

Foundation Vehicle Systems



You should be able to:

- Begin preparing for the ASE L4 ADAS specialist test
- Identify the foundation systems used in ADAS.
- Describe the foundation systems used in ADAS.
- Explain why a thorough understanding of electricity and electronics is necessary.
- Identify network communication systems used.

Terms to know:

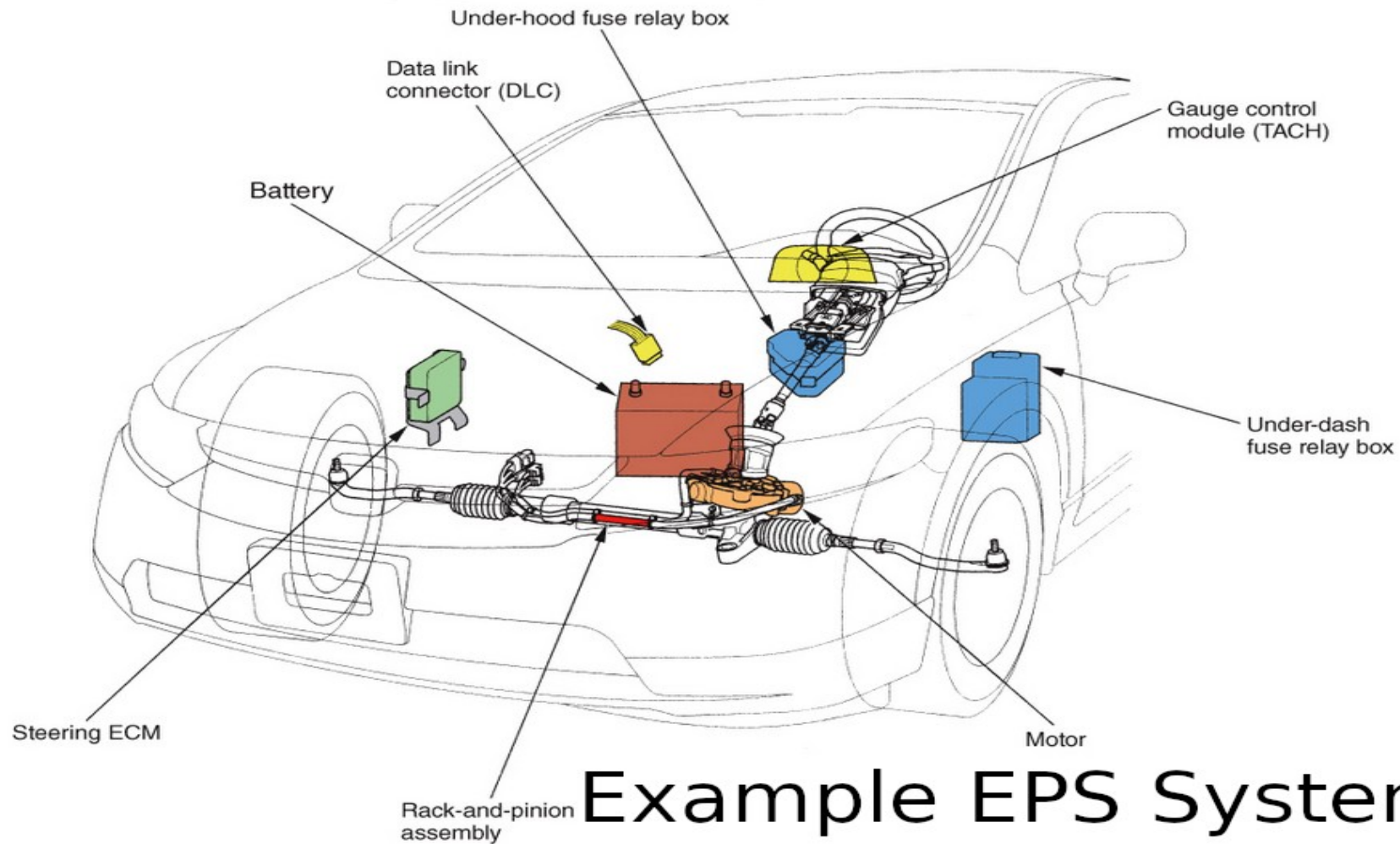
- Bus
- CAN
- EPS
- ESC
- ETC
- LIN
- LVDS
- SGW

Introduction.

