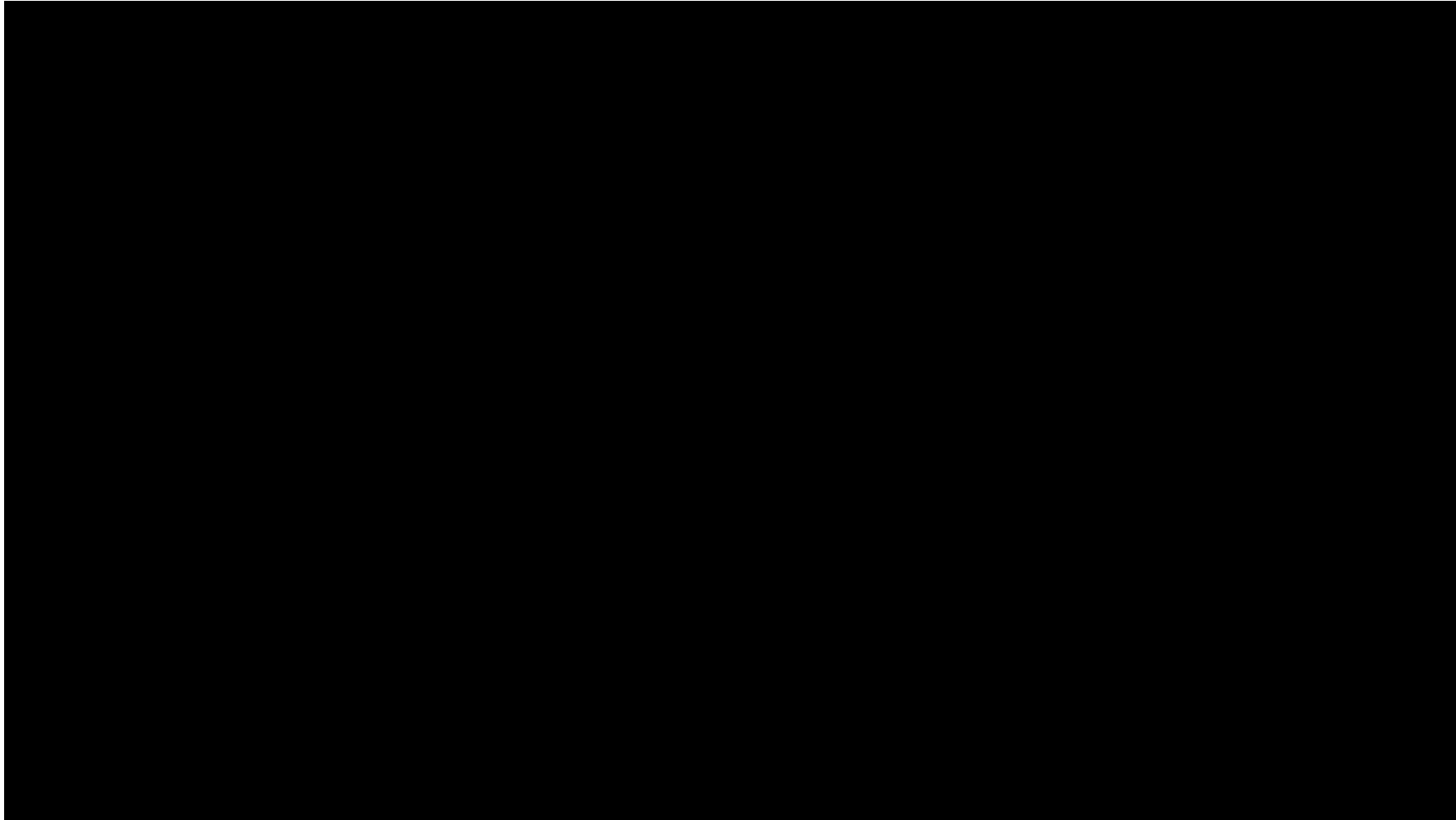


# CARNET

Cooperative Automotive Research Network



[www.carnetbarcelona.com](http://www.carnetbarcelona.com)



