

ESS-NW/CAR

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MF2063

December 10, 2018

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Introduction and background

Autonomous vehicles

JACK STEWART TRANSPORTATION 08:04:18 07:00 AM

TESLA SAYS ITS NEW SELF-DRIVING CHIP IS FINALLY BAKED

Move over Tesla, this self-driving car lets you sleep or watch a movie during your highway commute

from Autotech on 15:00 PM ET Tue, 26 June 2018



46 Corporations Working On Autonomous Vehicles

September 4, 2018

Autotech

f t in

Scania self-driving trucks to be tested on Finnish roads



How Intel Plans to Win Self-Driving Cars

Inside Intel's compelling self-driving car strategy.

Ashraf Eassa (TMFChipFoot)

Jul 9, 2018 at 6:06PM



Waymo's driverless cars hit a new milestone: 10 million miles on public roads

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Apple self-driving car fleet grows to 66 vehicles in California

By Malcolm Owen

Wednesday, July 18, 2018, 12:14 pm PT (03:14 pm ET)

Apple is continuing to increase the number of autonomous vehicles it has on the roads for testing, reportedly registering more vehicles with the Californian Department of Motor Vehicles to bring the fleet up to 66 self-driving cars operating in the state.

The UK firm hoping to take on Google's driverless cars

By Will Smale

Business reporter, BBC News

8 October 2018

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Article

Development of self-driving vehicles in the United Kingdom

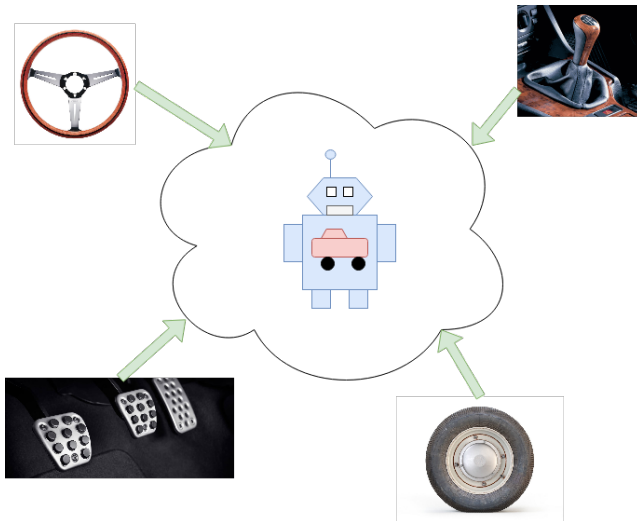
Where science fiction meets science

on a challenge

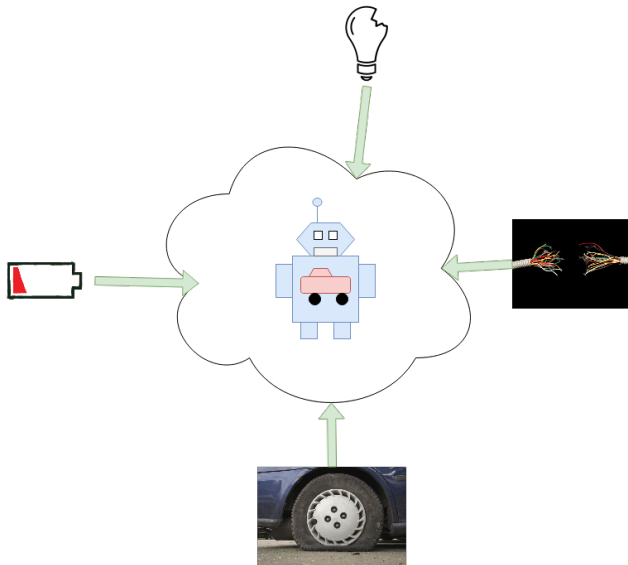
Nvidia is helping autonomous vehicles to navigate their way to safety



