Master of Science in Computer Engineering

Rethinking Automotive Software Development: Exploring Software Defined Vehicle and its potential

Candidate
Lorenzo SCIARA

Supervisors
prof. Danilo Bazzanella
dott.sa Piera Limonet

REPLY STORM

Politecnico di Torino

AGENDA

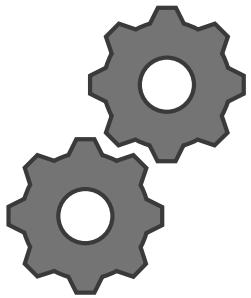
1. AUTOMOTIVE CONTEXT
2. SOFTWARE DEFINED VEHICLE
3. CLOUD COMPUTING
4. BENEFITS
5. CONTRIBUTORS
6. VALIDATION
7. FUTURE WORKS

AUTOMOTIVE CONTEXT

In the past automotive industry software production was always considered secondary to the mechanical ones.

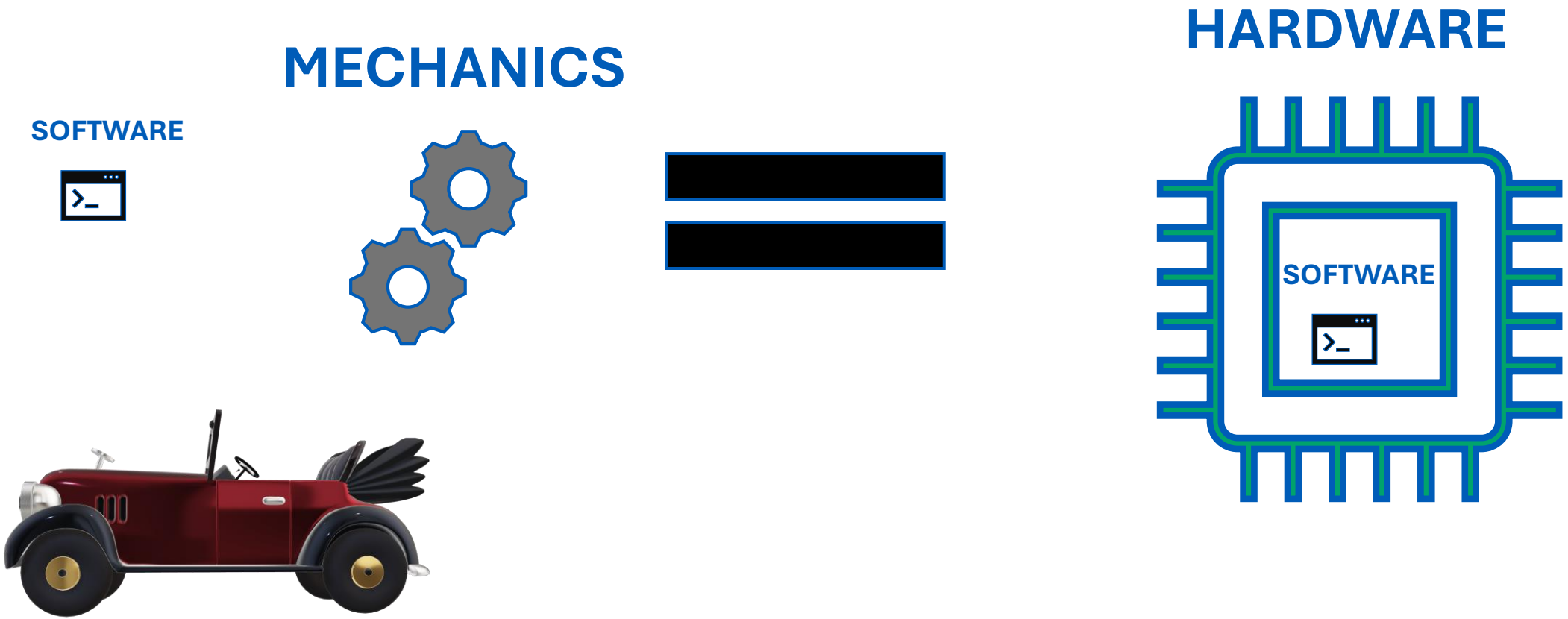
MECHANICS

SOFTWARE



AUTOMOTIVE CONTEXT

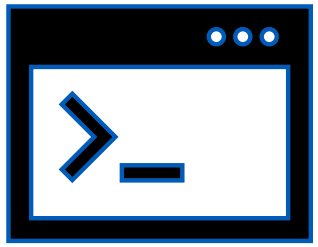
The focus on the mechanical parts of the vehicle resulted in software being very dependent on the hardware.

