

IoT-rješenja za digitalnu transformaciju gradova



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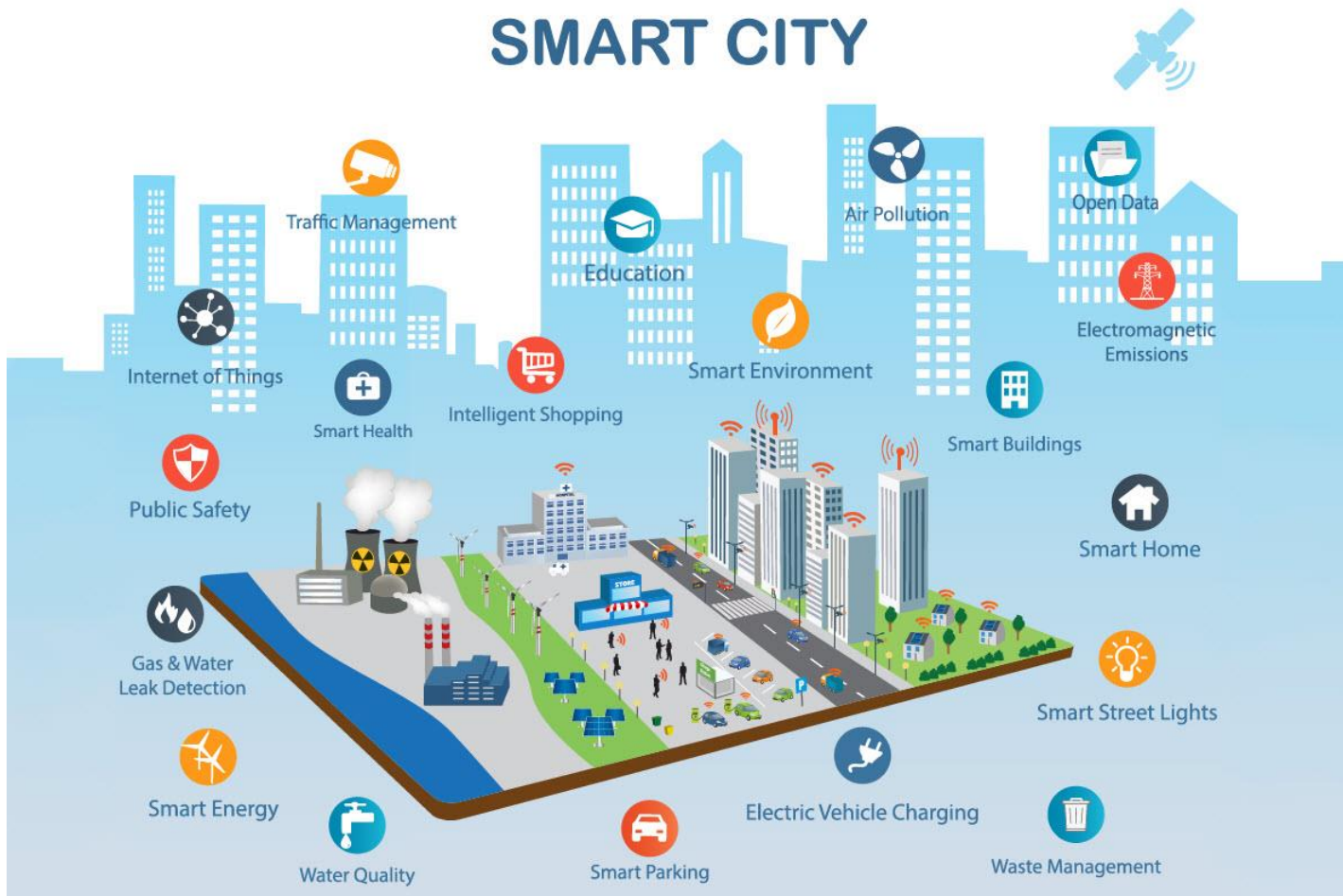
The Earth Will Don An Electronic Skin

„In the next century, planet earth will don an electronic skin. It will use the Internet as a scaffold to support and transmit its sensations.”