**Founding Members**



**Industrial Partners**



# CARNET is an innovation hub for future mobility research and talents

Cooperation Platform started by UPC Barcelona, Volkswagen Group Research and SEAT

- Co-Creation of Urban Mobility Concepts with local Universities and Startups
- Strategic contribution to **strengthen the automotive and mobility sector** in Spain / Catalonia
- Proactive **Recruiting** for the Automotive Industry
- Networking for **international Research Funding** (e.g. in cooperation with international partners)

## Training & Education

- Automotive Engineering Courses
- Industry Expert Lectures
- Postgraduate Program
- International Internship Program
- Industrial Seminar Projects
- Extend Automotive Master

## Cooperative Research

- Bilateral Project Funding
- Initiation of Bilateral Projects
- Showcase CARNET Portfolio
- Industrial Doctorates

## Networking

- International visibility and networking
- Public Projects (H2020)
- Showcase CARNET Portfolio
- Assistance for Project Funding
- **KIC Urban Mobility 2018**

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### Industrial Partners



# CARNET Structure



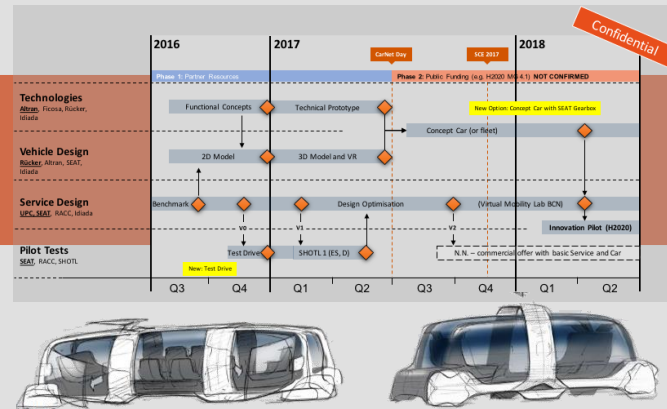
Founding Members	 UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH   VOLKSWAGEN AKTIENGESELLSCHAFT
Lead	 <b>Prof. Dr. Luis Jofre</b> UPC Academic Director CARNET  <b>Dr. Christoph Waller</b> SEAT/CTS Industrial Director CARNET
CARNET Office	 <b>Daniel Serra</b> CIT/UPC Project Manager CARNET  <b>Esther Scherer</b> SEAT/CTS Project Manager CARNET  <b>Monika Bachofner</b> CIT/UPC/TU-BS Education Strategy
CARNET Partners	    

# Cooperative projects

## Projects and Ideas Hierarchy

#	Project Proposal	Project Lead	RACC	RÜCKER LYPSSA	ALTRAN	Applus <sup>+</sup> IDIADA	FICOSA	SEAT	UPC
1	ChEffect: Urban Effects of Mobility Concepts	UPC	●	●	●	●	●	●	●
2	Infotransit	RACC	●	●	●	●	●	●	●
3	Battery Module Balancing	Altran	●	●	●	●	●	●	●
4	Smart City Expo	SEAT	●	●	●	●	●	●	●
5	Driver's Performance Index	RACC	●	●	●	●	●	●	●
6	Tools for automotive ecosystems	SEAT	●	●	●	●	●	●	●

## Projects Cooperation



## Projects Funding



**CARNET Lighthouse Projects: Interdisciplinary Cooperation to be supported by public funding**

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### Industrial Partners



# Education Strategy

## Mission

Leverage the integration of education, industry, government and mobile society in order to make innovative education more efficient and impactful

## Activities

- Interviews with relevant industrial players
- interviews with relevant academic schools and institutions
- SWOT Education for automotive Sector



