

ASECAP DAYS



COSTA NAVARINO 2019

Parallel session 2: European Projects Presentation

Self-explaining and forgiving road infrastructure: the SAFE STRIP project

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ERTRAC Vision Zero - 2050

- Fatality and in particular injury figures have remained nearly constant since 2013: **25,000 road fatalities and ca. 1.4 million injuries per year.**
- As a consequence, important European safety targets are getting out of reach. Neither will road fatalities be cut by 50% in the current decade, nor is the EU likely to move close to zero fatalities by 2050.
- ERTRAC Safe Road Transport roadmap: basis for FP7 and H2020 research topics

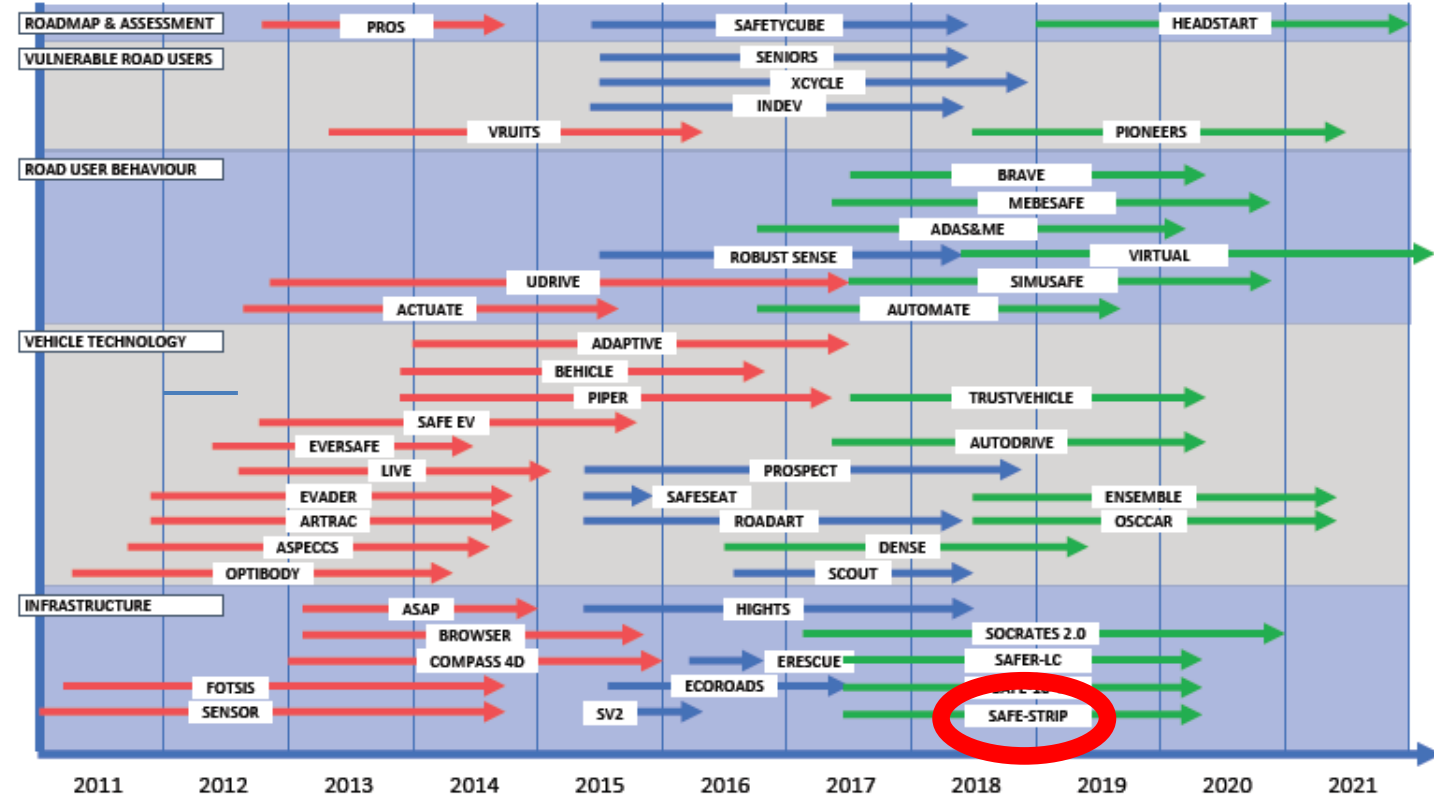


Figure 1: Overview of EC funded projects dedicated to road safety



- “**Safe** and green **Sensor Technologies** for self-explaining and forgiving **Road Interactive Applications**” - **SAFE STRIP**
- G.A. 723211
- **Topic:** MG-3.4-2016: Transport infrastructure innovation to increase the transport system safety at modal and intermodal level (including nodes and interchanges).
- **Duration:** 36 months
- **Start date:** 1 May 2017
- **EC funding:** 4.595.813.75€
- **18 Partners**
- www.safestrip.eu



