	- ECU is an embedded electronic device that controls one or more electrical systems in a vehicle. - The term ECU, however, is commonly used when referring to **engine** management systems - which are often called Engine Control Units. These are responsible for controlling the injection and ignition system of an engine. Please consider two meanings of this word in your documents. - In How it work, we just mentioned detail about Electronic Control Unit.	- ECU reads signals coming from sensors placed at various parts and in different components of the car. The data from these inputs is assessed by the ECU and compared against stored on-board data. The ECU then decides what needs to happen to ensure the system in question functions properly and issues new commands to suit, like remote actuators or logging. These outputs then alter the operation of the system, delivering the desired effect. - Common ECUs: ECM (Engine Control Module), PCM (Powertrain Control Module), BCM (Body Control Module), GEM (General Electric Module), Telematics Control Module (TCU)...		

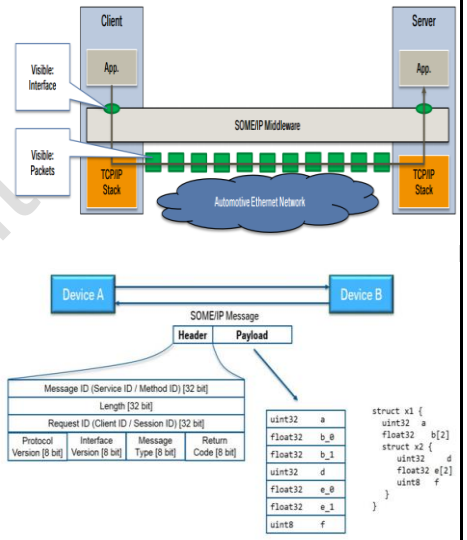
Common	ECU	EPB	P0	**E**lectronic **P**arking **B**rake	In road vehicles, the parking brake, also called **hand brake**, **emergency brake**, or **e-brake**, is used to keep the vehicle stationary on grades and flat roadsand, in many cases also perform an emergency stop. This was accomplished traditionally using a manual parking brake. With electric park brakes, the driver activates the holding mechanism with a button and the brake pads are then electrically applied onto the rear brakes. The implementation of the control logic for the actuators is carried out by either using a stand alone ECU or by integrating it in the ECU for electronic stability control	First installed in the 2001 BMW 7 Series (E65), electric park brakes have since appeared in a number of vehicles. Two variations are available: In the more-traditional "cable-pulling" type, an electric motor simply pulls the emergency brake cable on the push or pull of a button rather than a mechanical pedal or handle in the cabin. A more complex unit [3] (first seen on the 2003 Audi A8) uses a computer-controlled motor attached to each of the two rear brake calipers referred to as the Motor on Caliper(MoC) system. It is expected that these systems will incorporate other features in the future. Jaguar, Landrover, BMW, Renault, Subaru and VW already have a system where the park brake engages when the engine is stopped and is released when the gas pedal is pressed. An extension of this system, called the hill-hold function, prevents roll-back when stopping and starting on a hill. The OEM can easily turn off the system. Some electric park brakes function similar to "park" on an automatic transmission and will not engage when the vehicle is in motion, there is no emergency brake in this case.	Phanh tay điện, khác với phanh tay thường, sử dụng nút bấm, lái xe không cần phải giữ phanh tay khi cần dùng.	 Electric park brake in the center console in a Volkswagen Touran
Common	ECU	ESP / ESC / DSC / VSC	P0	Electronic Stability Control / Electronic Stability Program / Dynamic Stability Control / Vehicle Stability Control	ESC, also referred to as ESP or DSC or VSC, is a computerized technology that improves a vehicle's stability by detecting and reducing loss of traction (skidding).	When ESC detects loss of steering control, it automatically applies the brakes to help "steer" the vehicle where the driver intends to go. Braking is automatically applied to wheels individually, such as the outer front wheel to counter oversteer or the inner rear wheel to counter understeer. Some ESC systems also reduce engine power until control is regained. ESC does not improve a vehicle's cornering performance; instead, it helps to minimize the loss of control.	Trong quá trình chuyển động, nếu hệ thống cân bằng điện tử (ESC) phát hiện tình trạng xe bắt đầu mất lái (rõ rệt nhất vào lúc cua) thì ESC sẽ làm việc bằng cách can thiệp vào hệ thống phanh để giảm ngay vận tốc xe. ESC có thể ra lệnh cho hệ thống phanh hoạt động riêng rẽ cho một hoặc nhiều bánh xe, trên cầu trước hoặc cầu sau. Nhiệm vụ chính của hệ thống ESC chính là giúp ổn định xe khi phanh, khi xe vào cua và ngay cả lúc xe mới khởi hành, tăng tốc.	

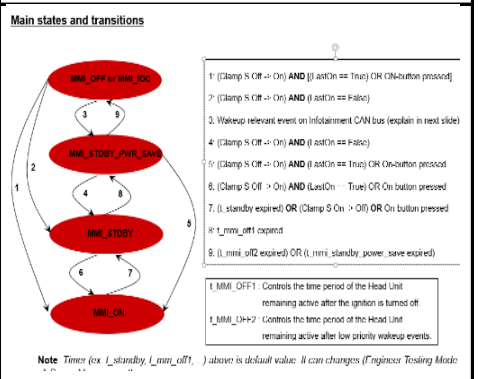
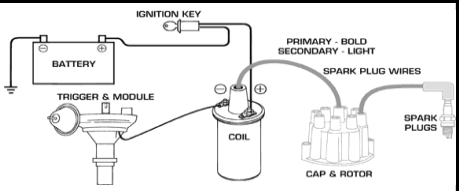
Common	ECU	HU or IHU	P0	Head Unit / Infortainment Head Unit	An automotive head unit, sometimes referred to as a deck, is a component of an automotive infotainment, which provides a unified hardware interface (mainly, the screen and buttons) for the entire system.	The head unit is the centerpiece of the car's sound and information system. Typically located in the center of the dashboard, modern head units are densely integrated electronic packages housed in detachable face plates. As high-end head units are common targets for theft, many head units are typically integrated into the vehicle's alarm system. Head units give the user control over the vehicle's information and entertainment media: AM/FM radio, satellite radio, DVDs/CDs, cassette tapes (although these are now uncommon), USB MP2, Dashcams, GPS navi, Bluetooth, WiFi etc. Many audio-only head units afford the user precise control over detailed audio functions such as volume, band, frequency, speaker balance, speaker fade, bass, treble, EQ and so on. Several OEMs such as General Motors are integrating more advanced systems into vehicle's head units such that they can offer vehicle data such as trouble warnings; such a head unit thus serves as a secondary instrument panel.		
Common	ECU	HUD	P0	**H**ead-**u**p **D**isplay	A head-up display or heads-up display, also known as a HUD, is any transparent display that presents data without requiring users to look away from their usual viewpoints	Displays the data on a transparent windscreen, enhancing the drivers' driving capability by fulfilling the requirements for safety, comfort, and information, without requiring users to look away from their usual viewpoints A typical HUD contains three primary components: a projector unit, a combiner, and a video generation computer.		
Common	ECU	HVAC	P0	**H**eating, **V**entilation, and **A**ir **C**onditioning	HVAC is heating, ventilation, and air conditioning system. HVAC is the technology of indoor and vehicular environmental comfort. Its goal is to provide thermal comfort and acceptable indoor air quality	When your air conditioning is not functioning properly, driving can be miserable and, in some cases, even dangerous. All modern cars have a heater, and most have an air conditioner. These components help maintain safe and comfortable driving conditions, including visibility.	HVAC là một hệ thống tỏa nhiệt hoàn chỉnh, thông hơi và điều hòa không khí	

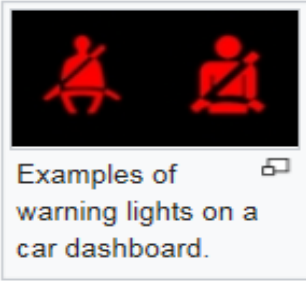
Common	ECU	ICE/IVI	P0	**I**n-**C**ar **E**ntertainment/ **I**n-**V**ehicle Infotainment	In-car entertainment (ICE), or in-vehicle infotainment (IVI), is a collection of hardware and software in automobiles that provides audio or video entertainment.	In car entertainment originated with car audio systems that consisted of radios and cassette or CD players, and now includes automotive navigation systems, video players, USB and Bluetooth connectivity, Carputers, in-car internet, and WiFi. Once controlled by simple dashboards knobs and dials, ICE systems can include steering wheel audio controls and handsfree voice control.		
Common	ECU	IPC / IPK	P0	**I**nstrument Panel **C**luster /**I**nstrument Pack	Same as **Cluster** IPC / IPK is an ECU name of a Cluster.			
Common	ECU	Telematics	P0	N/A	Telematics was a merging of the **telecommunications** and **informatics** (computing science). It refered to the transfer of information over telecommunications. Telematics is a general term, can involve any of the following: - The technology of sending, receiving and storing information using telecommunication devices to control remote objects - The integrated use of telecommunications and informatics for application in vehicles and to control vehicles on the move -Global navigation satellite system technology integrated with computers and mobile communications technology in automotive navigation systems Some commercial vehicle telematics services: GM Onstar, BMW Assist, Lexus Link, Toyota G-Book, Hyundai Blue Link, Nissan CarWings	To provide a vehicle telematics service, the manufacter needs to establish a center server system to manage all telematics activities of all vehicles. Regarding vehicle side, we need a device which is installed inside the vehicle, it is usually called as telematics box or tbox. This tbox can get the vehicle's status and send information to the center server via telecommunication like SMS or data service (3G, LTE) or voice call. In another hand, tbox can receive request from center and decide what need to happen. Để cung cấp dịch vụ telematics cho người mua xe, các nhà sản xuất xe nhất thiết phải xây dựng một hệ thống máy chủ trung tâm để quản lý tất cả các hoạt động liên quan đến telematics. Bên cạnh đó, bản thân trên mỗi chiếc xe cũng phải cài đặt một thiết bị để thực hiện các công việc phục vụ cho telematics và thường được gọi là telematics box (hay tbox). Thiết bị này do cài đặt trên xe nên có thể lấy được các thông tin trên xe và gửi về hệ thống máy chủ trung tâm thông qua kết nối viễn thông (Có thể xem thiết bị này có vai trò tương đương như một chiếc điện thoại di động, có thể kết nối Internet thông qua mạng việc thông 3G, LTE đến hệ thống máy chủ của hãng xe). Mặt khác thiết bị cũng có thể nhận được các yêu cầu từ máy chủ và xử lý.	Telematics là kết hợp của từ "telecommunication" (viễn thông) và "informatics" (khoa học máy tính) dùng để mô tả việc trao đổi thông tin thông qua mạng viễn thông. Telematics là một khái niệm chung, nó có thể là các khái niệm sau: - là công nghệ truyền - nhận thông tin thông qua các thiết bị truyền thông với mục đích điều khiển từ xa (giống với IoT) - là việc ứng dụng viễn thông với khoa học máy tính trên xe cộ để điều khiển các phương tiện này. - là việc tích hợp công nghệ định vị toàn cầu với viễn thông để ứng dụng vào hệ thống định vị trên các phương tiện giao thông. Trong ứng dụng telematics trên các phương tiện giao thông, các dịch vụ telematics đã được thương mại hóa như: GM Onstar, BMW Assist, Lexus Link, Toyota G-Book, Hyundai Blue Link, Nissan CarWings	

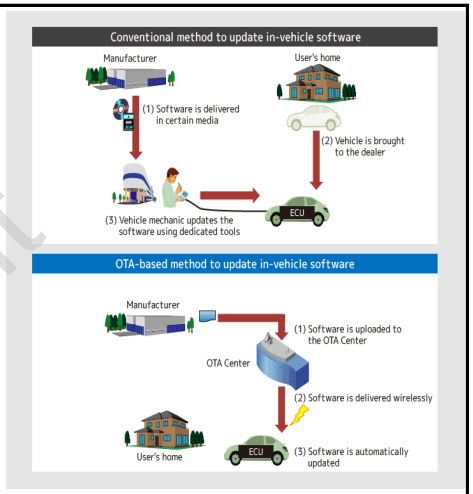
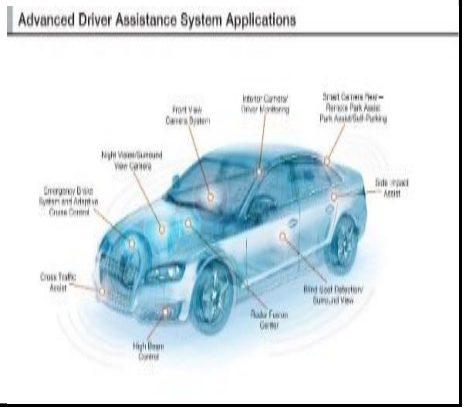
Common	Navigation	GNSS	P0	**G**lobal **N**avigation **S**atellite **S**ystem	Global Navigation Satellite System (GNSS) refers to a constellation of satellites providing signals from space that transmit positioning and timing data to GNSS receivers. The receivers then use this data to determine location.	Common GNSS Systems are GPS, GLONASS, Galileo, Beidou and other regional systems. The advantage to having access to multiple satellites is accuracy, redundancy and availability at all times. Though satellite systems don't often fail, if one fails GNSS receivers can pick up signals from other systems.	GNSS là hệ thống định vị toàn cầu sử dụng vệ tinh. Hệ thống GNSS hiện nay bao gồm GPS (sử dụng vệ tinh của Mỹ), GLONASS (Nga), Beidou (Trung Quốc) và các hệ thống vệ tinh khác (Nhật, Canada).	
Common	Navigation	GPS	P0	**G**lobal **P**ositioning **S**ystem	The Global Positioning System (GPS), originally Navstar GPS, is a satellite-based radionavigation system owned by the United States government and operated by the United States Air Force. It is a global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites	The Global Positioning System (GPS) is a global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on or near the Earth . - Can be set to GPS time synchronization status. (On / Off)		
Common	Navigation	Navigation	P0	N/A	Navigation is used to find direction in an automobile. It typically uses a satellite navigation device to get its position data which is then correlated to a position on a road. When directions are needed routing can be calculated. On the fly traffic information can be used to adjust the route.	Mathematically, automotive navigation is based on the shortest path problem, within graph theory, which examines how to identify the path that best meets some criteria (shortest, cheapest, fastest, etc.) between two points in a large network.		