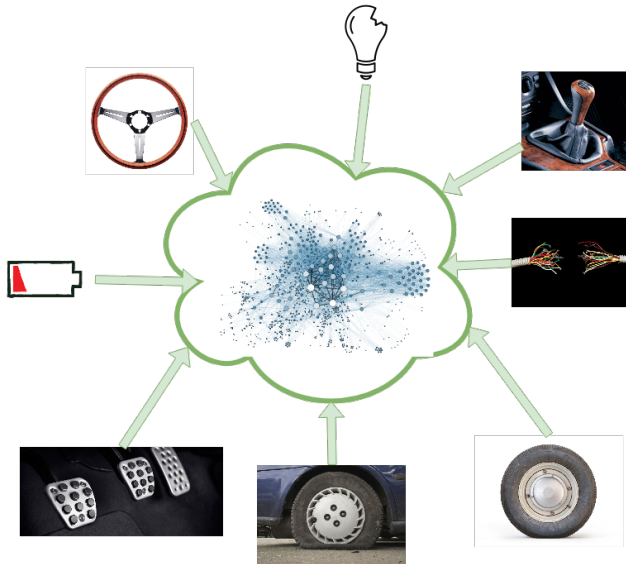
Autonomous vehicles



Autonomous vehicles



Autonomous vehicles

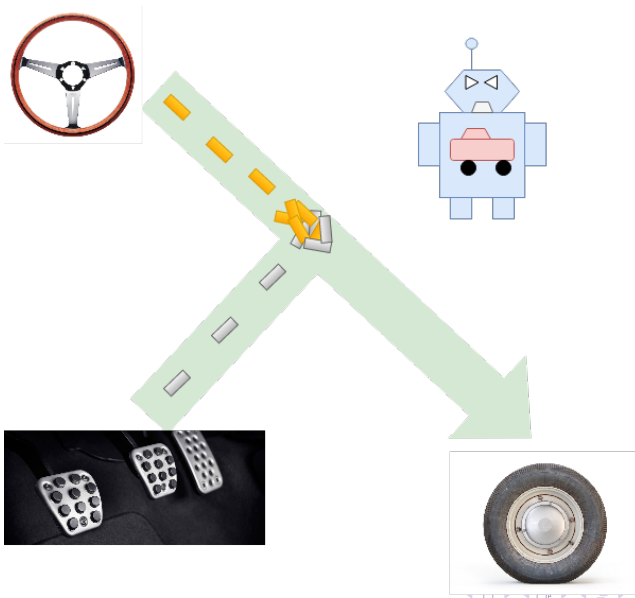


The problem with existing communication technologies

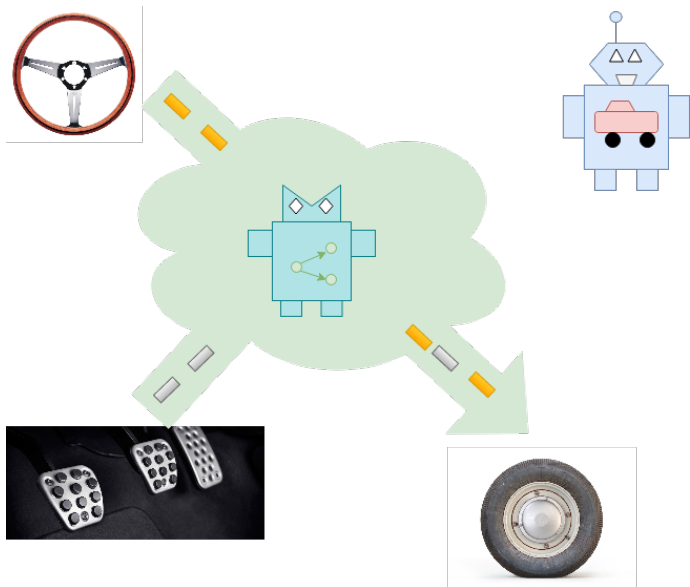
- Existing communication technologies between internal computers in cars:
 - CAN (1 Megabit/s)
 - LIN (19.2 Kilobit/s)
 - FlexRay (10 Megabit/s)
- Too slow for autonomous cars!
- Regular internet based technologies can be a solution for communication in cars.
- Wired ethernet speeds reach into the Gigabit/s range.



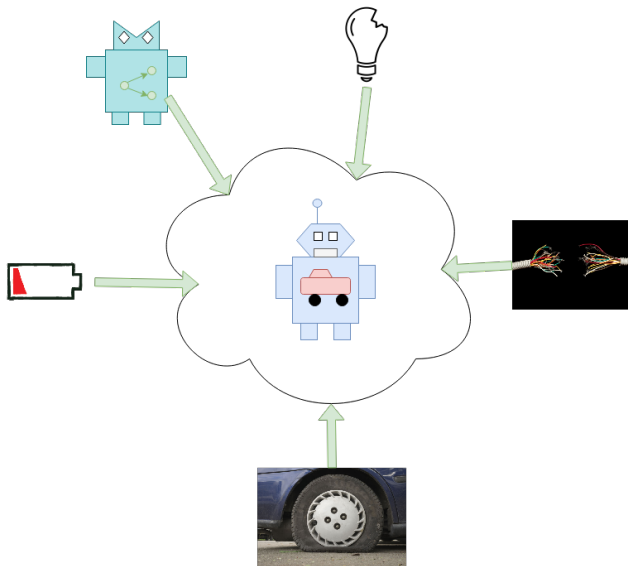
The problem with existing communication technologies



