E-CORRIDOR

Privacy issues and automotive sector

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Consiglio Nazionale delle Ricerche

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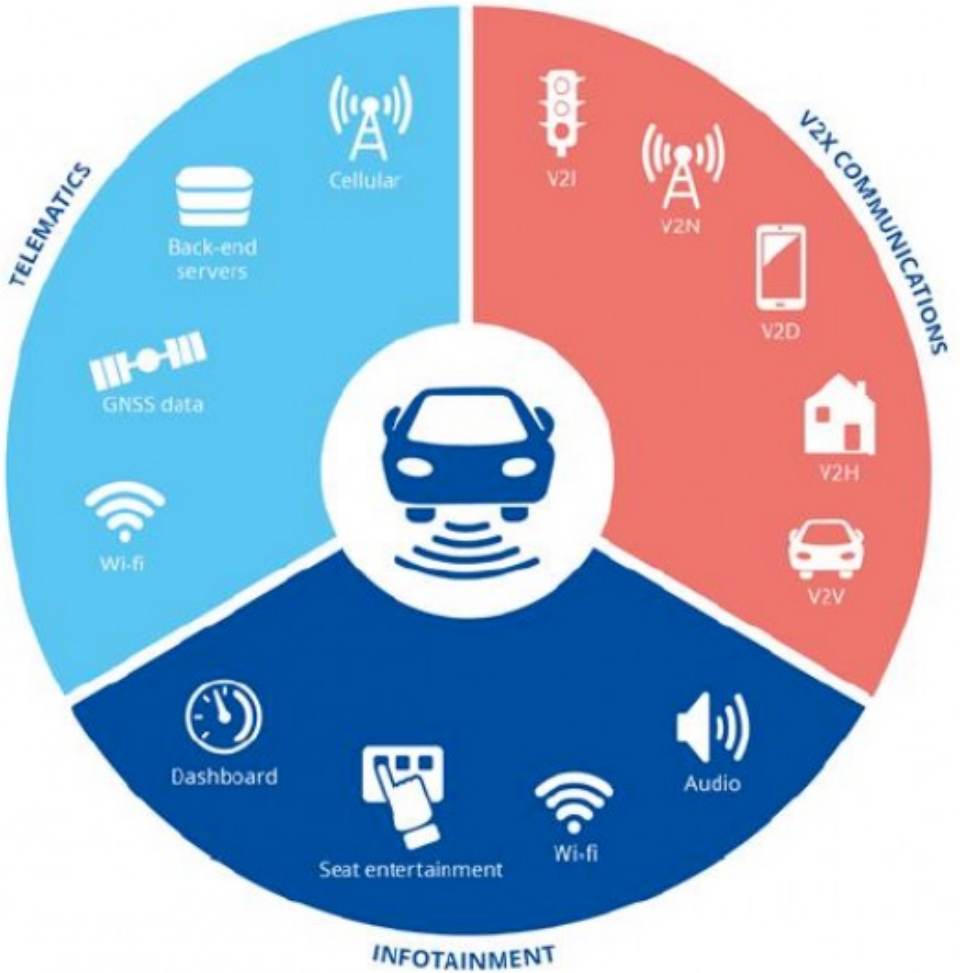
Outline

- Data within a vehicle
- Car maker privacy policies
  - Analysis of privacy policies
  - Data categorization
- How data can be used
  - Driver DNA
- Conclusion