Neil Gross

30. kolovoza 1999

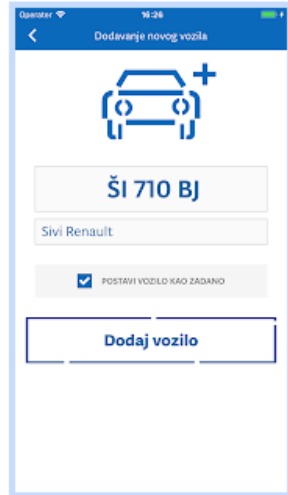
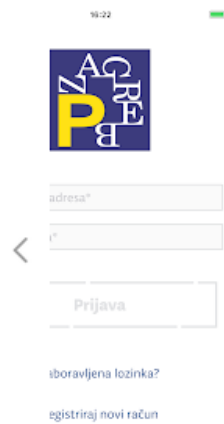
Koncept „pametnog” grada



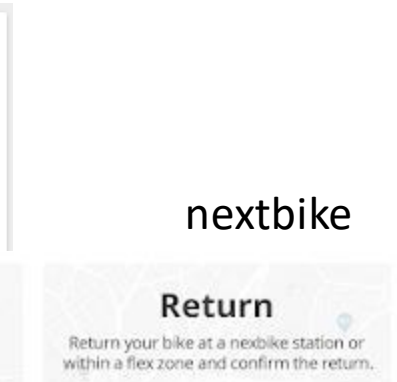
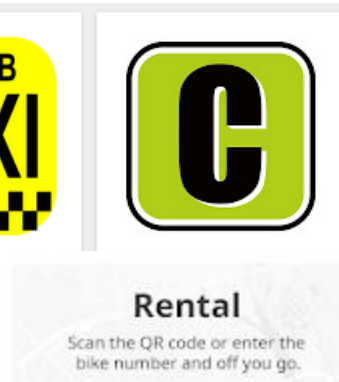
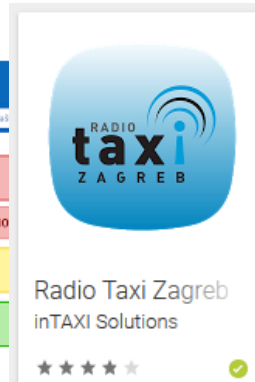
Umreženi uređaji i inovativne IKT usluge su pokretači razvoja održivih i tehnološki naprednih gradova u službi **građana i gradskih službi.**

- ◆ Javni prijevoz
- ◆ Parkiranje
- ◆ Gradski promet
- ◆ Zbrinjavanje otpada
- ◆ Mjerenje buke, kvalitete zraka
- ◆ Pametna rasvjeta
- ◆ Energetska učinkovitost
- ◆ Nadzor prometnica
- ◆ Upravljanje prometom

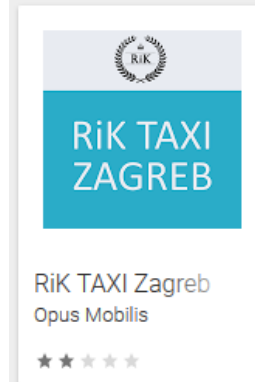
Gdje smo danas?



