

The background is a dark blue-grey color. It is decorated with various geometric shapes in orange and white. In the top left, there is a large orange circle with a white dotted pattern inside. To its right is a white circle and an orange hexagon. In the top right, there is a large orange trapezoid. On the left side, there is a white hexagon with a dotted pattern and a small orange circle. In the bottom left, there is a small orange hexagon and a white circle with a small orange dot inside. On the right side, there is a white circle with a small orange dot inside, and a large orange circle. In the bottom right, there is a white circle with a dotted pattern inside. There are also several dotted lines in orange and white scattered across the background.

# CAN-BUS :

## An Overview

By: Omar Najar

**01.**

## **What is CAN-Bus ?**

Simple introduction about Can-bus.

**02.**

## **Properties of CAN-Bus**

Explain some benefits of Can-bus..

**03.**

## **CAN-Bus History**

A timeline about the history of CAN-bus over years.



**04.**

## **Details on CAN-Bus**

CAN frame - Log Data , hardware and software ...etc.

**05.**

## **Future of CAN-Bus**

The future of this technology and its expected improvements

**06.**

## **Project \*\***

My project about CAN-bus .. Interesting part.

**07.**

## **Future Work & Conclusion**



01

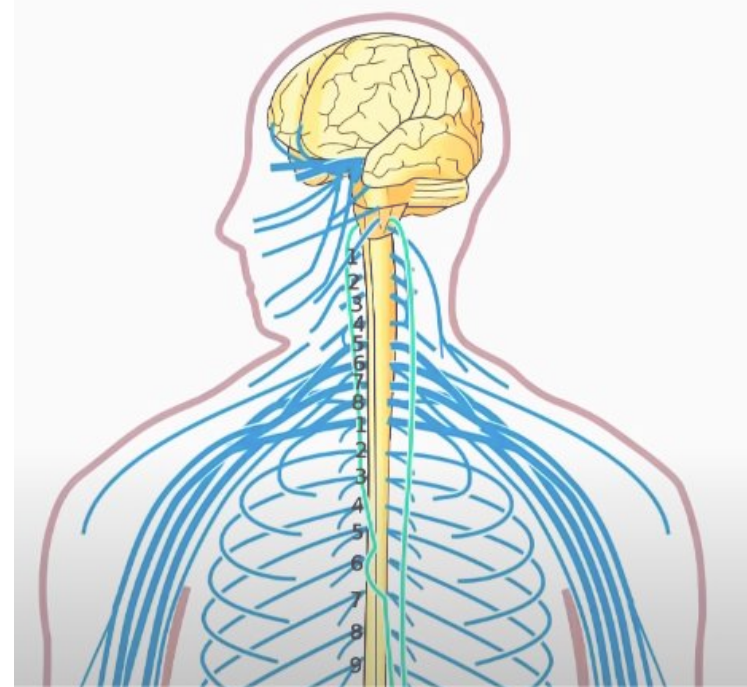
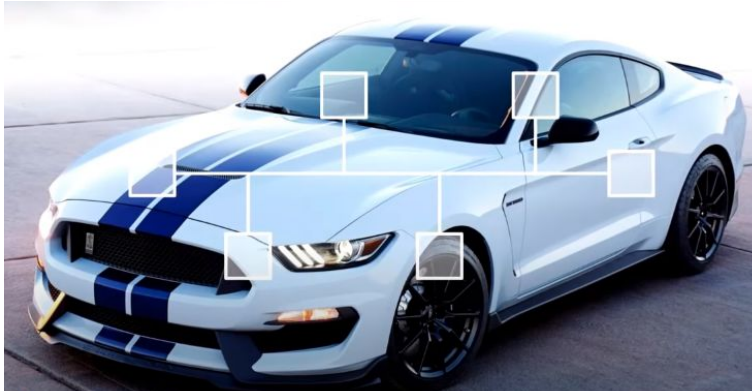
# Introduction

What is CAN-Bus ?

