

Signal to Service

Remote Control of Legacy Networks

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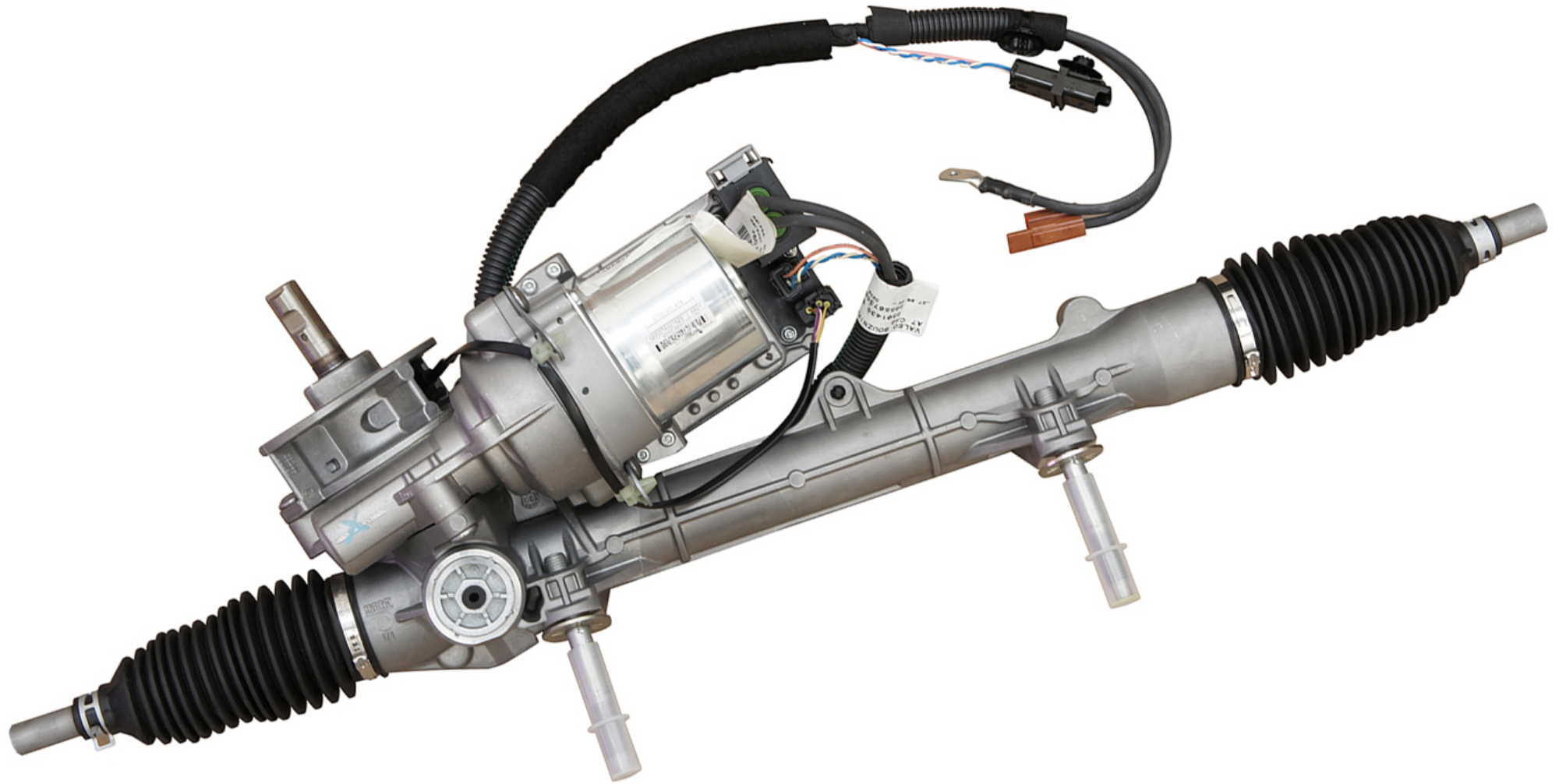
IEEE SA Ethernet & IP Automotive Technology Day