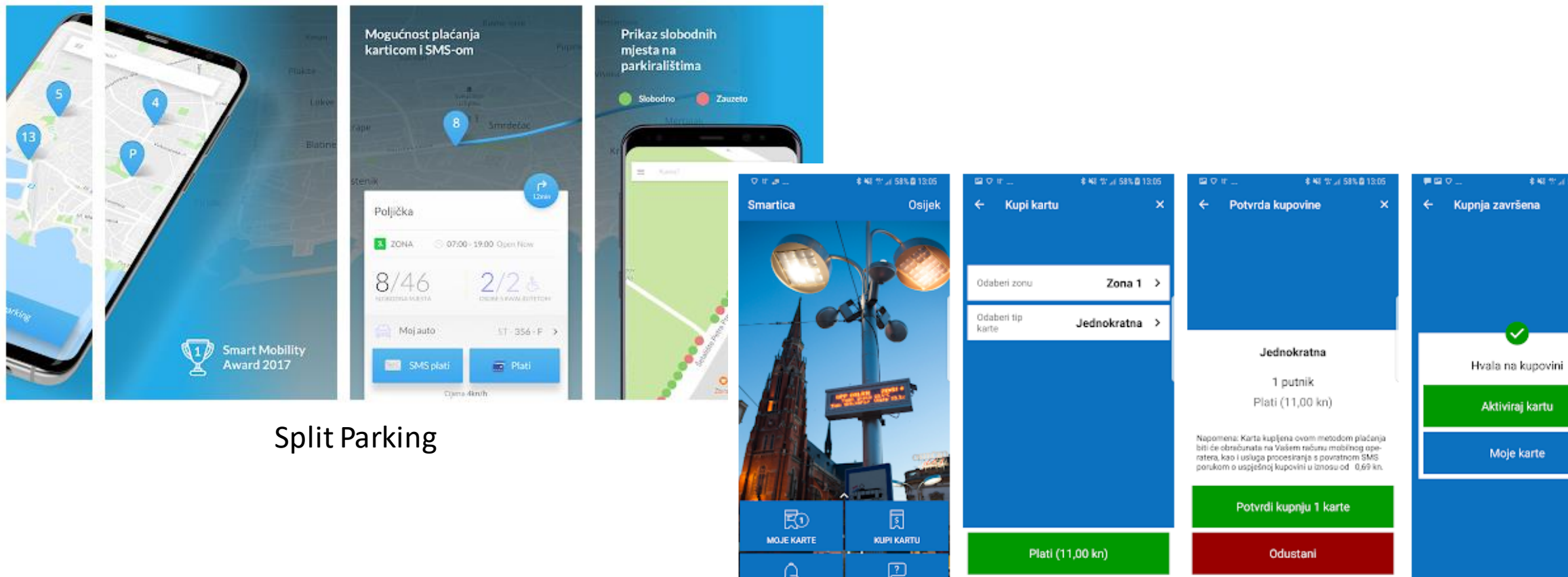
ZgPark



nextbike



Gdje smo danas?



