SIS 27 - Connectivity and Automation: latest development and future challenges

Francisco Sánchez - CTAG
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4. SUMMARY
Challenges for CAD

Testing and Validation

Connectivity

Sensors and perception

Functions and control

Road and infrastructure adaptation

Legislation

HMI and Human Factors

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CAD Testing approach

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Testbeds in Europe – Cooperative systems

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Testbeds in Europe – Cooperative systems

5 sites en France:
- IdF
- Bretagne
- Grand Est
- Bordeaux
- Isère

3 sites en Europe:
- Espagne
- Portugal
- Autriche
Testbeds in Europe – Towards CAD. L3PILOT

- Crossborder
  - Austria: Germany
  - Austria: Italy
  - Belgium: Germany
  - Belgium: Netherlands
  - Finland: Sweden
  - France: Germany
  - Germany: Netherlands

- Country, region - OEM
  - BE, Brussels; NL; ES, Barcelona - Toyota
  - DE, Aachen - Ford
  - DE, Ingolstadt - Audi
  - DE, Munich - BMW
  - DE, Offenbach - Honda
  - DE, Wolfsburg - VW
  - FR, Paris and other regions - REN, PSA
  - IT, Turin - CRF
  - LU; NL - Delphi
  - SE, Gothenburg;
  - UK, London - Volvo
  - UK, Coventry - JLR

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WWW.L3PILOT.EU

AUSTRIA, BELGIUM, FINLAND, FRANCE, GERMANY, GREECE, ITALY, NETHERLANDS, NORWAY, SWEDEN, SWITZERLAND, UNITED KINGDOM

1,000 test drivers and 100 vehicles in 11 European countries tests the viability of automated driving as a safe and efficient means of transportation. L3Pilot focuses on large-scale piloting of SAE Level 3 functions, with additional assessment of some Level 4 functions. It is co-funded by the European Union under the Horizon 2020 programme, Grant Number 723051, and is supported by the European Council for Automotive R&D.
Testbeds in Europe – Towards CAD. AUTOPILOT

**Brainport, NL**
- Automated Valet Parking
- Highway pilot
- Platooning

**Tampere, FI**
- Automated Valet Parking
- Urban Driving

**Versailles, FR**
- Automated Valet Parking
- Urban Driving
- Platooning

**Daejeon, KR**
- Urban Driving

**Vigo, SP**
- Urban Driving
- Automated Valet Parking

**Livorno, IT**
- Urban Driving
- Highway pilot

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100 ‘normal’ families will experience self-driving Volvo XC90s on public roads in Gothenburg

- The project was kicked off in 2013, and the pilot begins in 2017
- Similar pilots will later be run also in London and China
## Testbeds in Europe – Towards CAD. CONCORDA EATA Project

<table>
<thead>
<tr>
<th>Use case</th>
<th>Technologies</th>
<th>Sites</th>
</tr>
</thead>
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<tr>
<td><strong>STEP 1</strong>&lt;br&gt;Enabling services for&lt;br&gt;- Highway chauffeur (L2/3)&lt;br&gt;- High density truck platooning</td>
<td>Pre-Deployment:&lt;br&gt;- hybrid communication: LTE, ITS GS + LTE V, Mobile Edge Computing applications&lt;br&gt;- Network slicing&lt;br&gt;- LTE Broad casting: GNSS offset, hazards and HD-maps updates&lt;br&gt;Studies: business models responsibilities, safety concepts, Quality of service, Security and data protection Regulation and standardization</td>
<td>DE, FR, NL, ES, BE &lt;br&gt;20.40 km tracks &lt;br&gt;20+40 km tracks</td>
</tr>
</tbody>
</table>

| **STEP 2**<br>As step 1<br> + Valet parking | Application above technologies and studies | Cross border motorways networks |

| **STEP 3**<br>As step 2<br>Automated driving | Industrialization | Commercialisation on AD authorized motorways |

### Concorda system overview

- Service Creation Environment
- Simulcast data aggregation/casting (GNSS corrections, etc.)