SAFE STRIP aim

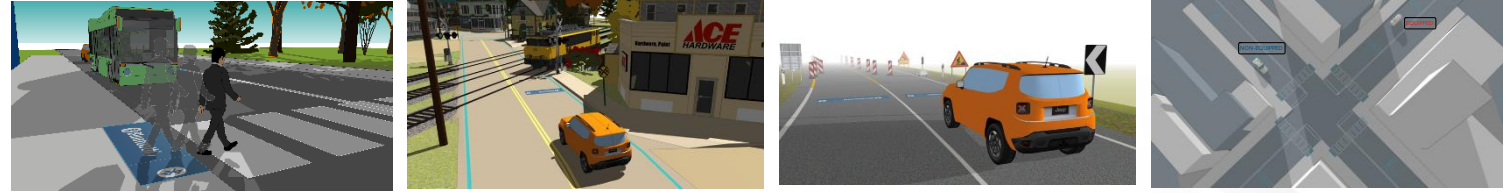
SAFE STRIP aims to introduce a **disruptive technology** that will achieve to **embed C-ITS applications in existing road infrastructure**, including novel I2V and V2I, as well as VMS/VSL functions **into low-cost, integrated strips markers on the road;**

to **make roads self-explanatory** (with personalised in-vehicle messages) **and forgiving** (due to advanced cooperative functions) **for all road users** (trucks, cars and vulnerable road users, such as PTWs riders) **and all vehicle generations** (non-equipped, C-ITS equipped, autonomous),

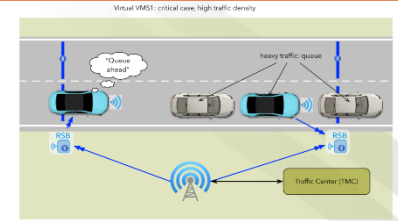
with reduced maintenance cost, full recyclability and added-value services, as well as supporting real-time predictive road maintenance functions.

SAFE STRIP Applications

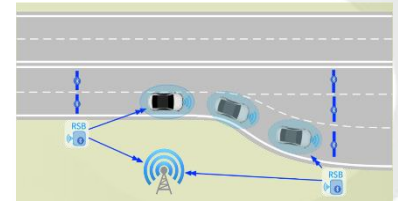
Cooperative Safety,
Rail crossing & work zone,
Merging/intersection



Personalised VMS/VDS and Traffic Centre Information



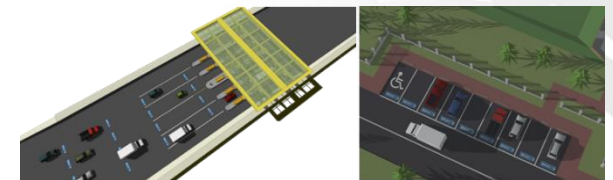
Interface to highway autonomous vehicles functions