Common	Network/Protocol	CAN	P0	**C**ontroller **A**rea **N**etwork	Controller Area Network: Internal network protocol in car to communicate between ECUs. It is a message-based protocol, designed originally for multiplex electrical wiring within automobiles to save on copper. CAN speed can reach to 1 Mbps CAN is most spread network in the car.	CAN is a multi-master serial bus standard for connecting Electronic Control Units (ECUs) also known as nodes. Two or more nodes are required on the CAN network to communicate. All nodes are connected to each other through a two wire bus. The wires are a twisted pair with a 120 Ω (nominal) characteristic impedance	Ô tô hiện đại có thể chứa đến hơn 70 đơn vị điều khiển điện tử. Từ đơn vị quan trọng nhất là điều khiển động cơ cho đến các đơn vị điều khiển truyền động, túi khí, chống bó cứng phanh, điều khiển hành trình, hệ thống âm thanh, cửa, cửa sổ, gương, nguồn điện, hay hệ thống thống sạc cho các xe điện... Một số hệ thống này có thể hoạt động độc lập, tuy nhất về cơ bản tất cả các đơn vị này cần được kết nối với nhau. Bản thân trong mỗi một hệ thống nhỏ cũng cần có kết nối đến các bộ phận chấp hành (actuator) và nhận dữ liệu từ các cảm biến. Chuẩn CAN được sinh ra được phục vụ cho các kết nối đó.	
Common	Network/Protocol	Ethernet	P0	N/A	Ethernet is a family of computer networking technologies commonly used in local area networks (LAN), metropolitan area networks (MAN) and wide area networks (WAN). Ethernet is widely used in home and industry. The Internet Protocol is commonly carried over Ethernet. Ethernet is mainly used for diagnostics, high potential for more.	Systems communicating over Ethernet divide a stream of data into shorter pieces called frames. Each frame contains source and destination addresses, and error-checking data so that damaged frames can be detected and discarded; most often, higher-layer protocols trigger retransmission of lost frames		
Common	Network/Protocol	LIN	P0	**L**ocal **I**nterconnect **N**etwork	The LIN bus is an inexpensive communications protocol used for communication between components in vehicles. In recent years, the LIN bus standard has been introduced to complement CAN for non-critical subsystems such as air-conditioning and infotainment, where data transmission speed and reliability are less critical. LIN is low cost bus for body applications (speed is 19.2 kbit/s).	LIN is a broadcast serial network comprising 16 nodes (one master and typically up to 15 slaves). Current uses combine the low-cost efficiency of LIN and simple sensors to create small networks. These sub-systems can be connected by back-bone-network (i.e. CAN in cars)		

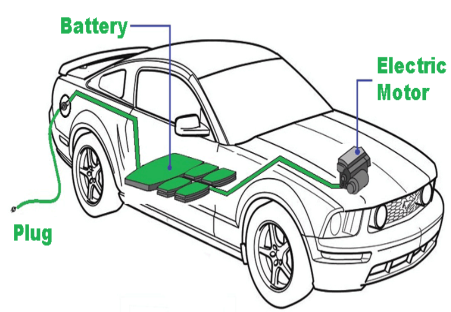
Common	Network/Protocol	SOME/IP	P0	**S**calable service-**O**riented **M**idddlewar**E** over **IP**	SOME/IP is an automotive/embedded communication protocol which supports remote procedure calls, event notifications and the underlying serialization/wire format , designd by BMW Group in 2011, based on TCP/IP Protocol Suite, that can be used for control messages between applications.	SOME/IP shall be implemented on different operating system (i.e. AUTOSAR, GENIVI, and OSEK) and even embedded devices without operating system SOME/IP supports a wide range of middleware features: 1. Serialization – transforming into and from on-wire representation. 2. Remote Procedure Call (RPC) – implementing remote invocation of functions. 3. Service Discovery (SD) – dynamically finding and functionality and configuring its access. 4. Publish/Subscribe (Pub/Sub) – dynamically configuring which data is needed and shall be sent to the client. 5. Segmentation of UDP messages – allowing the transport of large SOME/IP messages over UDP without the need of fragmentation.		
Common	Power Mode	Backup Battery	P0	N/A	Backup Battery is used if primary battery has issue to ensure importaint functions can not be interrupted. Sometimes, Backup Battery is called as BUB for shorter name.	There are two types of BUB: - Vehicle BUB: if primary battery is failure, vehicle can switch to BUB for some important and main funtions - ECU BUB: In normal conditions, ECU uses vehicle battery for its power. But incase of failure and maitaining the collision call, it switch to a built-in BUB. BUB is rechargable from vehicle power		
Common	Power Mode	BATT / B+	P0	**BATT**ery	Battery or an automotive battery is a rechargeable battery that supplies electrical current to a motor vehicle.	- Main purpose of battery: feed the starter, which starts the engine. Once the engine is running, power for the car's electrical systems is supplied by the alternator. - Every Bench will have battery to suppy electric for some function when Power Off		

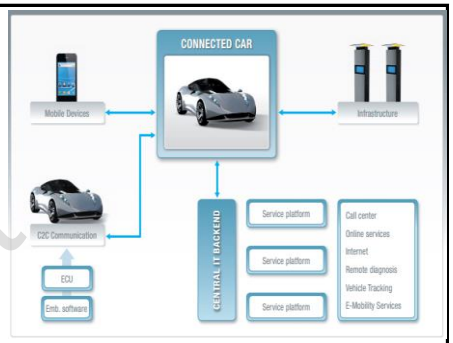
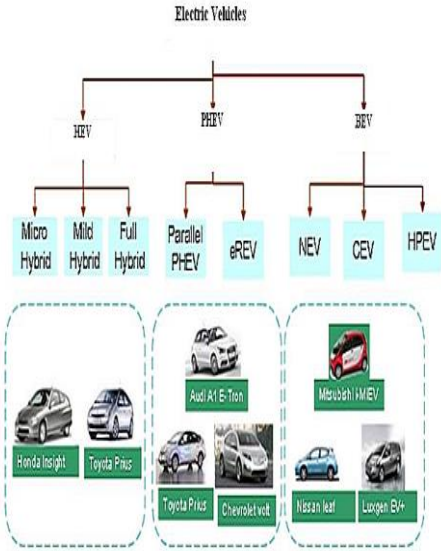
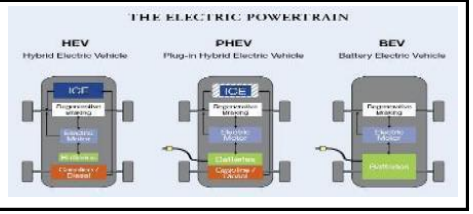
Common	Power Mode	Clamp 15 (KL15)	P0	Clamp 15	Terminal 15 ignition(SW-CL.15) state KL is the abbreviation for 'klemme' which is the German term for connector / connection. KL15 is ignition switch position #2 (on) KL30 is battery positive, hot at all times KL31 is battery negative, connected all the time KL50 is ignition position #3 (start) KLS is terminal S contact(Key Inserted/Ejected) state KLR means ignition switch position #1 (accessory)			
Common	Power Mode	Clamp 30 (KL30)	P0	Clamp 30	A permanent power supply KL is the abbreviation for 'klemme' which is the German term for connector / connection. KL30 is battery positive, hot at all times KL31 is battery negative, connected all the time KL50 is ignition position #3 (start) KLR means ignition switch position #1 (accessory)	A permanent power supply		
Common	Power Mode	Clamp S (KL S)	P0	Clamp S	Clamp S (KL S) KL is the abbreviation for 'klemme' which is the German term for connector / connection. (VW MIB3)Terminal S contact(Key Inserted/Ejected) state			
Common	Power Mode	Ignition / IGN / IG	P0	Ignition	Ignition is a system in vehicle to generate a very high voltage from the car's 12 volt battery, and to send this to each sparkplug in turn, igniting the fuel-air mixture in the engine's combustion chambers.		Hệ thống đánh lửa để khởi động động cơ xe: Trong hệ thống đánh lửa, tia lửa được phát ra giữa các điện cực của các bugi để đốt cháy hỗn hợp hòa khí. Hòa khí bị nén có điện trở lớn, nên cần phải tạo ra điện thế hàng chục ngàn vôn để đảm bảo phát ra tia lửa mạnh, có thể đốt cháy hỗn hợp hòa khí.	

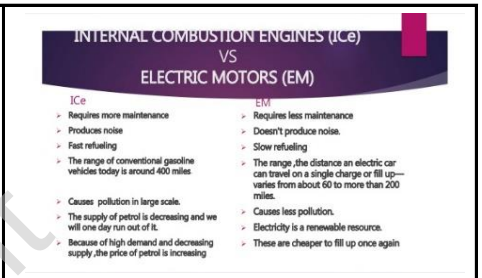
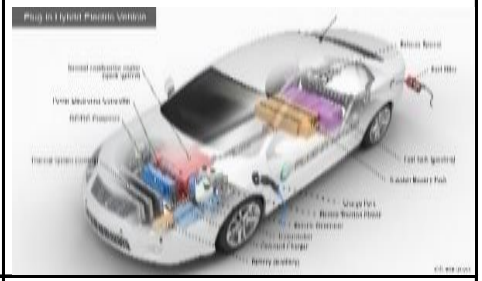
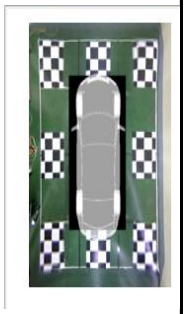
Common	Power Mode	Ignition key (OFF/ACC/ON/ START/RUN)	P0	N/A	The key used in a motor vehicle to turn the switch that connects the battery to the ignition system and other electrical devices	Mode IGN KEY OFF : Vehicle turn OFF, Steering wheel lock, Head Unit OFF, Cluster OFF IGN KEY ACC (Accessary) : Vehicle ON (but not run), steering wheel unlocked, Head Unit On, Cluster OFF IGN KEY ON : Vehicle ON (not run until release brake), Head Unit On, Cluster ON. This is the key positio when driving IGN KEY RUN : Vehicle is moving, Head Unit On, Cluster ON , some functions on Head Unit/Cluster are blocked to use while driving (depend on specification of OEM)		
Common	Safety	Air bag	P0	N/A	- Airbag is a safety device. - It cushions the impact of collisions, reducing the risk of injury.	- Once, collision happens, crash sensor determines whether there is an accident. - Control unit sends a signal to the inflator system. - The inflator sets off a chemical charge, producing an explosion of nitrogen gas, filling up the airbag *This all happens usually within 25~50ms		
Common	Safety	Seat belt	P0	N/A	A seat belt (also known as a seatbelt or safety belt) is a vehicle safety device designed to secure the occupant of a vehicle against harmful movement that may result during a collision or a sudden stop. A seat belt functions to reduce the likelihood of death or serious injury in a traffic collision	Common types of seat belt: + 2-point: attaches at its two endpoints, and was invented in the early 1900s (belt in airplane) + 3-point: is a Y-shaped arrangement. In a collision, the three-point belt spreads out the energy of the moving body over the chest, pelvis, and shoulders + 4-, 5-, 6-point: are typically found in child safety seats and in racing cars		 

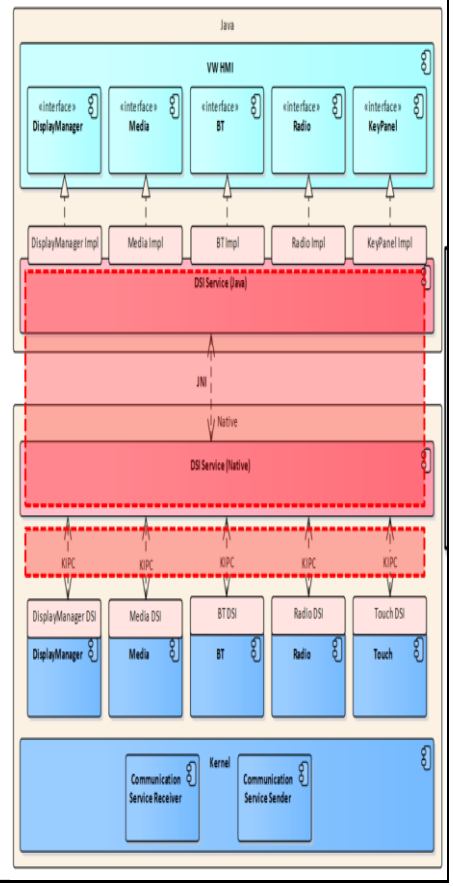
Common	Software update	OTA	P0	**O**ver **T**he **A**ir	OTA refers to message is tranfered through wireless. OTA update is one common usage of OTA which is a method of distributing new software, configuration settings, and even updating encryption keys to devices like cellphones, set-top boxes or secure voice communication equipment. One important feature of OTA is that one central location can send an update to all the users, who are unable to refuse, defeat, or alter that update, and that the update applies immediately to everyone on the channel			
Common	Software update	RR / RSU	P0	Remote Reflash / **R**emote **S**oftware **U**pdate	RR or RSU describes the update software in vehicle ECUs without physically connected to the vehicle. This word is same meaning with OTA Update.	Remote reflash will unilize a long range connection from the telematic box to a Remote IT system. Remote reflash feature will need to operate while the engine is not running.		
Common	Tools/Simulators	CANoe	P0	N/A	CANoe is a development and testing software tool from Vector Informatik GmbH. The software is primarily used by automotive manufacturers and electronic control unit (ECU) suppliers for development, analysis, simulation, testing, diagnostics and start-up of ECU networks and individual ECUs	CANoe supports CAN, LIN, FlexRay, Ethernet and MOST bus systems. The hardware models of CANoe are using in DCV are VN1630, VN1640, VN5610		Hardware: Example: VN1640A model Software: Example: Canoe v10.0
Common	Utity	ADAS	P0	**A**dvanced **D**river **A**ssistance **S**ystems	- ADAS are systems to help the driver in the driving process. - ADAS aims to automate/adapt/enhance vehicle systems for safety and better driving.	Adaptive features may automate lighting, provide adaptive cruise control, automate braking, incorporate GPS/ traffic warnings, connect to smartphones, alert driver to other cars or dangers, lane departure warning system, automatic lane centering, or show what is in blind spots. Safety features are designed to avoid collisions and accidents by offering technologies that alert the driver to potential problems, or to avoid collisions by implementing safeguards and taking over control of the vehicle.		

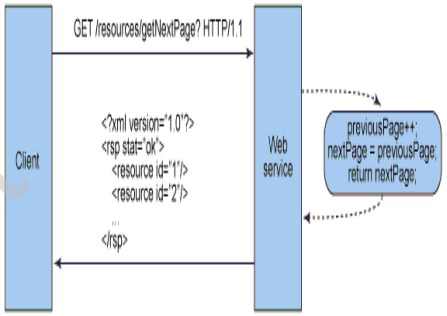
Common	Utity	Air distribution	P0	N/A	Air distribution(or Air Delivery Mode, Blower Mode): change the direction of the airflow.	- 1. Panel (AC) button: Air is directed to the instrument panel outlets. - 2. Floor-Windshield (Heater - Defrost) button: Indicate which vents air is flowing from inside the vehicle, air directed to the windshield & floor outlets. - 3. Floor (Heater) button: Air is directed to the floor - 4. Bi level button: Air is directed to the instrument panel & floor outlets.		
Common	Utity	Air recirculation (or Recirculate Air)	P0	N/A	It switches between drawing air in from outside and recirculating the air in the car. The default position is usually for outside air.	- Tap the Recirculate Air button on the Front Climate Screen toggles between air being recirculated inside the vehicle (Recirculate Air button is ACTIVE) and allowing outside air to flow into the vehicle (Recirculate Air button is INACTIVE). - Recirculating air inside the vehicle to limit the amount of pollution that may enter the car in situations like stop and go traffic conditions - Pausing air recirculation to prevent window fogging.		
Common	Utity	APA	P0	**A**dvanced **P**ark **A**ssist	- The technology assists drivers in parking their vehicle or automatic parking. - The car can steer itself into a parking space with little input from the user	- APA is available when vehicle speed is low and gear position is Reverse. - APA uses sensors/camera to detect objects/obtacles/parking lots and to estimate the size of parking space then manoeuvre the vehicle after driver detemines the parking lot.	Tính năng hỗ trợ đỗ xe: dựa vào tín hiệu từ các sensor và phân tích hình ảnh từ camera để nhận diện các đối tượng xung quanh xe. Khi được kích hoạt, hệ thống sẽ tự động tìm kiếm trong bán kính nào đó với tốc độ di chuyển cho phép để tìm ra khoảng trống đủ rộng hai bên đường để đỗ xe. Khi tìm được vị trí phù hợp, hệ thống sẽ báo hiệu tiếng kêu và hiển thị trên màn hình chỉ dẫn vị trí mà xe có thể đỗ vào. Lúc này người lái có thể rời tay khỏi vô lăng, chỉ cần thao tác cần số và chân phanh.	
Common	Utity	Climate	P0	N/A	- Climate control is a system for controlling the temperature inside a vehicle.	- The car's climate control system controls the heating and air-conditioning systems. - The climate control unit adjusts the temperature and air flow inside the car. - The climate control module can select hot/cold, defrost/vent, or fresh air/recirculated air.		

Common	Utity	SWC/SWRC	P0	Steering Wheel Control (Steering Switch Controls)/ Steering Wheel Remote Control	SWC/SWRC: Steering Wheel Control/ Steering Wheel Remote Control: are designed to make it less dangerous to interact with your car when driving. The basic idea is that you can use these controls without taking your hands off the steering wheel or taking your eyes off the road	Buttons might be appeared on the steering wheel: - Active call - End call - Volume up/ down - Next/ previous - Mute ...		
Common	Utity	RSE / RSI	P0	Rear Seat Entertainment /Rear Seat Infotainment	Rear Seat Entertainment (RSE)/Rear Seat Infotainment (RSI): A system is designed for the rear passengers to enjoin audio, media, navigaton…It's an entertainment solution for the rear seat in cars	The Rear Seat Infotainment System features two high-resolution monitors (measured diagonally, corner to corner) in the back of the front-seat headrests. These monitors work much like a smart TV. They give your vehicle's passengers flexibility to play media from smartphones, tablets, SD cards, USB drives, devices connected via HDMI (such as gaming systems or a smart TV stick), and DVDs (if equipped). Wireless connectivity (via Wi-Fi, if equipped and active) lets them seamlessly share video content between mobile devices, tablets and/or Rear Seat Infotainment monitors		
Common	Vehicle Type	BEV	P0	Battery Electric Vehicle	Battery Electric Vehicle: A battery electric vehicle (BEV), battery-only electric vehicle (BOEV), full electric vehicle (FEV) or all-electric vehicle is a type of electric vehicle (EV) that uses chemical energy stored in rechargeable battery packs. BEVs use electric motors and motor controllers instead of internal combustion engines (ICEs) for propulsion. They derive all power from battery packs and thus have no internal combustion engine, fuel cell, or fuel tank. BEVs include - but are not limited to - motorcycles, bicycles, scooters, skateboards, rail cars, watercraft, forklifts, buses, trucks, and cars.	**BEV** is a electric vehicle - Use electric motors and motor controllers - Power is derived from battery packs - No internal combustion engines (ICEs) for propulsion. - No fuel cell/tank	BEV là xe sử dụng hoàn toàn năng lượng điện để chuyển hóa thành năng lượng cơ học. Trên xe BEV chỉ sử dụng động cơ điện (electric motor) để tạo ra chuyển động cho xe thay vì sử dụng động cơ đốt trong (ICE) thông thường.	