Software-Defined Networking (SDN)



Software-Defined Networking (SDN)



Our project

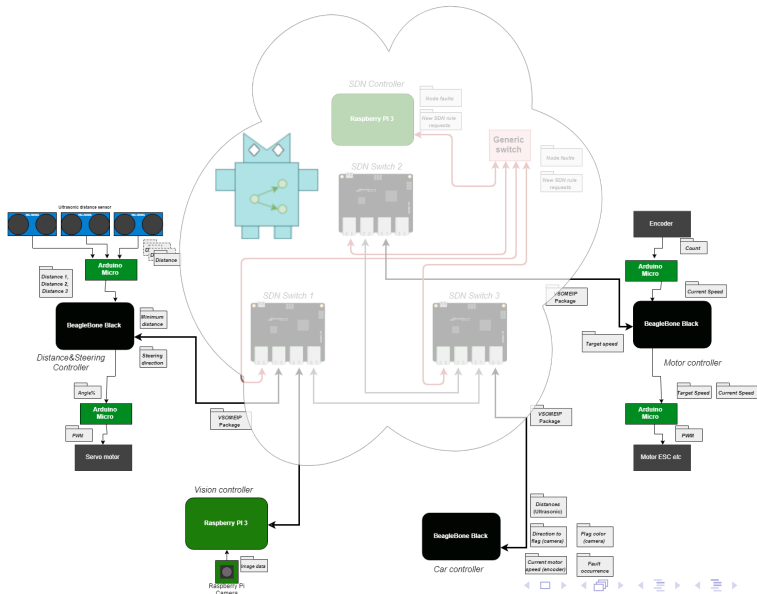
Goals of the project

- Produce a prototype of an SDN-based communication infrastructure for automotive vehicles.
- Produce a prototype of intelligent system monitoring and adaptation service for automotive vehicles.



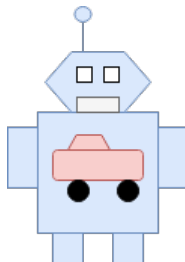
Figure: RC-car model kit used for the prototype

System architecture



Implemented services

- Speedometer
- Cruise control
- Steering
- Object recognition
- Distance measurement

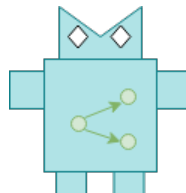
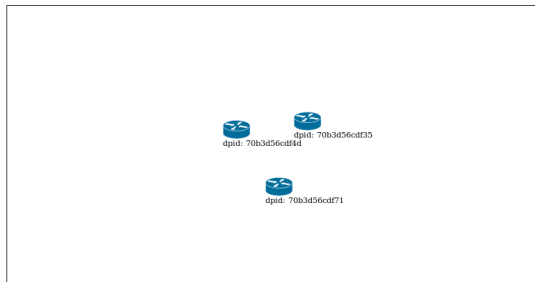


Network surveillance

Traffic monitor

Datapath	Name	Hw_addr	Port	Rx-pkts	Rx-bytes	Rx-error	Tx-pkts	Tx-bytes	Tx-error
000070b3d56cdf71	eth0	cb:4e:3e:a4:00:30	1	5859	614780	0	9464	856655	0
000070b3d56cdf71	eth1	9d:ab:65:6d:8d:bf	2	9647	797919	0	14388	1581775	0
000070b3d56cdf71	eth2	e4:b9:3f:35:4b:c9	3	11247	1205594	0	12004	1047240	0
000070b3d56cdf4d	eth0	cb:4e:3e:a4:00:30	1	7850	653099	0	16759	1881590	0
000070b3d56cdf4d	eth1	82:24:8c:ae:81:64	2	5698	610879	0	10662	963493	0
000070b3d56cdf4d	eth2	e4:b9:3f:35:4b:c9	3	14375	1577603	0	9647	861381	0
000070b3d56cdf35	eth0	82:2b:18:66:18:f4	1	7777	859438	0	11728	1002136	0
000070b3d56cdf35	eth1	9d:ab:65:6d:8d:bf	2	6149	631056	0	12063	1060752	0
000070b3d56cdf35	eth2	e4:b9:3f:35:4b:c9	3	12004	1047240	0	11247	1205594	0

Network Topology



Summary

- Ethernet is a promising candidate for increasing demand on bandwidth for communication in autonomous cars
- Ethernet is not without problems, many of which a SDN can help to solve.
- SDN networks allow for safe communications on autonomous vehicles by being fast, adaptive and customisable
- Fault detection and failsafe behaviour is a **must** in autonomous vehicles.

Come check out our DEMO in the
prototyping lab on floor 3!