Predictive road maintenance

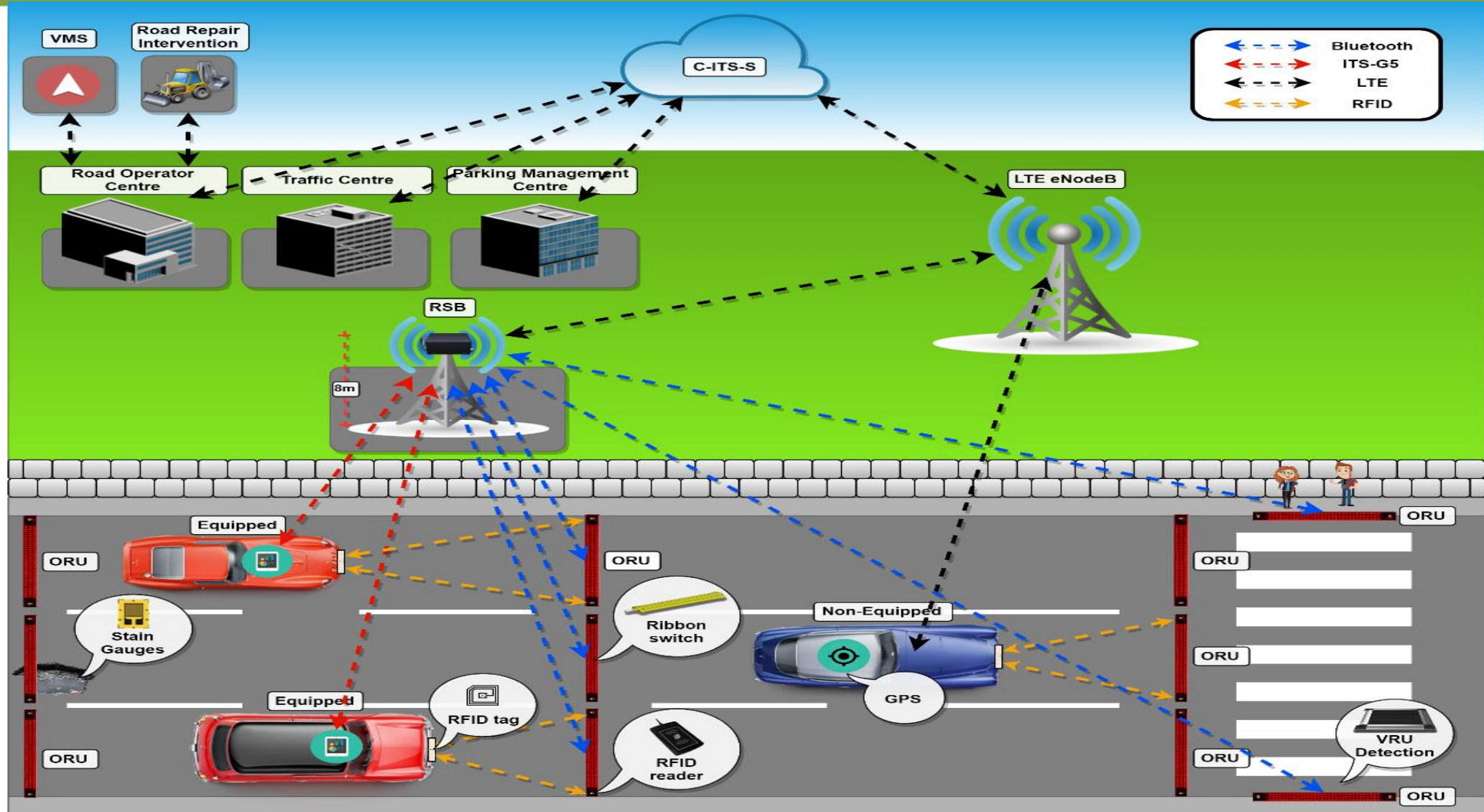


Supportive Added Value Services (eg. toll collection,
parking booking/charging)



Friction estimation module

SAFE STRIP architecture

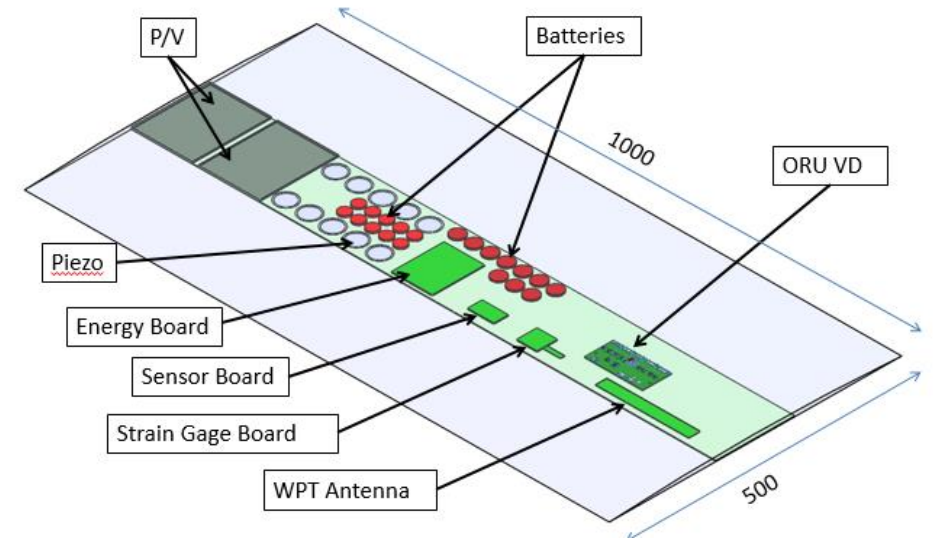


How does SAFE STRIP work?