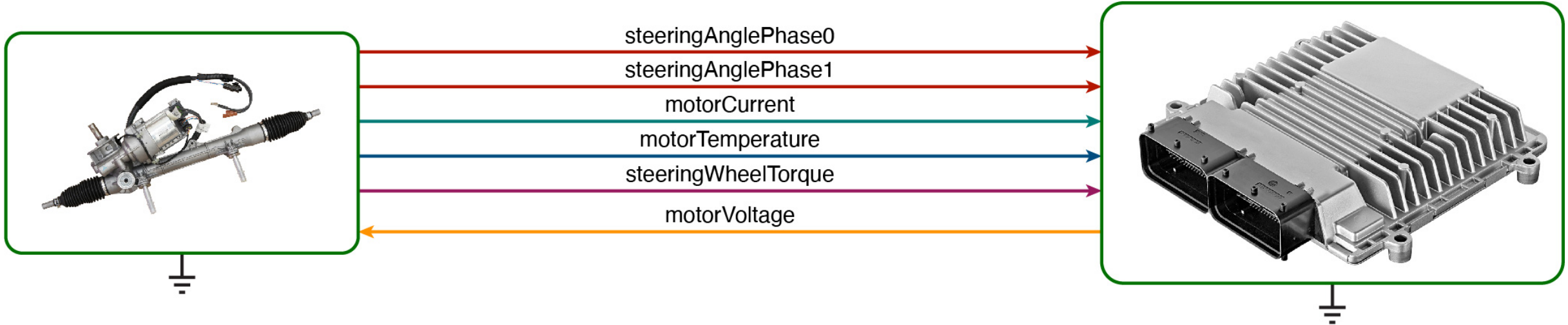
Yokohama, Japan—November 2022

Agenda

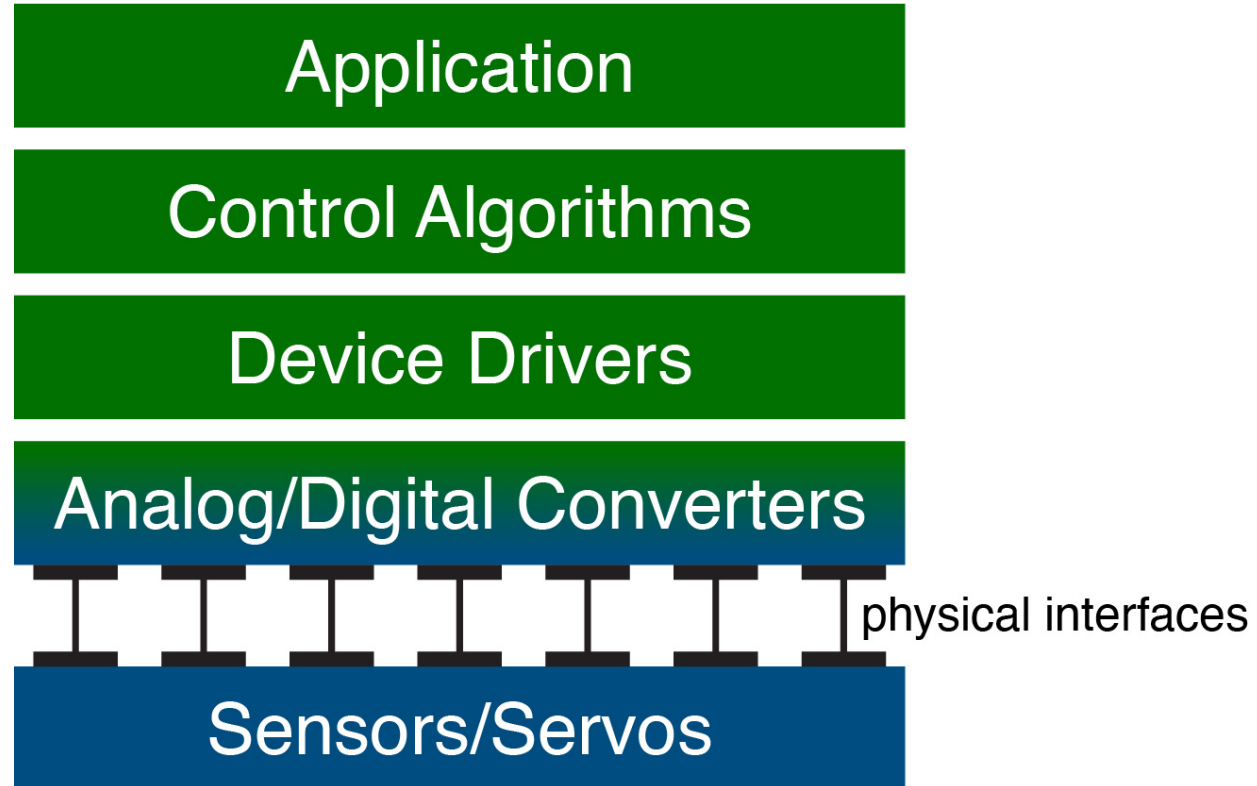
- It's all analog at the edges
- Levels of abstraction
- Positioning interfaces
- Unifying the network
- Taking abstraction to its limits