- ADAS use multiple foundation vehicle systems
 - Some of these have been around a while (late 1990s)
- Some examples are: Electric Power Steering (EPS), Electronic Throttle Control (ETC), Electronic Stability Control (ESC) and others.

Electric Power Steering

- Sometimes called Electric Power Assisted Steering (EPAS).
- EPS was introduced in the late 1990s.
 - Less vehicle emissions, less hazardous waste, easier integration into vehicles.
- Does not replace manual steering, just augments it.



Example EPS System

Electric Power Steering (cont)

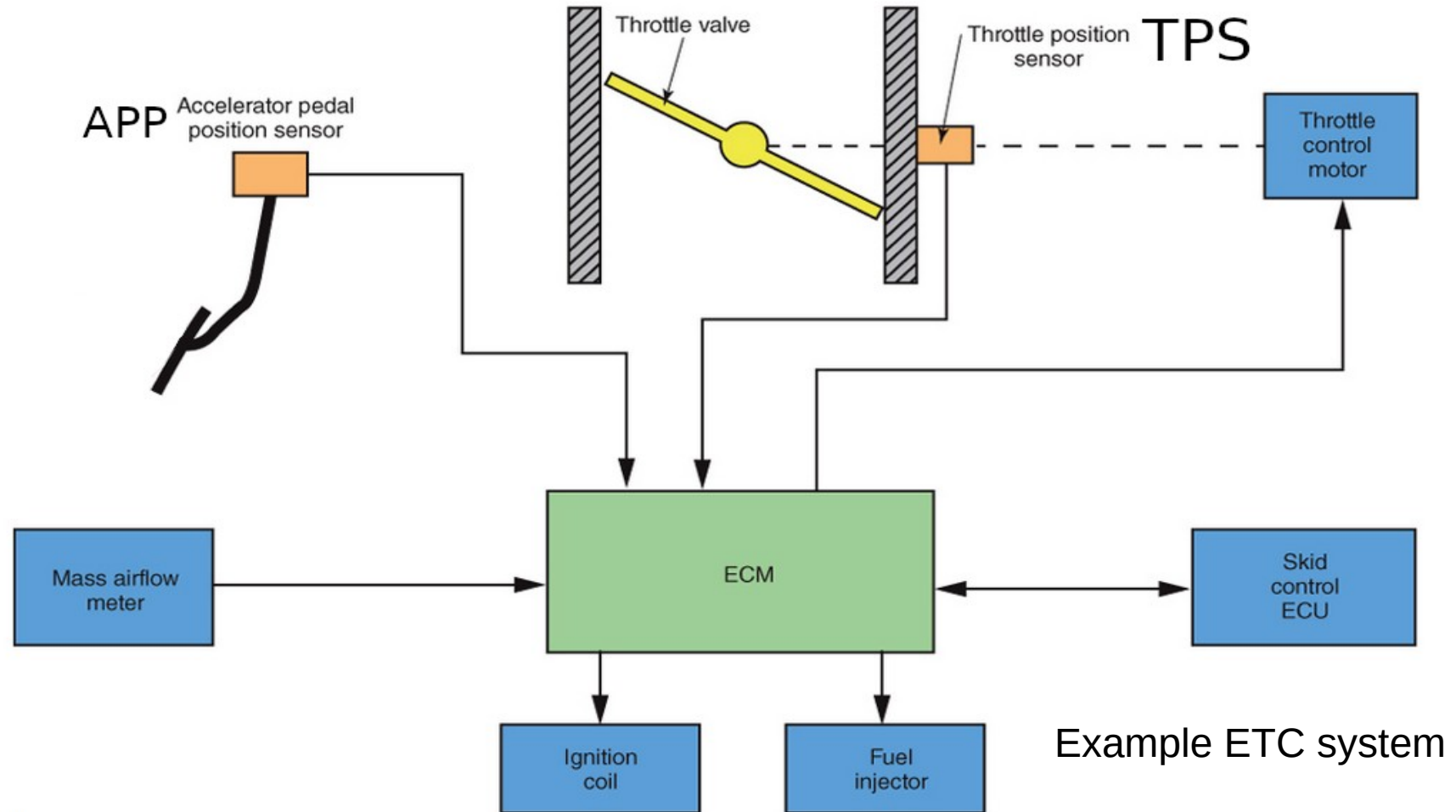
- A module, probably the ECM receives inputs such as speed and steering angle or position data from the steering column and other sensors.
 - The data is used to send the proper electrical current (direction and strength) to the EPS motor, a smallish electric motor that aids the driver in turning the steering rack.