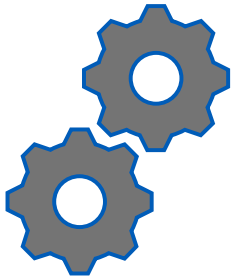


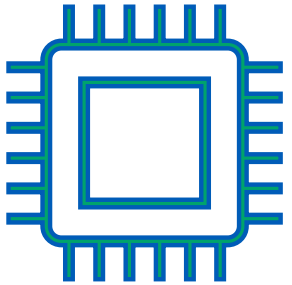
SOFTWARE DEFINED VEHICLE

Software Defined Vehicle enables software to become a fundamental element of vehicle design.

SOFTWARE **MECHANICS** **HARDWARE**







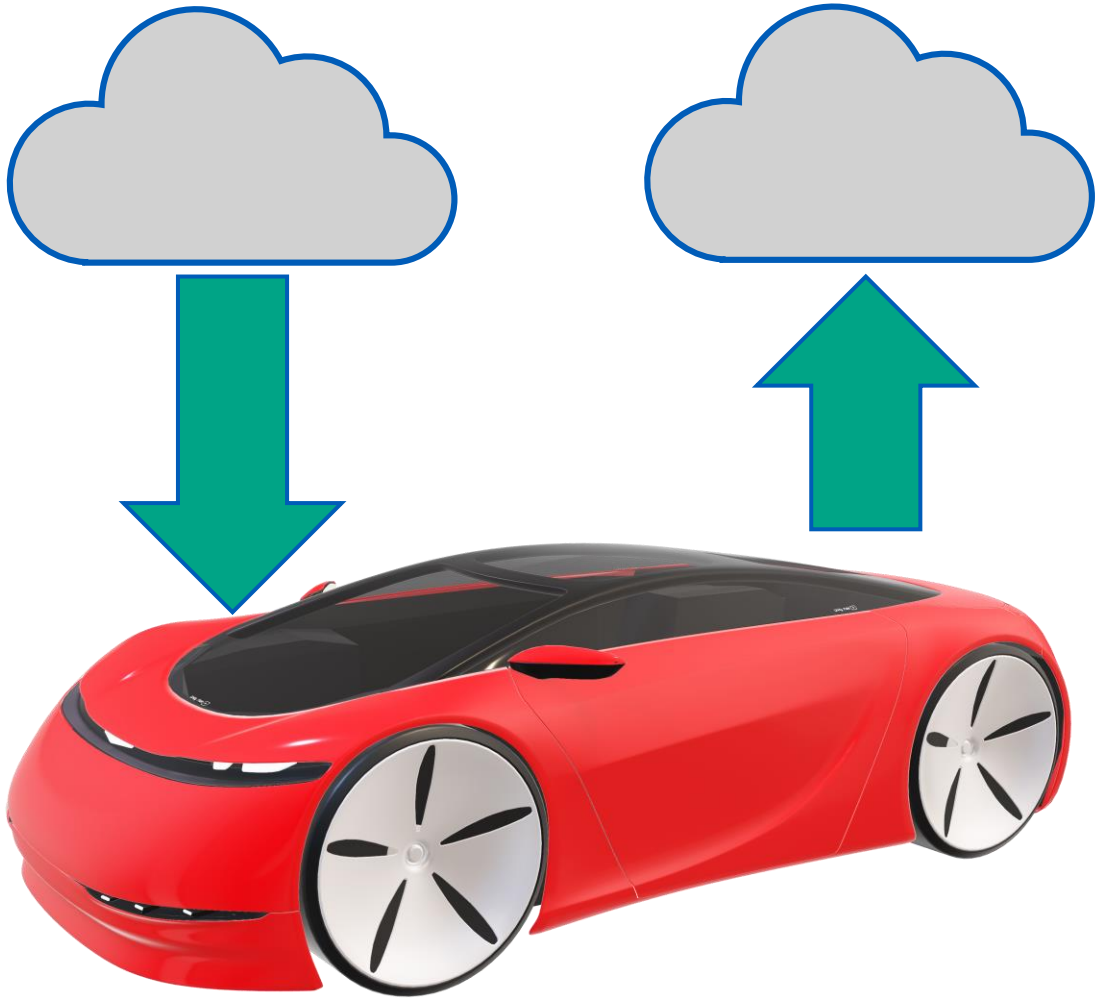
CLOUD COMPUTING

The vehicle is directly connected to the cloud

CLOUD COMPUTING

The vehicle is directly connected to the cloud

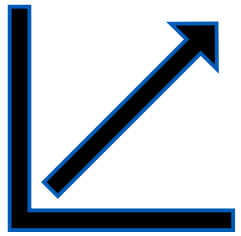
Both for data analysis and to receive *Over The Air (OTA)* updates.



BENEFITS

SECURITY

EFFICIENCY



DURABILITY

BENEFITS

SECURITY

Vehicle vulnerabilities can be remotely fixed with OTA updates.

EFFICIENCY

DURABILITY

BENEFITS

SECURITY