### Key Dates

<table>
<thead>
<tr>
<th>Year</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
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SISCOGA™ Testbed. TMCs (DGT and Vigo Council)
SISCOGA$^{4CAD}$ Testbed. TMCs (DGT and Vigo Council)
SISCOGA\textsuperscript{4CAD} Testbed. Proving Grounds

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SISCOGA$^4$CAD Testbed. Real Corridor

• ITS Corridor of more than 130 Km of Urban (Vigo) and interurban roads (AP9, A52, A55)
• ITS G5: 80 RSUs
• Cellular: 3G/4G and LTE/V2X, 5G
• Connected with Portuguese ITS Corridor
SISCOGA$^4$CAD Testbed. Stakeholders and Partners

- DGT
- CTAG Centro Tecnológico de Automoción de Galicia
- CONCELLO DE VIGO
- PSA GROUPE
- CEAGA
- Telefonica
- VITRASA
- Central Radio Taxi Vigo
- ESYCSA
- Little
## SISCOGA4CAD Testbed. Cooperative FOTs and Pilots

<table>
<thead>
<tr>
<th>R&amp;D</th>
<th>FOT</th>
<th>PILOT</th>
<th>DEPLOYMENT</th>
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<td>2016</td>
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<td></td>
<td></td>
<td></td>
<td>2017</td>
</tr>
</tbody>
</table>

- **C2ECOM**
- **SISCOGA NATIONAL FOT**
- **SISCOGA DRIVE-C2X FOT**
- **COMPASS4D PILOT**
- **CO-GISTICS**
- **SCOOP**

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SISCOGA$^{4CAD}$ Testbed. Example of results (COMPASS4D)

Emergency vehicle priority service
SISCOGA\textsuperscript{4CAD} Testbed. Hybrid Architecture
SISCOGA$^4$CAD Testbed. DGT instruction for testing CAD prototypes

**LEGAL ISSUES**

**INSTRUCTION 15/V-113:** Authorization to conduct tests or research trials of automated vehicles on roads open to general Traffic.

- Applicant must provide a **system certification**, complying with the Annex I requirements.
- The authorization procedure is really **swift and flexible**.
- **Mutual recognition** with other Member States

*Future: Type approval → Software certification*
SISCOGA$^4$CAD Testbed. Next activities and pilots

**Projet SCOOP**
January 2016 – December 2018
- **Functions:**
  - Selected Day 1 Cooperative Services
- **Fleet:** 10 Connected Vehicles
- **Location:** SISCOGA$^4$CAD Interurban and Portuguese Corridor

**AUTOPilot**
July 2017 – June 2020
- **Functions:**
  - AUTOMATED VALET PARKING
  - URBAN AUTOPilot
- **Fleet:** 4 CAD Vehicles
- **Location:** SISCOGA$^4$CAD Urban (Vigo)

**CONCORDA PROPOSAL**
July 2017 – December 2020
- **Functions:**
  - HIGHWAY CHAUFFEUR
- **Fleet:** 5 CAD Vehicles
- **Location:** SISCOGA$^4$CAD Interurban

**C-MOBILE**
June 2017 – November 2020
- **Functions:**
  - Traffic Efficiency (Green priority, GLOSA, Dynamic Speed Limits, Probe Vehicle Data)
  - Infrastructure To Vehicle Safety (RWW, RHW, EVW, Signal Violation Warning, Warning System for Pedestrian)
  - Vehicle to Vehicle Safety (Urban ACC, Emergency Brake Light, SVW, VRUs Warning)
- **Fleet:** 20 Trucks, 10 Buses, 30 Cars, 10 Emergency Vehicles, 10 motorcycles
- **Location:** SISCOGA$^4$CAD Urban (Vigo) and Interurban

**C-ROADS SPAIN**
July 2017 – June 2020
- **Functions:**
  - Day 1, Day 1.5 cooperative services
  - Urban Autopilot
  - Automated Valet Parking
  - Highways Chauffeur
  - Last Mile Autonomous Shuttle Services
- **Fleet:** 30 Private Vehicles, 15 Taxis, 30 Buses, 5 Emergency Vehicles, 5 CAD Vehicles
- **Location:** SISCOGA$^4$CAD Urban and Interurban and Portuguese Corridor (cross-tests)

More to come ...
SISCOGA$^{4CAD}$ Testbed. Example AUTOPILOT
SISCOGA\textsuperscript{4CAD} Testbed. Connected Highway Chauffeur
SISCOGA⁴CAD Testbed. CAD Functions for urban scenarios
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Muchas Gracias