### ..... CAN-Bus | Introduction .....

We can think of CAN-Bus as the following:

Imagine your car is like a **human body**, the Controller area network "CAN" is the nervous system of the human body , facilitating communication between all Parts of the body.. Similarly, " nodes " or "electronic control units " (ECU) are connected via the CAN bus which acts as a central network system.



### ..... CAN-Bus | Introduction .....

In automotive CAN bus system, ECUs " Electronic Control Units " can be the engine parts , airbags, or the audio system.

A modern car can have up to 70 ECUs. So, The CAN-bus allows ECUs to communicate with each other without complex wiring in between.

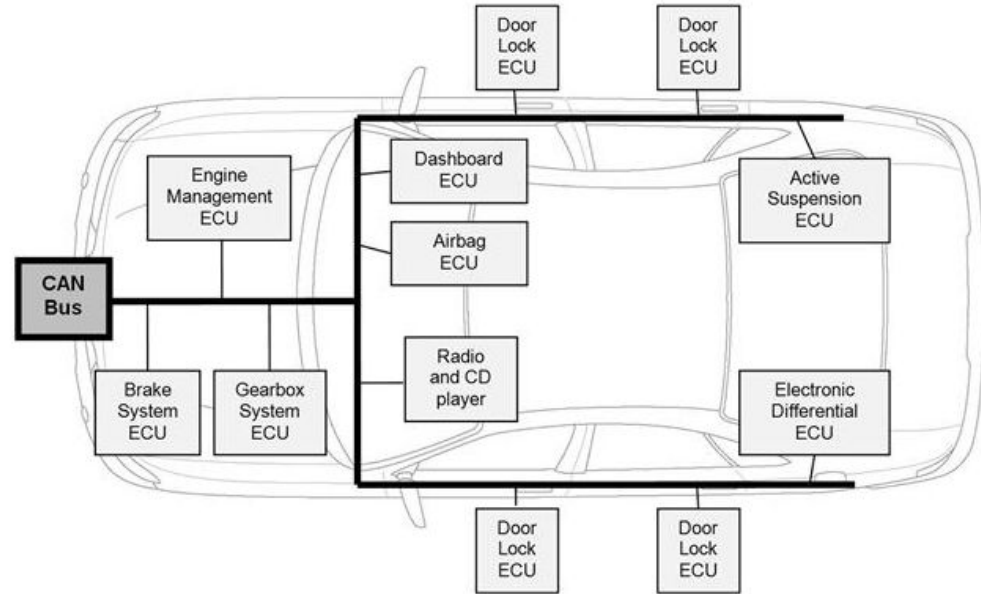
The advantage of this is it allows for several features to be added via software only.

the main primary purpose of CAN-Bus is that it allow to any ECU to communicate with the entire system without causing an overload to the controller computer.



### CAN-Bus | Introduction

In a simple way, Our modern car has different ECUs "Electronic Control Units" which do different jobs and all of ECUs are connected together by a CAN-Bus that control everything.



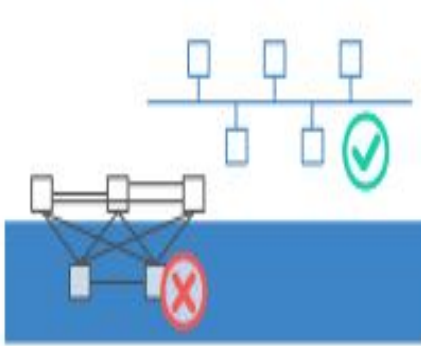


02

Properties

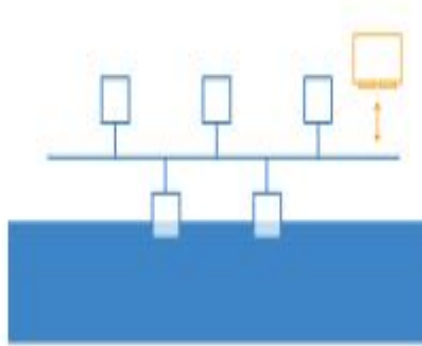


## ..... CAN-Bus | Properties .....



### Simple & low cost

ECUs communicate via a single CAN interface, not via analog lines which reduces error, weights and costs