EFFICIENCY

Software independence significantly increases the efficiency of software production.

DURABILITY

BENEFITS

SECURITY

EFFICIENCY

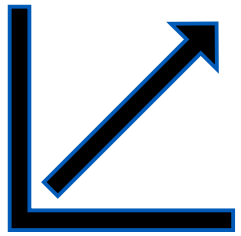
DURABILITY

Vehicle lifecycle is extended through continuous updates and the addition of new features.

BENEFITS

SECURITY

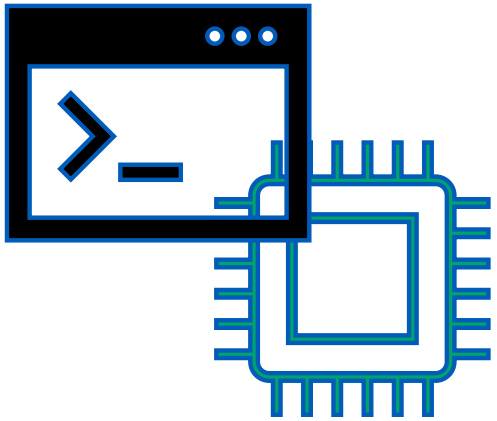
EFFICIENCY



DURABILITY

CONTRIBUTORS

TCU SIMULATOR

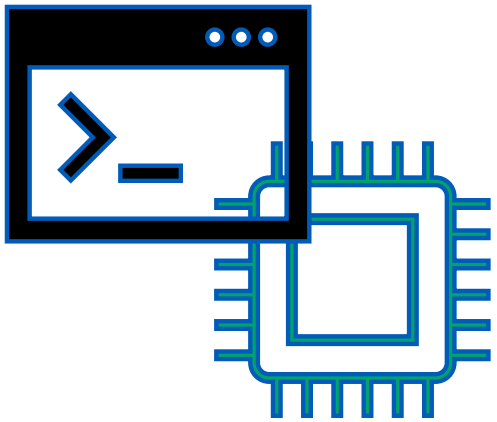


CLOUD INFRASTRUCTURE

DATA VIEWER

CONTRIBUTORS

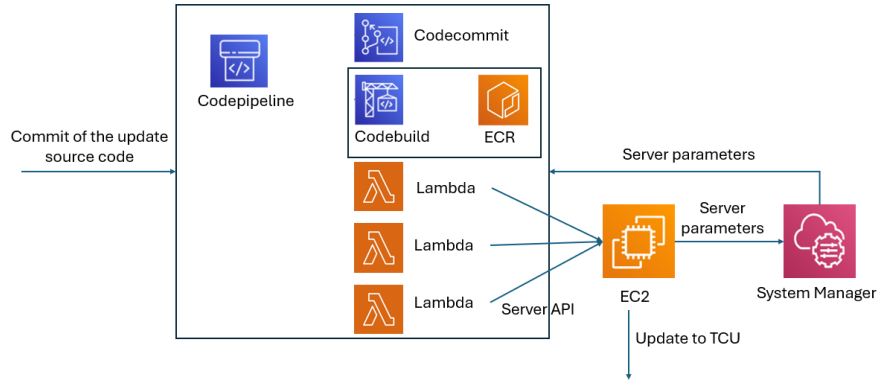
TCU SIMULATOR



Telematic Control Unit (TCU) Simulator is a system that can collect and transmit data from simulated subsystems and integrate updates from external sources.