Micro/nano sensors, communication & energy harvesting modules placed in **low-cost, integrated strips** on the **road pavement surface**

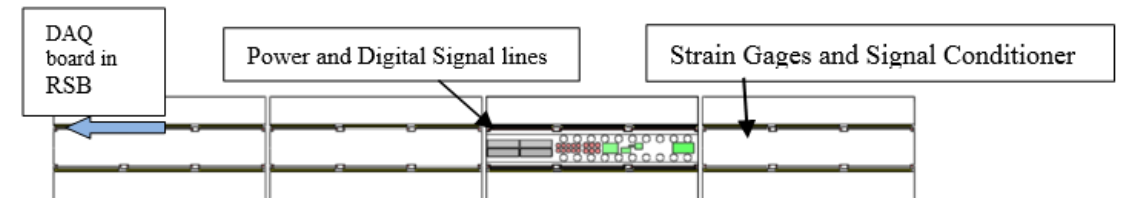
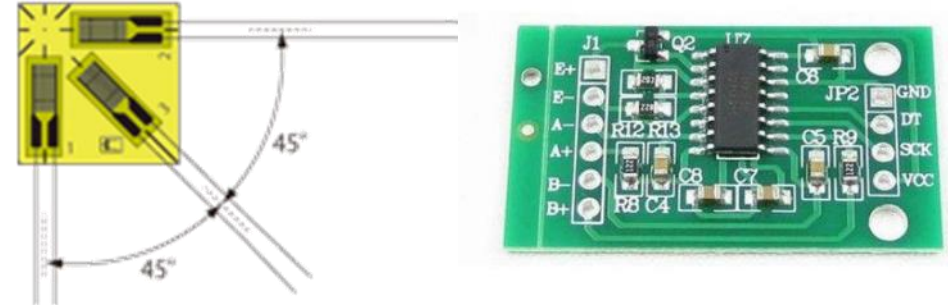
- Installation of a **standardised road marking material with custom profile - acrylic cold plastic** - abrasion resistant, no length, width or colour restrictions.
- **Height restriction is 10mm** for the overall encapsulated and painted strip (for majority of European roads); **3-5 mm stricter restriction for some roads.**

➔ STRIP max height: 8,5 mm

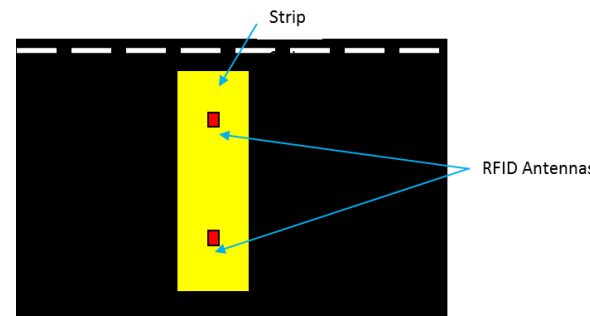


Inside the strip

- Sensors measuring temperature, gas & humidity
- Strain gauges for measuring road pavement deformation (two strain gages per lane, placed at right angle to each other)
- Switches for vehicle (& speed, direction) detection
- RFID-based system for vehicle identification – For personalisation of information!
- 6 Primary (200mAh each) and 10 secondary batteries (40mAh each) & 20 Piezo, 4 solar and 2 RF harvesters



RFID: Protocol EPCglobal Gen 2V2 (ISO 18000-63); One RFID reader per strip



Reader Module



RFID passive tags



Reader module with motherboard



RFID antenna 13x10 cm

Type and scope of collected data



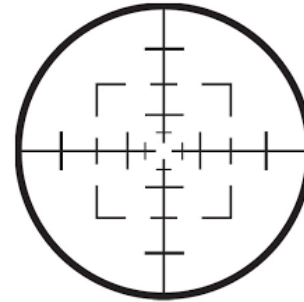
Data Type

Dynamic environmental parameters (i.e. temperature, humidity, water, ice, oil, smoke)

Dynamic friction coefficient (road sensors data fusion with vehicle “intelligent” tyre info)

Passing vehicle transit time, speed and position

Static info (speed limit, curvature, asphalt characteristics, crossings, work zones)



Scope

Intelligence for in-vehicle apps

Lane-level virtual corridors for automated vehicles

Road predictive maintenance

Alternative VMS and Toll Stations

SAFE STRIP Iterative testing



CRF, FIAT 500L



CERTH, Lancia Thesis



VALEO demo car - Cruise4U



Piaggio (Beverly)