Split Parking

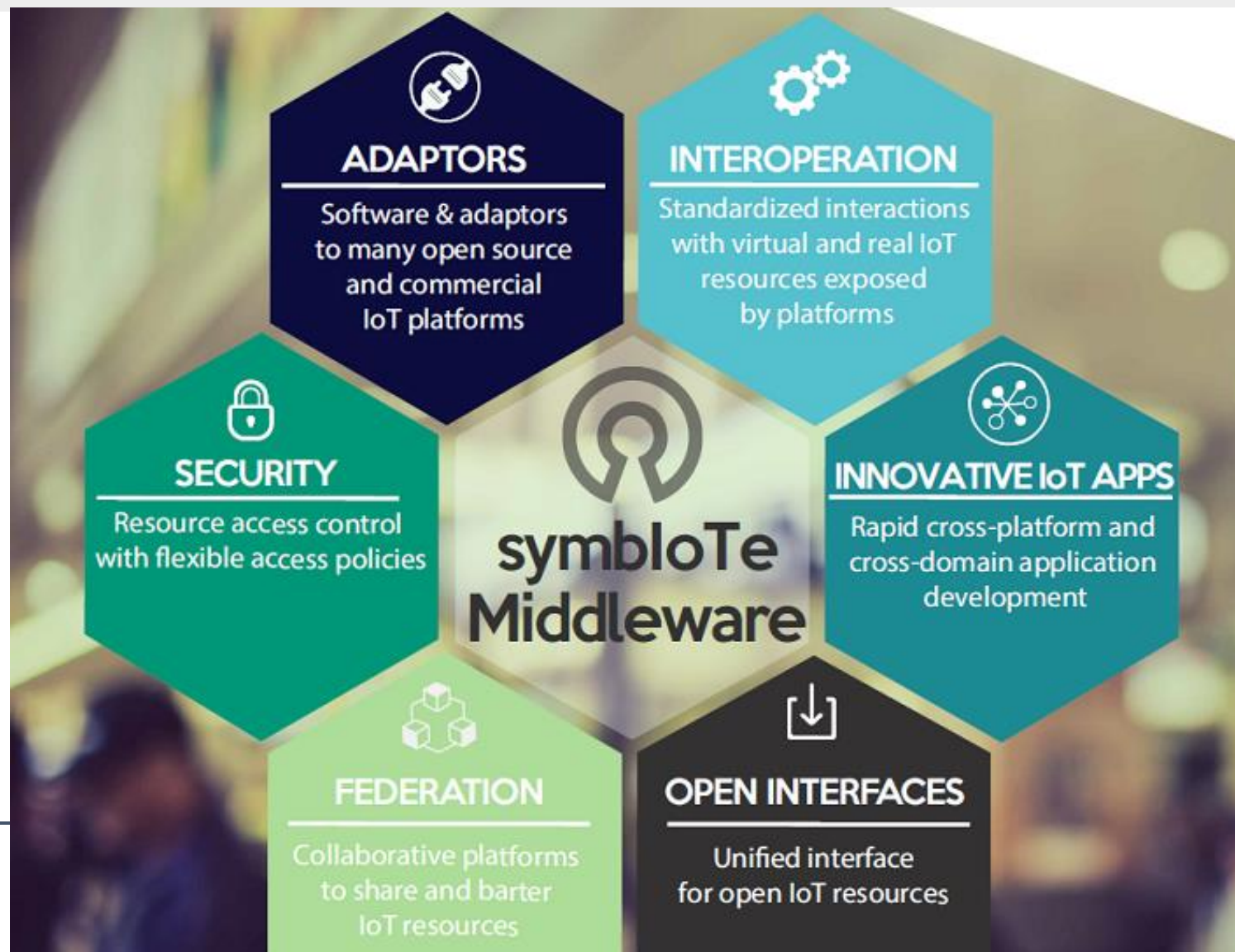
Smartica



IoT, interoperabilnost i pametni grad

- Postojeća gradska infrastruktura je nedovoljno iskorištena
- Nedostatak interoperabilnih ekosustava
- Potreba za aplikacijama neovisnim o IoT-infrastrukturi i platformama (*cross-domain apps*)
- Tehnička interoperabilnost, na nivou komunikacijskih protokola, je dobro pokrivena standardima, ali **semantička nad različitom infrastrukturom** i dalje predstavlja izazov

Projekt symbloTe (2016.-2018.)



symbiote [sim-bee-oht]