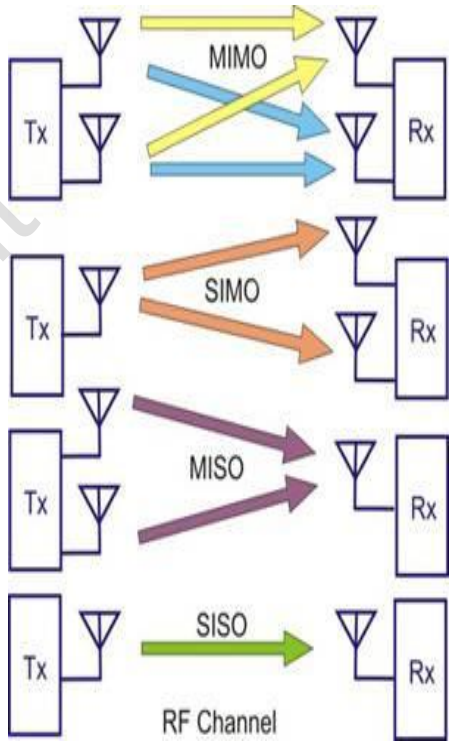
Common	Vehicle Type	Connected Car	P0	N/A	A connected car is one that has its own connection to the Internet, usually via a wireless local area network (WLAN) that allows the car to share internet access and data with other devices inside and outside the car	Connected car features fall into several categories: safety, navigation, infotainment, diagnostics/efficency and payments. A connected car can assist with a wide range of potentially useful functions such as monitor traffic information, remotely start car's engine, lock the car, make it flash its headlights or honk its horn, parking the car automatically, book car n for a service, connectivity to help motorists in emergency situation.		
Common	Vehicle Type	EV	P0	Electric Vehicle	An electric vehicle, also called an electric drive vehicle, uses one or more electric motors or traction motors for propulsion. An electric vehicle may be powered through a collector system by electricity from off-vehicle sources, or may be self-contained with a battery, solar panels or an electric generator to convert fuel to electricity.EVs include road and rail vehicles, surface and underwater vessels, electric aircraft and electric spacecraft. EV includes BEV and HEV/PHEV.	Example on HU: Tap icon EV on HU to display EV screen,however other HU models will show different Using canlink for control EV,connet canlink with HU and computer, computer must be have CANlink app and hard driver. Turn on canlink on comptert, when sent message on computer through canlink to Hu, HU recevie message and run EV follow message EV screen will be change any thinh alow value of signal, and we will can't change EV if do not have can. Have many message : HU_EV_PE_00 0x1AA, HU_GW_E_00 0x0E8, GW_CLU_P 0x56E.....		
Common	Vehicle Type	HEV or (Hybrid)	P0	Hybrid Electric Vehicle	A hybrid electric vehicle (HEV) is a type of hybrid vehicle that combines a conventional internal combustion engine (ICE) system with an electric propulsion system (hybrid vehicle drivetrain).		Xe lai là xe có một động cơ điện và một động cơ đốt trong và một thùng dự trữ nhiên liệu cùng với một thiết bị dự trữ điện (pin sạc)	

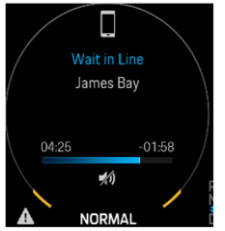
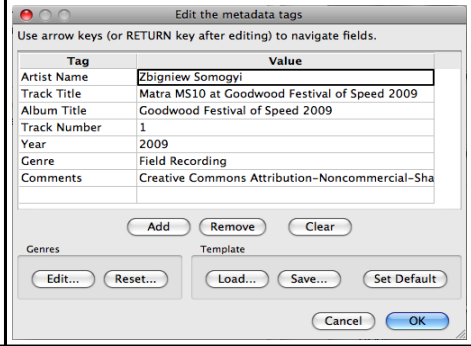
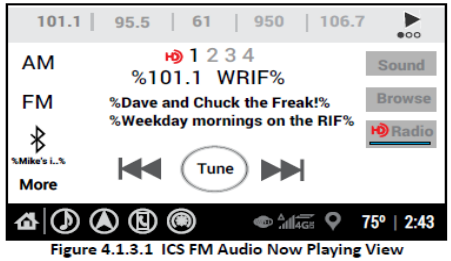
Common	Vehicle Type	ICE or CE	P0	Internal combustion engine	An internal combustion engine (ICE) is a heat engine where the combustion of a fuel occurs with an oxidizer (usually air) in a combustion chamber that is an integral part of the working fluid flow circuit.	Typically an ICE is fed with fossil fuels like natural gas or petroleum products such as gasoline, diesel fuel or fuel oil.	Động cơ đốt trong là một loại động cơ nhiệt tạo ra công cơ học dưới dạng moment quay (hay còn gọi là moment xoắn) bằng cách đốt nhiên liệu bên trong động cơ. Các loại động cơ sử dụng dòng chảy (tiếng Anh: fluid flow engine) để tạo công thông qua việc đốt cháy nhiên liệu	
Common	Vehicle Type	PHEV	P0	**P**lug-In **H**ybrid **E**lectric **V**ehicle	A plug-in hybrid electric vehicle (PHEV) is a hybrid electric vehicle whose battery can be recharged by plugging it in to an external source of electric power as well by its on-board engine and generator.		PHEV là xe lai sạc điện có đặc điểm của một chiếc lai thông thường, có một động cơ điện và một động cơ đốt trong và một thùng dự trữ nhiên liệu cùng với một thiết bị dự trữ điện (pin sạc). Ngoài ra, nó có thêm phích cắm để kết nối với điện lưới.	
AVN	Camera	AVM	P0	**A**rround **V**iew **M**onitor/ **M**onitoring	Arround view monitor/ monitoring is a support technology that assists drivers to park more easily by better understanding the vehicle's surroundings through a virtual bird's-eye view from above the vehicle. The Around View Monitor helps the driver visually confirm the vehicle's position relative to the lines around parking spaces and adjacent objects, allowing the driver to maneuver into parking spots with more ease.	The Around View Monitor processes video from four cameras, displaying the composite footage on the screen as if there is a single birds-eye view camera right above the vehicle. This makes parking much easier. Through the bird's-eye view, a driver can check for obstructions around the vehicle. The system can display the bird's-eye, front and rear views, making it possible to check the vehicle's 360-degree surroundings simultaneously with either the fore and back.		 
AVN	Camera	LWC	P0	Lane Watch camera	LaneWatch is a camera system that supplements side mirrors. A camera is installed in the right mirror and pointed toward the vehicle's blind spot. When activated, it displays an image of that area on a 7-inch screen inside the vehicle.	When the right turn signal is activated, an image of the area to the right rear of the vehicle is shown on the display.	Camera quan sát làn đường, được gắn trên gương phải của xe. Hỗ trợ người lái có thể quan sát được các điểm mù trên làn đường. LWC sẽ hiển thị trên HU khi xi-nhan rẽ phải được bật hoặc cũng có thể hiển thị màn hình LWC trên HU bởi thao tác "press button LWC" của người dùng	

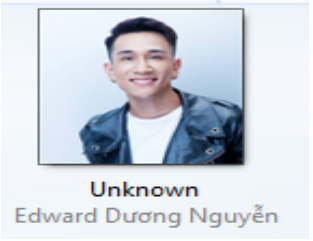
AVN	Camera	RVC	P0	**R**ear **V**iew **C**amera	Rear View Camera or reverse camera/ rear camera The “Rear view camera“ system allows the driver to see behind his vehicle. It helps the driver during maneuvers, giving him an enhanced rear view.	A backup camera (also called reversing camera) is a special type of video camera that is produced specifically for the purpose of being attached to the rear of a vehicle to aid in backing up, and to alleviate the rear blind spot. Backup cameras are alternatively known as 'reversing cameras' or 'rear-view cameras'. It is specifically designed to avoid a backup collision.		
AVN	CarSSW	DSI	P0	**D**evice **S**ervice **I**nterface	DSI is an interface to communicate between HMI and core services.	Let take an example to describe how DSI work: HMI provides Display, Media, Bluetooth, Radio, and Touch features. Anyway, HMI is not developed by LGE (provided by 3rd-party company) and the interface of this HMI is written by Java. Moreover, the core services of AVN are developed by LGE need to be written by Native (C++) language for ensuring the performance of AVN. With this reason, LGE need to build an interface to communicate between HMI and core services. It is the DSI. When user interact on HMI through Touch, DSI will get this touch information and send to Touch service to further process. Touch service can send response information to HMI through DSI.	Ví dụ để mô tả DSI: Một AVN dạng tách rời gồm một màn hình cảm ứng và một mạch xử lý. Màn hình cảm ứng (HMI) được phát triển bởi một hãng thứ ba, trong khi đó mạch xử lý được phát triển bởi LGE. HMI cung cấp giao diện để tương tác với mạch xử lý chính sử dụng ngôn ngữ Java, trong khi đó, đội ngũ LGE muốn sử dụng Native (C++) để phát triển core services cho mạch xử lý (vì lý do đảm bảo hiệu năng xử lý). Do đó để tương tác được giữa HMI và Core services, LGE phát triển thêm giao diện DSI để giúp hai thành phần giao tiếp được với nhau. Ví dụ khi người dùng chạm vào màn hình cảm ứng, DSI sẽ giúp chuyển thông tin này để Touch service của mạch xử lý, service này sử dụng thông tin và đưa ra phương án xử lý (có thể sẽ phản hồi lại và gửi thông tin phản hồi về HMI thông qua DSI).	

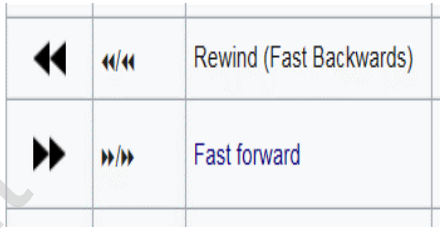
AVN	CarSSW	RSI	P0	RESTful Service Interface	- RESTful service is WEB service based on REST. - RSI defines structure of each service as JSON file. - RSI defines HTTP request/response payload structure (element property) - RSI defines allowed HTTP operation (GET, POST, UPDATE, DELETE) + *(REST stands for Representational State Transfer, which is an architectural style for networked hypermedia applications)* *- Almost every RESTful service uses HTTP as its underlying protocol)*	-The client and service talk to each other via messages. Clients send a request to the server, and the server replies with a response For example, a RESTful URL: ***GET*** */v1/path/to/* ***resource*** *HTTP/1.1* *Host: www.example.gov.au* *Accept: application/json, text/javascript* - ***Resource*** *is any information. For example, in Media service: albums, artists, genres ... are resources.* - ***Resource method*** *(HTTP method) is* ***GET, PUT, POST*** *and* ***DELETE***		
AVN	Connection	HFP	P0	Hands-Free Profile	HFP is the profile most commonly used to allow mobile phones to communicate with Bluetooth headsets and car kits. A Bluetooth car kit will use HFP to connect to a Bluetooth phone, allowing phone calls to take place via the car's audio system (or an installed speaker) while the phone stays safely in a pocket or purse.	HFP provides the ability to carry out basic functions such as answering, rejecting and ending calls, and adjusting the call audio volume, as well as more advanced features like using the phone's voice dial functionality		
AVN	Connectivity	Bluetooth / BT	P0	Bluetooth	Bluetooth is a wireless technology standard for exchanging data over short distances from fixed and mobile devices, and building personal area networks			
AVN	Connectivity	BTA	P0	**B**lue**T**ooth **A**udio	Bluetooth audio is a short-range radio technology that was developed to provide wireless audio and data transmission. Two Bluetooth-enabled devices (like a mobile phone and a car) can be paired so that they establish a communication link when they come within range of each other.	After Phone and Car are paired via Bluetooh, open the Bluetooth Audio App or Bluetooth Source on HU to choose your audiobook and start listening.	Chức năng Bluetooth audio cho phép người dùng có thể nghe nhạc từ nguồn nhạc trên điện thoại mà đã được kết nối BT với H/U của người dùng.	

AVN	Connectivity	Pairing	P0	N/A	The process of associating each other between two devices through Bluetooth communication.	Pairing occurs when two Bluetooth devices communicate with each other and establish a connection. A record of information about this connection is then stored in the memory of each device. There are 2 ways: 1. Security Simple Pairing (SSP) 2. Legacy Pairing (Bluetooth 2.0 and earlier)		
AVN	Connectivity	NFC	P0	**N**ear **F**ield **C**ommunication	NFC is a set of communication protocols that enable two electronic devices, one of which is usually a portable device such as a smartphone, to establish communication by bringing them within 4 cm (1.6 in) of each other	2 devices that support NFC Device 1 want to send contacts file to device 2 via NFC Turn ON NFC, move 2 devices near each other (~1cm) Select file on device 1 then send to device 2		
AVN	Connectivity	AP/WAP	P0	**A**ccess **P**oint/ **W**ireless **A**ccess **P**oint	- WAP or AP is a networking hardware device that allows a Wi-Fi device to connect to a wired network	An AP connects directly to a wired local area network, typically Ethernet, and the AP then provides wireless connections using wireless LAN technology, typically Wi-Fi, for other devices to utilize that wired connection.		
AVN	Connectivity	APN	P0	**A**ccess **P**oint **N**ame	APN is the name of a gateway between a GSM, GPRS, 3G or 4G mobile network and another computer network, frequently the public Internet. Example: APN of Viettel Operator: + 3G: APN: v-internet (Mobiphone: m-wap) Username: [Blank] (Mobiphone:mms) Password: =[Blank] (Mobiphone:mms) +LTE: APN: [Blank] Username: [Blank] Password: =[Blank]	A mobile device making a data connection must be configured with an APN to present to the carrier. The carrier will then examine this identifier to determine what type of network connection should be created, for example: which IP addresses should be assigned to the wireless device, which security methods should be used, and how or if, it should be connected to some private customer network	Tên điểm truy cập (Access Point Name - APN) là tên của các cài đặt mà điện thoại của bạn đọc để thiết lập kết nối tới cổng giữa mạng di động của nhà cung cấp và Internet công cộng. Nhà cung cấp đọc các cài đặt này, sau đó đảm bảo xác nhận đúng địa chỉ IP, kết nối tới đúng cổng an toàn và xem bạn có cần kết nối tới mạng riêng tư như VPN không. Tất cả các thao tác được thực hiện ở phía nhà cung cấp dịch vụ, nhưng bạn cũng cần đảm bảo các cài đặt được thiết lập đúng để có được mạng bạn cần.	