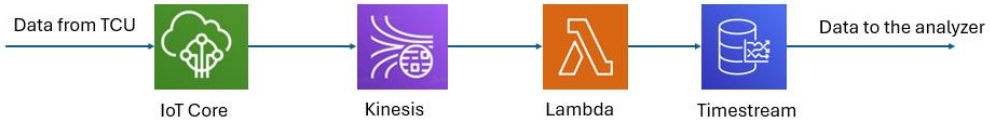
CONTRIBUTORS

CLOUD INFRASTRUCTURE



Using AWS services, two distinct cloud infrastructures can be built:

The first is for collecting data from the *TCU simulator*.

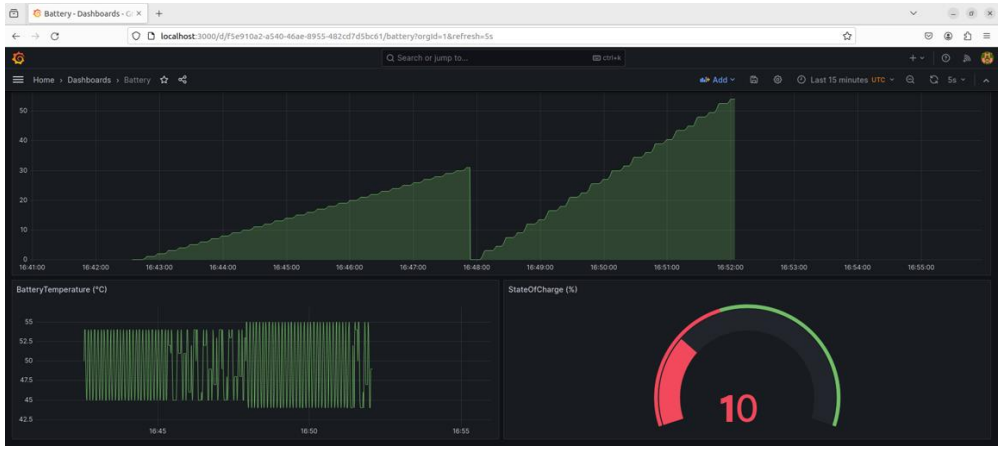


The second is to manage and deploy software updates using the *Hawkbit server*.

CONTRIBUTORS

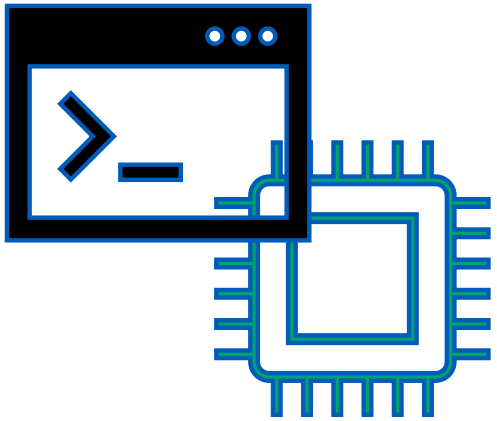
DATA VIEWER

The data is displayed in an intuitive and user-friendly dashboard using a *Grafana* server thanks to the connection to the cloud infrastructure.