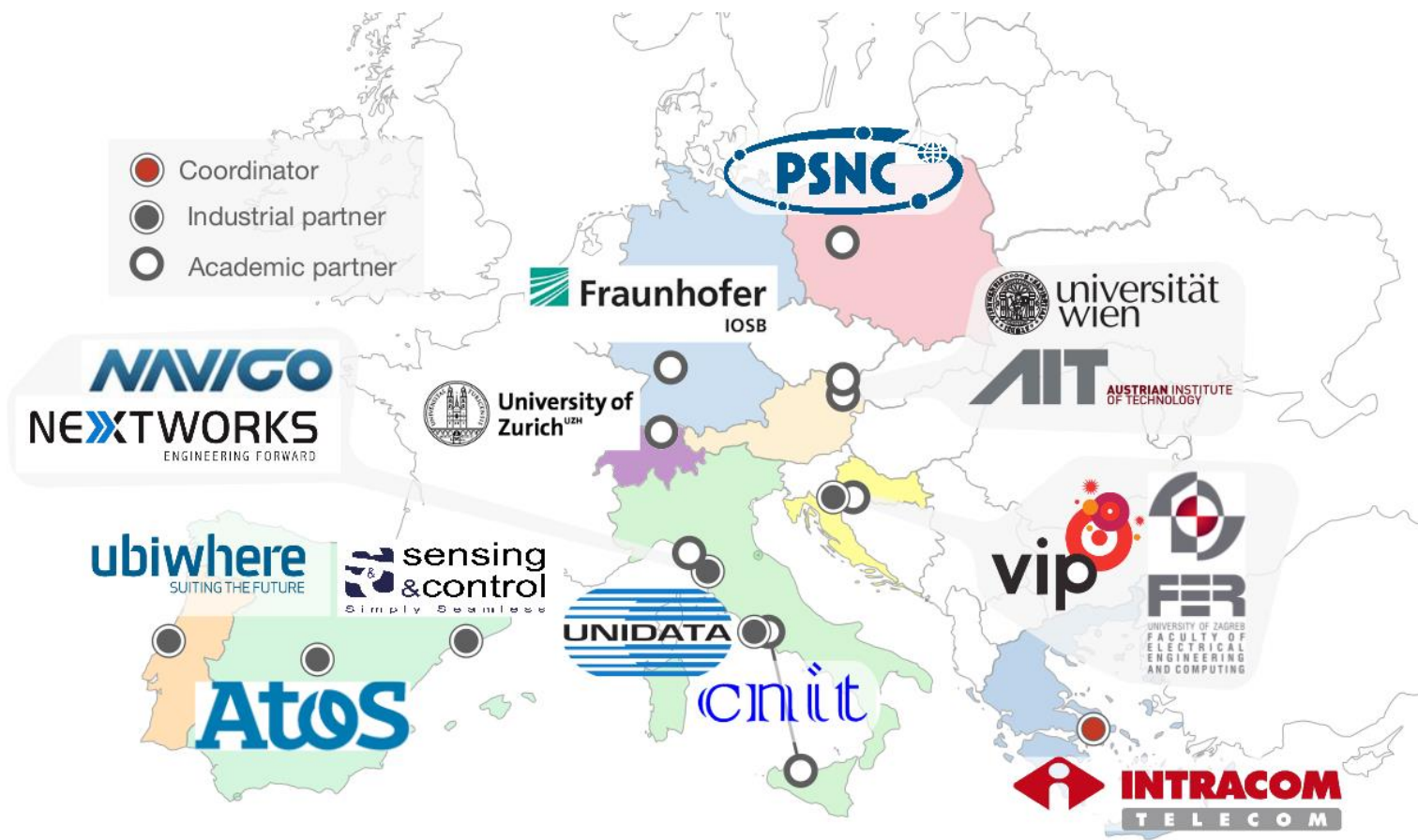
noun, *biology*

an organism living in a state of symbiosis

**symbloTe: Symbiosis of smart objects
across IoT environments**

istraživački projekt (RIA) financiran u programu Obzor2020 (2016. – 2018.)

Konzorcij symbloTe



- 15 partners
- SMEs w/ IoT solutions
- research institutes
- universities
- large companies

use cases:

- smart residence
- smart campus
- smart mobility
- smart yachting
- smart stadium

symbloTe middleware



symbloTe

The Open Source IoT interoperability middleware

LATEST VERSION: 3.1.0, FEBRUARY 2019

15	7	25	133000
Contributing partners	Software releases	Number of components	Lines of code