Vehicle data

A huge amount of data is generated during the driving experience



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Our Goal - 6 questions

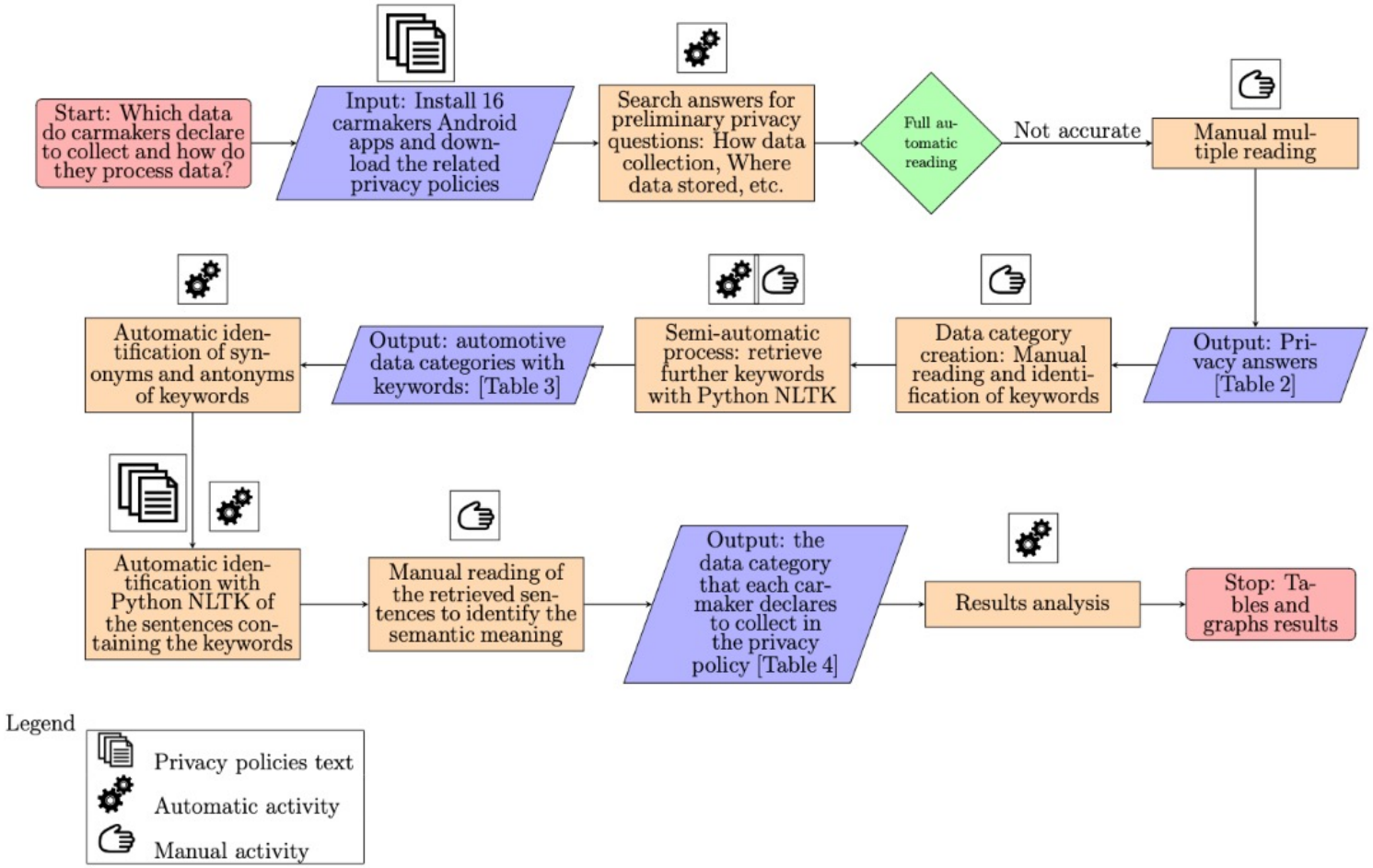
1. How data are collected from a car
2. Where data are stored
3. How data are protected
4. How long data are strored
5. Why data are collected
6. Third party sharing

Car Maker privacy policies

Each car maker has a proprietary app with a privacy policy

Company	App Name
Audi	myAudi
BMW	My BMW
Citroen	My Citroen
Fiat	Uconnect LIVE
Ford	FordPass
Hyundai	Bluelink Europe
Kia	Kia UVO (UVO Connect)
Mercedes	Mercedes Me
Opel	myOpel
Peugeot	myPeugeot
Renault/Dacia	MY Renault
Skoda	MySkoda (Skoda Connect)
Tesla	Tesla
Toyota	MyT
Volkswagen	We Connect

