

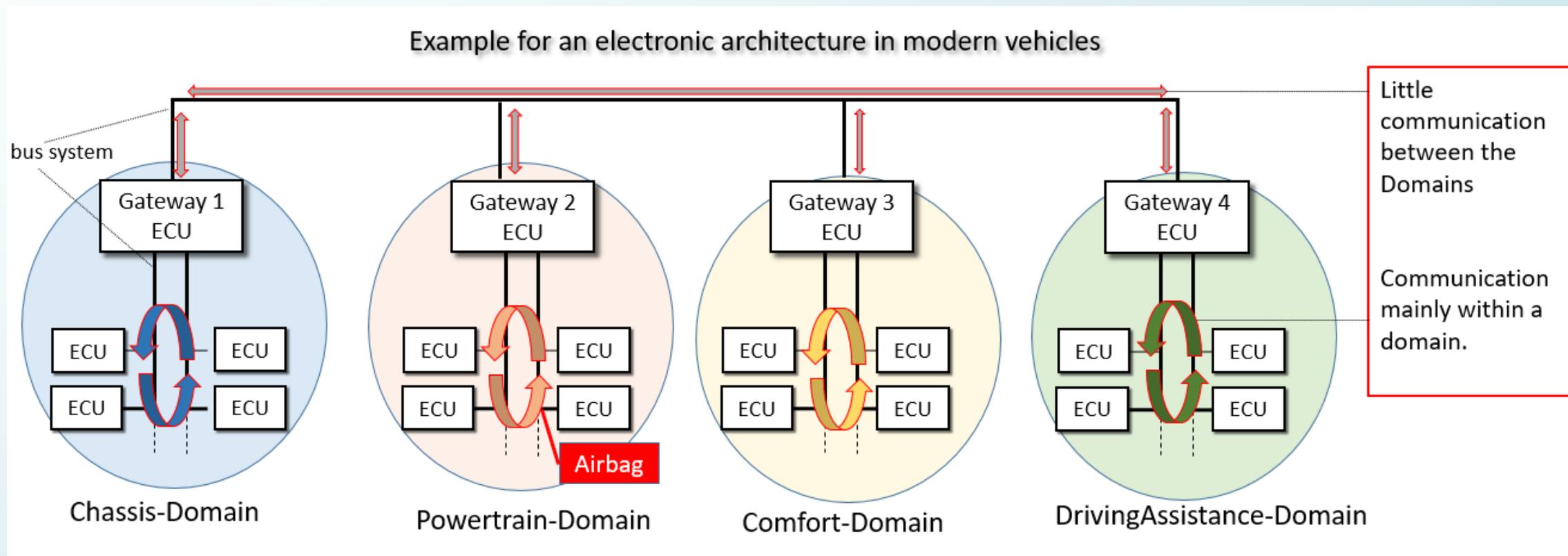


OICA explanation of vehicle communication network constrains



Constraints of the vehicle communication network

Schematic vehicle communication network





Constraints of the vehicle communication network

- In modern vehicles related ECUs (for example Chassis domain: brake system, steering system, suspension system) are usually connected within one BUS system and have access to all the information on that bus.
- Data from other BUS systems (for example Powertrain domain, Comfort domain) are not accessible unless they are routed explicitly via at least one or even more Gateway ECUs. Only functional needed data is routed because of limited routing capacity in Gateway ECUs and limited BUS-capacity.
- The Airbag ECU (usually host of the EDR functionality) is part of different domains and bus systems, depending on the electronic architecture in a specific vehicle. Therefore it is only able to access and record limited data in the vehicle.
- Vehicles in series production usually offer only very limited capacity for further routing requirements because of micro controller (in the Gateway ECUs) and BUS system limitations.



BUS system limitations

- One of the most commonly used BUS system in vehicles today is the CAN BUS.
- CAN works with a multi-master-principle with a CSMA/CR process for resolving collisions. The collision resolving process ensures that if several ECUs want to send messages at the same time the message with the highest priority will be send.
- The priority of a message is predefined depending on the content of the message for the affecting functions in the vehicle. This means, that messages for important vehicle functions are transmitted with a higher priority and are therefore are more likely to access the bus.
- Because the EDR mainly receives messages already defined, it receives messages with high and low priority, depending on the vehicle function using it in the first place.



BUS system limitations

- Because of this manufacturers typically limit the data load on the CAN to ~40-60% of its maximum load capacity, to ensure that communication from ECUs that do not have the highest priority is still possible.
- As capacity of CAN bus is used less than 40-60% of its capacity in order to enable communication of 'secondary ECUs, it is also important to note that if we add new data in the main stream (load the CAN bus more) we would lose this flexibility AND we would face the risk of overload and then safety could be compromised because of delays in communication!
- For the discussion on the sample rate of the data elements for the EDR the limits of the BUS system also have a significant influence: The transmission of data to the EDR is limited by the capabilities of the BUS, because the clock rate of commonly used CAN BUS systems today is typically 10ms, therefore it is technically not feasible to record data elements for example with a sample rate of 1kHz.