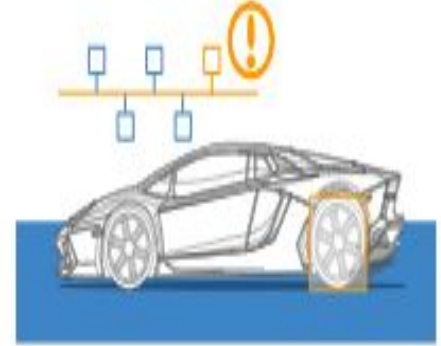
### Fully Centralized

The CAN Bus system allows for central error diagnosis and configuration across all ECUs



### Extremely Robust

The system is robust towards failure of subsystems and electromagnetic interference making it ideal for vehicles



### Efficient & Flexible

CAN messages are prioritized based on IDs so that the highest priority IDs are not interrupted. ECUs have chips to receive messages which make it easy to modify



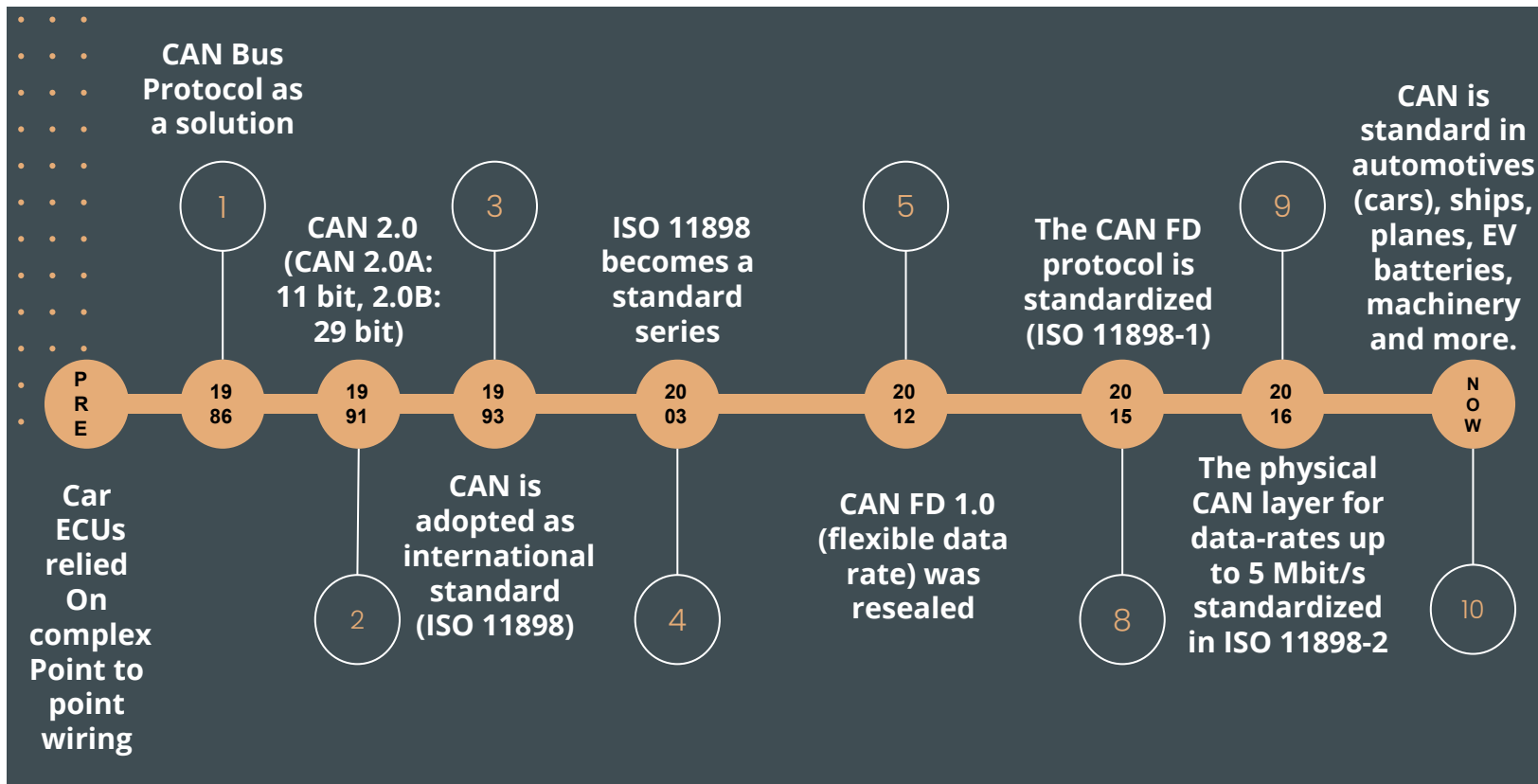


03

# CAN-Bus History



# TimeLine





04