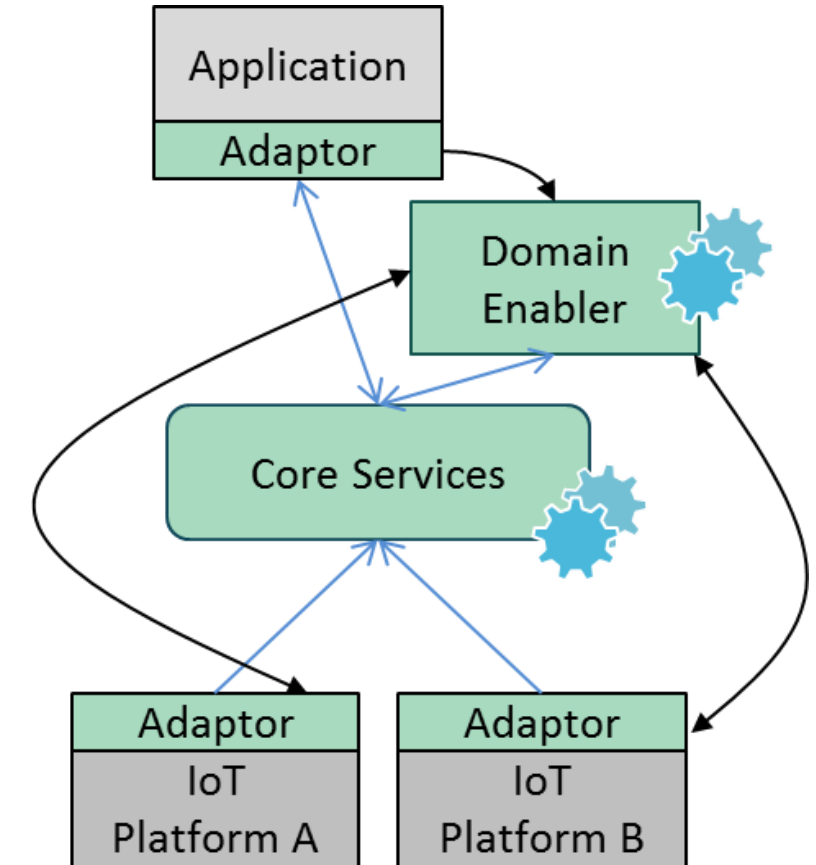
Open source

<https://github.com/symbiote-h2020>

<https://middleware.symbiote-h2020.eu>

IoT portal & semantička tražilica

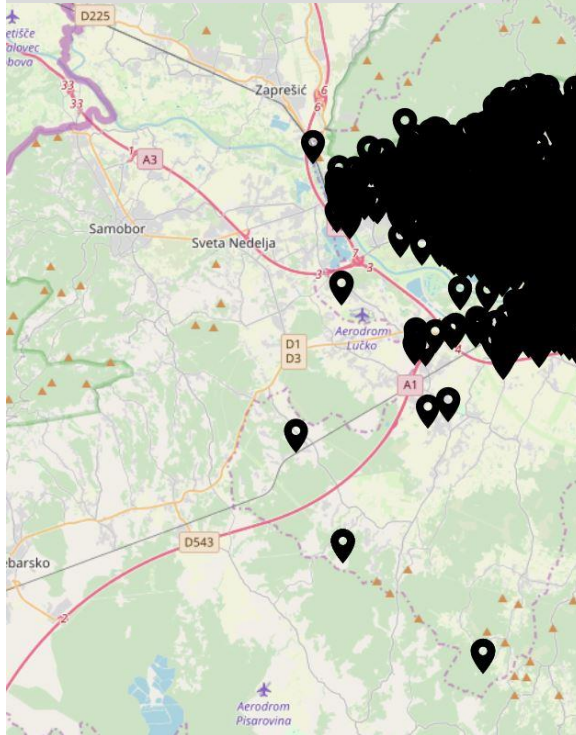
- IoT platforme nude resurse (senzore, aktuatore, servise) koristeći unificirano sučelje (RESTful)
- pojednostavljeni razvoj aplikacija i servisa za krajnjeg korisnika koristeći različite platforme
- IoT portal with Core services: registar i semantička tražilica IoT-resursa
- Domain Enabler: za razvoj servisa s dodanom vrijednosti, pojednostavljuje interakciju s različitim platformama



