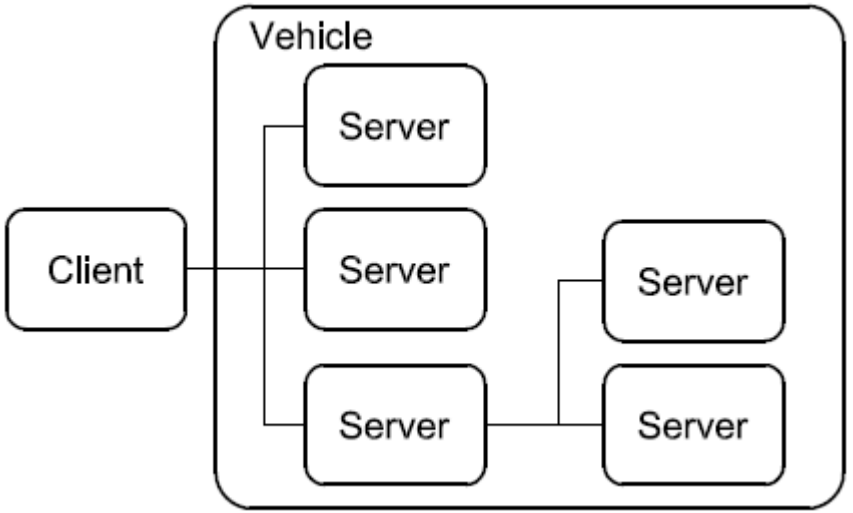
GLOBAL EDGE
Intelligence Of Things

Unified Diagnostic Services

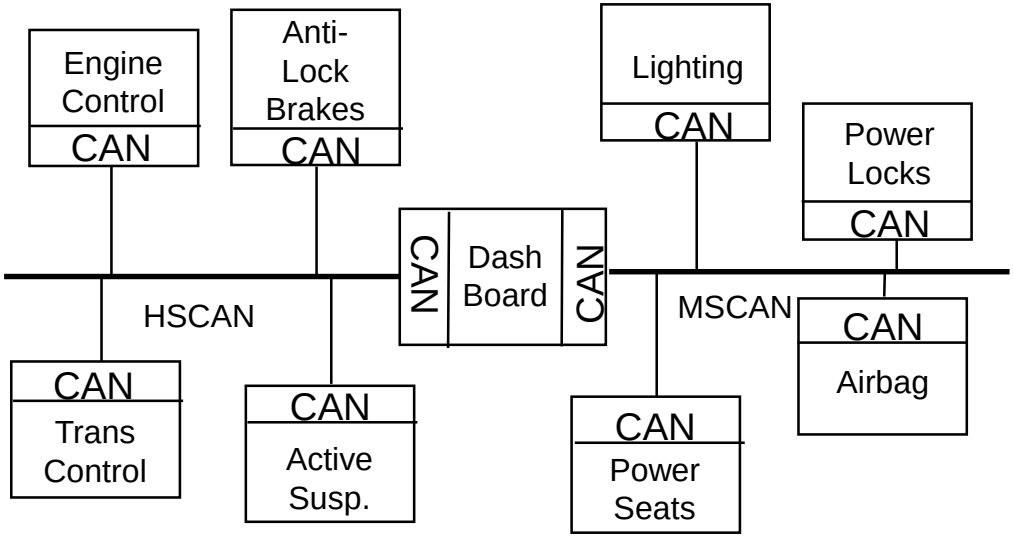
Agenda

- Introduction to Client Server Communication
- Discussion on frequently used UDS services
- Summary of UDS Services as per ISO standard
- Supported negative responses
- Q & A