# CAN-Bus In Details

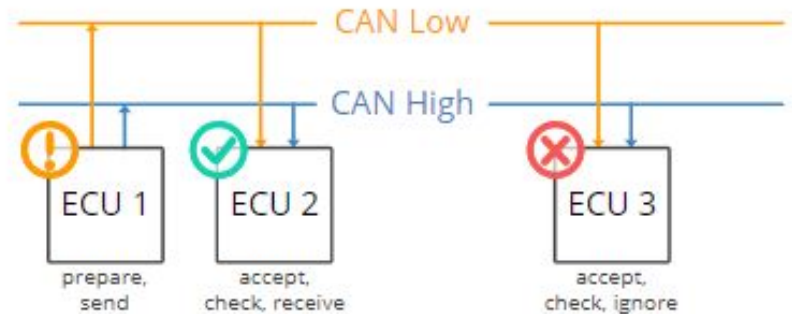


# CAN-Bus | In Details

## 1. ECUs:

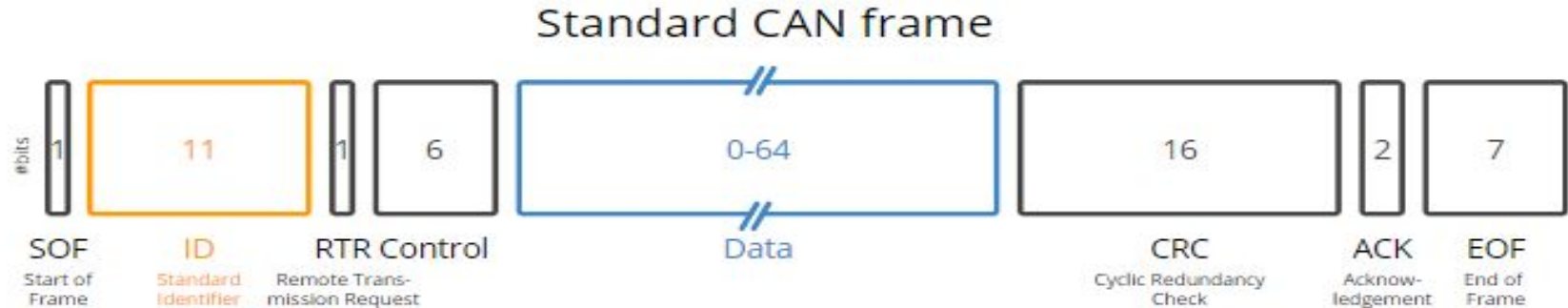
The CAN bus system enables each ECU to communicate with all other ECUs - without complex dedicated wiring.

Specifically, an ECU can prepare and broadcast information (e.g. sensor data) via the CAN bus (consisting of two wires, CAN low and CAN high). The broadcasted data is accepted by all other ECUs on the CAN network - and each ECU can then check the data and decide whether to receive or ignore it.