**identify**

actual and future market requirements

**develop**

a new education ecosystem

**teach**

MOBILITY CHANGERS

### Founding Members



### Industrial Partners



## Successful usecases

### challenges for innovative education and recruitment



3<sup>rd</sup> Creative Lab

“An innovative teaching initiative”



1st Hackathon

“Bringing ideas to life in just 48h”



Forum TIC UPC

“Best Talent for the most innovative challenges”

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## CARNET: Selected Events 2016

### CARNET Innovation Day



Network event in order to showcase the innovation potential of the partners and identify network projects

- Invitation of CARNET initiators, local partners and stakeholder institutions
- Project Showcases and Networking Events
- CARNET public communication to media
- Keynotes on Urban Planning and Smart Cities

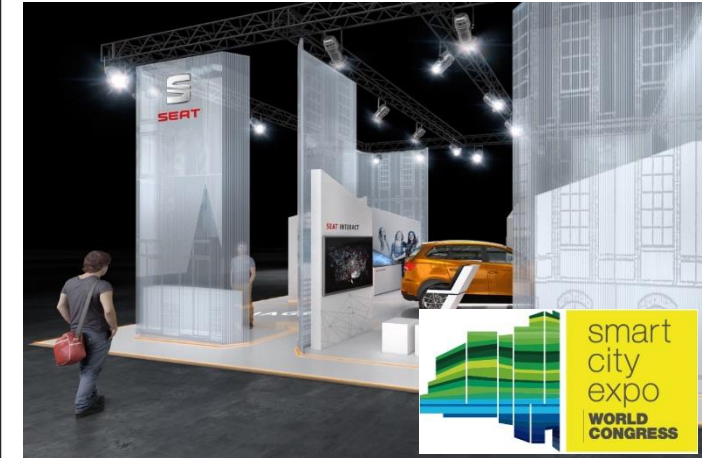
### New Mobility Symposium



Scientific Symposium on intelligent mobility by potential consortium members for a KIC 2018 application

- Invitation of NFF, VW, KTH Stockholm, Scania, Uni Prag, UPC Barcelona, SEAT and others
- Joint initiative by NFF and CARNET
- Scientific Presentations of all parties
- Definition of a research agenda for common European project funding

### Smart City Congress 2016



SEAT and VW Research presentation of a future mobility vision on the Smart City World Expo 2016 in Barcelona

- Showcasing the mobility vision of SEAT with global media attention in Barcelona
- Joint presentation by VW Group research, SEAT and partners in BCN.
- Coordination by CARNET team.