AVN	Connectivity	MIMO	P0	**M**ultiple-**I**nput **M**ultiple-**O**utput	MIMO is a wireless technology that uses multiple transmitters and receivers to transfer more data at the same time. All wireless products with 802.11n standard support MIMO.	At one time, in wireless the term "MIMO" referred to the use of multiple antennas at the transmitter and the receiver. In modern usage, "MIMO" specifically refers to a practical technique for sending and receiving more than one data signal simultaneously over the same radio channel by exploiting multipath propagation. MIMO is fundamentally different from smart antenna techniques developed to enhance the performance of a single data signal, such as beamforming and diversity. SISO/SIMO/MISO are special cases of MIMO Multiple-input and single-output (MISO) is a special case when the receiver has a single antenna. Single-input and multiple-output (SIMO) is a special case when the transmitter has a single antenna. Single-input single-output (SISO) is a conventional radio system where neither transmitter nor receiver has multiple antenna.		
AVN	Connectivity	SSID	P0	**S**ervice **S**et **ID**entifier	An SSID is the Name of a Wifi Network. For excample: uLGE is a SSID that we use to connect to wifi of DCV.	This name allows stations to connect to the desired network when multiple independent networks operate in the same physical area. There are two types of SSID: (1) The Basic Service Set Identification (BSSID) (2) The Extended Service Set Identification (ESSID) In an ad hoc wireless network with no access points, the Basic Service Set Identification (BSSID) is used. In an infrastructure wireless network that includes an access point, the ESSID is used, but may still be referred to as SSID.		
AVN	Media	AVC	P0	**A**udio **V**ideo **C**odec	In software, Audio Video Codec is program/libraries that compresses/ decompresses digital audio/video according to the given format like MPEG4, FLAC …			

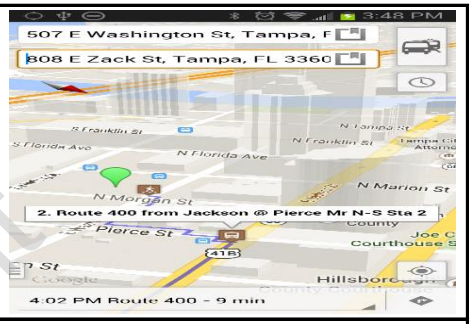
AVN	Media	Cover Flow	P0	N/A	The panel which displays albums art			
AVN	Media	FAV	P0	Favorite	FAV is an option for personalization purpose. FAV is typically representive by a star icon.	In AVN, it is commonly used for favorite songs/video to help driver quickly choose the list of audio/video. For example: favorite media list (media), favorite contact list (phone)		
AVN	Media	Media	P0	N/A	Media is a general term for feature playing multimedia file in AVN like audios, videos, movies and music. Media is related to media sources (USB, BT, Ipod,..) which is included in Audio. Audio includes another source: radio sources (FM, AM, DAB, SXM) There are some possible screens: Playscreen and Playlist	- In some project, we use CAN and BAP signal to send media file information. In other projects, we can select media sources from source page		 Playscreen  Playlist screen
AVN	Media	Metadata	P0	N/A	- Metadata means data (information) about data. It decribes one or more aspects of the data. - Many distinct types of metadata exist, among these: + Descriptive metadata + Structural metadata + Administrative metadata + Reference metadata + Statistical metadata	Example: The metadata of a music file includes title, artist, album, year, track, genre... The metadata can be loaded on now playing or some other screens of AVN.		
AVN	Media	Now Playing View	P0	N/A	All audio sources play using a main Now Playing screen with similar format and layout	Specific details for each source will be given in their own section. Ex, The following information is shown on the AM now playing view: Line 1: Frequency, HD Logo, Call Letters Line 2: Artist Name (HD Only) Line 3: Song Title (HD Only) Browse Sound		 Figure 4.1.3.1 ICS FM Audio Now Playing View (ICS_FM_AUDIO_MAIN_NOW_PLAYING)

AVN	Media	USB	P0	**U**niversal **S**erial **B**us	USB is an industry standard that was developed to define cables, connectors and protocols for connection, communication, and power supply between personal computers and their peripheral devices	In Media, USB to indicate the source of media files, which means media player will get files through USB connection.		
AVN	Media	AAC	P0	Advanced Audio Coding	AAC is an audio coding standard for lossy digital audio compression. Designed to be the successor of the MP2 format, AAC generally achieves better sound quality than MP2 at the same bit rate	AAC is the default or standard audio format for YouTube, iPhone, iPod, iPad, Nintendo DSi, Nintendo 3DS, iTunes, DivX Plus Web Player, PlayStation 3 and various Nokia Series 40 phones. AAC is also supported by manufacturers of in-dash car audio systems.		
AVN	Media	MP2/WMA/AAC	P0	MPEG Audio Layer III	MP2 is an audio format. - MP2: MPEG Audio Layer III including MPEG-1, MPEG-2, MPEG-2.5 Audio Layer III			
AVN	Media	MP4	P0	MPEG4	MPEG-4 Part 14 or MP4 is a digital multimedia container format most commonly used to store video and audio, but it can also be used to store other data such as subtitles and still images.			
AVN	Media	WMA	P0	Windows Media Audio	WMA is a series of audio codecs and their corresponding audio coding formats developed by Microsoft			
AVN	Media	Album Art	P0	N/A	- It's also album cover art - It is artwork created for a music album			

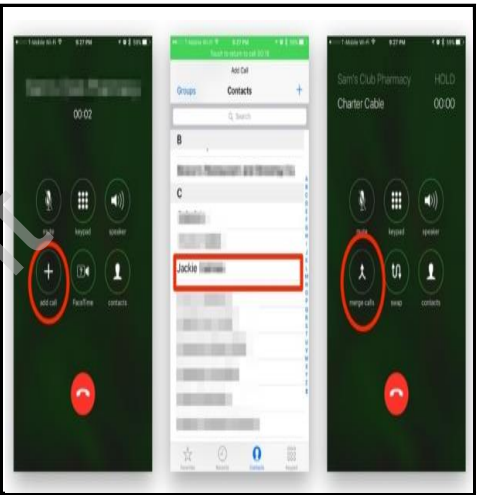
AVN	Media	FF/REW	P0	**F**ast **F**orward/**Rew**ind	Fast-forward is to move forward through a recording at a speed faster than that at which it would usually be played. Rewind or Fast Backwards, in other hand, is to help to move backward	To active fast forward: press button FFW or long touch Next button; To active REW: press button REW or long touch Previous button. When the SEEK UP key is RELEASE during FF operation, it start playing from the current play position at normal speed. In some product, If file is last in folder, play next folder ; If file is last in category, play first file in current category	Tua đi/ Tua lại	
AVN	Media	RFS	P0	Reset Factory Setting	A factory reset, also known as master reset, is a software restore of an electronic device to its original system state by erasing all of the information stored on the device in an attempt to restore the device's software to its original manufacturer settings.		Khôi phục lại software trên thiết bị về trạng thái mặc định (xóa hết các thông tin được tạo ra bởi người dùng)	
AVN	Media	Skip backward	P0	N/A	Skip backward is one of item in media controls. It means to go to the previous track.	Press "Skip backward" button on the media player screen to go to the previous track		
AVN	Media	Skip forward	P0	N/A	Go to the next track	Go to the next track		
AVN	Media	Audio Source	P0	N/A	"Audio source" is a term to indicate the input channel which contains audio files then media/audio player will use this channel to get audio data. For example: - USB - Bluetooth - CD/DVD - Radio - AUX			
AVN	Media	AV socket	P0	**A**udio **V**ideo socket	Audio connectors and video connectors are electrical connectors (or optical connectors) - plugs and sockets - for carrying audio signal and video signal.	There are 2 types of AV sockets: AV-IN and AV-out. AV-IN socket: use device contains AV-IN socket as output. AV-OUT socket: use device contains AV-OUT socket as input		

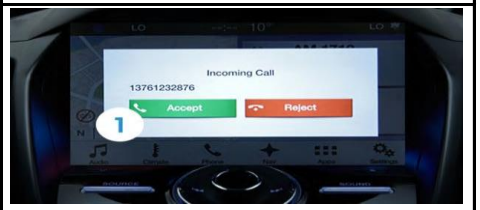
AVN	Media	ID3Tag	P0	N/A	ID3 is a metadata container most often used in conjunction with the MP2 audio file format. It allows information such as the title, artist, album, track number, and other information about the file to be stored in the file itself.	ID3 tags may be edited in a variety of ways. On some platforms the file's properties may be edited by viewing extended information in the file manager. Additionally most audio players allow editing single or groups of files. Editing groups of files is often referred to as "batch tagging". There are also specialized applications, called taggers, which concentrate specifically on editing the tags and related tasks		
AVN	Media	MSC	P0	Mass Storage Class	MSC is mainly used for devices that allow access to their internal data storage. Typical examples for MSC class devices are: External hard drives (HDD); External optical drives (such as CD or DVD drives); Portable Flash memory devices; Solid-state drives (SSD); Digital cameras; Card readers ...			
AVN	Media	MTP	P0	**M**edia **T**ransfer **P**rotocol	- MTP is communications protocol that allows media files to be transferred automically to and from portable devices - MTP is introduced by Microsoft - MTP is extention of PTP (Picture Transfer Protocol)	Connect your MTP to your car via usb port cable. Plug one end of the cable on your MTP Media and the opposite end to the your car via Usb Hub. Your MTP will be displayed on your car with interface the same on your MTP device so that you can easy to use.		

AVN	Navigation	ETA	P0	**E**stimated **T**ime of **A**rrival	The ETA option is the time when a ship, vehicle, aircraft, cargo, emergency service or person is expected to arrive at a certain place.	Route calculation a ETA (Estimate Time of Arrival) has to calculate by the system with following parameter: - Average speed (Database attribute of related street segment) - Time dependent average speed (traffic pattern) is available - Maneuvre Penalties - Road Furniture Penalties During operation, the device recalls the average driving velocity for the inputted driver over each different type of thoroughfare traversed. Using prestored average velocity data, the device calculates an initial estimated time en route and an estimated time of arrival for a desired route. The device continues to receive GPS data as to the driver's position and velocity and updates the average velocity record for that driver on the specific type of thoroughfare. As the average velocity fluctuates, the device adjusts the estimated time en route and the estimated time of arrival. The device further has control processes for potentially erroneous sampling. The device has a predetermined threshold in which data inputs below that threshold will not be averaged into the memory.		
AVN	Navigation	GPS device	P0	**G**lobal **P**ositioning **S**ystem Device	A GPS device, GPS receiver, or simply GPS is a device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position	Just connect GPS cable to the port on HU correctly and wait for some time (about 1 minute). After that, check the Map screen, it will display your current location base on GPS data, and local time should be changed too.		
AVN	Navigation	POI	P0	**P**oint **O**f **I**nterest	POI is a specific point location that someone may find useful or interesting. Most consumers use the term when referring to hotels, campsites, fuel stations or any other categories used in modern (automotive) navigation systems	Example: Press Navigation SK on HU, display Navigation screen. Press POI SK then display POI category (hospital, medical services, pharmacies, police station,.....) or POI name. Chose anything so display POI alow category or name. AVN displays all place of POI around your destinaton		

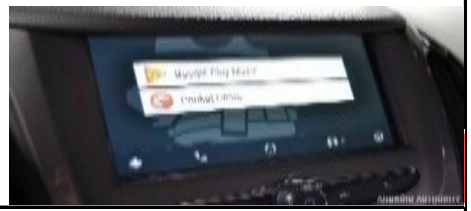
AVN	Navigation	Routing	P0	N/A	Routing is the process of selecting a path for traffic in a network, or between or across multiple networks. In navigation, routing is a process to suggest a route from a start position to a destination.			
AVN	Navigation	TBT	P0	**T**urn-**B**y-**T**urn	Turn-by-turn systems typically is feature of some GPS navigation devices. It uses an electronic voice to inform the user whether to turn left or right, the street name, and how much distance to the turn	For example: 'Enter Navigation feature (Tap Navigation icon on screen) -> Then select location -> vehicle is run by simulator -> Turn by Turn is executed.		
AVN	Phone call	(Phone) Active Call	P0	N/A	When you answer an incoming call or interact with a hold call, it's Active Call	Have incoming call to HU or make outgoing call from HU to another phone, keep the call on HU. For example, In case that device 1 is connected to Head Unit via Bluetooth or Phone projection (CarPlay, Android Auto). There are 2 ways to make an active call: - Device 1 receive incoming call from device 2 => device 1 accept call in Head Unit screen, after that, active call occurs. - Make outgoing from device 1 to device 2 => device 2 accept call in device side => Active call		

AVN	Phone call	3 way call	P0	N/A	A type of phone call that helps 3 users can speak together.	One of ways to make 3-way call is below: - Step 1. Make 1st incoming call from device 2 to device 1 - Step 2. On device 1, accept the 1st incoming call (1st call) - Step 3. Make 2nd incoming call from device 3 to device 1 - Step 4. On device 1, accept the 2nd incoming call, after that, the 1st call will be in-hold call automatically. (2nd Call) - Step 5. In device 1, merge 1st Call and 2nd Call by press "3 way call" button. - After that, the 3-way call is established. Note: In some projects (MIB3), "3 way call" is a configuration option that you shall set up for AVN by using tool (ODIS). When "3 way call" is enable, user can make a conference call (more than or equal 3 users can speak together)		
AVN	Phone call	Call State	P0	N/A	There are some Call State with from start a call to hang up call: 0 - Call Start 1 - Incomming Call 2 - Call Failed - reconnection 3 - Call Failed 4 - Call Connecting 5 - Call Connected 6 - Call data sending 7 - Call ended			

AVN	Phone call	Conference call	P0	N/A	A type of phone call that helps 3 or more users can speak together.	One of ways to make conference call is below: - Step 1. Make 1st incoming call from device 2 to device 1 => Accept Call (1st Call) - Step 2. In device 1, push on "Add" (phone) button then choose contact you want to call. - Step 3. On other phones, accept the call from devce 1. - After that, the conference call is established. *Conference call is different from 3 way call about the number of active call, 3 way call just have 3 but Conference call can support 3 or more one.		
AVN	Phone call	DTMF	P0	**D**ual **T**one **M**ultiple **F**requencies	Dual Tone Multiple Frequencies : is the signal to the phone company that you generate when you press an ordinary telephone's touch keys	With DTMF, each key you press on your phone generates two tones of specific frequencies. So that a voice can't imitate the tones, one tone is generated from a high-frequency group of tones and the other from a low frequency group		
AVN	Phone call	Hand-free calling	P0	N/A	Hand-free (or hands-free) calling is a call mode. User listens via speaker of HU/AVN/Bench and speaks via mic of HU/AVN/Bench without using phone in hand.	- Step 1. Connect Phone to AVN via Bluetooth or phone projection, setting for sound ouput via AVN. - Step 2. Phone receive incoming call - Step 3. Accept call by press "accept" button on AVN screen => After that, you can speak/listen to Caller by using AVN		

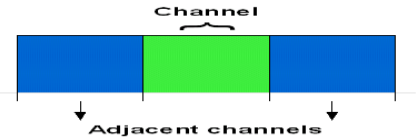
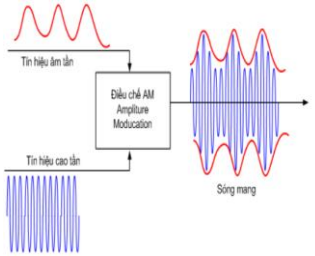
AVN	Phone call	Hold Call	P0	N/A	In telephony, a call may be placed on hold, in which case the connection is not terminated but no verbal communication is possible until the call is removed from hold by the same or another extension on the key telephone system. Music on hold or on hold messaging may be played for the caller while the call is on hold, especially if the call has been placed to a customer service center. For example: when a call (1st call) is active and user receive 2nd incoming call, he/she hold the 1st call and activate the 2nd incoming call.	- Step 1. Make 1st incoming call from device 2 to device 1 - Step 2. Accept the call - Step 3. Make 2nd incoming call from device 3 to device 1 - Step 4. Accept 2nd Call and Hold 1st Call => The 1st Call will be on Hold		
AVN	Phone call	Incoming call	P0	N/A	Is a call from other phone to your phone	When device 1 makes a call to Device 2, we can say that: => Device 1 makes an outgoing call to Device 2 => Device 2 receives an incoming call from Device 1		
AVN	Phone call	Merge Call	P0	N/A	Is a phone feature to combine 2 incoming phone calls into a 3-way call	- Step 1. Make 1st incoming call from device 2 to device 1 - Step 2. On device 1, accept the 1st incoming call (1st call) - Step 3. Make 2nd incoming call from device 3 to device 1 - Step 4. On device 1, accept the 2nd incoming call, after that, the 1st call will be in-hold call automatically. (2nd Call) - Step 5. On device 1, merge 1st Call and 2nd Call. - After that, the 3-way call is established		
AVN	Phone call	Outgoing call	P0	N/A	Is a call from our phone to other phone	When device 1 makes a call to Device 2, we can say that: => Device 1 makes an outgoing call to Device 2 => Device 2 receives an incoming call from Device 1		

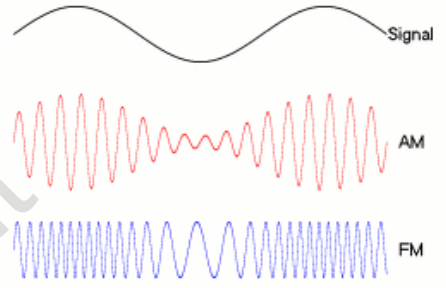
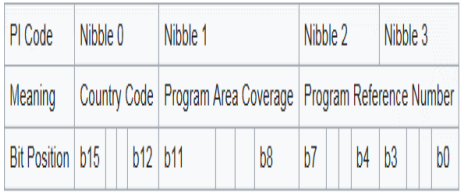
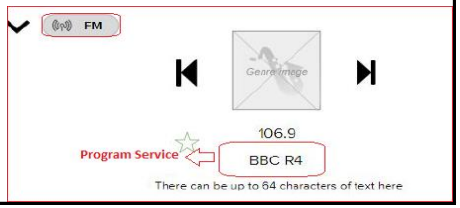
AVN	Phone call	Speed dial	P0	N/A	Is a quickly way to make phone call to a frequent calling number without typing all input number	- On Phone Setting, choose Speed Dial, input the phone number and select the number you want to store. - For example: You often call to number 091234567, input that number with number "1" to store. Then when you want to call the phone number, just long press number 1, Phone will automatically make outgoing call to that number.		
AVN	Phone call	Switching calls	P0	N/A	Change connection between 2 parallel phone calls by user	- Step 1. Phone 1 is connected to HU via BT. - Step 2. Make an incoming call (Call1) to Phone 1. - Step 3. Accept call on HU. - Step 4. Make another incoming call (Call2) to Phone 1. - Step 5. User can accept the Call2 on HU --> it means that user switch call from call 1 to call 2. *Note: To do this feature on HU, user needs to setup depend on requirement of each OEM.		
AVN	Phone call	Voicemail	P0	N/A	Any system of conveying a stored telecommunications voice messages, including using an answering machine	Voicemail systems are designed to convey a caller's recorded audio message to a recipient. To do so they contain a user interface to select, play, and manage messages; a delivery method to either play or otherwise deliver the message; and a notification ability to inform the user of a waiting message. Most systems use phone networks, either cellular- or landline-based, as the conduit for all of these functions. Some systems may use multiple telecommunications methods, permitting recipients and callers to retrieve or leave messages through multiple methods such as PCs, PDA, Cellphones or Smartphones.		