It's All Analog at the Edges

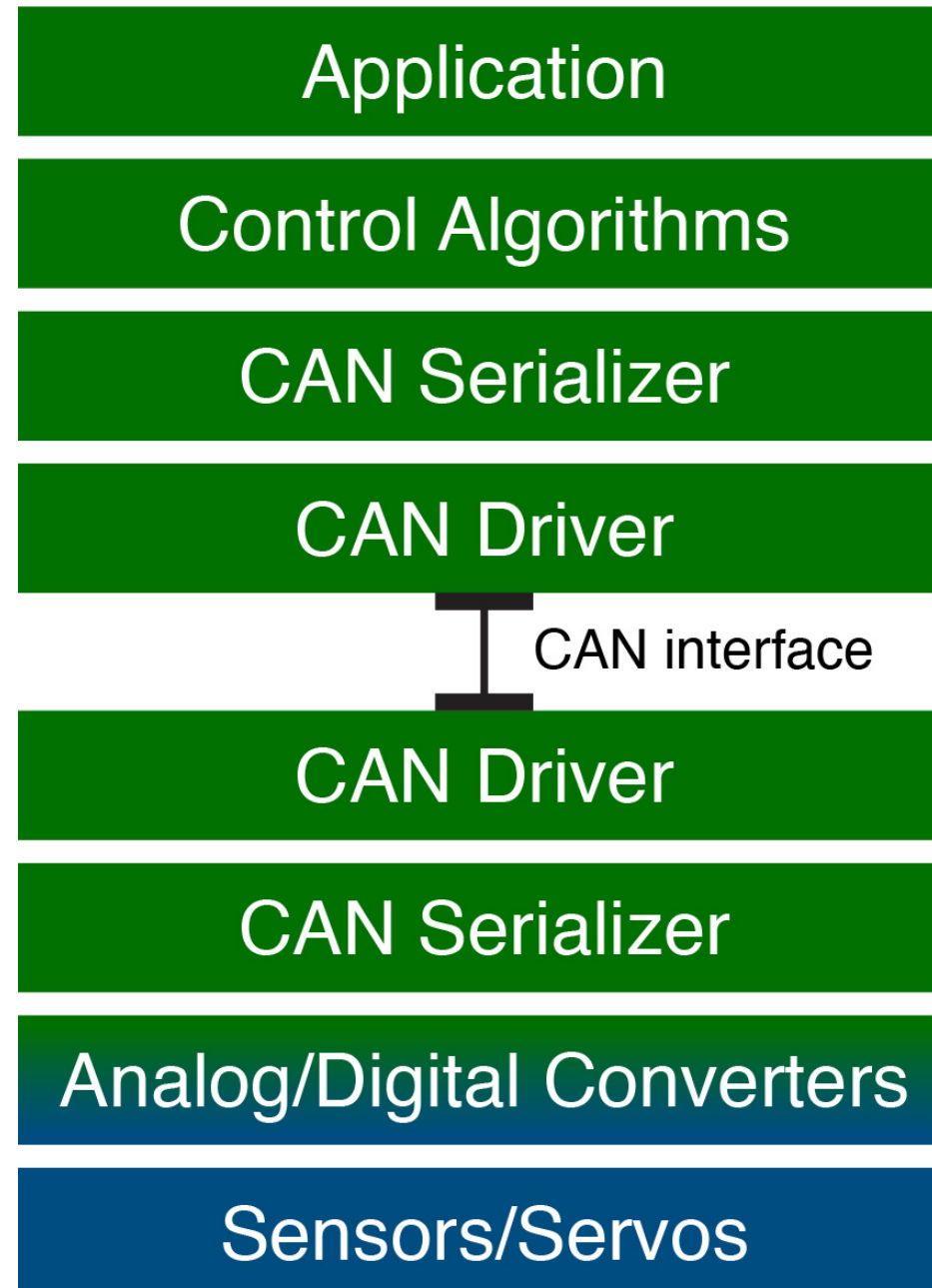


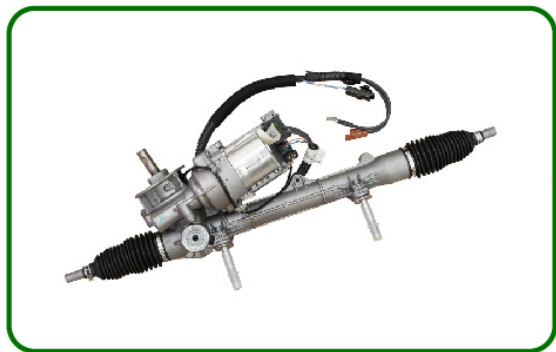


Levels of Abstraction