24.11.2016

#### Founding Members

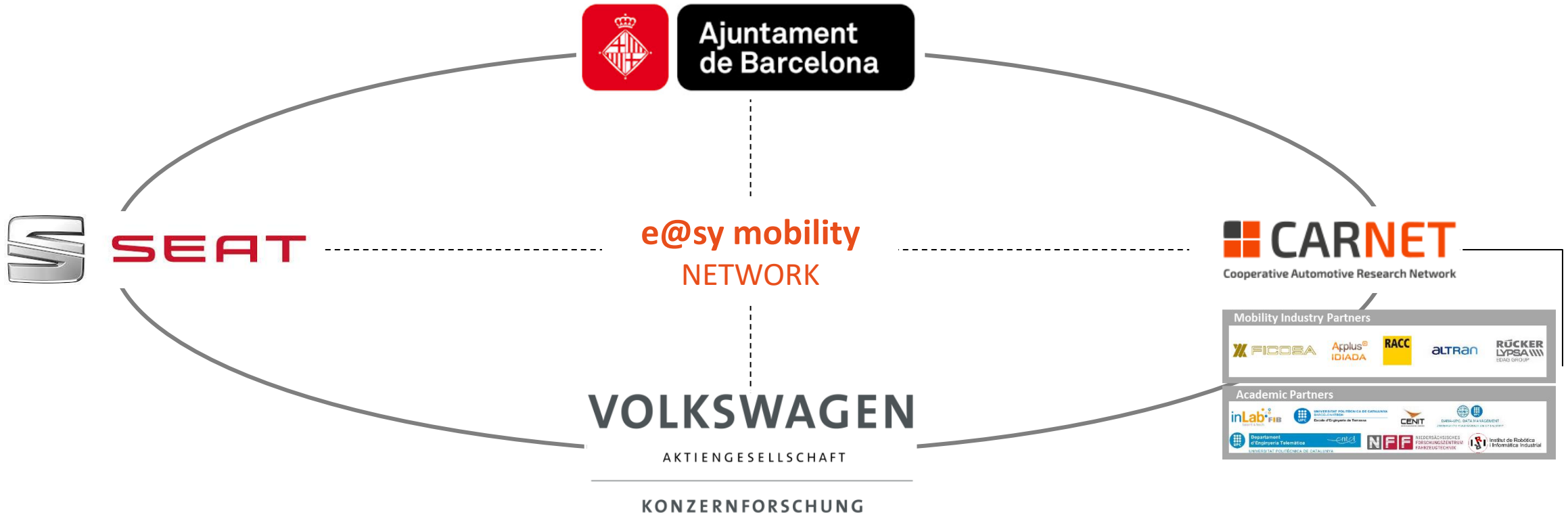


#### Industrial Partners





# Strategic Networking



**Bridging the gap between administrative and industrial mobility concept development**

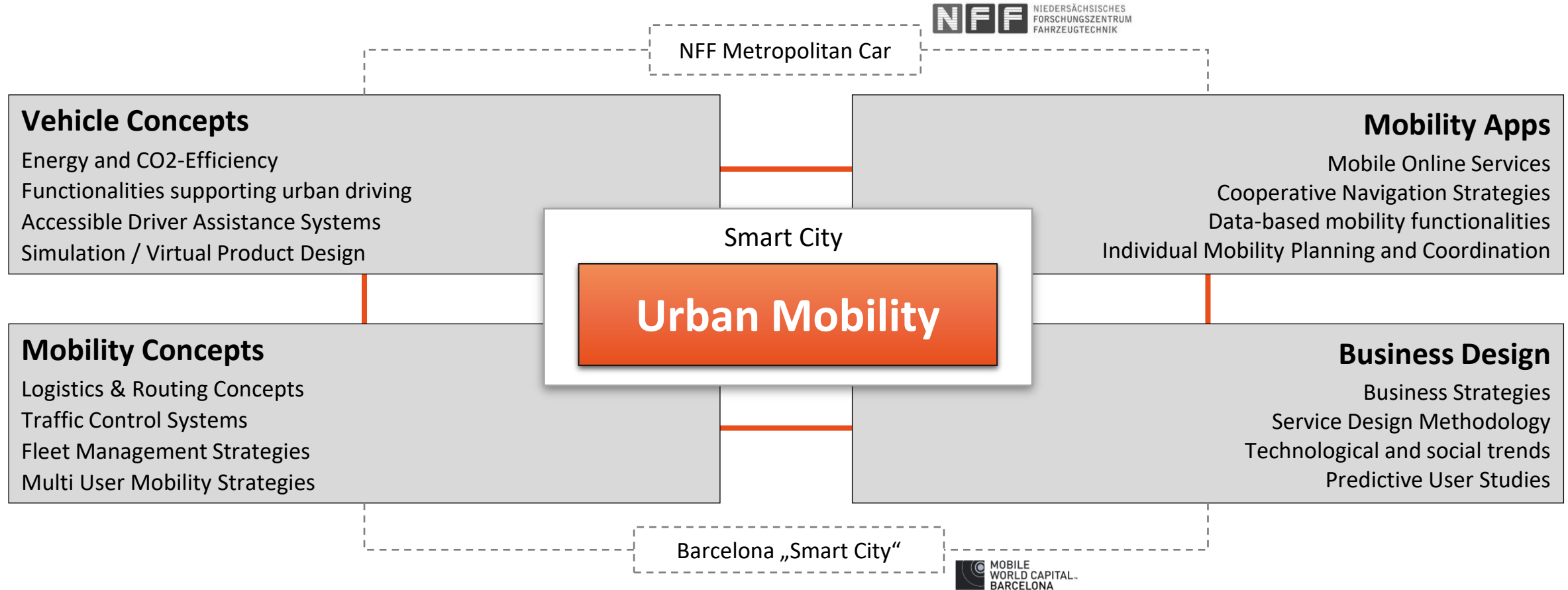
**Founding Members**



**Industrial Partners**



# Fields of Research



**Founding Members**



**Industrial Partners**

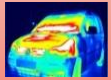


## Selected Pilot Projects

### Vehicle Concepts



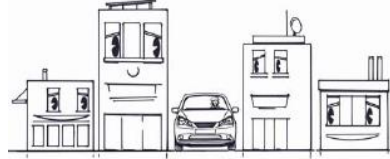
Entry Electric Engine  
Reluctance Machine



Thermal Management  
of Electric Vehicles



Creative Lab(s): Urban  
Vehicle Concepts



Lane Level Urban  
Navigation System



iCity Navigation  
Concepts Barcelona



Smart Automotive  
Text Messaging

### Mobility Apps

### Mobility Concepts



CoCar: Demand  
Responsive Transport



CitEffect - Virtual  
Mobility Lab



Microcity Service  
Parking Concept



Cooperative Fleet  
Data Maps

### Business Design



SEAT Connected  
Sharing Platform



Barcelona  
Community Car

#### Founding Members



#### Industrial Partners



## Selected Pilot Projects

### Vehicle Concepts



Entry Electric Engine  
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# The iCity Technology Framework



## iCity open interface

- The iCity Urban Platform was initiated as an **open API hub** for smart city data exchange in Barcelona
- iCity project aims to develop and implement smart city solutions that allow **third parties** to develop, operate and exploit **services of public interest**