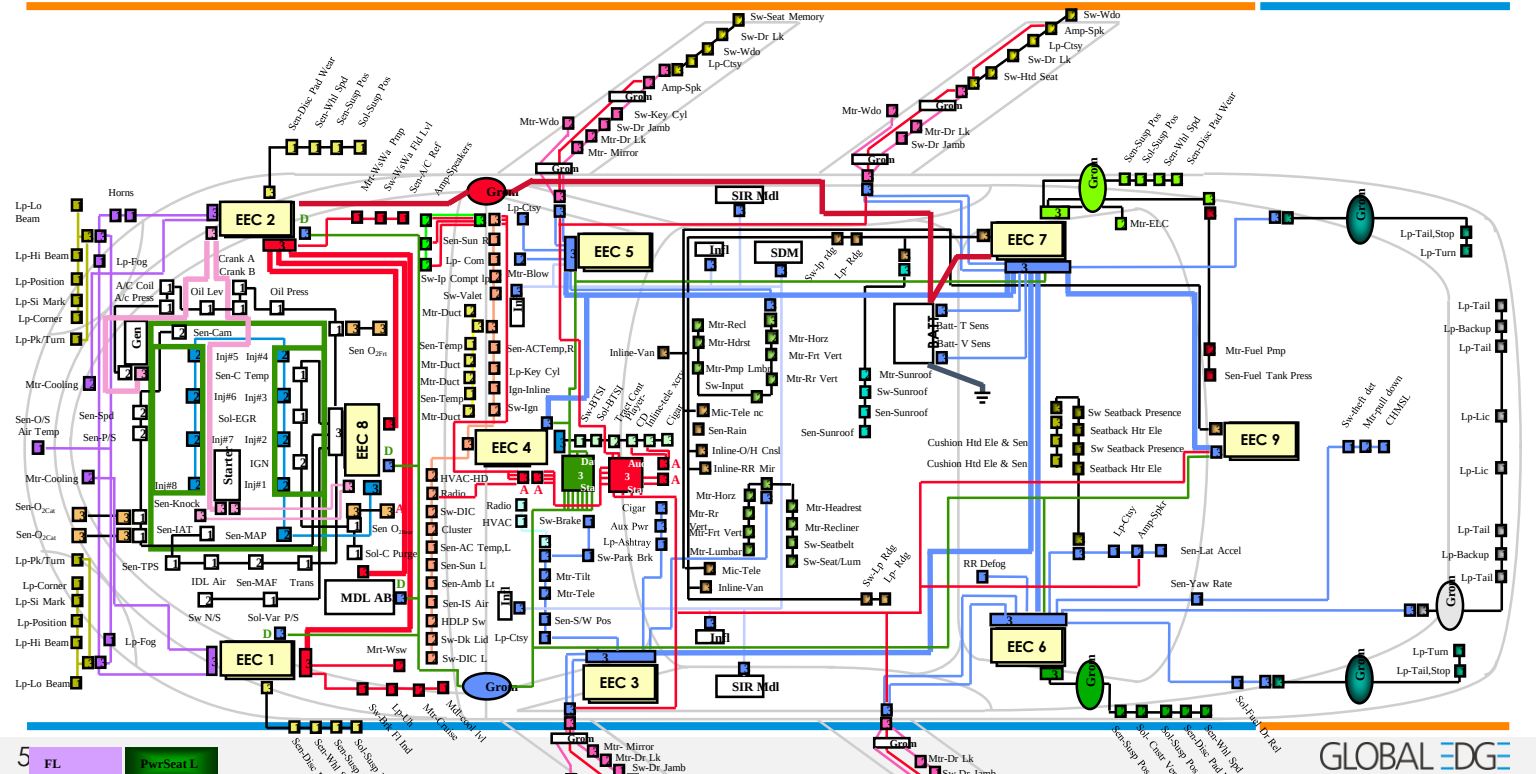
Client Server communication



Sample Automotive CAN Network



Advanced Network Architecture



FL PwrSeat L

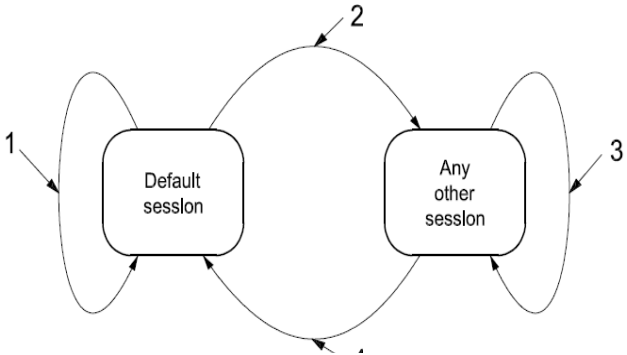
Diagnostic Session Control Service (10 hex)

The Diagnostic Session Control service is used to enable different diagnostic sessions in the server(s).