# CAN-Bus | In Details

## 2. CAN Frame:



- **SOF:** The Start of Frame is a 'dominant 0' to tell the other nodes that a CAN node intends to talk
- **ID:** The ID is the frame identifier - lower values have higher priority
- **RTR:** The Remote Transmission Request indicates whether a node sends data or requests dedicated data from another node
- **Control:** The Control contains the Identifier Extension Bit (IDE) which is a 'dominant 0' for 11-bit. It also contains the 4 bit Data Length Code (DLC) that specifies the length of the data bytes to be transmitted (0 to 8 bytes)
- **Data:** The Data contains the data bytes aka payload, which includes CAN signals that can be extracted and decoded for information
- **CRC:** The Cyclic Redundancy Check is used to ensure data integrity
- **ACK:** The ACK slot indicates if the node has acknowledged and received the data correctly
- **EOF:** The EOF marks the end of the CAN frame

## CAN-Bus | In Details

### 3. Protocols:

CAN Bus provides the basis for communication but not a lot more..

CAN - Standart doesn't specify how to handle messages over than 8 bytes or how to decode the row data..

Therefore, a standardized protocols are defined to further define how data is communicated between ECUs over a network

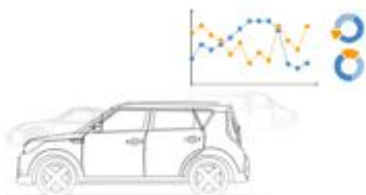
Protocols are such as :

- 1- **SAE J1939** : The standard of in-vehicle network for buses, trucks, and heavy-duty vehicles.
- 2- **OBD- II** : Self-diagnostics and reporting capabilities that mechanics uses to find problem of your car..( support real-time parameter such as speed.)
- 3- **CAN Open** : used for industrial automation applications. (widely used.)



## CAN-Bus | In Details

### 4. Examples:



#### Logging/streaming data from cars

OBD2 data from cars can e.g. be used to reduce fuel costs, improve driving, test prototype parts and insurance



#### Heavy duty fleet telematics

J1939 data from trucks, buses, tractors etc. can be used in fleet management to reduce costs or improve safety



#### Predictive maintenance

Vehicles and machinery can be monitored via IoT CAN loggers in the cloud to predict and avoid breakdowns



#### Vehicle/machine blackbox

A CAN logger can serve as a 'blackbox' for vehicles or equipment, providing data for e.g. disputes or diagnostics



05

# Future of CAN-Bus





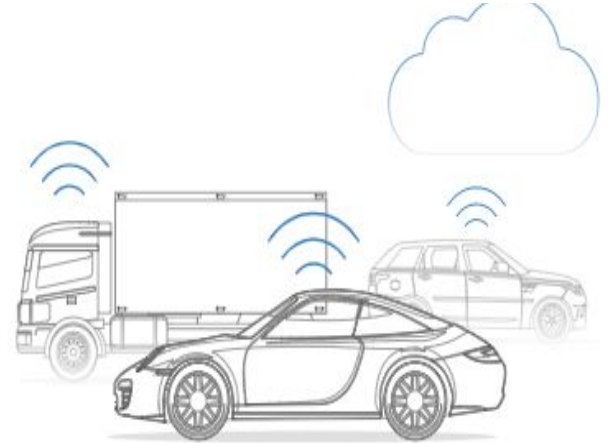
## CAN-Bus | Future

Looking ahead, the CAN bus protocol will stay relevant - though it will be impacted by major trends:

- A need for increasingly advanced vehicle functionality
- The rise of cloud computing
- Growth in Internet of Things (IoT) and connected vehicles
- The impact of autonomous vehicles

In particular, the rise in connected vehicles (V2X) and cloud will lead to a rapid growth in vehicle telematics and IoT CAN loggers.