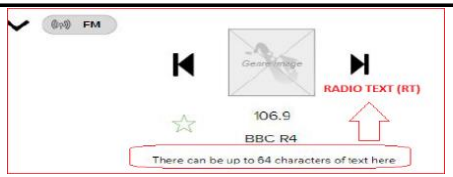
AVN	Phone call	Phonebook	P0	N/A	It is the contacts list that contains an alphabetical list of the names, images, addresses, and telephone numbers, ... of the contacts which stored on device.	- Phonebook will download on to the system (HU) base on permisson + First pairing: user have to set permission on popup (access phonebook data, message... or not) + Paired: user can change permission on BT setting (device or HU) - Phonebook will be updated when reconnecting or has changed or countimer expired,... (base on project) - Downloading completed, Phonebook will show on the system	Danh bạ điện thoại	
AVN	Phone Projection	AAVR	P0	**A**ndroid **A**uto **V**oice **R**ecognition	- AAVR or voice commands supported by Android Auto. - It helps drivers can fully control their car's infotainment system with their voice.			
AVN	Phone Projection	Google VR	P0	**G**oogle **V**oice **R**ecognition	Google Voice recognition: Google Voice is a telephony service that provides call forwarding and voicemail services, voice and text messaging, as well as U.S. and international call termination for Google Account customers			
AVN	Phone Projection	GPM	P0	**G**oogle **P**lay **M**usic	Google Play Music is a music and podcast streaming application and online music locker operated by Google.	In common, Android Auto uses GPM to play music, user need to install GPM in Mobile device to run on AA.		
AVN	Phone Projection	SIRI	P0	N/A	Apple personal voice assistance, available on iOS devices			

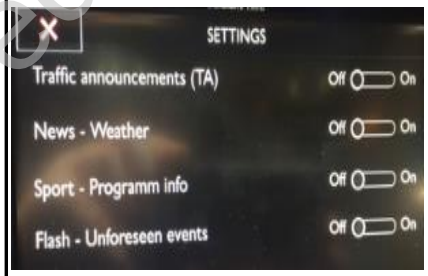
AVN	Phone Projection	Wireless Carplay	P0	N/A	Since iOS 9, Apple has supported wireless CarPlay implementations. Wireless CarPlay alleviates the need for a Lightning cable, allowing an iPhone to connect to an in-car system wirelessly.	Wireless carplay can connect via bluetooth and Wifi connection with in-car system		
AVN	Phone Projection	AA / AAP	P0	**A**ndroid **A**uto/**A**ndroid **A**uto **P**rojection	- Android Auto is a mobile app developed by Google to mirror features from an Android device to a car's compatible head unit (AVN). '- Android Auto is a simpler way to use your phone in the car so you can stay focused on the road. This app supports Google maps/navigation, music/media player, phone call, SMS, google assistant (by voice).	Because in Vietnam is not supported Android Auto, so you can not download Android Auto directly from Google App store. If you want to install Android auto, you should install from external files to your Android phone: - Step1: Go to Settings > Lock screen and security > Enable Unknown Sources > OK (do this step to allow your device to install a program not from Google Store) - Step2: Download Android Auto APK and copy it to the Device Storage - SteP2: Go to File Manager on Phone > Browse the APK file > Open and Install ---------- [Using] - Connection: connect Android device to vehicle via USB cable and Bluetooth - Vehicle time date and Phone have to matching - Android auto is connected, BT is auto connected to Android auto device, user can use phone functions on vehicle like: music, phone, map, ...		
AVN	Phone Projection	Baidu CarLife	P0	N/A	Baidu CarLife is an app that can run on Android or iOS devices. It uses Baidu's own voice control engine, similar to Siri or Google Voice.	Operating system required in mobiphone: Android 4.1 / IOS 7 and above. Users can connect their cars and smartphones via Wifi or USB cable. CarLife supports navigation, hands-free calling and music steaming.		

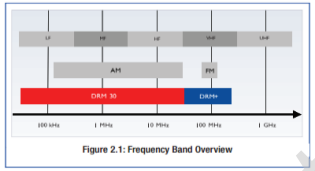
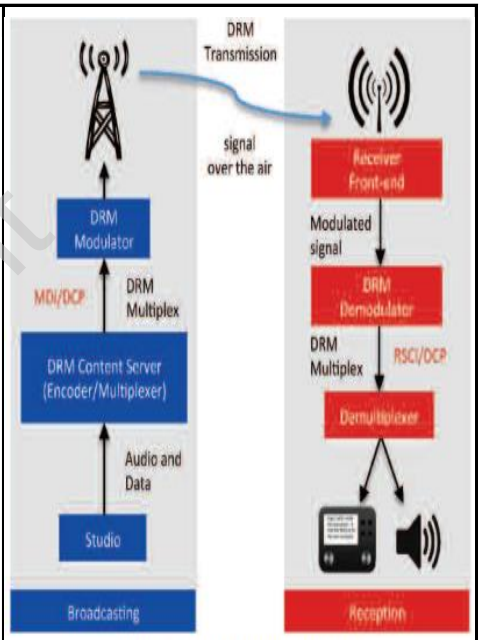
AVN	Phone Projection	CP	P0	Apple **C**ar**P**lay	Apple CarPlay is a mobile app developed by Apple to mirror features from an iOS device to a car's compatible head unit. Apple CarPlay available on iOS phone and supports maps/navigation, media player, phone call, SMS, voice and apps from iOS device...	Device must have carplay application with at least IOS 7.1 HU must enable Carplay at setup device connection, time set is realtime and the same time on device. when complete device and HU, icon CP on HU is appear, tap icon to display CP screen then you can use on HU with funtions: music, phone, map,... - CarPlay function and Siri on the phone must be turned on before connecting - To connect device with HU, using cable : plug one into your mobile device and the USB port on HU. - CarPlay is connected, BT is disabled for CarPlay device, user can use phone functions on vehicle like: music, phone, map, ...		
AVN	Phone Projection	MirrorLink	P0	N/A	MirrorLink is a device interoperability standard that offers integration between a smartphone and a car's infotainment system. MirrorLink transforms smartphones into automotive application platforms where apps are hosted and run on the smartphone while drivers and passengers interact with them through the steering wheel controls, dashboard buttons and touch screens of their car's In-Vehicle Infotainment (IVI) system.	MirrorLink currently works with Symbian phones (only Nokia Belle phones), Samsung Galaxy series (on Android Lollipop (5.0)), and Sony Xperia Z series Android phones. Sony audio has launched two audio head units in 2012 Q2, which are MirrorLink compliant. Phone maker Motorola and audio head unit maker Alpine are also members of the group supporting MirrorLink. Alpine will offer MirrorLink based aftermarket systems in the US in 2013. VW will offer MirrorLink based infotainment systems starting with its 2nd generation MIB infotainment hardware starting in 2014 with the new Polo		
AVN	Phone Projection	Native Navi	P0	N/A	Embedded Navigation (OEM Navigation): Navigation is a field of study that focuses on the process of monitoring and controlling the movement of vehicle from one place to another. Native Navigation is used to indicate the navigation application of Head Unit, not navigation application of android auto or carplay.	Native Navi is the navigation application of head Unit. This word to distinguish with navigation application of the projection .		

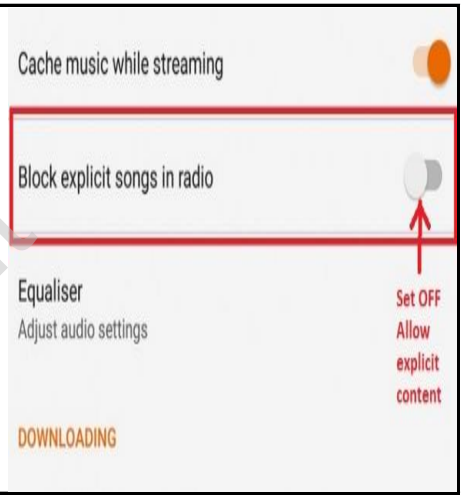
AVN	Phone Projection	Projection	P0	N/A	Certain devices that support broadcasting their screen or app functionality onto the vehicle interface. This shall be launched from the Home screen Projection icon. Ex: Apple CarPlay, Android Auto, Baidu Carlife			
AVN	Radio	Adjacent Channel	P0	N/A	- Adjacent Channels are AM, FM, or TV channels that are next to another channel. - Their information is used to minimize their interference			
AVN	Radio	AF	P0	**A**lternative **F**requency	- AF is a field contained in FM-RDS (Radio Data System) data - It allows a receiver to re-tune to a different frequency providing the same station when the first signal becomes too weak.	- Enable AF feature for radio receiver of the moving vehicle. - Tune to the station that broadcasts FM-RDS with AF. - When singnal of the main station gets too weak, radio receiver automatically switches to alternative frequency of the same station continously		
AVN	Radio	AM	P0	**A**mplitude **M**odulation	- AM is a modulation technique used for transmitting information via radio carrier wave. In amplitude modulation, the amplitude (signal strength) of the carrier wave is varied in proportion to that of the message signal being transmitted. The message signal is, for example, a function of the sound to be reproduced by a loudspeaker, or the light intensity of pixels of a television screen - AM carrier frequencies are in the frequency range 535-1605 kHz.			
AVN	Radio	Direct Tune	P0	N/A	Direct Tune is to tune a radio station by inputing/selecting its specific frequency.	In Manual Tune mode, rotate the dial or touch the screen frequency. You can change the frequency by dragging while touching.		

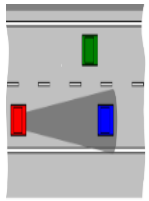
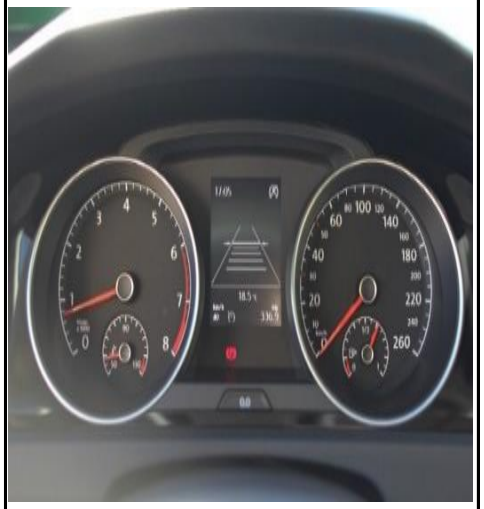
AVN	Radio	FM	P0	**F**requency **M**odulation	Frequency modulation (FM) is the encoding of information in a carrier wave by varying the instantaneous frequency of the wave. This contrasts with amplitude modulation, in which the amplitude of the carrier wave varies, while the frequency remains constant. - FM transmission have a broadcast wave 88-108 MHz	The most obvious method of applying modulation to a signal is to superimpose the audio signal onto the amplitude of the carrier. However this is by no means the only method which can be employed. It is also possible to vary the frequency of the signal to give frequency modulation or FM		
AVN	Radio	HD Radio	P0	**H**ybrid **D**igital Radio	- HD Radio is a trademarked term for iBiquity's in-band on-channel (IBOC) digital radio technology. - Used by AM/FM with embedded digital signal	Note: IBOC is a hybrid method of transmitting digital radio and analog radio broadcast signals simultaneously on the same frequency		
AVN	Radio	PI	P0	**P**rogramme **I**dentification	- PI in FM-RDS is the unique 4 character hexadecimal code that identifies the station. - Every station receives a specific code with a country prefix. This allows for quick identification of radio program type, based on country, coverage area, and program reference number. While the country code is specified by the standard, bit 11 to bit 0 is specified by each country local authorities.	PI is provided by radio stations transmitting Radio Data System (RDS) data as part of the FM radio broadcast. The PI code allows the radio to display the name of the radio station.		
AVN	Radio	PS / PSN	P0	**P**rogram **S**ervice / **P**rogram **S**ervice **N**ame	PS is simply an eight-character static display that represents station identity name	- It's FM-RDS (Radio Data System) content. Example: ON AVN: Turn on menu: RDS mode ON Signal generator: Set RDS mode is ON => ON Now playing of FM source of Audio: PSN is displayed with 8 character		

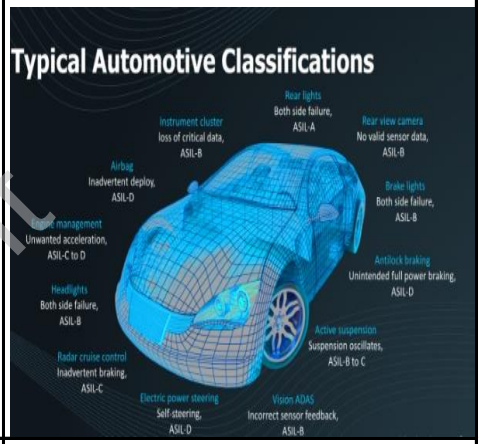
AVN	Radio	Radio tuner	P0	N/A	A tuner is a subsystem that receives radio frequency (RF) transmissions like radio broadcasts and converts the selected carrier frequency and its associated bandwidth into a fixed frequency that is suitable for further processing, usually because a lower frequency is used on the output.	Broadcast FM/AM transmissions usually feed this intermediate frequency (IF) directly into a demodulator that convert the radio signal into audio-frequencysignals that can be fed into an amplifier to drive a loudspeaker.		
AVN	Radio	RDS/DAB Signal Generator	P0	N/A	- It is a device that supports digital audio like DAB, DAB+, DMB, DRM30, DRM+; analog radio AM, FM and embedded-digital-signal radio as FM-RDS - It supports radio frequency output from 10dBM ~-120 dBM	3.2.2.3.+DAB+Generator		
AVN	Radio	RDS/RBDS	P0	**R**adio **D**ata **S**ystem/ **R**adio **B**roadcast **D**ata **S**ystem	- RDS/RBDS is a communications protocol standard for embedding small amounts of digital information in conventional FM radio broadcasts, for example: PSN, PI... - RDS is official name used by European Broadcasting Union - RBDS is official name used for US			
AVN	Radio	RF	P0	**R**adio **F**requency	- Radio frequency (RF) refers to the oscillation rate of electromagnetic radio waves. - Its range: 3 kHz to 300 GHz			
AVN	Radio	RT	P0	**R**adio **T**ext	- RT is a 64-character field in the RDS/RBDS standards. - It's used as either a static (such as station slogans) or dynamic display (such as the title and artist)	- For radio receiver, setting For FM-RDS must be ENABLED.		
AVN	Radio	SEEK DOWN operation	P0	N/A	Go to previous radio station			
AVN	Radio	SEEK UP operation	P0	N/A	Go to next radio station			