- Default Session – 01
- ECU Programming Session – 02
- ECU Extended Diagnostic Session – 03
- Safety System Diagnostic Session – 04

Request message: 10 01

Response message: 50 01



Key

1 default session
2 other session
3 same or other session
4 default session

ECU Reset service (11 hex)

This service requests the server to effectively perform a server reset

- Hard Reset – 01
- Key Off On Reset – 02
- Soft Reset – 03
- Enable Rapid Power Shut Down – 04
- Disable Rapid Power Shut Down – 05

Request message: 11 01

Response message: 51 01

Security Access service (27 hex)

The purpose of this service is to provide a means to access data and/or diagnostic services which have restricted access for security, emissions or safety reasons.

A typical example of the use of this service is as follows:

- client requests the “seed”;
- server sends the “seed”;
- client sends the “key” (appropriate for the Seed received);
- Server responds that the “key” was valid and that it will unlock itself.

Request Seed: 27 01 Send Key: 27 02 C9 A9

Response message: 67 01 36 57 Response message: 67 02

Communication Control service (28 hex)

The purpose of this service is to switch on/off the transmission and/or the reception of certain messages of (a) server(s).

- Enable Rx And Tx - 00
- Enable Rx And Disable Tx – 01
- Disable Rx And Enable Tx– 02
- Disable Rx And Tx – 03

Request message: 28 01 02

Response message: 68 01

Tester Present service (3E hex)

This service is used to indicate to a server (or servers) that a client is still connected to the vehicle network and helps the server to remain in previously activated diagnostic services and/or communications.

Request message: 3E 00/80

Response message: 7E 00

Read Data By Identifier service (22 hex)

- The Read Data By Identifier service allows the client to request data record values from the server identified by one or more data Identifiers.
- The request message contains one or more two-byte data Identifier values that identify data record(s) maintained by the server.
- The server may limit the number of data Identifiers that can be simultaneously requested.

Data identifiers :

F190hex: The VIN number

F180hex: boot Software Identification Data Identifier

F181hex: application Software Identification Data Identifier

Read Memory By Address service (23 hex)

- The Read Memory By Address service allows the client to request memory data from the server via a provided starting address and by specify the size of memory to be read.
- The number of bytes used for the memory Address and memory Size parameter is defined by address And Length Format Identifier.

Request Message: 23 24 20 48 13 92 01 03

Response message: 63 00……8C (259)

Write Data By Identifier service (2E hex)

- The Write Data By Identifier service allows the client to write information into the server at an internal location specified by the provided data identifier.
- The server may restrict or prohibit write access to certain data Identifier values.
- Possible uses for this service are:
  - programming configuration information into the server (e.g. VIN number)
  - clearing non-volatile memory

Write Memory By Address service (3D hex)

- The Write Memory By Address service allows the client to write information into the server at one or more contiguous memory locations.
- The format and definition of the data Record shall be vehicle-manufacturer-specific and may or may not be secured.
- Possible uses for this service are:
  - clearing the non-volatile memory
  - changing calibration values

Clear Diagnostic Information service (14 hex)

- The Clear Diagnostic Information service is used by the client to clear diagnostic information in one server's or multiple servers' memory.
- Permanent DTCs cannot be cleared by any test equipment.
- Any DTC information stored in an optionally available DTC mirror memory in the server is not affected by this service.
- DTC information reset/cleared via this service includes but is not limited to the following:
  - DTC status byte
  - captured DTC snapshot data
  - captured DTC extended data
  - Other DTC-related data such as first/most recent DTC, flags, counters, timers, etc.