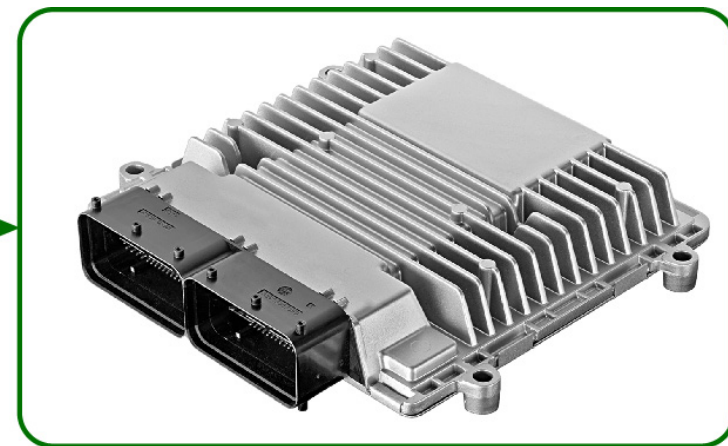


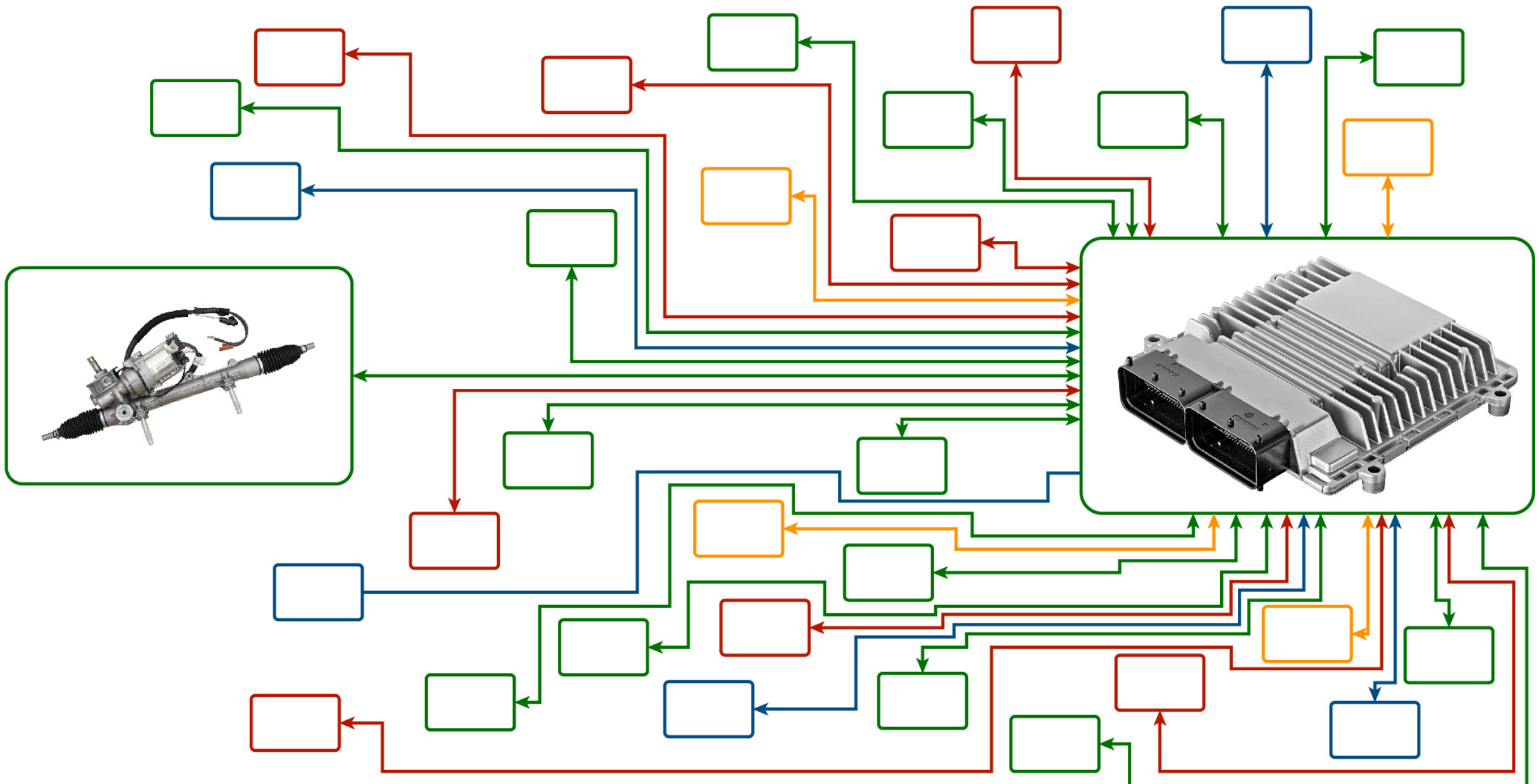
Positioning Interfaces