CONTRIBUTORS

TCU SIMULATOR

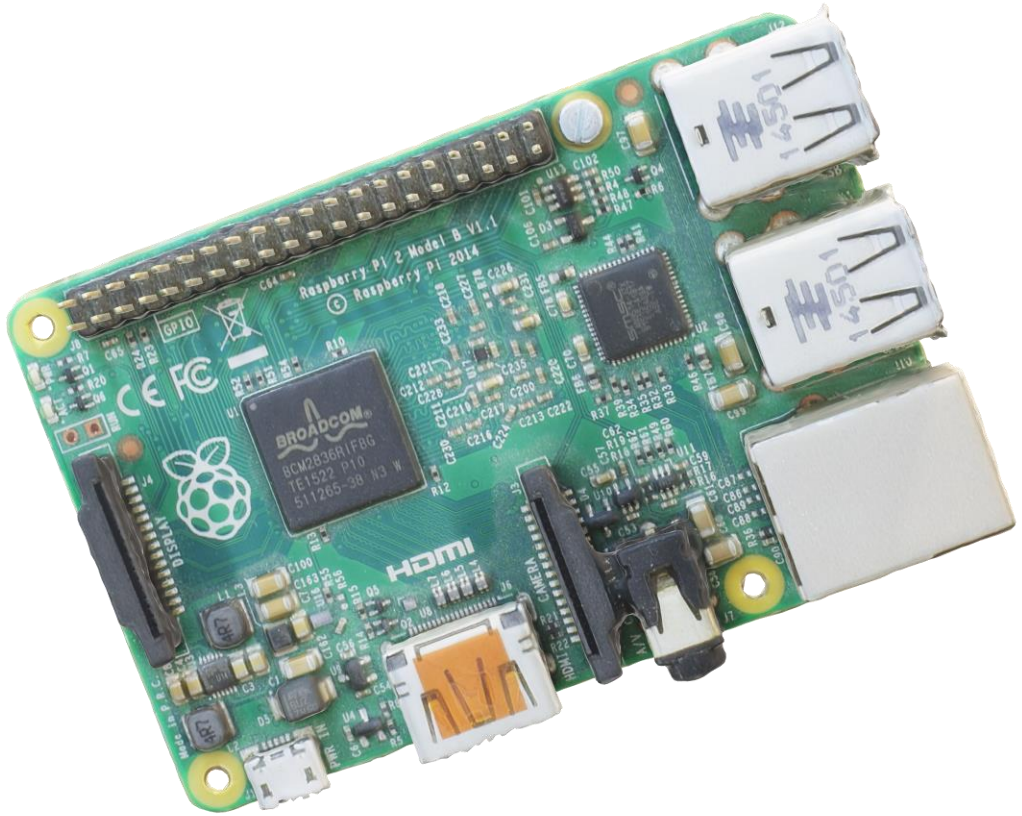


CLOUD INFRASTRUCTURE

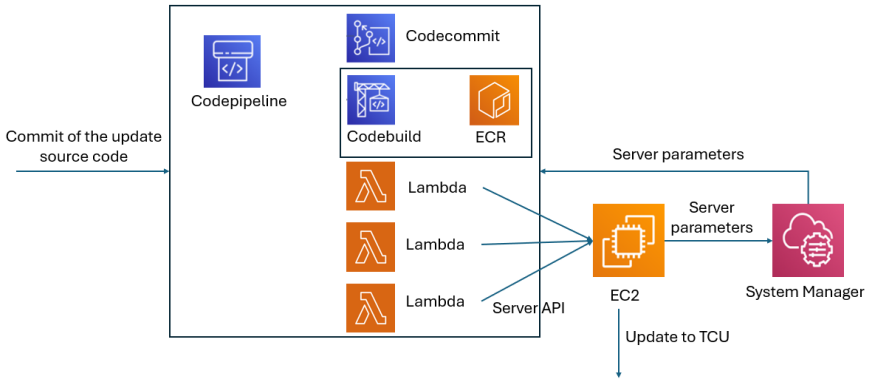
DATA VIEWER

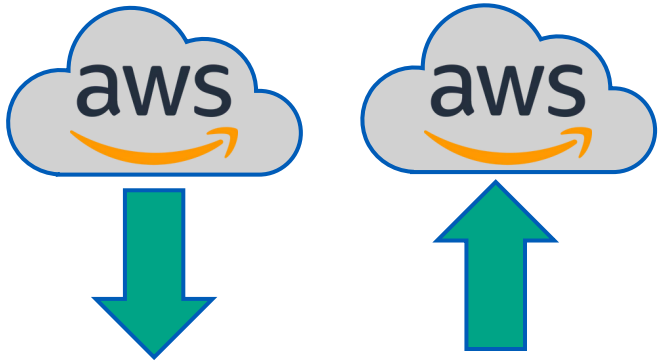
VALIDATION

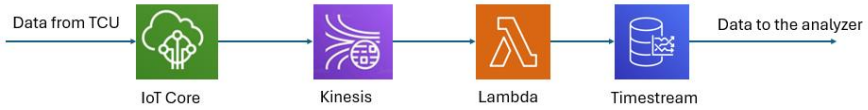
The entire proof of concept is tested on a system that can simulate a vehicle TCU as closely as possible. For this reason, the *RaspberryPi* was chosen.