In turn, bringing the CAN bus network 'online' also exposes vehicles to security risks - and may require a shift to new CAN protocols like CAN FD.





06

Project



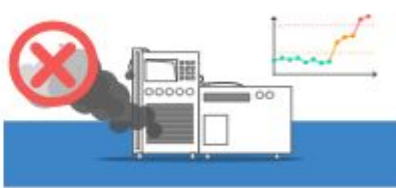
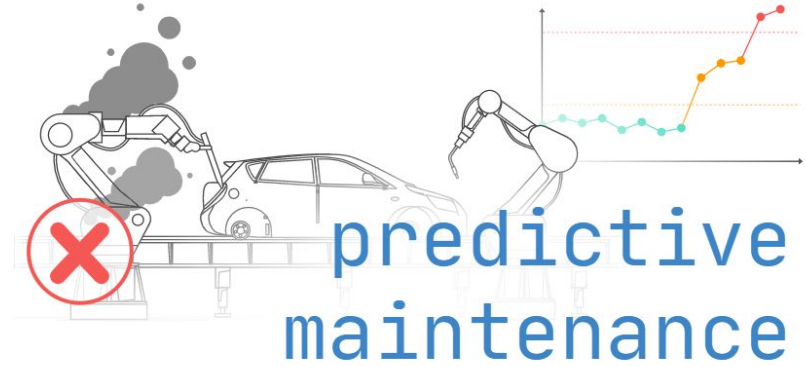
# CAN-Bus | Project

To understand more about CAN-Bus , I prepared for you a simple project ..

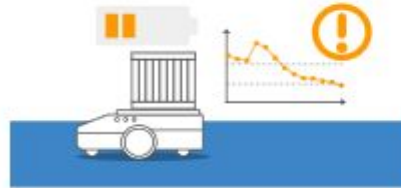
Project idea is to use CAN-Bus data that recorded from buses, trucks, and cars and how to use it for

**Predictive Maintenance.!**

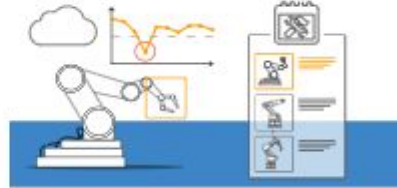
What are the benefits of Predictive Maintenance.?