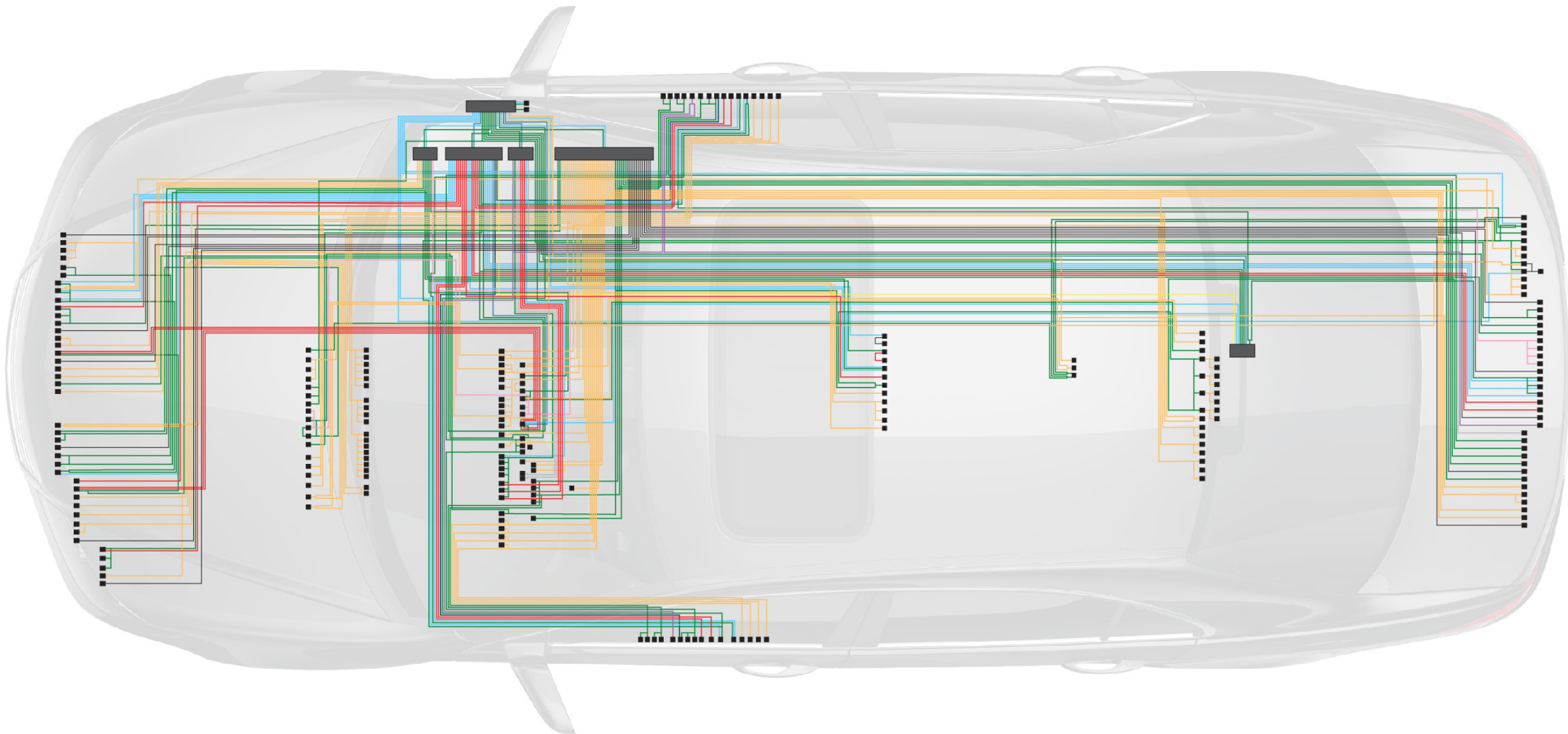


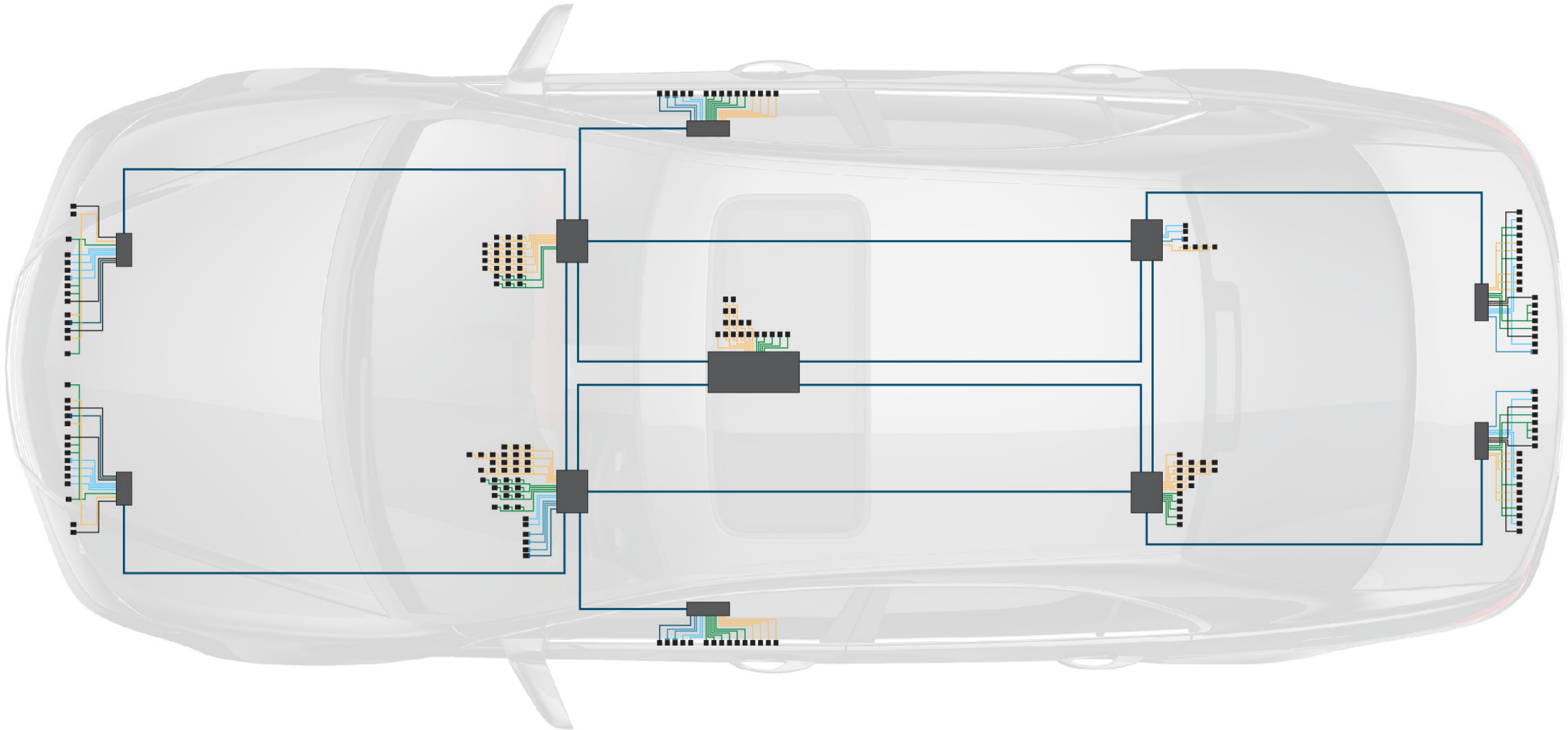


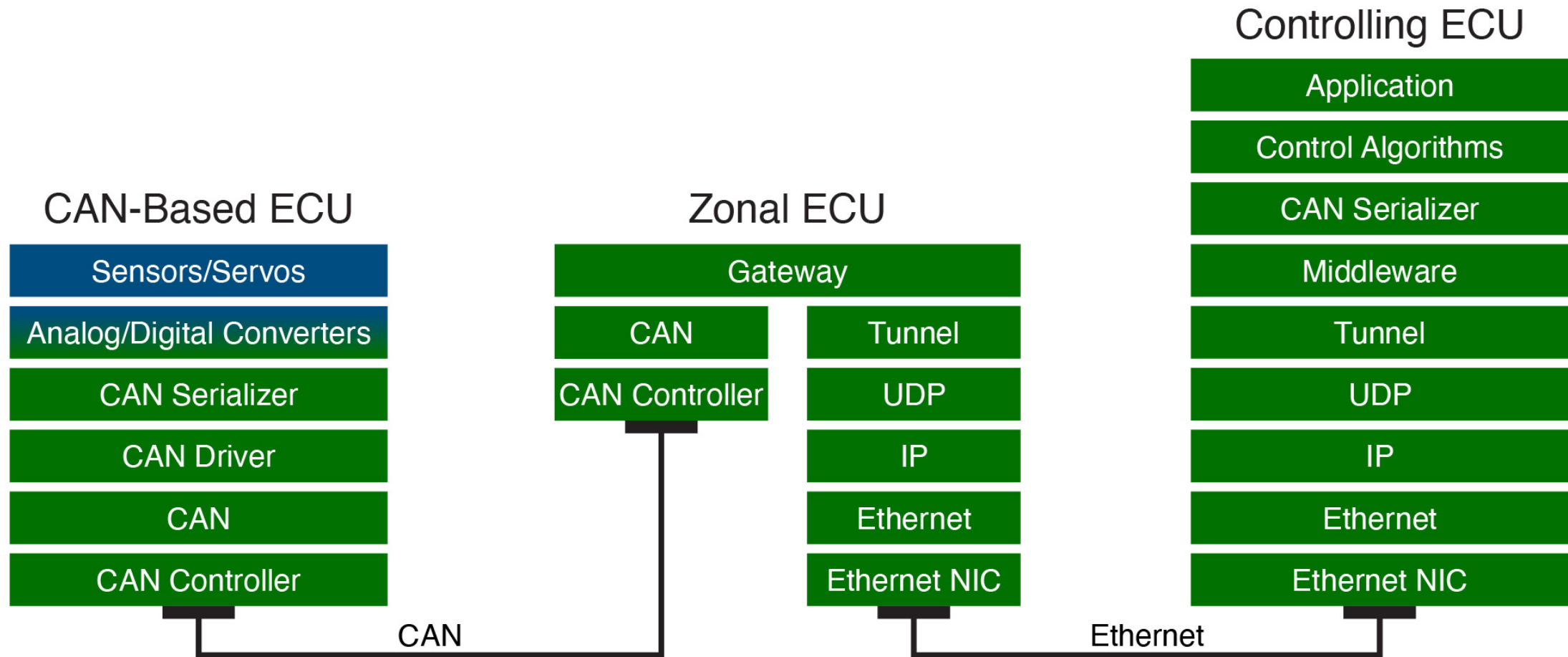
CAN