Our analysis workflow

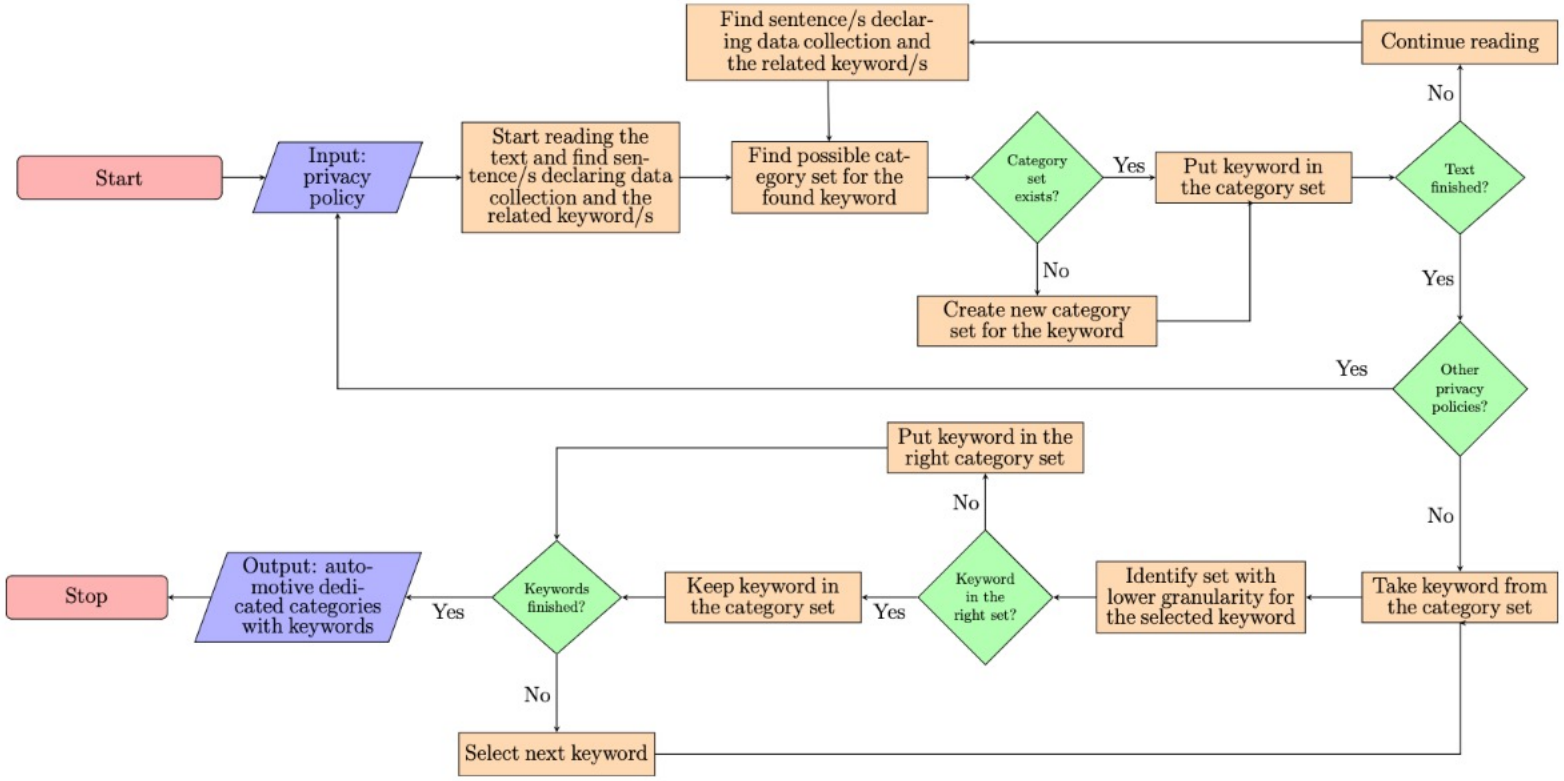


Analysis results

Y = provided ; N = not provided or too generic. In *italics* direct quotes from the relative document.