- The Platform integrates data from different smart city clusters such as **mobility, energy, climate, emissions**
- CARNET and SEAT cooperate with Barcelona on iCity based navigation concepts since 2015
- Target: Creation of **new vehicle services** and introduction of **vehicle fleets as data providers**

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### Industrial Partners

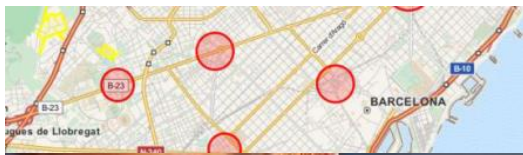


# Smart City Navigation Concepts



## BCN Experience Drive

### 1 Social Navigation



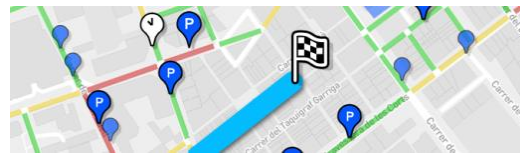
- / KPI Responsive Navi Routing
- / Responds to emissions and events
- / Real time connectivity to City iOS
- / Incentives for social routing

### 2 Smart City Explorer



- / Explorer Mode with Route Planner
- / Multi POI Routing with day planner
- / Integrated booking and billing
- / Driving Safe Tour Guide

### 3 Parking Finder



- / Multi Source Parking Map
- / Onstreet and Offstreet
- / Real time connectivity to City iOS
- / Prediction Mode

### 4 Smart Traffic Lights



- / Green Wave Assistance
- / Micro Routings to avoid waiting
- / Real Time Micro Traffic Prediction
- / Closed Loop with iCity Platform

#### Founding Members



#### Industrial Partners



## Selected Pilot Projects

### Vehicle Concepts



Entry Electric Engine  
Reluctance Machine



Thermal Management  
of Electric Vehicles



Creative Lab(s): Urban  
Vehicle Concepts

### Mobility Apps



Lane Level Urban  
Navigation System



iCity Navigation  
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Microcity Service  
Parking Concept