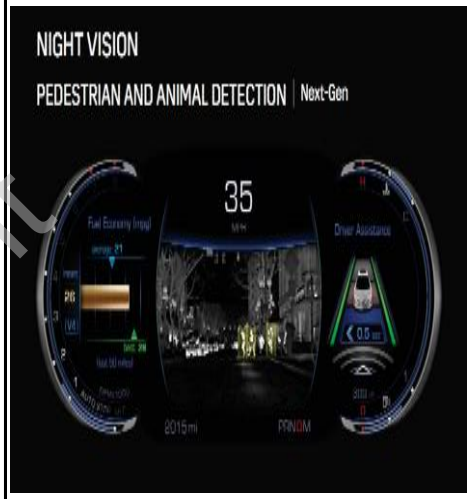
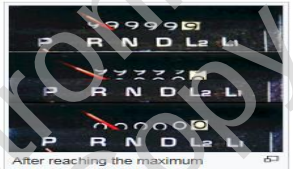
AVN	Radio	TA	P0	**T**raffic **A**nnouncement	- The Traffic Announcement Identification flag (TA) is used to indicate an ongoing traffic announcement - The tuner can use TA to auto-switch to FM tuner if another audio source is selected	1. TP = 1, TA = 1: **Ongoing traffic announcement** on present program 2. TP = 1, TA = 0: Traffic program itself offers traffic program 3. TP = 0, TA = 0: Program offers no traffic program 4. TP = 0, TA = 1: Traffic program is offered via an EON (Enhanced Other Networks) referenced program		
AVN	Radio	TP	P0	**T**raffic **P**rogramme	- The Traffic Program Identification flag (TP) is used to identify stations that offer traffic program '- The signal shall be taken into account during automatic search tuning.	- TP = 0: Program offers no traffic program - TP = 1: Traffic program itself offers traffic program		
AVN	Radio	DAB	P0	**D**igital **A**udio **B**roadcasting	Digital audio broadcasting (DAB) is a digital radio standard for broadcasting digital audio radio services, used in countries across Europe, the Middle East and Asia Pacific.	DAB uses a wide-bandwidth broadcast technology and typically spectra have been allocated for it in Band III (174–240 MHz) and L band (1.452–1.492 GHz), although the scheme allows for operation between 30 and 300 MHz. The DAB system hardware and software shall be compliant with the DAB, DAB+ and DMB-A standards		
AVN	Radio	DAB Anouncement	P0	N/A	- DAB Announcement is a short audio message that interupts the current DAB radio mode. - There are about 11 announcement types: + Alarm + Road Trafic flash + Transport flash + Warning/Service + News flash + Area weather flash + Event announcement + Special event + Programme Information + Sport report + Financial report	In vehicle, to receive DAB announcment, driver shall enable the settings for Announcement. 		

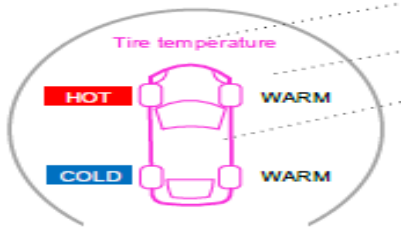
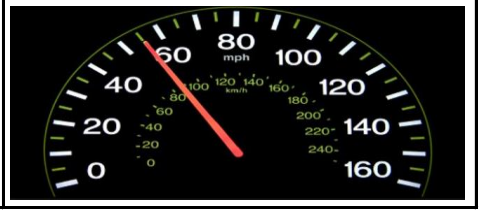
AVN	Radio	DRM	P0	Digital Radio Mondiale	Digital Radio Mondiale (DRM; mondiale being Italian and French for "worldwide") is the universal, openly standardised digital broadcasting system for all broadcasting frequencies up to 300 MHz, including the AM bands (LF, MF, HF) and VHF bands I, II (FM band) and III. DRM is greener, clearer, wider, bigger, better quality & audio content and cost efficient than analogue radio; it provides digital sound quality and the ease-of-use that comes from digital radio, combined with a wealth of enhanced features such as, Surround Sound, Journaline text information, Slideshow, EPG, and data services	DRM system is specifically designed to allow the new digital transmissions to co-exist with the current analogue broadcasts, and a significant amount of work has been undertaken to quantify the operating parameters that assure mutual analogue and digital compatibility. Hence the changeover from analogue to digital broadcasting can be phased over a period of time, which in turn allows existing broadcasters to spread therequired investment to meet any budgetary constraints. Furthermore, unlike some other digital systems, the DRM system has been designed to allow suitable analogue transmitters to be modified to switch easily between digital and analogue broadcasts. This can significantly reduce the initial investment cost for a broadcaster. An additional budgetary benefit is the reduction of transmission energy costs.	 Figure 2.1: Frequency Band Overview	 Figure 5.2: Simple DRM Broadcast chain
AVN	Radio	SXM/XM/ Sirius	P0	Sirius Stream X-Machine	SXM/XM/ Sirius: is satellite radio (SDARS) and online radio services in the United States and Canada, operated by Sirius XM Holdings.	It provided pay-for-service radio, analogous to cable television. Its service included 73 different music channels, 39 news, sports, talk and entertainment channels, 21 regional traffic and weather channels and 23 play-by-play sports channels. XM channels were identified by Arbitron with the label "XM"		
AVN	Radio	Itunes radio	P0	N/A	Itunes radio is an Internet radio service by Apple Inc. that let users listen to automatically generated playlists based on direct input as well as collected data on music preferences.	ITunes Radio was a free, ad-supported service available to all iTunes users, featuring Siri integration on iOS. Users were able to skip tracks, customize stations, and purchase the station's songs from the iTunes Store.Users could also search through their history of previous songs.		

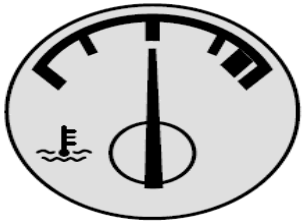
AVN	Radio	Block Explicit	P0	N/A	It is a setting s to block/allow explicit content to display or play. The explicit content is applied when the lyrics or content of a song or a music video, streaming contain one or more of the following criteria which could be considered offensive or unsuitable for children: strong language, violence, mental abuse, sexualised behavior, racist, homophobic, misogunistic or other language that could be considered discriminatory; dangerous or ciminal behaviour.	Example: On Radio, set in Audio Setting of SXM source. Set ON means the explicit content will be blocked. Set OFF means allow explicit content.	Chế độ chặn thông tin nhạy cảm, bạo lực (thường dùng khi gia đình có trẻ em)	
AVN	Voice Recognition	ASR	P0	**A**utomated **S**peech **R**ecognition	- Automatic speech recognition (ASR) is the use of computer hardware and software-based techniques to identify and process human voice: + Convert spoken words into computer text + Authenticate users via their voice + Perform actions based on the instructions defined by the human	User input audio signal, ASR will identify and process this signal then output text into the system		
AVN	Voice Recognition	STT	P0	**S**peech **T**o **T**ext	- Speech to Text: is a software/function/characteristic of electronic system that transforms spoken voice into text - It is also known as automatic speech recognition (ASR), computer speech recognition or Speech recognition.	- "speech to text" (STT) is used some methodologies and technologies that enables the recognition and translation of spoken language into text by computers. - After that, display the text on the destination screen or send it to the other functions.		
AVN	Voice Recognition	TTS	P0	**T**ext **T**o **S**peech	Text To Speech: is a software/function/characteristic of eletronic system that converts text into spoken voice output.	- User input text with the supported format into the text box in some functions like Email, Messaging, Multimedia Message Service. - System will translate text to voice data and readout those text following speed rate value : Slow, Medium, and Fast		

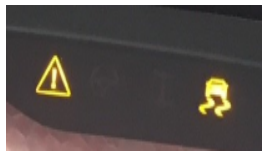
AVN	Voice Recognition	VR / SR	P0	**V**oice **R**ecognition / **S**peech **R**ecognition	Voice or speech recognition is the ability of a machine or program to receive and interpret dictation, or to **understand and carry out spoken commands**.	- With IOS device: Press Home button to open voice recognition - With Android device: Choose icon google voice When user don't connect any device and selecting language support VR , press and hold PTT to display VR then the speech recognizer "hearing" what you said and perform commands of speaker		
Cluster	Common	ACC	P0	**A**daptive **C**ruise **C**ontrol	ACC is an available cruise control system for road vehicles that automatically adjusts the vehicle speed to maintain a safe distance from vehicles ahead. This is also known as Dynamic cruise control.	Using the signals from the radar sensor, the control unit computes the distance to the vehicle ahead and your car's speed relative to it. It also works out its lateral position on multi-lane roads. If there are several vehicles within the sensor's field of coverage at the same time, this information is used to select which of the vehicles the system should track. The radar sensor is not capable of detecting stationary obstructions, such as the end of a tailback or crash barriers, however. If approaching a slower vehicle ahead or if another vehicle cuts in front of you, the adaptive cruise control slows down the car by initiating corrective controls in the engine management and, if necessary, in the braking system too. If the required rate of deceleration exceeds 30% of the vehicle's maximum stopping power, visual and audible warning signals will prompt the driver to apply the brakes manually.	Hệ thống điều khiển hành trình chủ động ACC – Adaptive Cruise Control có khả năng duy trì tốc độ theo ý muốn của tài xế, nó còn cảnh báo va chạm và hỗ trợ giảm tốc trong trường hợp cần thiết. Công nghệ ACC – Adaptive Cruise Control là sự nâng cấp từ tính năng ga tự động Cruise Control, nhằm tăng sự an toàn và tính tiện dụng cho người lái xe. Ưu điểm: + Giúp người lái thư giãn hơn khi vận hành phương tiện + Giúp tiết kiệm nhiên liệu hơn (Khoảng 30%) + Giúp kiểm soát được tốc độ cho phép Nhược điểm: + Chỉ thích hợp khi sử dụng trên đường cao tốc, đường phẳng ít chướng ngại vật + Dẫn đến tâm lý chủ quan khi vận hành	 

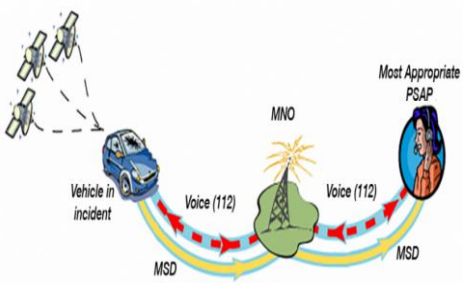
Cluster	Common	ASIL	P0	**A**utomotive **S**afety **I**ntegrity **L**evel	ASIL is a risk classification scheme defined by the ISO 26262 - Functional Safety for Road Vehicles standard. There are four ASILs identified by the standard: 1. ASIL A 2. ASIL B 3. ASIL C 4. ASIL D ASIL D dictates the highest integrity requirements on the product and ASIL A the lowest.	The determination of ASIL is the result of hazard analysis and risk assessment. In the context of ISO 26262, a hazard is assessed based on the relative impact of hazardous effects related to a system, as adjusted for relative likelihoods of the hazard manifesting those effects. That is, each hazard is assessed in terms of severity of possible injuries within the context how much of the time a vehicle is exposed to the possibility of the hazard happening as well as the relative likelihood that a typical driver can act to prevent the injury		
Cluster	Common	Fuel Gauge	P0	N/A	The fuel gauge shows approximately how much fuel is remaining in the tank	When the ignition is switched ON, the fuel gauge shows approximately how much fuel is remaining in the tank.		
Cluster	Common	Hazard	P0	N/A	An warning light and button use to trigger others in case your car in emegency. Hazard warning lights are a pair of intermittent flashing indicator lights that flash in unison to warn other drivers that the vehicle is a temporary obstruction. They are also called hazard flashers and hazard lights. Different countries use hazard warning lights in different ways. In New Zealand we wouldn't use them on a motorway to warn other drivers that we're slowing down, but in the UK this is recommended.	Press this button to make the front and rear turn signal lamps flash on and off. Press again to turn the flashers off. When the hazard warning flashers are on, the vehicle's turn signals will not work.		

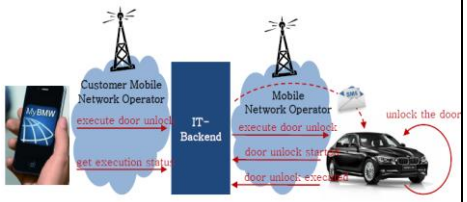
Cluster	Common	Night Vision	P0	N/A	An automotive night vision system uses a thermographic camera to increase a driver's perception and seeing distance in darkness or poor weather beyond the reach of the vehicle's headlights	Displays and scales the height and width of the the NightVision picture The street ahead of the car is filmed with a night vision camera and the corresponding picture is displayed on the instrument cluster. The feature night vision has a detection system for pedestrians and animals. If a pedestrian or an animal is detected on the street then the driver gets a warning signal (collision warning). This detection system only works when it's dark enough. During bright daylight, the detection system do not work but the screen is still available.		
Cluster	Common	Odometer	P0	N/A	Odometer is an Instrument for measuring the distance traveled (as by a vehicle). In countries using Imperial units or US customary units it is sometimes called a **mileometer** or **milometer** (unit: miles), others use the kilometer (unit: km).	Display the total driven distance of the car 		

Cluster	Common	Personalization	P0	N/A	Personalization configuration for user accounts	- Loads and executes the parameter data set of detected user accounts. - Displays the account information - This function possible to save or saves automaticcally all car specific settings of vehicle(e.g. seat setting, assistance system..). The user is recoginezed through the entry key and the setting are adapted according to the specific user account. The PopUp „Personalization“ Welcomes the driver with his name. The control panel and settings of personalization are located in the MIB. The PopUp is used for welcoming the user. 1 Welcome message Here the welcome message is displayed with the name of the current driver profile (e.g. Mr. Müller). Note: The welcome message PopUp should have a timeout of 4000 ms (codable).		
Cluster	Common	RDK / TPMS	P0	**R**eifen **D**ruck **K**ontrolle (means Tire Pressure Control) / **T**ire **P**resure **M**onitoring **S**ystem	Displays tire Temperature and its pressure. RDK was jointly developed by Bosch GmbH and Porsche AG.	Display temperature for 4 wheels The temperature have one of the following state: 1. Hot = red color highlight 2. Warm = no color highlight 3. Cold = blue color highlight		
Cluster	Common	Speedometer	P0	N/A	A **speedometer** or a speed meter is a gauge that measures and displays the instantaneous speed of a vehicle	https://www.explainthatstuff.com/how-speedometer-works.html		

Cluster	Common	Tachometer	P0	N/A	Tachometer is an instrument for measuring the speed of an engines rotation	A tachometer is a sensor device used to measure the rotation speed of an object such as the engine shaft in a car, and is usually restricted to mechanical or electrical instruments. This device indicates the revolutions per minute (RPM) performed by the object.		
Cluster	Common	Telltale	P0	N/A	Telltale Indicators are Graphical Icons and/or Text displayed in the Cluster that indicate the state of a vehicle system or subsystem to the user. Such states include ON/OFF, ENAbLED/DISAbLED, WARNING, etc. *Telltale is an indicator of malfunction of a system within a motor vehicle by an illuminated symbol or text legend*	When active, they must always be shown and must not be obscured by any other graphics.		
Cluster	Common	Temperature gauge	P0	N/A	A temperature gauge is used to indicate the temperature of an item being monitored. The temperature gauge in your vehicle is designed to indicate the temperature of your engine's **coolant**. This gauge will tell you if your engine's coolant is cold, normal, or overheating. It is an important dial that is located on the dashboard of your vehicle.			
Cluster	Common	Trip computer	P0	N/A	A trip computer is a computer fitted to some cars; most modern trip computers record, calculate, and display the distance travelled, the average speed, the average fuel consumption, and real-time fuel consumption.	Example: A trip is available when IGN ON Includes below information: + Outside temperature + Traveled distance + Average Fuel consumption + Average speed + Time		

Cluster	Common	Warning light	P0	N/A	Array of dashboard warning lights to let driver know an issue with the car.	Displays warning lights as LCD icon and LED (Refer Cluster warning indicator for details). Example: + Seatbelt indicator: You're not wearing your seatbelt + Airbag indicator: there's something faulty with the airbags + Brake warning light: it's likely that you left your handbrake on, or your car is low on b 		 
Cluster	Common	Warning Messages	P0	N/A	Message inform to drivers about possible issue if the car have something wrong	Displays warning messages as popup in consideration of priority		
Telematics	Application	AACN / ACN	P0	**A**dvanced **A**utomatic **C**ollision **N**otification / **A**utomatic **C**ollision **N**otification	An automatic crash notification system is an emerging safety technology designed to notify emergency responders that a crash has occurred and provide crash data.	When vehicle has collision, the sensors in vehicle will send crash/collision signal to ACN system. This system will send signal to vehicle network. When telematics receives this signal, it will make an emergency call to call center.	ACN/AACN là hệ thống cảnh báo va chạm/ đụng độ. Khi xe bị va chạm, các sensor lắp trên xe sẽ gửi tín hiệu va chạm đến hệ thống ACN/AACN. Hệ thống cảnh báo va chạm sẽ phân tích tín hiệu va chạm và quyết định có cảnh báo không. Khi xác định là tín hiệu va chạm cần cảnh báo, hệ thống sẽ gửi tín hiệu cảnh báo va chạm vào mạng lưới xe để các ECU khác có thể nhận được tín hiệu này. Ví dụ 1: Đối với thiết bị telematics, khi nhận được tín hiệu cảnh báo này sẽ thực hiện cuộc gọi khẩn cấp lên tổng đài để thông báo về việc xe bị va chạm. Ví dụ 2: Đối với thiết bị AVN, khi nhận được tín hiệu cảnh báo, sẽ hiển thị màn hình cảnh báo khẩn cấp.	