Company	How data are collected	Where data are stored	How data are protected	How long data are stored after inactivity	Why data are collected	Third party sharing
Audi	Y	Y	only for Adobe Analytics	up to 30 years	Y	Y
BMW	Y	Y	state-of-the-art technology	some data more than 5 years	Y	Y
Citroen	N	Y	N	10 years	Y	Y
Fiat	N	Y	N	*until necessary*	Y	Y
Ford	N	Y	*reasonable security*	*until necessary*	Y	Y
Hyundai	N	N	N	some data up to 10 years	Y	Y
Kia	N	Y	N	up to 10 years	Y	Y
Mercedes	N	N	privacy by design	*until necessary*	Y	Y
Opel	Y	Y	N	10 years	Y	Y
Peugeot	Y	Y	N	10 years	Y	Y
Renault/Dacia	Y	Y	N	variable period	Y	Y
Skoda	Y	N	N	6 months after delete of account	Y	Y
Tesla	Y	N	*appropriate countermeasures*	*necessary period*	Y	Y
Toyota	N	N	*appropriate security*	*as long as necessary*	Y	Y
Volkswagen	Y	Y	N	*erased after purpose*	Y	Y

Data category – semi automatic approach



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Data category

Category	Keywords	Category	Keywords
PII	• Name • Surname • Address • Date of birth • Mobile number • Email address • License plate number	**Geolocation**	• Position • GPS time • Speed • Directions • Traffic • Departure and destination name • Estimated travel time • Point-of-interest searching (POI)
Driver's Phone	• IP address • MAC address • OS version • Browser Information	**Financial**	• Customer ID • Credit card number • Purchasing • Financial data for payments • Fuel costs
Offences and Violations	• Speeding • Information on car accident • Information on airbag usage • Vehicle security systems usage	**Driver's Behavior**	• Driving style • Travels statistics • Steering movements • Accelerator and brake usage
Vehicle Status	• Vehicle Identification Number (VIN) • Engine status • ECUs status • Oil level • Tyre pressure • Automatic maintenance requests • Maintenance history	**Surrounding vehicle environment**	• Detected signs and lanes • Environment • Static and dynamic objects near the car • Side distance from near objects • Climate • Light influx
Voice and Messages	• Emergency call • Voice controls • To perform voice recognition • Messages and chat with call center	**App Usage**	• Behavior • Logs • Time • Duration

Car maker point of view

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DECLARED DATA COLLECTION ● = declared ; ○ = not declared										
Company	**Personal**	**Geolocation**	**Driver's Phone**	**Financial**	**Offences and Violations**	**Driver's Behavior**	**Vehicle Status**	**Surrounding Vehicle Environment**	**Voice and Messages**	**App Usage**
Audi	●	●	●	●	●	○	●	○	○	●
BMW	●	●	○	○	○	○	●	●	●	○
Citroen	●	●	●	○	○	○	●	○	○	●
Fiat	●	●	○	○	○	○	○	○	○	○
Ford	●	●	●	●	○	●	●	●	●	●
Hyundai	●	●	●	○	○	○	●	○	●	●
Kia	●	●	○	○	○	○	●	○	●	○
Mercedes	●	○	○	○	○	○	○	○	○	○
Opel	●	●	●	○	○	○	●	○	○	●
Peugeot	●	●	●	○	○	○	●	○	○	●
Renault/Dacia	●	●	●	●	○	●	●	○	○	●
Skoda	●	●	○	●	○	○	●	○	●	●
Tesla	●	●	●	●	●	●	●	●	●	●
Toyota	●	●	○	○	○	○	●	○	○	○
Volkswagen	●	●	●	●	○	●	●	●	●	●

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Why should a user subscribe to these policies?