Reduced asset  
downtime



Extend remaining  
useful life



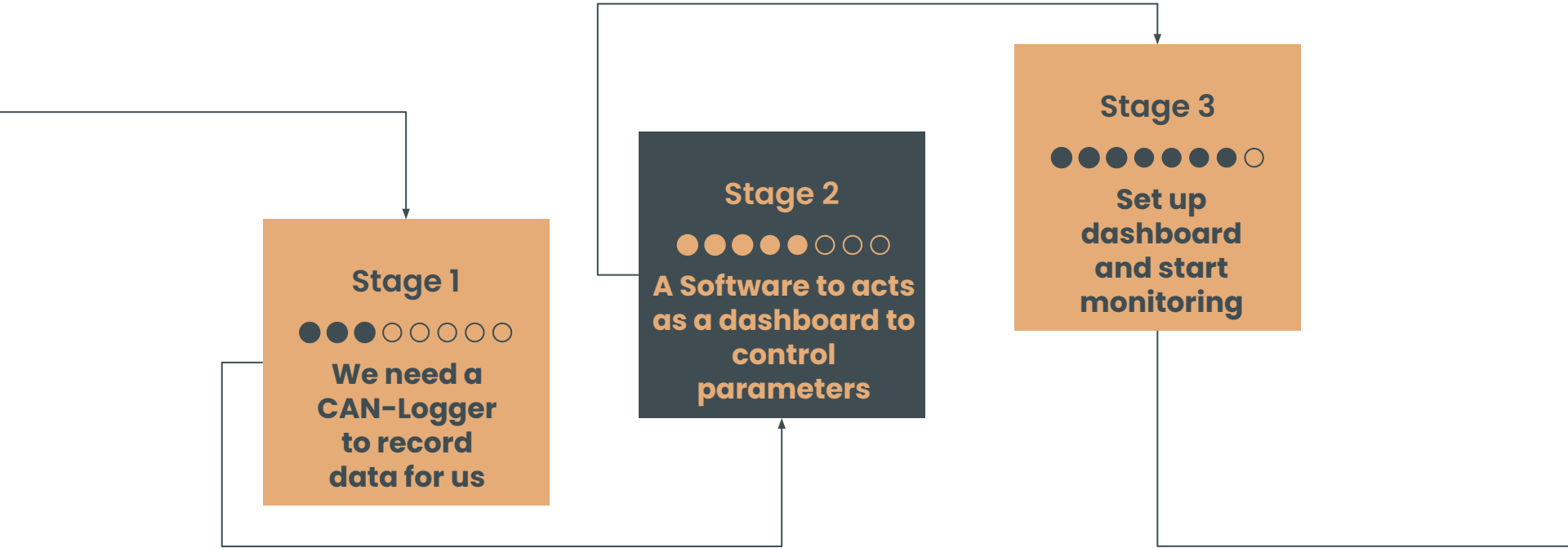
Maintenance & parts  
optimization



OEM services &  
remote diagnostics

## ..... Project Stages .....

*What do we need to perform such a project ?*



Stage 1

●●●○○○○○

**We need a  
CAN-Logger  
to record  
data for us**

## Stage 1 CAN-Logger

The **CANedge2** is a WiFi CAN bus data logger, ideal for predictive maintenance of CAN-based assets.



PLUG & PLAY



PRO SPECS



SO SMALL



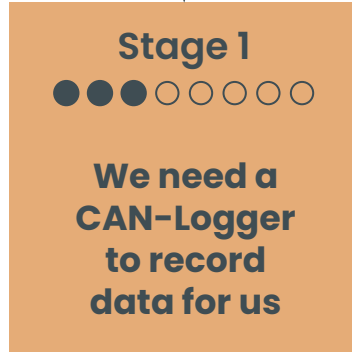
SECURE WIFI



MANAGE FLEET

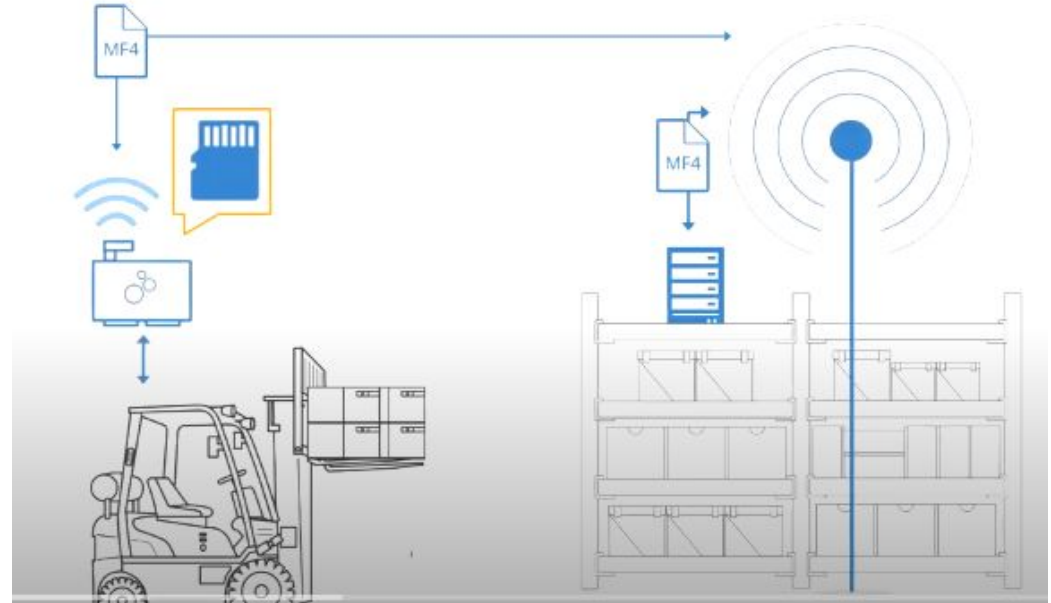


OPEN SOURCE



Then, the data is stored on as a SD card and can be auto-pushed to your own server via a wifi