Electric Power Steering (cont)

- The amount of support is depended on vehicle speed (parking/highway).
- EPS can and do work with things like parking assistance, lane keeping assistance, and collision avoidance systems.

Electronic Throttle Control

- ETC was actually introduced quite early (late 1980s)
- ETC enables vehicle stability, cruise control, and (outside of ADAS) torque management for transmission shifts.
- May also be called throttle by wire or drive by wire.



ETC (cont)

- The Accelerator Pedal Position sensor (APP) sends position data to the engine control module, either via a data link or via discrete wiring. The sensor has redundant circuits for safety.
- Other data used are the Throttle Position Sensor, Mass Air Flow Meter, and Traction Control.

ETC (cont)

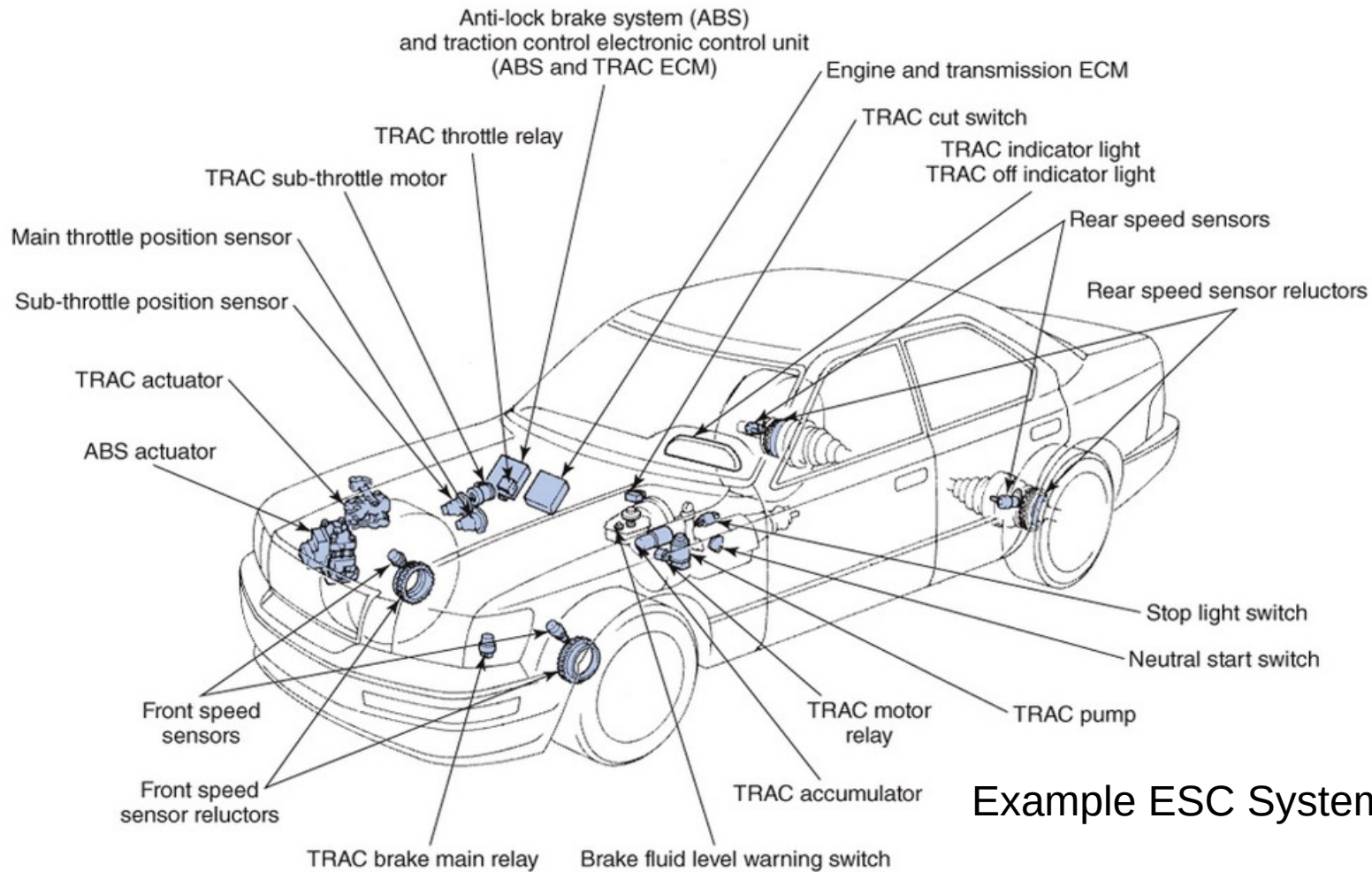
- ADAS will use ETC for things like adaptive cruise control, parking assistance, and self-driving if so equipped.