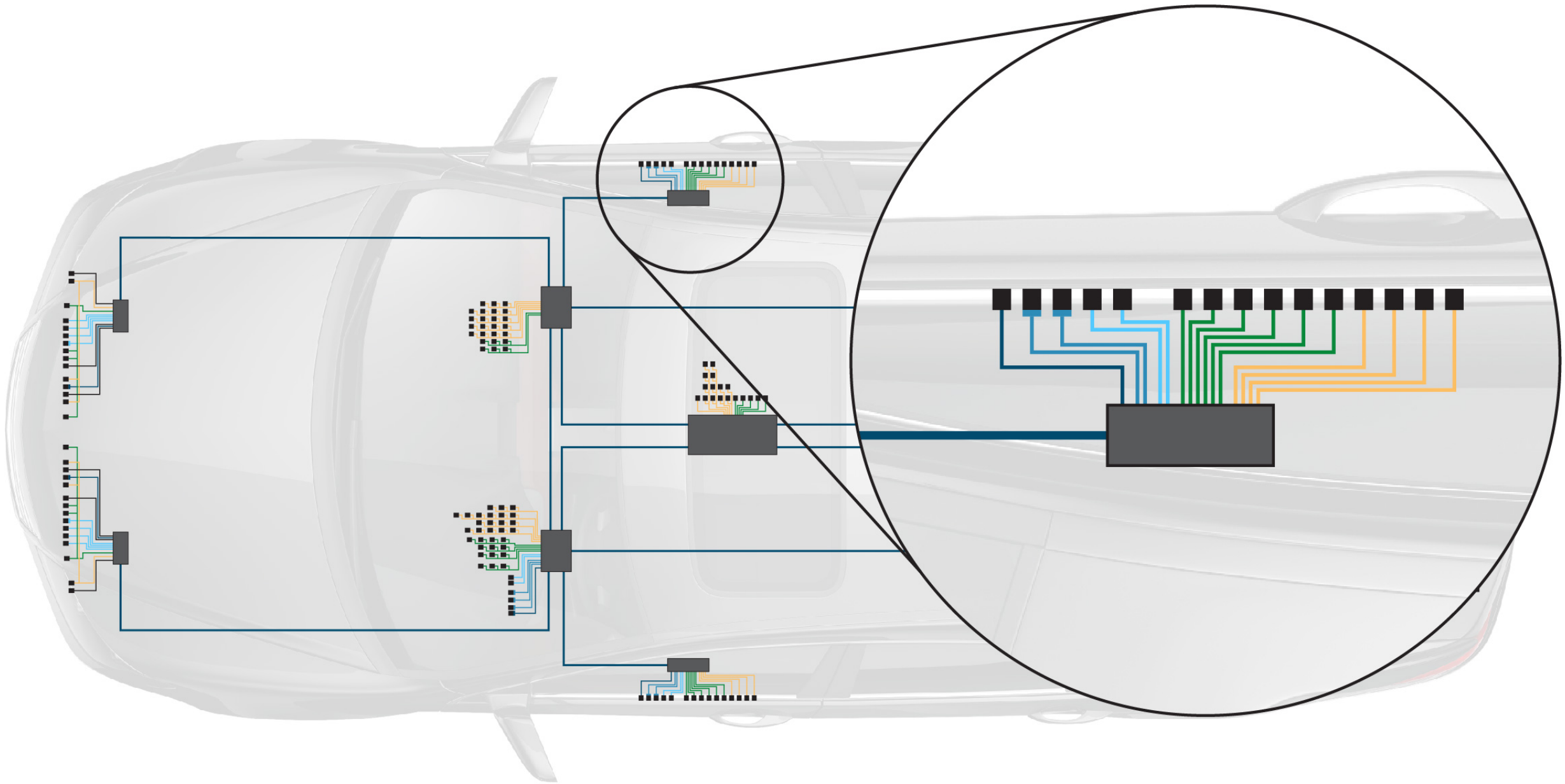


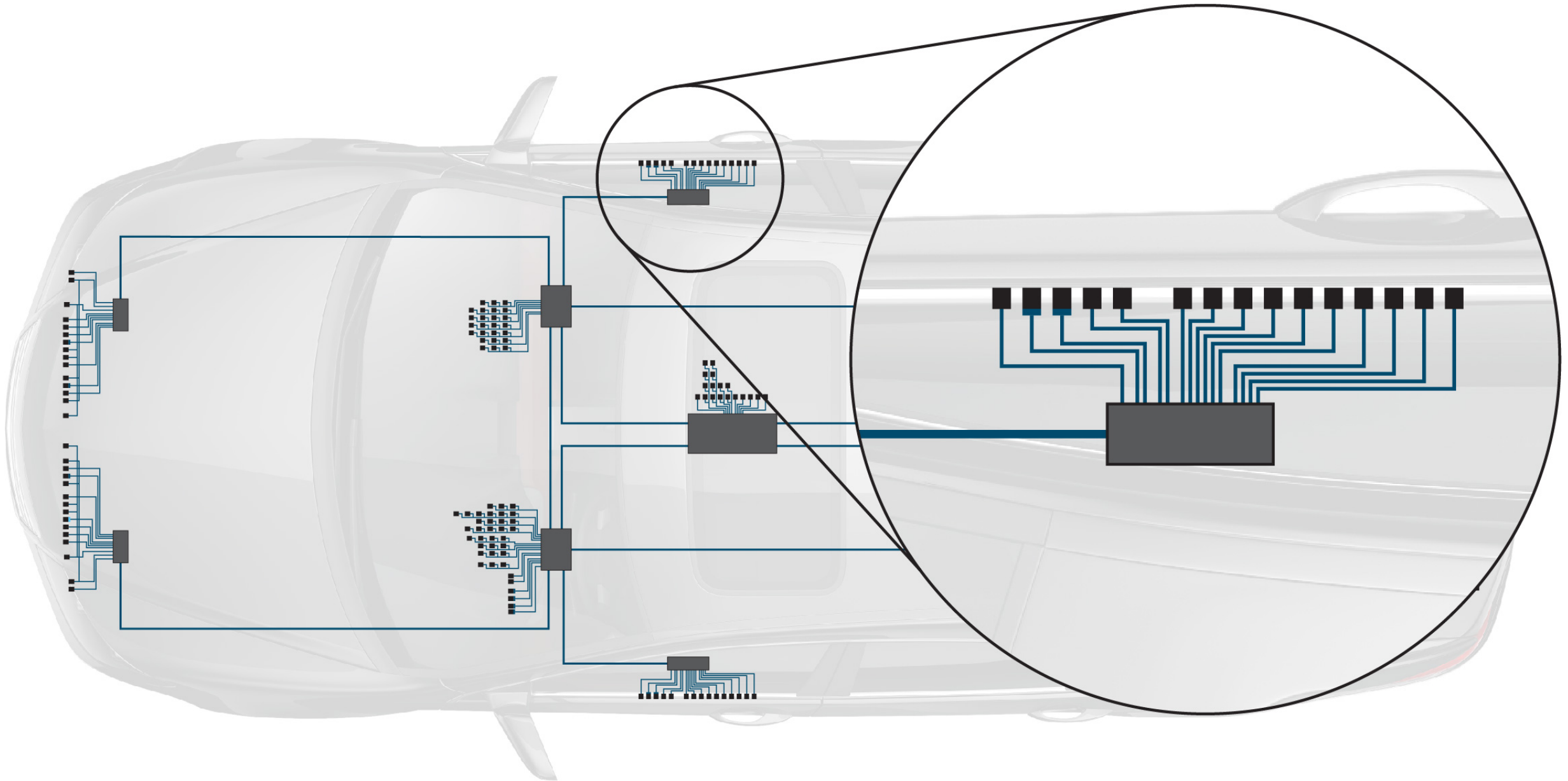


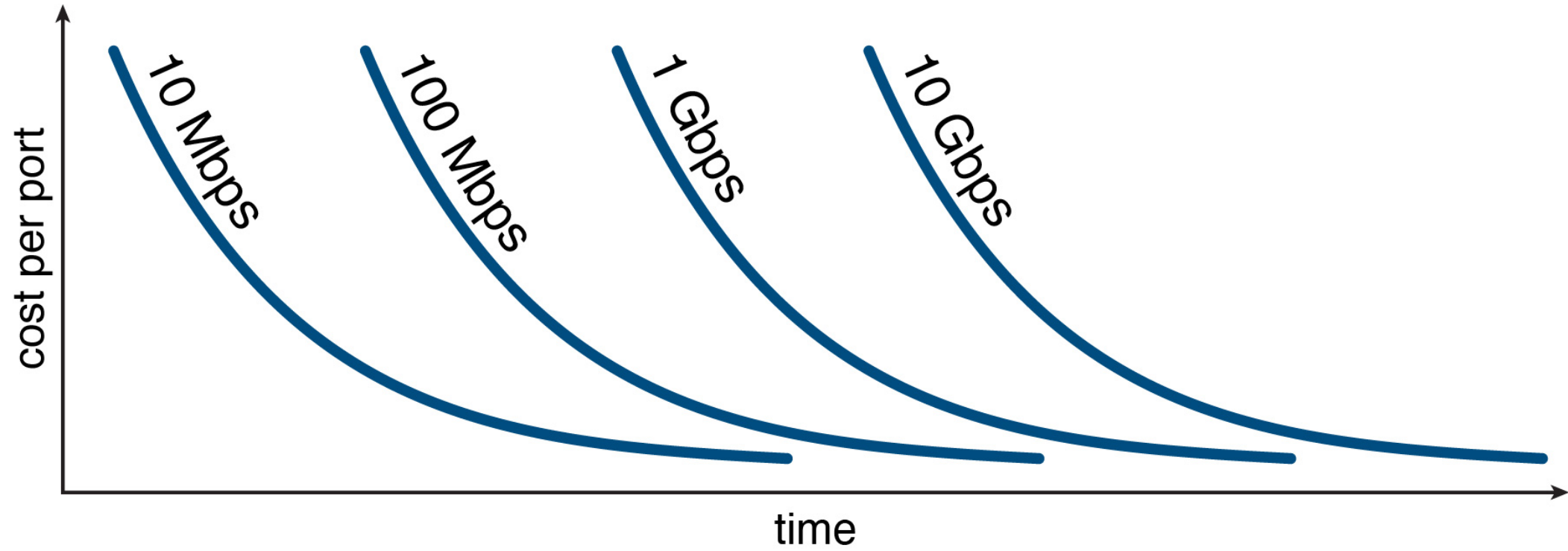
Connection Type?

- Unreliable
 - UDP
 - periodic messages
 - last is best
- Reliable
 - TCP
 - file data transfers
 - software/database updates