## Stage 1 CAN-Logger



## Stage 1 CAN-Logger

### Stage 1



We need a  
CAN-Logger  
to record  
data for us

Then, the data is stored on as a SD card and can be auto-pushed to your own server via a 3G/4G access point .

After that, the data can be handled by software tools and we can visualize data in dashboard.



## Stage 2

●●●●●○○○  
**A Software to acts  
as a dashboard to  
control  
parameters**

## Stage 2 Software

[Grafana](#)[Products](#)[Open Source](#)[Learn](#)[Downloads](#)[Login](#)[Contact us](#)[Features](#)[Contribute](#)[Dashboards](#)[Plugins](#)[Download](#)

## The analytics platform for all your metrics

Grafana allows you to query, visualize, alert on and understand your metrics no matter where they are stored. Create, explore, and share dashboards with your team and foster a data driven culture.

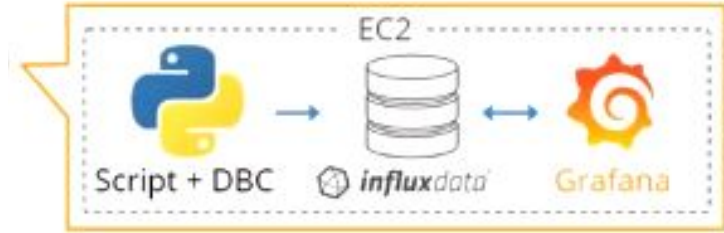
Trusted and loved by the community.

[Get Grafana →](#)[Live Demo](#)[Github Project](#)

**Grafana** , is the first Open Source  
Dashboard Tool which enable us to  
control and view CANBus data.



## Stage 3 Setup & Get Ready



Stage 3  
●●●●●●○

**Set up  
dashboard  
and start  
monitoring**

Three Steps for The Integration:

1. Set up an Influx DataBase : Where processed data will be stored in human readable form.
2. Set up Grafana and connect to Influxdb to read your data.
3. We use a plug&play python script to decode your data and push it to influx database.

After that, we will be ready to build our own dashboard and control it..

# THE IMPLEMENTATION

..... **For Access** .....



## Project Resource

CAN Bus Data Loggers - Simple. Pro. Interoperable ([csselectronics.com](http://csselectronics.com))



07

Future Work



## **CAN-Bus and its Impact on Autonomous Vehicles : Challenges & Complexities.**

The controller area network (CAN-Bus) is the nervous system that enable communication. It contains of 'nodes' or 'electronic control units' (ECUs) which are like the parts of the body, interconnected via the CAN bus. Information sensed by one part can be shared with another. The Can-bus is simple, with low cost. Also, it is fully centralized , extremely robust and efficient. In this research paper, the ability of CAN-bus of achieving its characteristics within the scope of Autonomous vehicles will be discussed. Also, The challenges and complexities to use Can-bus and its protocol will be mentioned. The power of Can-bus in the future of IOT systems and cars must be qualified enough to work in such autonomous systems.



08

Conclusion



**This is an overview about CAN-Bus including the definition and properties of CAN-BUS. It also shows how it works in details and the power of CAN-bus in automotive vehicles.**

**Moreover will be explained in the article where we will sum up the overview of CAN-Bus to a project and article that discuss a specific part in this technology.**

[CAN-Bus: Introduction and History | Blogs | Altium](#)

[The Top 28 Can Bus Open Source Projects \(awesomeopensource.com\)](#)

[CAN Bus Explained - A Simple Intro \(2021\) \(csselectronics.com\)](#)



**Thanks for listening ..**