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DRIVES

- DRIVES -> DRIVEr Services
- It allows drivers to get rewarded for their driving style

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TARGET

E-CORRIDOR

- For a safer and more sustainable mobility with a rewarding system and direct impact on the driver

People Interest: Save Money

Incentive safe and green driving

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TARGET

- Personalized services

  - Car sharing
  - Recharging station
  - Restaurant / Market
  - Maintenance service
  - …

In general, every service provider joining E-Corridor

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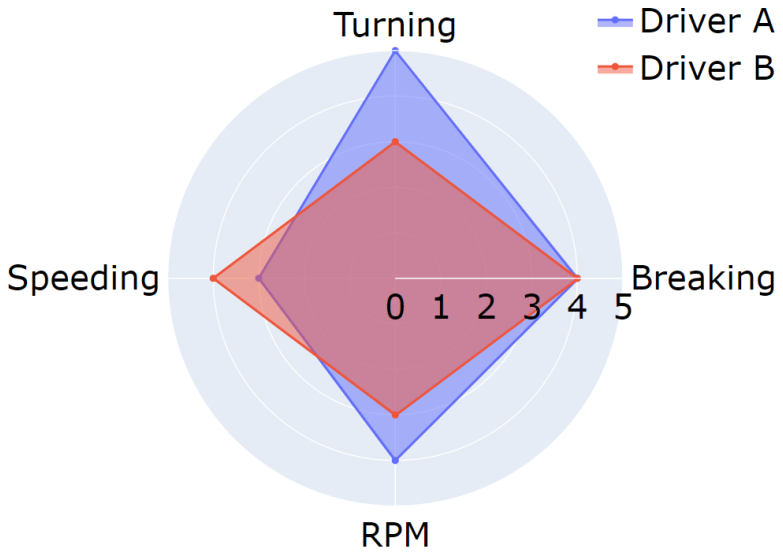
HOW TO DEFINE THE DRIVING STYLE? DRIVER DNA

Metric composed of four vehicle parameters which define different driving attitudes :

- Turning
- Breaking
- Speed
- RPM



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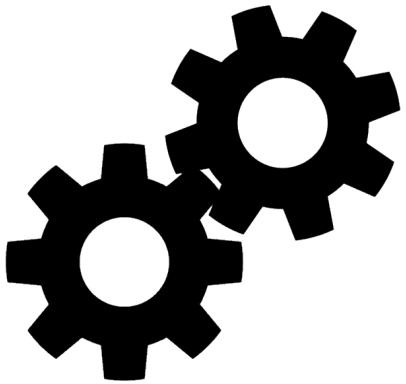
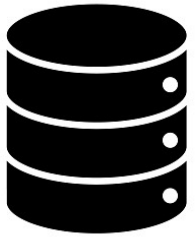
DRIVER DNA


```
"1638346164442": {
    "lat": 44.31858635,
    "long": 9.33896889,
    "bea": 289.5,
    "vin": "",
    "ENGINE_RPM": "1348RPM",
    "BAROMETRIC_PRESSURE": "101kPa",
    "TIMING_ADVANCE": "...UNABLETOCONNECT",
    "THROTTLE_POS": "NODATA",
    "SPEED": "21km\/h",
    "MAF": "22.16g\/s",
    "FUEL_RAIL_PRESSURE": "49000kPa",
    "AMBIENT_AIR_TEMP": "NODATA",
    "ENGINE_RUNTIME": "NODATA",
    "AIR_INTAKE_TEMP": "15C",
    "DESCRIBE_PROTOCOL": "AUTO",
    "VIN": "...0140:490201202020",
    "ENGINE_LOAD": "5.9%",
    "INTAKE_MANIFOLD_PRESSURE": "119kPa",
    "FUEL_LEVEL": "31.8%",
    "ENGINE_COOLANT_TEMP": "29C"
},
```

Driver DNA Calculation

[e.g. 1200 rpm]



Other drivers database

[e.g. 1200 -> second quantile]

Which quantile?