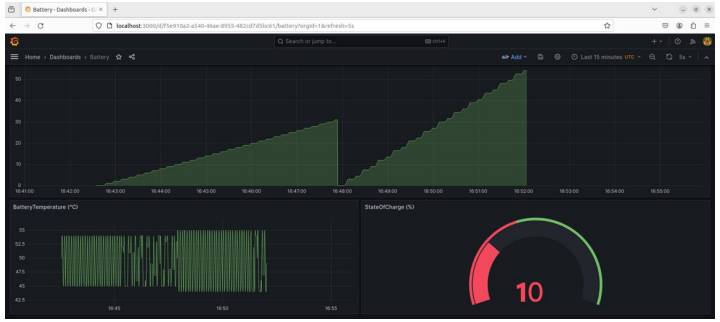


VALIDATION


Codepipeline
Codecommit
Codebuild
ECR
Commit of the update source code
Lambda
Lambda
Lambda
Server API
Server parameters
Server parameters
EC2
System Manager
Update to TCU


aws
aws


Data from TCU
IoT Core
Kinesis
Lambda
Timestream
Data to the analyzer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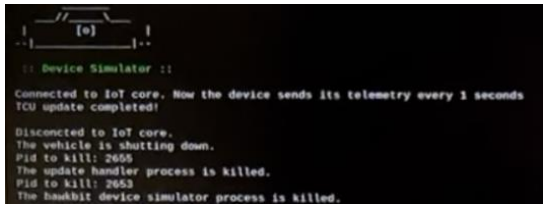
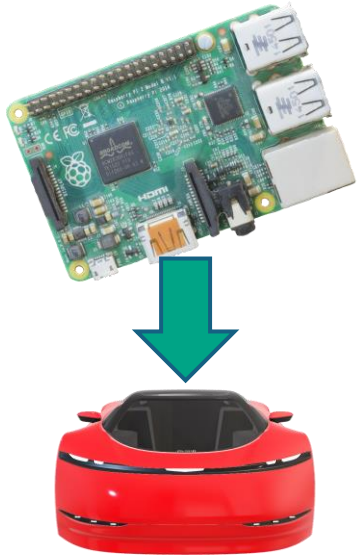

:: Device Simulator ::
Connected to IoT core. Now the device sends its telemetry every 1 seconds
TCU update completed!
Disconcted to IoT core.
The vehicle is shutting down.
Pid to kill: 2655
The update handler process is killed.
Pid to kill: 2653
The hawkbit device simulator process is killed.

FUTURE WORKS



VEHICLE APPLICATION

hawkBit

CLOOSER EXAMINATION

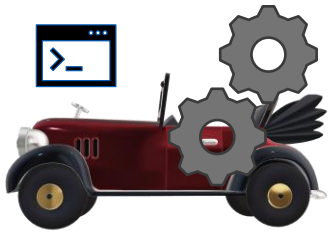
SDV

AD → ML

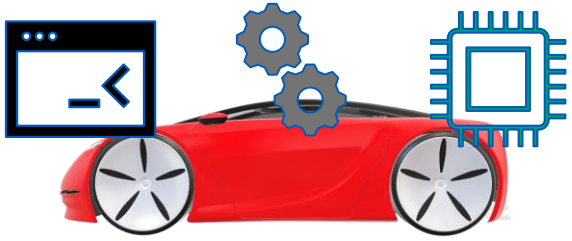
INTEGRATION

KEY POINTS

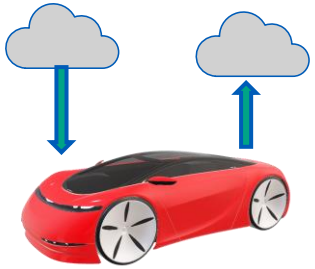
AUTOMOTIVE CONTEXT



SOFTWARE DEFINED VEHICLE



CLOUD

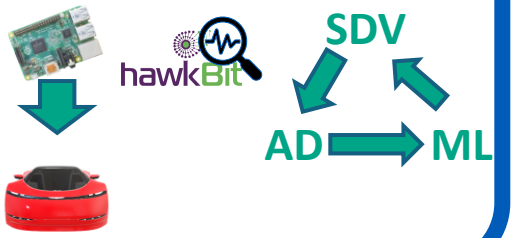


BENEFITS

CONTRIBUTORS

VALIDATION

FUTURE WORKS



Thanks for the attention
Any questions?