Piaggio (MP3)



CERTH, Piaggio MP3 Hybrid



CONTI test vehicle



- 4 rounds (2 of them with user trials in real-traffic)
- 7 demonstrators
- 5 test sites
 - 2 highways (A22 in Italy & Attiki Odos in Greece)



Expected Impacts

- Reduction of highway fatal accidents \approx 5% - 8%
- Reduction of fatal accidents at specific traffic scenarios (i.e. merging/intersections) \approx 15% - 30%
- Cost saving for infrastructure \approx 50%-95%
- Cost saving for driver/rider \approx 95% - 100%

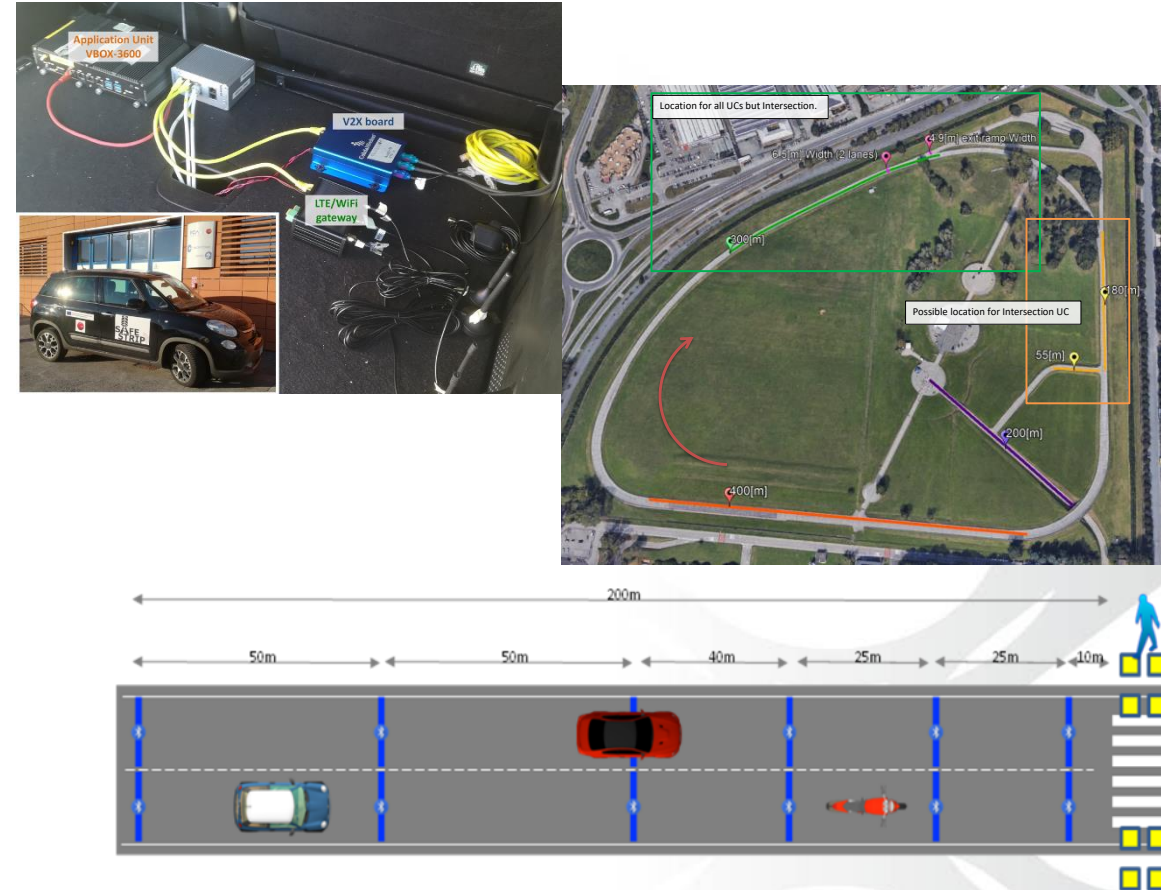
******Depending on the business model & the penetration rate***

System can be extended:

- In other modes
- For other C-ITS applications
- For other conceptual contexts (i.e. SAFE STRIP in pavements)

Current progress

- In the middle of iterative implementation on all levels (infrastructure, apps & demonstrators)
- Getting prepared for the first holistic setup in our test sites to test apps with users of equipped and non-equipped vehicles (cars & PTW's) under real-life conditions – **June 2019.**
- **Our final workshop with live demo will come beginning of 2020 – Stay tuned!**





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www.safestrip.eu



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