DRIVER DNA [e.g. 4,3,1,2]

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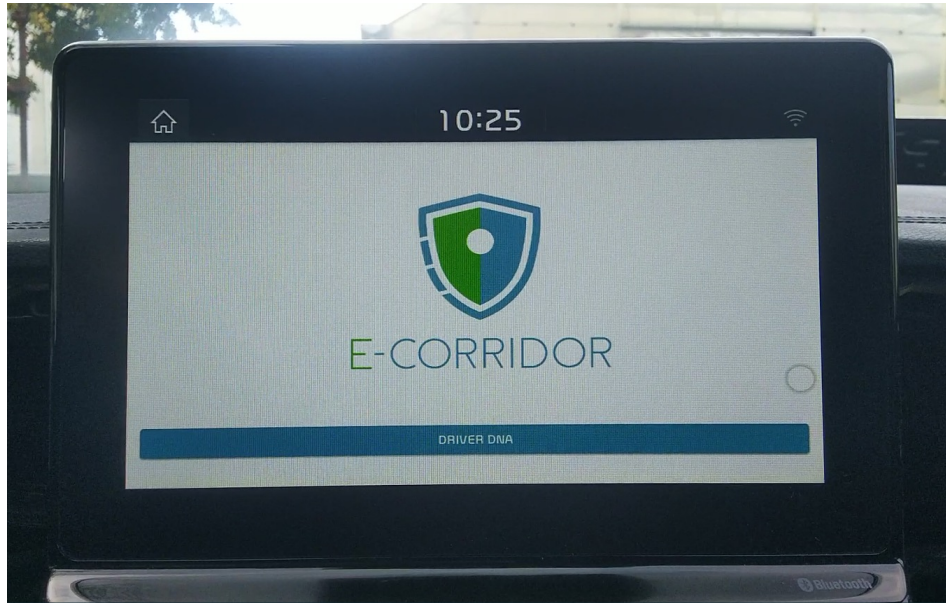
INFRASTRUCTURE: IN-VEHICLE



OBD-II dongle located under the dashboard beneath the steering wheel column.

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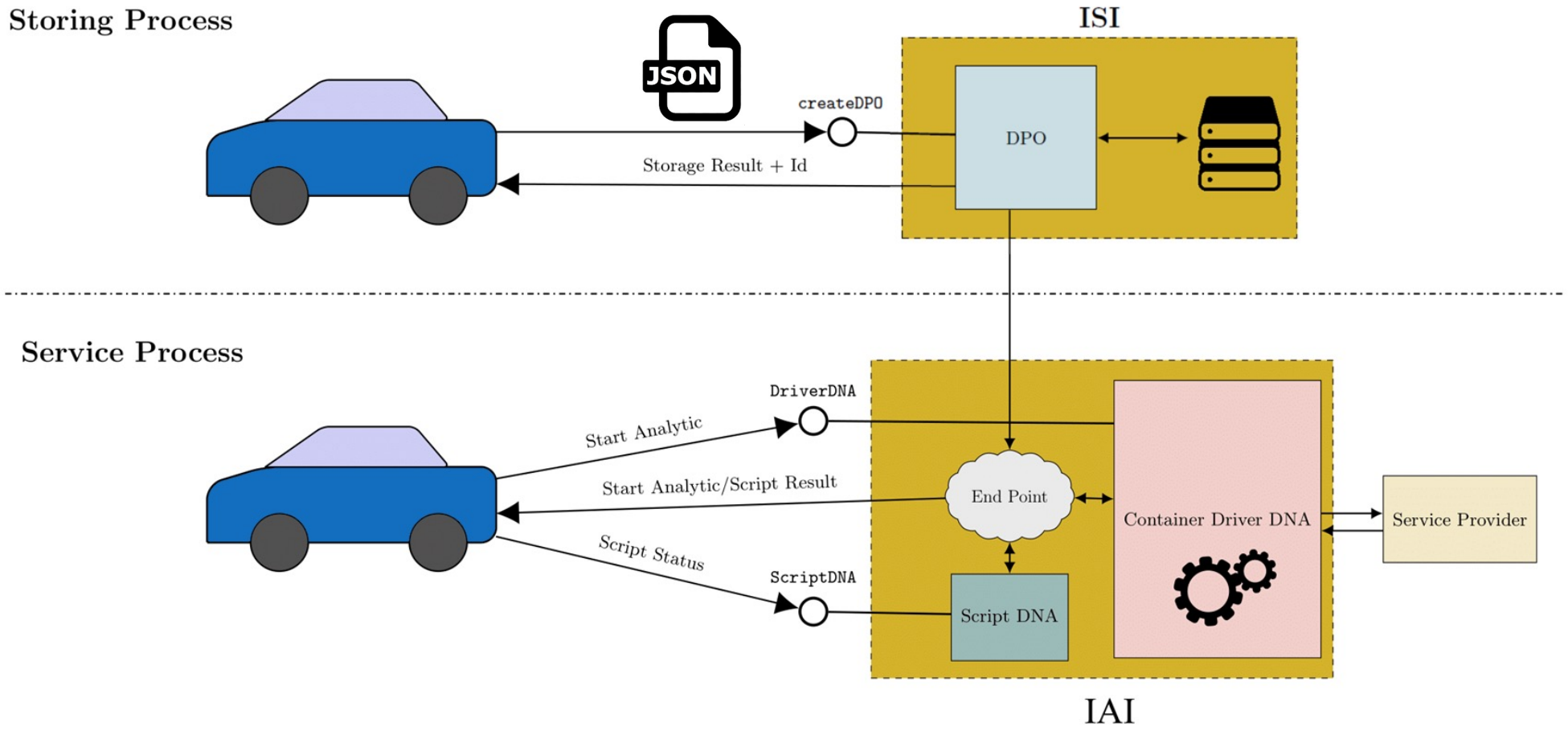
INFRASTRUCTURE: OUT-OF-THE-VEHICLE