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Community Car

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# CitEffect: Virtual Mobility Lab Barcelona

## Virtual Modelling of new Mobility Concepts in a Traffic Simulation



**On Demand Tripsharing (CoCar)**  
Sharing of rides that have similar starting areas and destinations (P2P or professional service)



**Social Navigation / Balanced Mobility**  
Social Navigation Strategy to avoid traffic and emission peaks through chronological and local distribution of trips



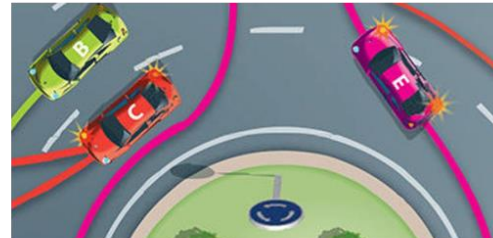
**Microcity Service Parking**  
Multimodal Mobility Exchange Station at the city border with innovative service parking offers



**E-Vehicle and E-Bike**  
Vehicle with electric drivetrain with standard size but improved emissions and driving behavior



**Last Mile Device**  
Minature Vehicle to be used for short distances or as last mile transportation after parking the car



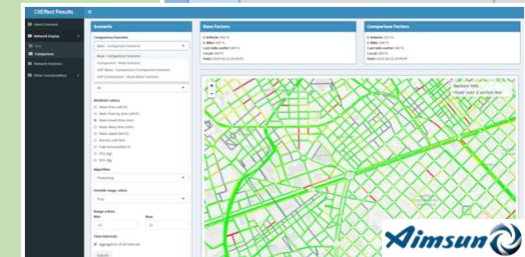
**Lane Level Navigation**  
Lane level guidance to avoid last minute lane changes and improve the traffic flow (calibrated with test fleet data in BCN)

## Complex Traffic Simulation

### VIRTUAL MOBILITY LAB

#### Simulated Urban KPIs

KPI	Description	Driver	City
1	density	Mean Density (veh/km)	x x
2	flow	Mean flow by lane (veh/h)	x
3	ttime	Mean Travel Time for 1km (sec/km)	x
4	dtime	Mean Delay Time for 1km compared to ideal (sec/km)	x
5	speed	Mean speed (km/h)	x x
6	travel	Total travelled distance of all vehicles (km)	x



Map View Interface

**CitEffect is a complex urban mobility simulation that is able to predict urban mobility KPIs**

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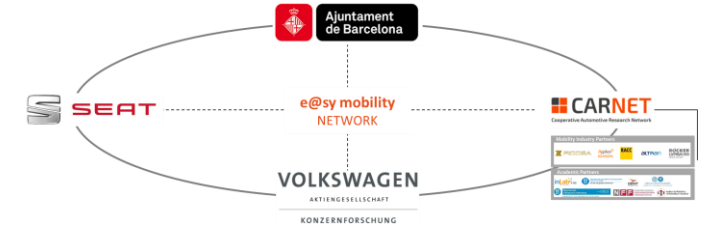