IoT-portal za grad Zagrebu



Zagreb: 1,812 entries
OpenIoT: 75
openUwedat: 30
HERE traffic API: 1693



Gdi Ensamble

Hebrangova od HNK do Zrinjevca

DETAILS

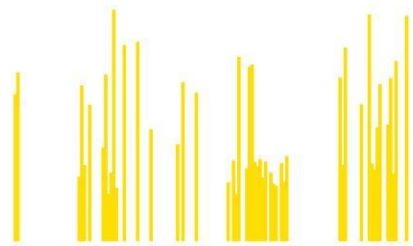
RotationalSpeed

rpm



AverageSpeed

speed



HERE API

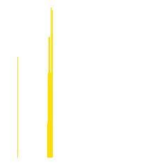
Andrije Hebranga

Sensor for getting average speed and jam factor of the road.

DETAILS

Jam Factor

Jam factor, range[0-10]



Average speed

Average speed



OpenIoT

Virtual sensor based on the MGRS cell

DETAILS

no2



pressure



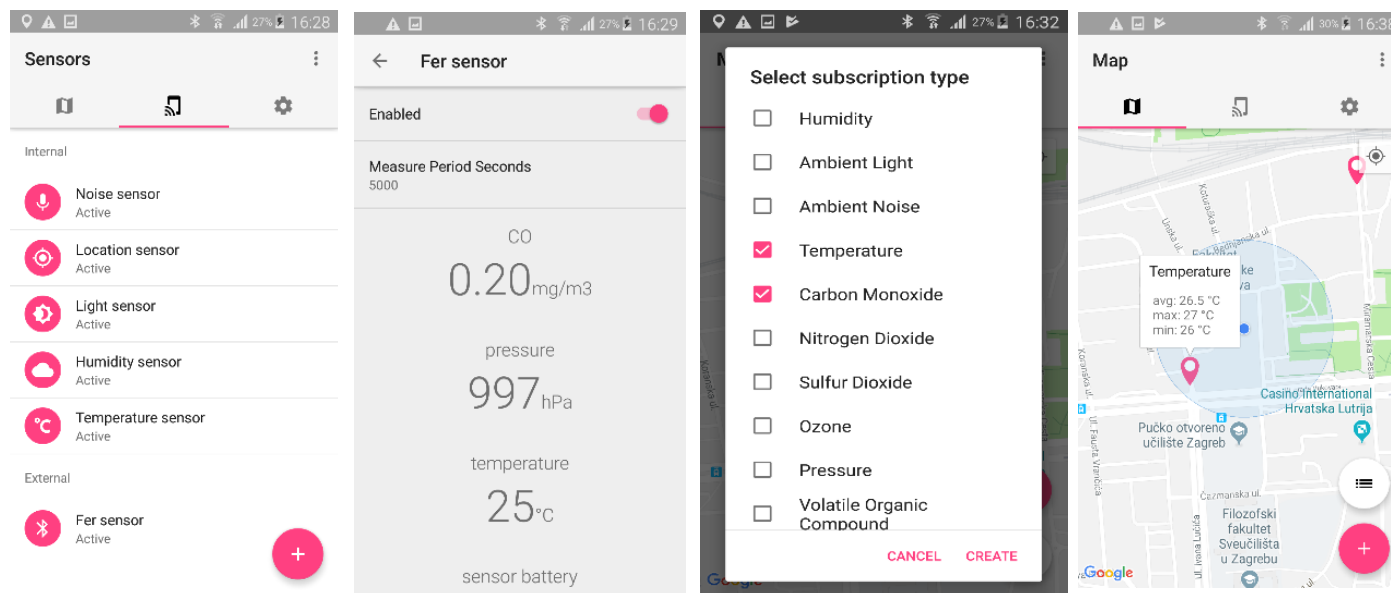
5G dan, 23.09.2019.