Electronic Stability Control

- ESC has been around for a while (1997).
- It is now, as of 2012 required on all vehicles.
- The system is designed to compensate for any oversteer or understeer conditions.
 - Uses brakes, steering, and engine management systems.

ESC (Cont)

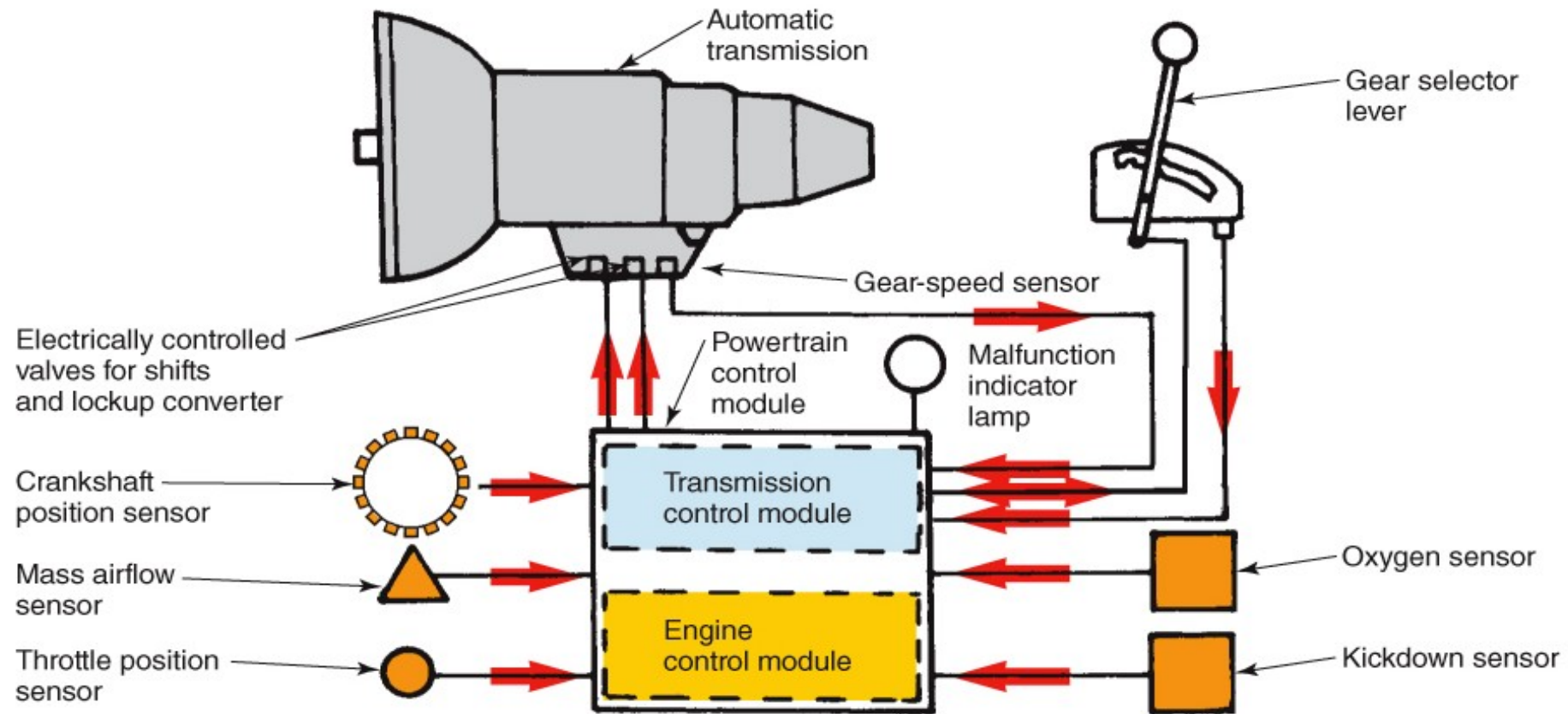
- Main inputs are wheel speed, steering angle, and yaw sensors.
 - If the WSS indicates a loss of traction and/or a skid, the system will selectively apply brakes.
 - If the yaw sensor input is not in agreement with the steering angle sensor, the system will selectively apply brakes to bring the vehicle direction and steering sensor input in agreement.