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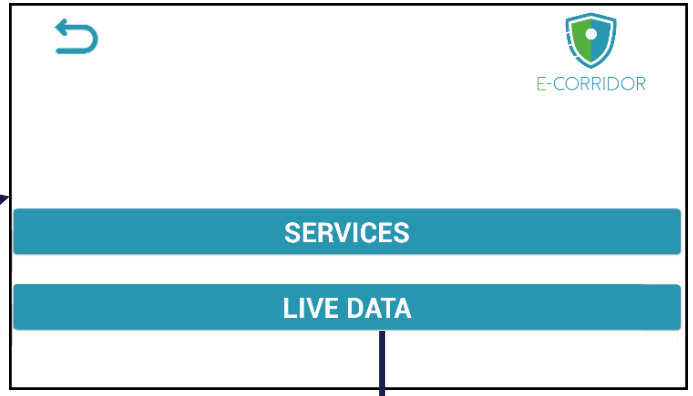
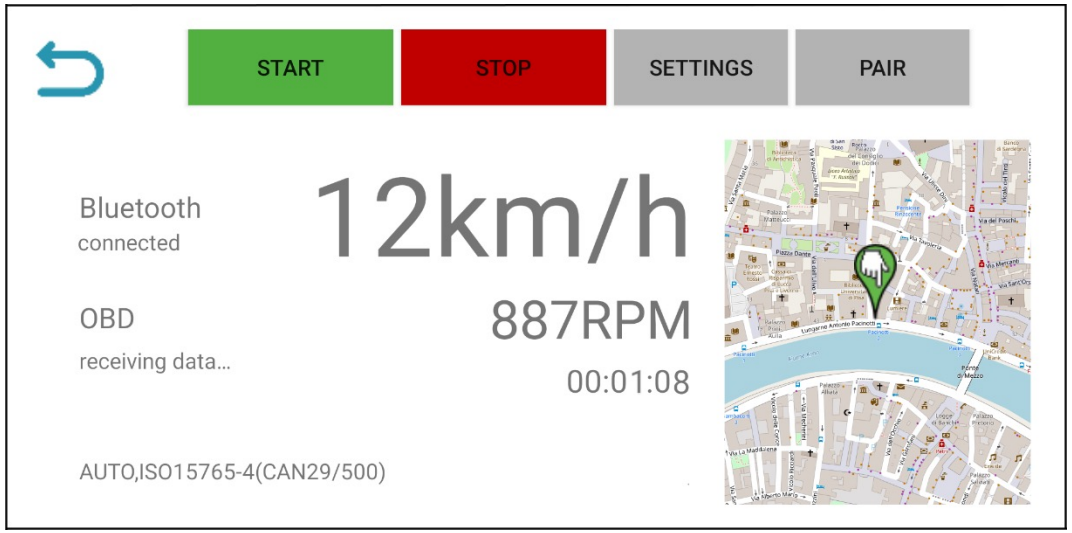
DRIVES' LAYOUT