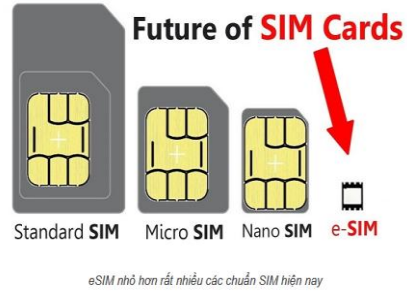
Telematics	Application	Ecall	P0	**E**mergency **Call**	Emergency Call is a call which is made by telematics device to emergency call center. In GM telematics, ecall is the name for emergency call in EU market only.	The emergency call can be made automatically upon collision detection or via driver request by pressing HMI button		
Telematics	Application	ECSL	P0	**E**mergency **C**all **S**equence **L**ogging	Fuction to store a number of latest emergency call log in internal memory of telematic device. These data can be get by server to analysis purpose.	For example: telematics box will store two latest emergency call log and then call center can request to get this information for more analysis.		
Telematics	Application	Emergency Button	P0	N/A	Emergency Button is deployed on vehicle to help user trigger an emergency call to connect to Emergency Call Center. Common names of emergency button: SOS button, Ecall button.	The common case is to press and release the button in a time (depend on the requirement) to trigger a call.		
Telematics	Application	External MIC	P0	External **Mic**rophone	External microphone is another microphone is installed in car which supports only for telematics call (main microphone is typically in head unit)	In common, when a telematic call (Example: emergency call), the driver will automatically use the external microphone and external speaker (the main ones is mute).		
Telematics	Application	MSD	P0	**M**inimum **S**et of **D**ata	MSD is required for Emergency call. Typically, MSD includes following information (which depends on the legal requirements in different region): + Position + Time of the accident + Direction of the travel + Vehicle Identification number + ... MSD provides information of vehicle at the time of the emergency.	When emergency call is triggered, Telematics box will send MSD to server via telecommunication channel		
Telematics	Application	PSAP	P0	Public-Safety Answering Point	A public-safety answering point, sometimes called "public-safety access point", is a call center responsible for answering calls to an emergency telephone number for police, firefighting, and ambulance services. It is commonly used in Canada, United States.	The call center to help people to solve problem related to public-safety like 113-114-115 in Vietnam.		

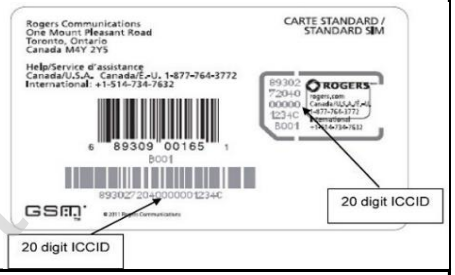
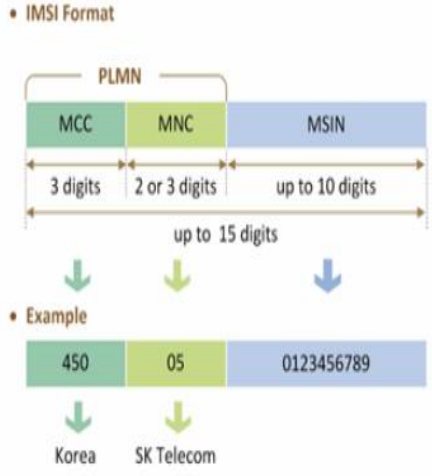
Telematics	Application	Auth Code	P0	Authentication Code	In telematics, some application required authentication process between telematics device with other component to ensure the certification connection. Authentication code is stored in both telematics unit and the other for ensure security of communication.	For example: + Authentication code between telematics unit with the call center server. + Authentication code between 2 ECUs inside vehicle		
Telematics	Application	Provision / Provisioning / Subcriber (GM)	P0	N/A	The term Provisioning (JLR, BMW, Toyota, Geely) or Account/Subcriber (GM), which originated in telecommunications, is the act of acquiring a service. Example: Vehicle manufacturer provides a list of telematics services/application for driver to choose (emergency call, remote control, broken car support...). The services was selected by driver (he/she may need to pay for them) are provisioning with him/her (he can use these services). Otherwise, the services which he didn't pay or not included in the telematic product are unprovisioning.	Provisioning or Subcriber is represented through configuration parameter in telematics unit, commonly, through XML file. When perform provisioning action, there is a request which is sent from (dealer) server tp telematics unit is installed inside vehicle to change the configuration parameter.		
Telematics	Application	Remote Control / Remote service	P0	N/A	The remote control or remote service is for the scenario that user sends the request in the remote control client (such as application on mobile phone, call center website) to vehicle, so that the vehicle can perform the operation required	User performs remote (Ex: remote engine start) on mobile device which has Internet access (or on control website). The request will be sent to telematics unit then it will send request to vehicle to start the engine. When telematics unit received response from vehicle, it will send response to user.		
Telematics	Application	Remote engine start/stop	P0	N/A	Remote engine start supports the end users to send the request via mobile phone application or call center to vehicle with the purpose of starting/stopping the car engine		Ứng dụng điện thoại giúp người dùng khởi động/tắt động cơ mà không cần ngồi trên xe.	

Telematics	Application	Remote honk/flash or remote car seeking	P0	N/A	The remote honk/flash is used by the user to send the request in the mobile application or call center to the vehicle, so that the vehicle can be easily located		Ứng dụng điện thoại giúp người dùng tìm xe bằng cách yêu cầu xe nháy đèn trước hoặc/và tự động còi báo.	
Telematics	Application	FOTA	P0	Firmware Over The Air	Method to distribute updated firmware by wireless telecommunications.	New firmware is transferred to the ECU via wireless channel (wifi or telecommunication network), then installed, and put into use. It is often necessary to reset the ECU for the new programming to take effect.		
Telematics	Application	AN / TN	P0	**A**nti-theft **N**otification/ **T**heft **N**otification	An anti-theft system is any device or method used to prevent or detect the unauthorized appropriation of items considered valuable.	A group of many vehicle sensors detect unauthorization attemp then send signal for further processing. For example: a sensor on door can detect the window is broken and send signal to indicated ECU such as telematics, then it will send notification to user mobiphone to warning.		
Telematics	Application	SVT	P0	**S**tolen **V**ehicle **T**racking	Vehicle tracking systems use the GPS/GNSS and telecommunication technology, providing vehicle location accuracy. This feature to support driver to find the vehicle when it was stolen.	The vehicle location data will be sent to server frequently. There is a server which collect these data to help driver to track the vehicle location. For example: when user detected the car was stolen, he can call directly to call center, call center then use SVT to tracking vehicle position and contact with police to find the car. In some projects, SVT and theft notification are related. When vehicle detects theft through sensors, it sends the alarm the user, and then when user confirm the car is actually stolen, vehicle will send position data to help tracking location.		
Telematics	Common	FPCB	P0	**F**lexible **P**rinted **C**ircuit **B**oards	FPCB or Flexible electronics, also known as flex circuits, is a technology for assembling electronic circuits by mounting electronic devices on flexible plastic substrates, such as polyimide, PEEK or transparent conductive polyester film	In telematic projects, the hardware of telematics unit is a PCB. We also use the FPCB to attach external SIM card instead of using built-in SIM inside main PCB for testing purpose.	Bảng mạch in linh hoạt là công nghệ lắp ráp các mạch điện tử bằng cách gắn các thiết bị điện tử trên các chất dẻo dẻo như polyimide , PEEK hoặc màng polyester dẫn điện trong suốt.	
Telematics	Common	NAD	P0	**N**etwork **A**ccess **D**evice	Network Access Device: a component in telematic device to connect to cellular network			

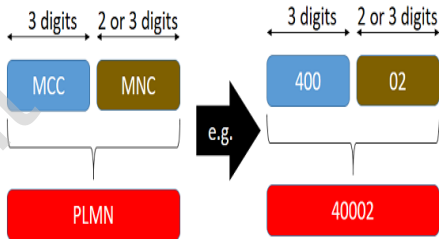
Telematics	Common	Shark antenna	P0	N/A	Shark antenna or shark fin antenna is a type of antenna with shape like a shark fin which is eqipped on vehicle to booster wireless signal for services inside the car.	Most shark fin “antennas” on modern vehicles are actually modules: they contain several antennas inside a single housing. Common features include AM/FM, 4G LTE, GPS navigation, and Satellite Radio elements.		 
Telematics	Diagnostics	DID	P0	Data IDentifier	DID is represented for data. It is used for locating a memory block. Each ECU can store many DIDs. DID is a term which is usually found in diagnostics domain. In service layer, these DIDs have same meaning as configuration parameters. For example, vehicle identifier number (VIN) is represented by DID 0xF190 in a project, this DID is matching with a data block of 17 bytes which are the value of VIN	Use DID to get the value of data. The DIDs are mainly defined by OEM, you should get the list of DID for testing. For example: To get the VIN value is stored in an ECU, we use DID 0xF190 in a project. If the ECU returns output like: 39 38 37 36 35 34 33 32 31 30 41 42 43 44 45 46 47 in hex value (17 bytes), that means the ECU stores VIN number as 9876543210ABCDEFG in ASCII value.		
Telematics	Diagnostics	DTC	P0	Diagnostic Trouble Code	Diagnostic Trouble Codes is 3-byte hexadecimal number (in UDS). DTC is used to uniquely identify the fault of an ECU in memory. If ISO 15031-6 is supported, a unique 5 –character-string plus an additional Failure Type Byte (when using UDS) is used to describe the fault on the external test tool (e.g. “B162C” or “B162A 12”). Each DTC is dedicated for one fault which ECU can detect. Each ECU can detect many different DTCs if it supported diagnostic service. Based on the DTC, people can match with the corresponding fault to check the ECU's issues.	For example: DTC B12400 means "E-call button stucks" has value in hexa is 923400. In diagnostics, if ECU detects DTC B12400, that means this ECU has trouble with E-call button (this button has stuck).		

Telematics	Diagnostics	NRC	P0	**N**egative **R**esponse **C**ode	In diagnostics message, we use client-server model. When a client sends a request to server, server may respond to client. If a service cannot be executed, the ECU responds with a negative response. And negative response includes NRC, NRC is used to indicate the cause of the error.	Each NRC is represented for an error. Example: + NRC 0x11 means the diagnostic funtion in request is not supported + NRC 0x13 means the request message has incorrect length		
Telematics	Diagnostics	PDU	P0	**P**rotocol **D**ata **U**nit	PDU is a single unit of information transmitted among peer entities of a computer network. A PDU is composed of protocol specific control information and user data.	Examples: PDU of the OSI model are: + Layer 4 (Transport layer) PDU is the segment or the datagram + Layer 3 (Network layer) PDU is the packet + Layer 2 (Data Link Layer) PDU is the frame + Layer 1 (Physical layer) PDU is the bit or symbol		
Telematics	Diagnostics	Stuck Button	P0	N/A	Stuck button is an issue of button when it is pressed for a duration of time more than a threshold time. The threshold time will be defined in the requirement.	Stuck button can be detected by ECU through diagnostic service, when it happened, the DTC is occurred. For example: If we press SOS button during between 2~8seconds, a call is triggered to call center, but if the button is pressed for more than 15 seconds, it means the button is stuck and an issue is occured.		

Telematics	Diagnostics	UDS	P0	**U**nified **D**iagnostic **S**ervices	Unified Diagnostic Services is a diagnostic communication protocol in the electronic control unit (ECU) environment within the automotive electronics, which is specified in the ISO 14229-1.	It is derived from ISO 14230-3 (KWP2000) and ISO 15765-3 (Diagnostic Communication over Controller Area Network (DoCAN)[2]). Unified in this context means that it is an international and not a company-specific standard. By now this communication protocol is used in almost all new ECUs made by Tier 1 suppliers of Original Equipment Manufacturer (OEM). These ECUs control a wide range of functions in vehicles including electronic fuel injection (EFI), Engine control unit (ECU), the transmission, anti-lock braking system, door locks, braking, and more. This protocol allows to do following function groups: - Diagnostic and Communications Management - Data Transmission - Stored Data Transmission - Input / Output Control - Remote Activation of Routine - Upload / Download		
Telematics	Telecommunication	eSIM	P0	embedded Subscriber Identity Module	- eSIM is a small chip(SIM card - hardware) embedded in device and cannot be removed.	- The SIM stores all information that is necessary to identify and authenticate the mobile subscriber. - Allows the download and activation of eSIM profiles over the air in a seamless, secure, and convenient way - eSIM needs to be supported by the network or carrier and enabled by them and not all networks surport eSIM as yet	SIM (Subscriber Identity Module) là con chip nhỏ có để lưu trữ chi tiết tài khoản cá nhân của bạn trên đó. Còn eSIM giống như một SIM điện tử được gắn trực tiếp lên bo mạch và có kích thước vô cùng bé so với SIM truyền thống hiện tại.	 *eSIM nhỏ hơn rất nhiều các chuẩn SIM hiện nay*
Telematics	Telecommunication	eUICC	P0	**E**mbedded **U**niversal **I**ntegrated **C**ircuit **C**ard	- eUICC is the software component (diffirentiate with UICC, eSIM - hardware component) that allows the remote SIM provisioning of multiple network profiles	- This allows the user to select which network profile to download and connect to without the need to physically obtain or swap out SIMs, making it well-suited for devices with embedded SIMs		

Telematics	Telecommunication	ICCID	P0	**I**ntegrated **C**ircuit **C**ard **Id**entifier	Each SIM is internationally identified by its integrated circuit card identifier (ICCID). ICCIDs are stored in the SIM cards and are also engraved or printed on the SIM card body during a process called personalisation.	A full ICCID is 19 or 20 characters. Sometimes it happens that on the SIM card is printed only the last 13 digits of ICCID number.		
Telematics	Telecommunication	IMSI	P0	**I**nternational **M**obile **S**ubscriber **I**dentity	IMSI is used to identify the user of a cellular network and is a unique identification associated with all cellular networks. It is stored as a 64 bit field and is sent by the phone to the network. The IMSI is used in any mobile network that interconnects with other networks. For GSM, UMTS and LTE network, this number is provisioned in the SIM card and for CDMA2000 in the phone directly or in the R-UIM card	An IMSI is usually presented as a 15 digit number, but can be shorter (not longer). The first 3 digits are the mobile country code (MCC), which are followed by the mobile network code (MNC), either 2 digits (European standard) or 3 digits (North American standard). The length of the MNC depends on the value of the MCC, and it is recommended that the length is uniform within a MCC area. The remaining digits are the mobile subscription identification number (MSIN) within the network's customer base (mostly 10 or 9 digits depending on the MNC length).	IMSI (số nhận dạng thuê bao di động quốc tế) được chứa trong thẻ SIM. Số IMSI thường là một chuỗi 15 chữ số, bao gồm một MCC (mobile country code), một MNC (mobile network code) và một MSIN (mobile station identification number). Nhằm đảm bảo số IMSI không bị đánh cắp dễ dàng, số IMSI chỉ được gửi đến mạng di động lần đầu khi thiết bị di động được bật lên gia nhập mạng. Số IMSI dùng để nhận dạng 1 thuê bao ở mức độ quốc tế (thuộc quốc gia nào, nhà mạng nào).	
Telematics	Telecommunication	LTE	P0	**L**ong **T**erm **E**volution	Telecomunication technology to reach 4G standard.	A standard for high-speed wireless communication for mobile devices and data terminals, based on the GSM/EDGE and UMTS/HSPA technologies. It increases the capacity and speed using a different radio interface together with core network improvements.		
Telematics	Telecommunication	MCC	P0	**M**obile **C**ountry **C**ode	IMSI = MCC + MNC + MSIN (Mobile Subscriber Identification Number). Mobile Country Code indicates the country of a subcriber in the telecommunication network.	The mobile country code consists of three decimal digits and the mobile network code consists of two or three decimal digits. Link to search MCC and MNC: http://vuthanhvan.vansu.vn/cell/MNC.htm	- Mã định danh quốc gia. Ví dụ: số IMSI là 452040123456789 => Mã quốc gia là 452: số IMSI thuộc Việt Nam; Mã nhà mạng là 04: thuê bao thuộc nhà mạng Viettel. - Mã này khác với mã vùng trong số điện thoại. Ví dụ: MCC của Việt Nam là 452, trong khi mã vùng điện thoại là +84.	**Vietnam** **MCC** **MNC** **Brand** 452 01 MobiFone 452 02 Vinaphone 452 03 S-Fone 452 04 Viettel Mobile 452 05 Vietnamobile 452 06 E-Mobile 452 07 Beeline VN