Example ESC System.

Transmission Control.

- The Electronic Gearbox System (EGS) uses a Transmission Control Module.
 - Which may be part of the Powertrain Control Module (PCM).
 - Conventional automatic transmission or some form of a manual transmission with electronic control.



Example EGS system

Vehicle Electronic Systems

- Electronic components now exist in basically all vehicle functions and parts.
- Electronics have become a major part of the everyday automotive technicians work.
 - Looking at technician bulletin boards, electronics are the major concern for today's automotive technician

VES (Cont)

- Increasingly complex vehicles have increasingly complex onboard electronics.
- As a technician you will be diagnosing and repairing these systems.
 - This means that an increased understanding of electrical and electronic systems are absolutely necessary.
 - It is recommended that you specifically take classes and/or self-study on electronic systems.

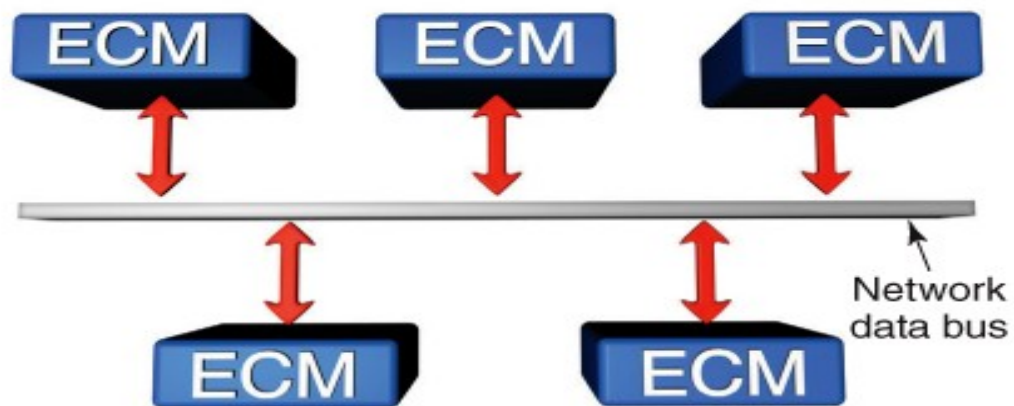
VES (cont)

- An everyday task now is reprogramming after component replacement, firmware/software updates, and calibrations.
 - Ability to follow very specific procedures is critical for successful completion of these and many other tasks.

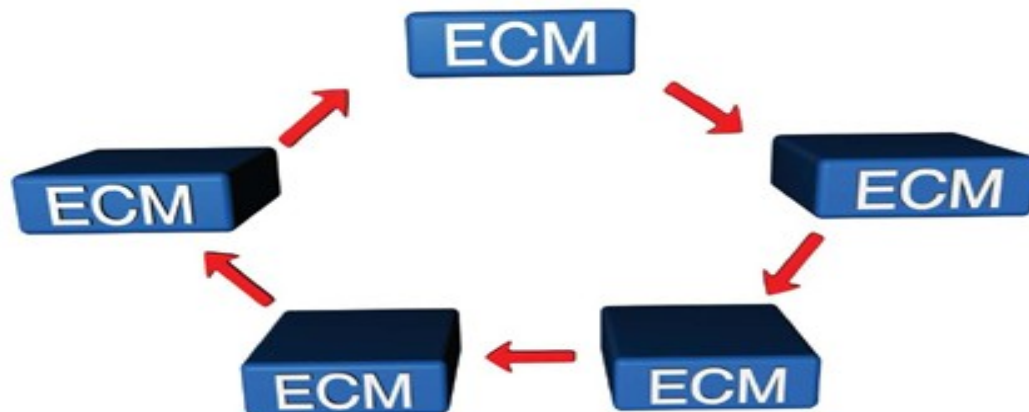
VES (cont)

- Just about every sensor and module on a modern vehicle communicates using some data communication network or another.
 - Or maybe more than one.
 - Understanding networks and network topology are then critical for being able to diagnose and repair problems on these vehicles.

Bus Configuration



Ring Configuration



Networks.