Home Page



Menu Page



Live Data Page

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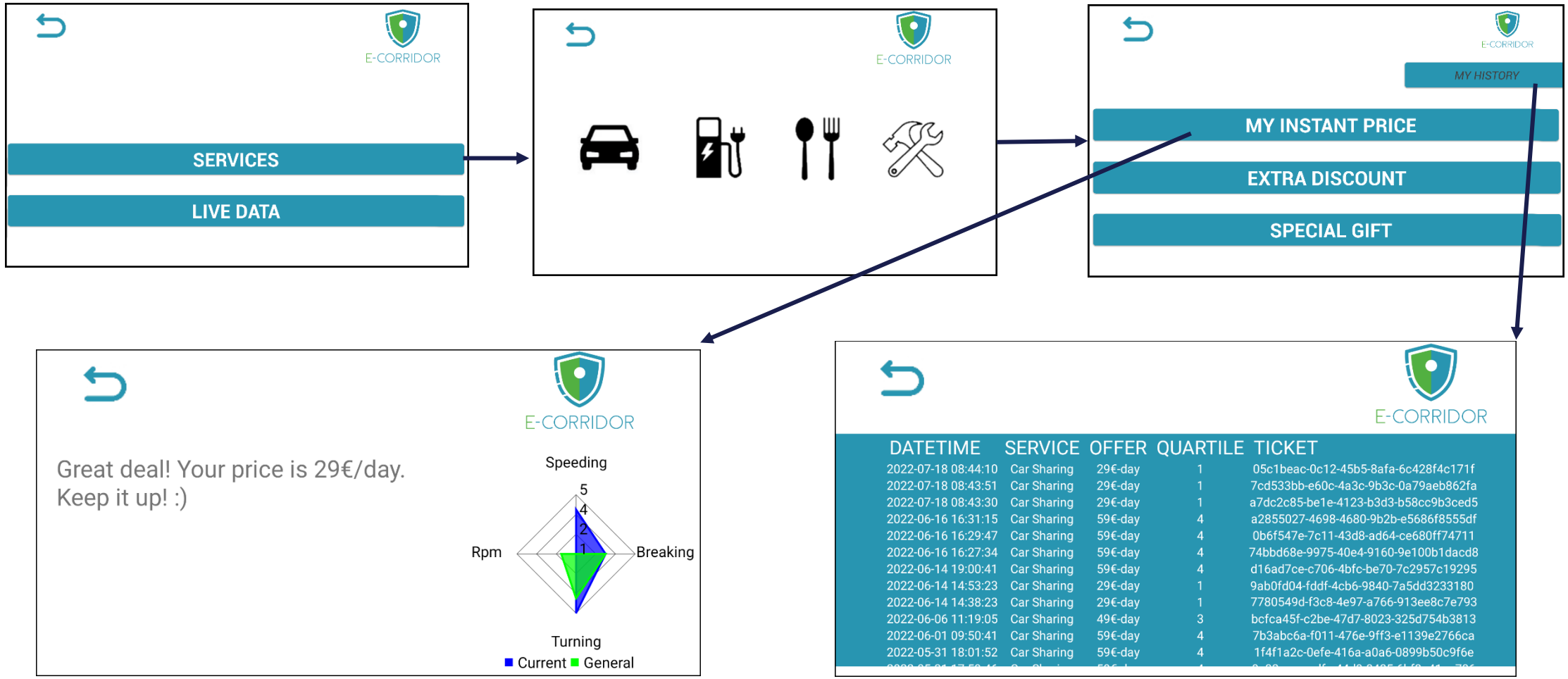
DRIVES' LAYOUT



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Video

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E-CORRIDOR
Edge Enabled Privacy & Security Platform
For Multi Modal Transport

Thanks!

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