Telematics	Telecommunication	MDN or MSISDN	P0	**M**obile **D**irectly **N**umber / **M**obile **S**ubscriber **I**ntegrated **S**ervice **D**igital Network **N**umber	MSISDN is a number uniquely identifying a subscription in a GSM or a UMTS mobile network. The MSISDN together with IMSI are two important numbers used for identifying a mobile subscriber. IMSI is stored in the SIM while MSISDN is the number used for routing calls to the subscriber. A SIM has a unique IMSI that does not change, while the MSISDN can change in time	Maximum length of an MSISDN to 15 digits. 1-3 digits are reserved for country code	MSISDN là số điện thoại người dùng sử dụng để kết nối đến người dùng khác.	
Telematics	Telecommunication	MNC	P0	**M**obile **N**etwork **C**ode	IMSI = MCC + MNC + MSIN (Mobile Subscriber Identification Number). In order to uniquely identify a mobile subscribers network the MCC is combined with a Mobile Network Code (MNC). Each network provider in same country has different MNC.	The mobile network code consists of two or three decimal digits	Mã nhà mạng dùng để định danh thuê bao thuộc nhà mạng nào trên đường truyền. Ví dụ: số IMSI là 450050123456789 => Mã quốc gia là 450: số IMSI thuộc Hàn Quốc; Mã nhà mạng là 05: thuê bao thuộc nhà mạng SKT (SK telecom)	**South Korea** **MCC** **MNC** **Brand** 450 02 KTF 450 03 Digital 017 450 04 KTF 450 05 SKT 450 06 LGT 450 08 KTF SHOW
Telematics	Telecommunication	MNO	P0	**M**obile **N**etwork **O**perator	A mobile network operator (MNO) is a telecommunications service provider organization that provides wireless voice and data communication for its subscribed mobile users. ... Mobile network operators are also known as carrier service providers, mobile phone operator and mobile network carriers.	Examples of MNO: + In Vietnam: Viettel, MobiPhone, Vinaphone, Vietnammobile, Gmobile, S-Fone + In Korea: SK Telecom, KT, LG U+ + In Japan: KDDI, NTT, SoftBank + In China: China Mobile, China Unicom, China Telecom + In Russia: MTS, MegaFon, Beeline, Tele2... + In UK: EE, O2, Vodafone, Three + In US: Verizon Wireless, AT&T Mobility, T-Mobile US, Sprint Corporation, U.S. Cellular	Danh sách các nhà cung cấp dịch vụ viễn thông: https://en.wikipedia.org/wiki/List_of_mobile_network_operators	

<table>
<tr>
<td>Telematics</td>
<td>Telecommunication</td>
<td>PLMN</td>
<td>P0</td>
<td>Public Land Mobile Network</td>
<td>PLMN defined in telecommunications regulation, is a network that is established and operated by an administration or by a recognized operating agency (ROA) for the specific purpose of providing land mobile telecommunications services to the public.
It is a five- to six-digit number identifying a country, and a mobile network operator in that country, usually represented in the form 001-01 or 001-001.
PLMN = MCC + MNC</td>
<td>A PLMN is identified by the Mobile Country Code (MCC) and the Mobile Network Code (MNC). Each operator providing mobile services has its own PLMN. PLMNs interconnect with other PLMNs and Public switched telephone networks (PSTN) for telephone communications or with internet service providers for data and internet access of which links are defined as interconnect links between providers. These links mostly incorporate SDH digital transmission networks via fiber optic on land and digital microwave links.</td>
<td></td>
<td> 
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<tr>
<td>Telematics</td>
<td>Telecommunication</td>
<td>UICC</td>
<td>P0</td>
<td>Universal Integrated Circuit Card</td>
<td>The universal integrated circuit card (UICC) is the smart card used in mobile terminals in GSM and UMTS networks
UICC (Universal Integrated Circuit Card) is the hardware used in mobile devices that contains SIM and/or USIM applications enabling access to GSM, UMTS/3G and LTE networks.</td>
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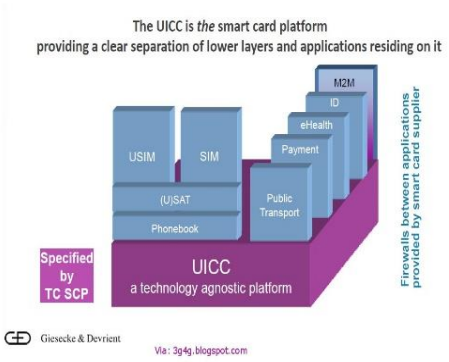
<tr>
<td>Telematics</td>
<td>Telecommunication</td>
<td>USIM</td>
<td>P0</td>
<td>Universal Subscriber Identity Module</td>
<td>In 2G times, the SIM consisted of the hardware and the software.
USIM refers to Universal Subscriber Identity Module and works on UMTS Universal Mobile Telecommunications System, which is a 3G(third generation) networking standard. It was launched in 2001. The physical card is known as UICC(Universal Integrated Circuit Card) and USIM is an application running on top of UICC.</td>
<td>USIM vs SIM
<table>
<tr><th>USIM</th><th>SIM</th></tr>
<tr><td>UMTS-SIM (>=3G)</td><td>GSM-SIM (2G)</td></tr>
<tr><td>APN settings ca be written directly on to the card</td><td>N/A</td></tr>
<tr><td>MMS can stored on the card</td><td>N/A</td></tr>
<tr><td>Extended phone book (256K)</td><td>Limited Phone Book (32K or 64K)</td></tr>
<tr><td>Backward compatible with 2G-GSM technology</td><td>Compatible with 3G also</td></tr>
<tr><td>Operator Logo can be stored on the card</td><td>Can’t store image</td></tr>
<tr><td>More secured: Milenage and kausami algorithm</td><td>A3, A5, A8 algorithm are not very secured</td></tr>
</table></td>
<td></td>
<td> 
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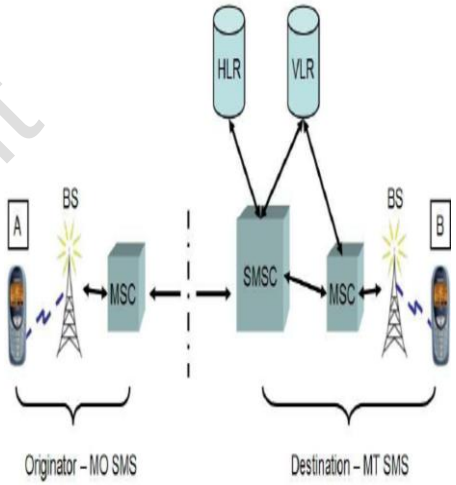
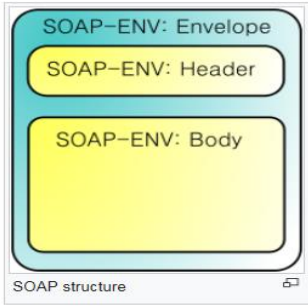
Telematics	Telecommunication	AIF	P0	**A**ir **I**nter**f**ace	AIF is the Wireless Communications Protocol between the the telematics Center system and the telematic In-the Vehicle system, defines the messages that are sent across the Air Interface Protocol that is being used in concordance with transmitting messages across digital or analog channels inside telematics hardware			
Telematics	Telecommunication	HTTP	P0	**H**yper**t**ext **T**ransfer **P**rotocol	Protocol used to send and receive data of HTML document etc. between Web server and client. Communication protocol used to exchange data like HTML documents between web server and client. The HTTP request methods: GET, HEAD, POST, PUT, DELETE, TRACE, OPTIONS, CONNECT, PATCH	HTTP functions as a request–response protocol in the client–server computing model. A web browser, for example, may be the client and an application running on a computer hosting a website may be the server. The client submits an HTTP request message to the server. The server, which provides resources such as HTML files and other content, or performs other functions on behalf of the client, returns a response message to the client. The response contains completion status information about the request and may also contain requested content in its message body. Common tool to test HTTP: Postman **Example:** **Client request:** GET /index.html HTTP/1.1 Host: www.example.com	Ví dụ: (server trả về mã http code = 200) **Client request:** GET /index.html HTTP/1.1 Host: www.example.com **Server response:** HTTP/1.1 200 OK Date: Mon, 23 May 2005 22:38:34 GMT Content-Type: text/html; charset=UTF-8 Content-Length: 138 Last-Modified: Wed, 08 Jan 2003 23:11:55 GMT Server: Apache/1.3.3.7 (Unix) (Red-Hat/Linux) ETag: "3f80f-1b6-3e1cb03b" Accept-Ranges: bytes Connection: close <html> <head> <title>An Example Page</title> </head> <body> Hello World, this is a very simple HTML document. </body> </html>	

Telematics	Telecommunication	SMS	P0	**S**hort **M**essage **S**ervice	SMS (short message service) is a text messaging service component of most telephone, internet, and mobile-device systems.It uses standardized communication protocols to enable mobile devices to exchange short text messages. The protocols allowed users to send and receive messages of up to 160 alpha-numeric characters to and from GSM mobiles. Although most SMS messages are mobile-to-mobile text messages, support for the service has expanded to include other mobile technologies.	Each message contains up to 160 characters. Once a message is sent, it is received by a Short Message Service Center (SMSC), which must then direct it to the appropriate mobile device. To do this, the SMSC sends a SMS Request to the home location register (HLR) to find the roaming customer. Once the HLR receives the request, it will respond to the SMSC with the subscriber's status: 1) inactive or active 2) where subscriber is roaming. If the response is 'inactive', then the SMSC will hold onto the message for a period of time. When the subscriber accesses his device, the HLR sends a SMS Notification to the SMSC, and the SMSC will attempt delivery. The SMSC transfers the message in a Short Message Delivery Point-to-Point format to the serving system. The system pages the device, and if it responds, the message gets delivered. The SMSC receives verification that the message was received by the end user, then categorizes the message as 'sent' and will not attempt to send again		
Telematics	Telecommunication	SOAP	P0	**S**imple **O**bject **A**ccess **P**rotocol	SOAP is a messaging protocol specification for exchanging structured information in the implementation of web services in computer networks.	SOAP provides the Messaging Protocol layer of a web services protocol stack for web services. It is an XML-based protocol consisting of three parts: + An envelope, which defines the message structure and how to process it + A set of encoding rules for expressing instances of application-defined datatypes + A convention for representing procedure calls and responses	 SOAP structure	Example message (encapsulated in HTTP) [edit] POST /InStock HTTP/1.1 Host: www.example.org Content-Type: application/soap+xml; charset=utf-8 Content-Length: 299 SOAPAction: "http://www.w3.org/2003/05/soap-envelope" <?xml version="1.0"?> <soap:Envelope xmlns:soap="http://www.w3.org/2003/05/s <soap:Header> </soap:Header> <soap:Body> <m:GetStockPrice> <m:StockName>GOOG</m:StockName> </m:GetStockPrice> </soap:Body> </soap:Envelope>

Telematics	Telecommunication	TLS	P0	**T**ransport **L**ayer **S**ecurity	Transport Layer Security (TLS) is a protocol that provides privacy and data integrity between two communicating applications. Transport Layer Security (TLS), and its now-deprecated predecessor, Secure Sockets Layer (SSL), are cryptographic protocols designed to provide communications security over a computer network. TLS is using to prevent the attack in the data transfer channel. If a hacker can read the data between client and server, he/she can read all the data.	To establish TLS connection between 2 components, they should share the keys for encryption first. The connection is private (or secure) because symmetric cryptography is used to encrypt the data transmitted	TLS (SSL) là giao thức mã hóa an toàn, nhằm nâng cao tính bảo mật và toàn vẹn của dữ liệu được trao đổi trên mạng máy tính. Thông thường, khi hai đối tượng truyền dữ liệu với nhau, nếu dữ liệu không được mã hóa, kẻ tấn công ở giữa đường truyền có thể đọc được toàn bộ dữ liệu. Tuy nhiên, nếu dữ liệu truyền đi đã được mã hóa, kẻ tấn công chỉ có thể lấy được các dữ liệu đã mã hóa và không nắm được nội dung chính. Để mã hóa dữ liệu cần dùng khóa (key) để mã hóa. Nếu hai đối tượng sử dụng cùng một khóa (shared key) để mã hóa và giải mã, thì gọi là khóa đối xứng. TLS sử dụng công nghệ khóa đối xứng để mã hóa dữ liệu truyền đi. Tuy nhiên,trước khi muốn truyền được dữ liệu, hai đối tượng phải cùng lưu lại giá trị khóa để mã hóa và giải mã. Do đó để cài đặt TLS cần phải thực hiện bước thiết lập khóa và lưu khóa trên hai đối tượng muốn trao đổi dữ liệu với nhau.	
Telematics	Telematic Power Mode	Telematic Normal mode	P0	N/A	Action when the KL 30 is re-connected. KL 30 = ignition position 3 (where the ignition defaults after starting the engine - running).			
Telematics	Telematic Power Mode	Telematic OFF/ Shut down Mode	P0	N/A	In OFF mode, telematic board may not support any function, minimal power consumption.			

Telematics	Telematic Power Mode	Telematic Standby / Sleep Mode	P0	N/A	- During these modes, the control unit shall consume as little power as possible. All components shall be powered down, except the ones(ex, RTC, Ethernet, Airbag Interface,…) - When vehicle stopped, telematic board may change to low power state with limited functionality. This state supports wake up to Normal (working) state when meet specific condition.			
Telematics	Vehicle interface	VIF	P0	**V**ehicle **I**nter**f**ace	VIF is the component to connect the ECU to vehicle's bus like CAN or ethernet which supports to translates proprietary network messages to the standard message format which can use by ECU.			
Telematics	Vehicle interface	SRS	P0	**S**upplemental **R**estraint **S**ystem	The Supplementary Restraint System (SRS) is basically an air-bag system	The Supplementary Restraint System (SRS) is basically an air-bag system. This works together with conventional 3-point seat belts and prevents impact of the driver's chest and face with the steering wheel in the event of a collision. SRS may sometimes be installed to the passenger's side to prevent impact with the dashboard. Side-impact air-bags are also fitted to protect the upper body and head during a sideways impact.		
Telematics	Vehicle interface	T-Box	P0	**T**elematics **Box**	T-box is common name of the telematics device which is installed inside a vehicle to support telematics services/application on that vehicle. Development product name: GM: VCP, TCP Geely: NGT, TEM, TEM2 JLR: TCU3, TCU4, VDC Toyota: DCM BMW: Wave	The "telematics box" is an electronic control unit that incorporates a phone module for the connection to communication networks, a module for vehicle "multi-constellation" satellite localisation (GPS, Galileo, Glonas systems) and a 3-axes accelerometer to detect acceleration and braking parameters.		

Telematics	Vehicle interface	TCU	P0	**T**elematic **C**ontrol **U**nit	A telematic control unit (TCU) in the automobile industry refers to the embedded system on board a vehicle that controls tracking of the vehicle. TCU is to indicate telematic box in the view of vehicle network (ECU).	A TCU consists of: - A global positioning system (GPS) unit, which keeps track of the latitude and longitude values of the vehicle; - An external interface for mobile communication (GSM, GPRS, Wi-Fi, WiMax, or LTE), which provides the tracked values to a centralized geographical information system (GIS) database server; - An electronic processing unit; - a microcontroller, in some versions; a microprocessor or field programmable gate array (FPGA), which processes the information and acts on the interface between the GPS; - A mobile communication unit; And some amount of memory for saving GPS values in case of mobile-free zones or to intelligently store information about the vehicle's sensor data		