Unifying the Network





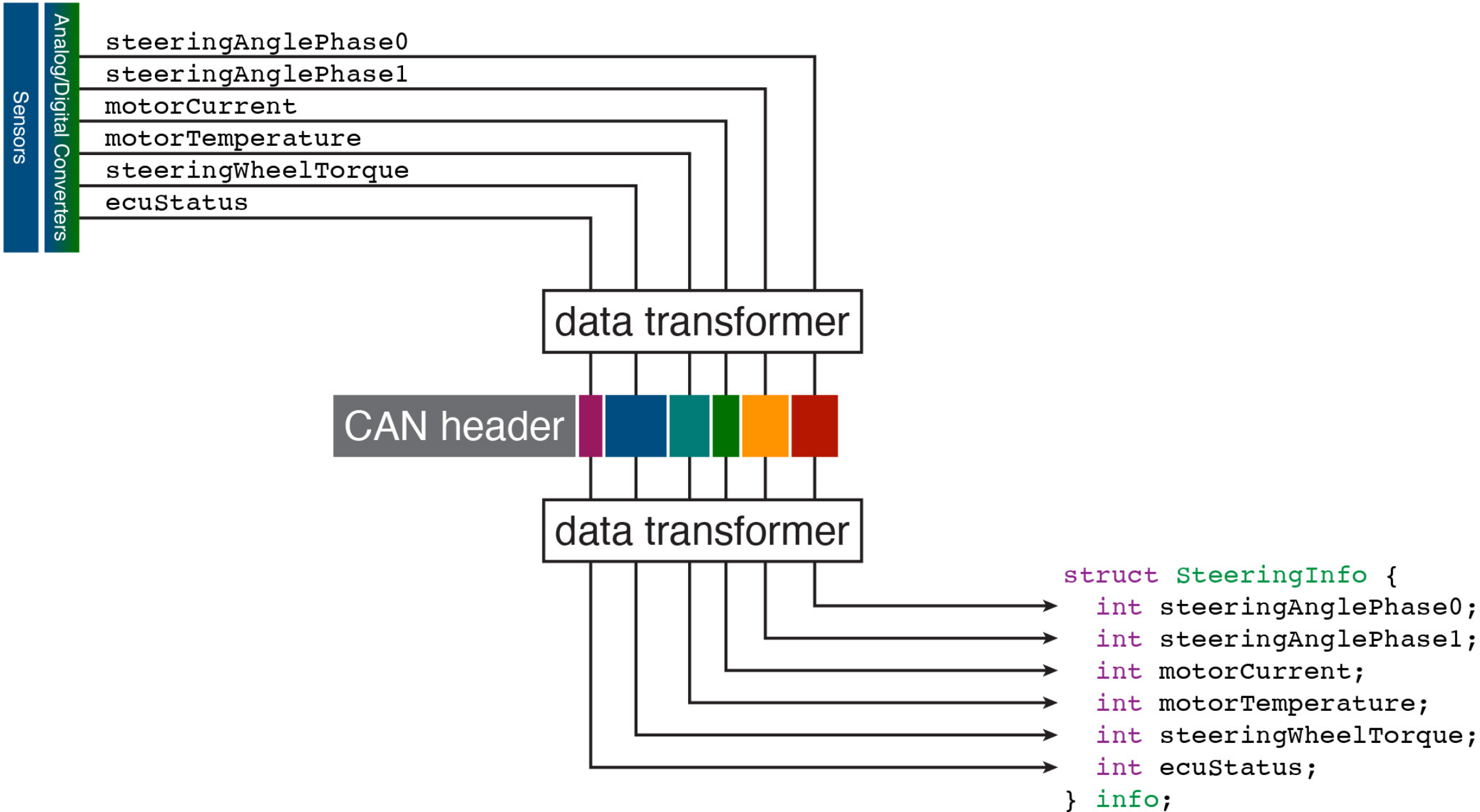


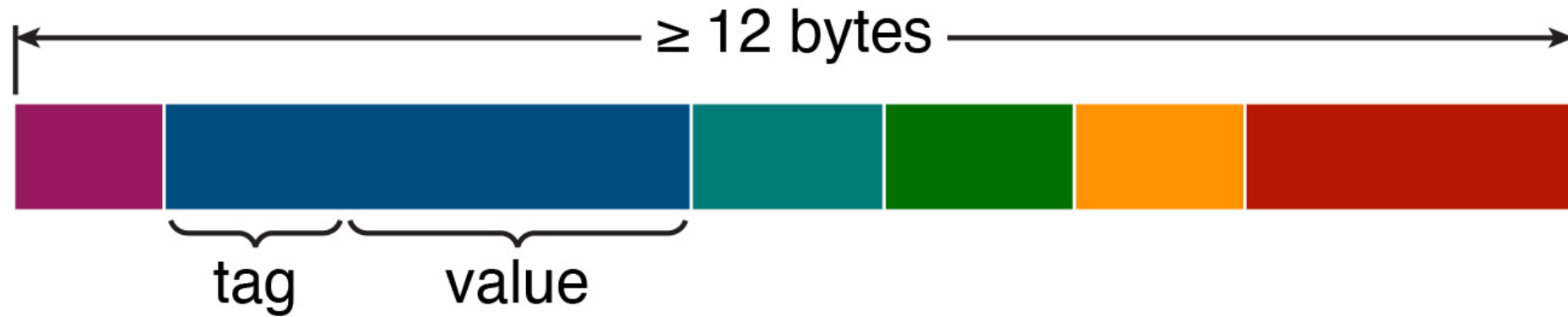
Eventually, Ethernet will reach cost parity with CAN.

The Benefits of Ethernet

- Longer payloads
- Higher bandwidths
- Layered protocols
- Security
- Time sync
- QoS
- Etc.

Add layers of abstraction.

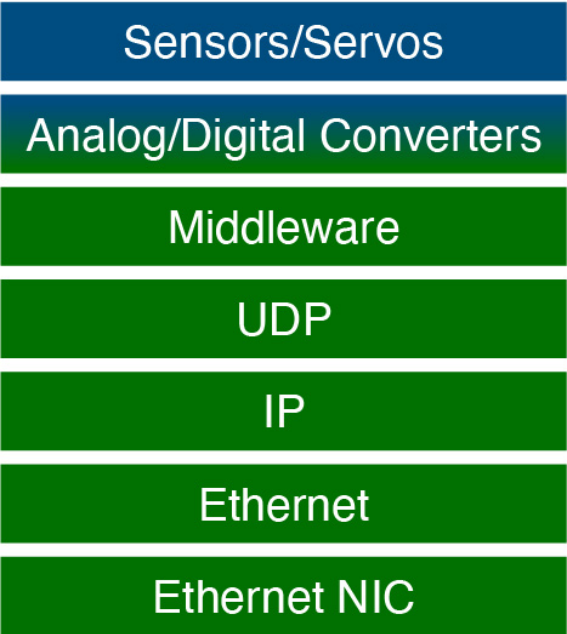




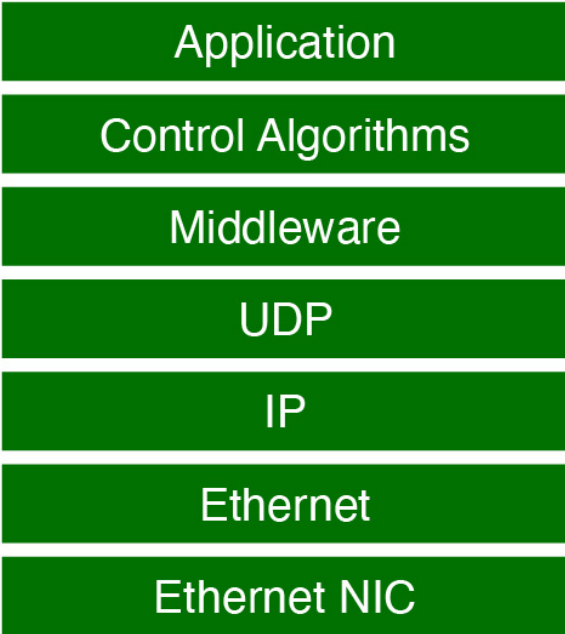
tag: type and ID, typically one byte

value: 1–10 bytes, depending on type and magnitude

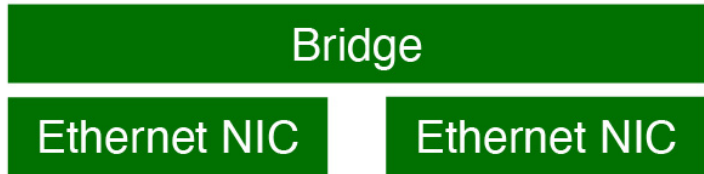
Ethernet-Based ECU



Controlling ECU



Zonal ECU



Ethernet (lower speed)

Ethernet (higher speed)

Remote Procedure Call (RPC)

- Functions called by local system
- Function executed by remote system
- Structured data as input/output parameters
- Widely adopted
- Numerous protocols
 - E.g., gRPC

Taking Abstraction to Its Limits





Brian Petersen — IEEE SA Ethernet & IP Automotive Technology Day, November 2022

Why Not Sensors and Servos?

- Cheaper computing
- Cheaper communications
- Why burden the central or zonal ECUs?

What If?

- Ethernet everywhere
- Remote procedure calls
- Standardized, class-specific APIs
- Separate evolution of sensors/servos and controlling ECUs

Questions?

Thank You