Read DTC Information service (19 hex)

- This service allows a client to read the status of server-resident Diagnostic Trouble Code (DTC) information from any server or group of servers within a vehicle.
- Using this service the client can do the following:
  - Retrieve the number of DTCs matching a client-defined DTC status mask
  - Retrieve the list of all DTCs matching a client-defined DTC status mask
  - Retrieve DTC Snapshot data
  - Retrieve DTC Extended Data
  - Retrieve the status of all DTC's supported by the server
  - Retrieve the most recently failed DTC within the server
- There are 21 different sub functions to support all these operations.

Summary of UDS Services

Diagnostic and Communication Management Functional Unit

DiagnosticSessionControl	10
ECUReset	11
SecurityAccess	27
CommunicationControl	28
TesterPresent	3E
SecuredDataTransmission	84
ControlDTCSetting	85
ResponseOnEvent	86
LinkControl	87

Summary of UDS Services continued…

Data Transmission Functional Unit

ReadDataByIdentifier	22
ReadMemoryByAddress	23
ReadScalingDataByIdentifier	24
ReadDataByPeriodicIdentifier	2A
DynamicallyDefineDataIdentifier	2C
WriteDataByIdentifier	2E
WriteMemoryByAddress	3D

Summary of UDS Services continued…

Stored Data Transmission Functional Unit

ReadDTCInformation	19
ClearDiagnosticInformation	14

Input/Output Control Functional Unit

InputOutputControlByidentifier	2F

Remote Activation Of Routine Functional Unit

RoutineControl	31

Upload/Download Functional Unit

RequestDownload	34
RequestUpload	35
TransferData	36
RequestTransferExit	37

Supported negative responses

- Service Not Supported – 11 hex
- Sub Function Not Supported – 12 hex
- Incorrect Message Length Or InvalidFormat – 13 hex
- Response Too Long – 14 hex
- Busy Repeat Request – 21 hex
- Conditions Not Correct – 22 hex
- Request Sequence Error – 24 hex
- Request Out Of Range – 31 hex
- Security Access Denied – 33 hex
- Invalid Key – 35 hex
- Exceed Number Of Attempts – 36 hex
- Required Time Delay Not Expired – 37 hex

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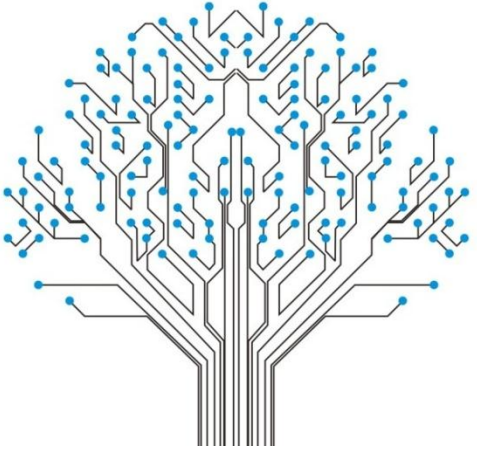
Thank you



Fairness

Learning

Responsibility

Innovation

Respect

DTC Status byte

statusOfDTC: bit field name	Bit #	Bit state	Description
testFailed	0	0	DTC is no longer failed at the time of the request.
testFailedThisOperationCycle	1	1	DTC failed on the current operation cycle.
pendingDTC	2	0	DTC was not failed on the current or previous operation cycle.
confirmedDTC	3	0	DTC is not confirmed at the time of the request.
testNotCompletedSinceLastClear	4	0	DTC test has been completed since the last code clear.
testFailedSinceLastClear	5	0	DTC test never failed since last code clear.
testNotCompletedThisOperationCycle	6	0	DTC test completed this operation cycle.
warningIndicatorRequested	7	0	Server is not requesting warningIndicator to be active.

Additional Info

- 28 hex page 263 communication type details annex B, page 61 eg. message flow.
- 22 hex page 265 data identifiers Annex C.
- 23 hex page 108, Request message definition.
- 2E hex page 152 message flow example.
- 3D hex page 156 WriteMemoryByAddress request message flow example
- 14 hex clear DTC page 159 annex D.1 page 278.
- 19 hex page 171 sub function table.