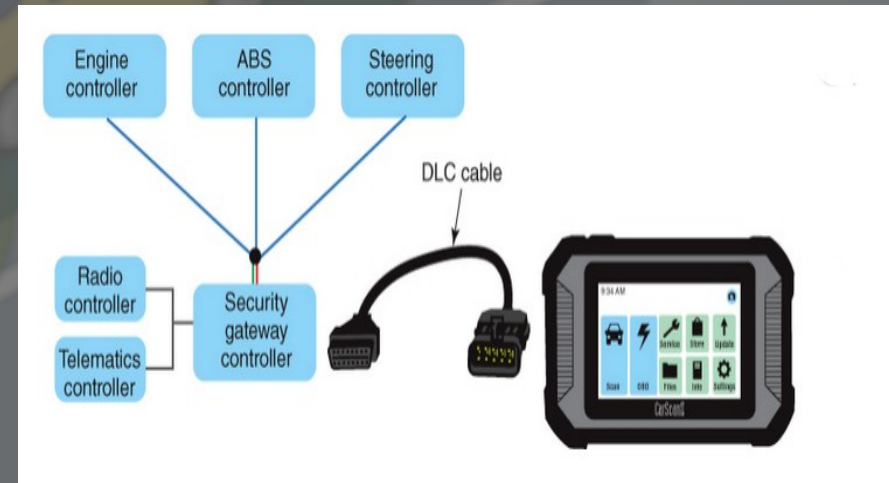
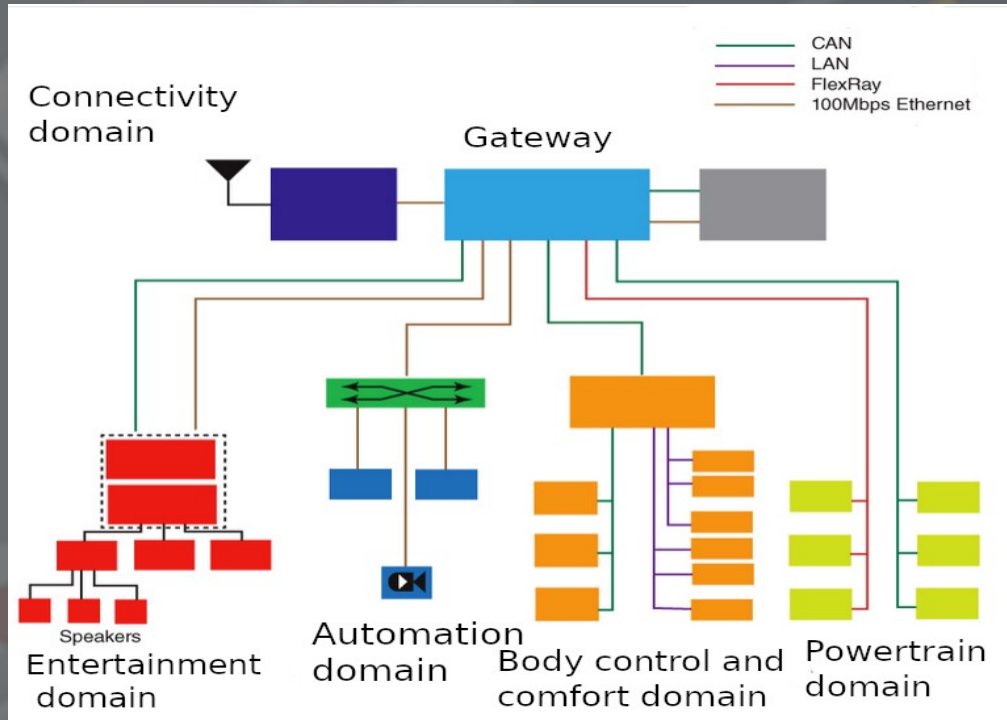
- Several different topologies are used.
 - Depending on data rate, reliability, and network availability.
 - Some systems does not use electrical signaling, but instead uses light.
 - Fiber optics.
 - Media Oriented Systems Transport (MOST)
 - Navigation and entertainment.

Networks. (cont)

- The most common network in vehicles is the Controller Area Network. (CAN)
 - Stable and with high data rates.
 - You will be using our CAN trainer to learn more about this network type.

Networks. (cont)

- Gateway and secure gateway.





Questions and/or concerns?

Homework.

- Please do the homework on Brightspace.
 - Foundation vehicle systems.
 - Please refer to Brightspace for when due.