#### Industrial Partners





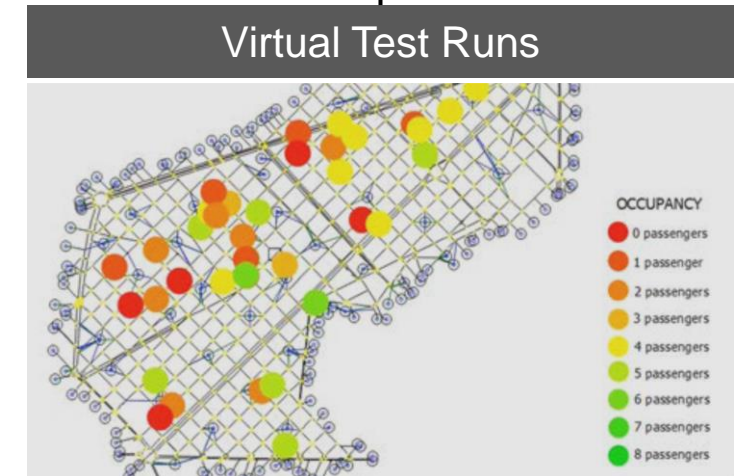
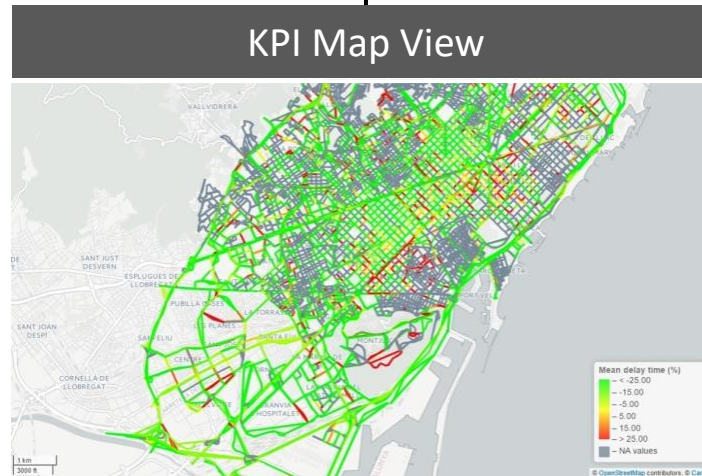
# CitEffect: Results Examples



+

### Global KPIs

Concept	P-Rate	density	flow	ttime	dttime	speed	travel	ttime	CO2	NOx	fuelc
E-Vehicle	15%	-0,6%	0,1%	-0,6%	-5,3%	0,1%	-0,1%	-1,1%	-28,0%	-15,2%	-28,0%
	30%	-2,1%	-0,3%	-2,4%	-20,4%	0,9%	-0,1%	-2,3%	-51,1%	-30,3%	-50,9%
Tripsharing	15%	-14,9%	-12,4%	-4,2%	-34,9%	2,1%	-11,2%	-14,8%	-21,1%	-11,8%	-20,2%
	30%	-26,7%	-23,7%	-5,4%	-45,6%	3,2%	-22,4%	-26,5%	-40,0%	-23,1%	-38,8%
Microcity	2x5T	10,1%	-2,2%	2,7%	23,2%	-0,7%	-4,0%	-1,8%	-9,0%	-8,6%	-3,8%
	2x10T	-1,3%	-0,7%	-0,8%	-6,7%	0,0%	-0,4%	-1,1%	-0,6%	-0,7%	-0,4%
Social Nav	15-25-30-30	-2,3%	-0,3%	-3,3%	-27,7%	1,5%	1,1%	-1,8%	-5,9%	0,6%	-4,9%
	25-25-25-25	-2,3%	1,6%	-4,5%	-38,5%	2,1%	4,5%	0,1%	-6,6%	3,9%	-5,1%
MIX 1 (2020) TS: 15%, BM: 15-25-30-30		-15,6%	-11,9%	-5,5%	-46,3%	3,0%	-10,2%	-15,0%	-25,8%	-11,0%	-24,4%
MIX 2 (2025): EV: 15% TS: 30%, BM: 25-25-25-25		-26,5%	-22,1%	-6,9%	-57,7%	4,2%	-19,2%	-24,7%	-59,7%	-32,1%	-58,6%
MIX 3 (2030): EV: 30%, MC: 2x10T, TS: 30%, BM: 25-25-25-25		-26,1%	-22,0%	-6,5%	-54,8%	3,9%	-19,1%	-24,3%	-72,5%	-43,9%	-71,8%



CitEffect is a powerful planning tool for mobility concepts pilots in city partnerships

#### Founding Members



#### Industrial Partners



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Industrial Partners



# Gràcies!



[www.carnetbarcelona.com](http://www.carnetbarcelona.com)