Zelene rute za bicikliste i pješake

- Zelene rute za bicikliste i pješake u Zagrebu, Beču i Portu

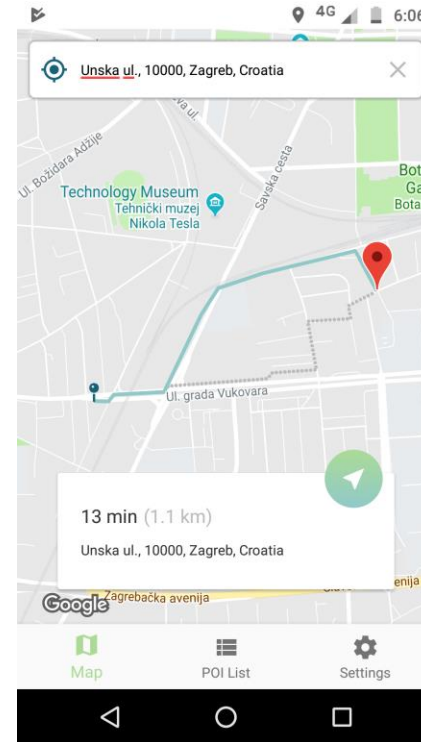
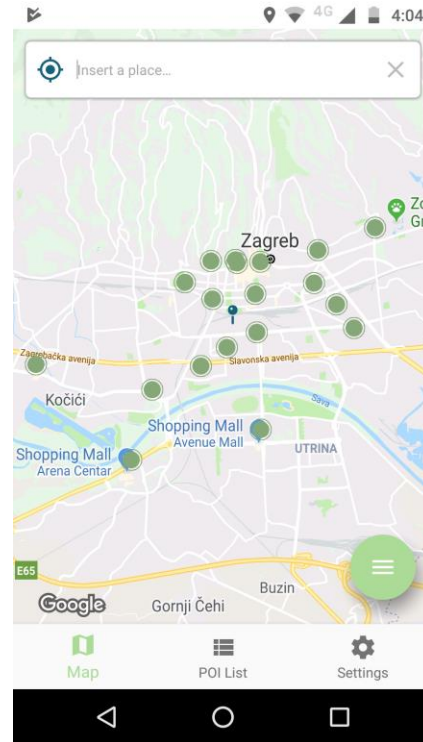
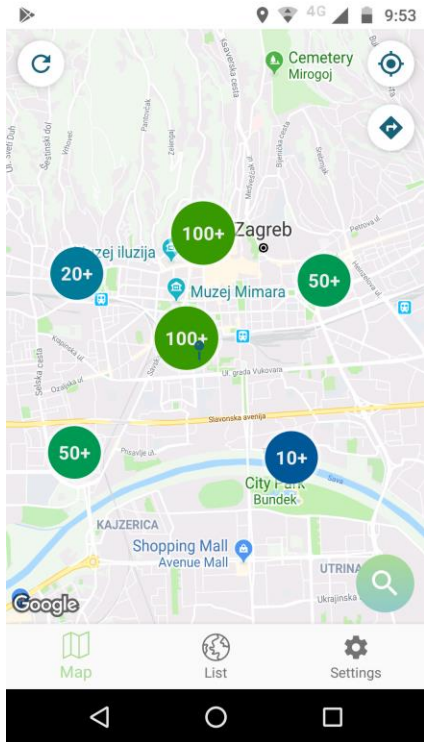


CUPUS Crowdsensing App



 **Google Play / CUPUS Crowdsensing**

symbloTe SMEUR Green Routing App




Ispitivanje rješenja u gradu Zagrebu u drugoj polovici 2018. u suradnji s udrugom



sindikata biciklista



 Google Play / symbloTe SMEUR

sybBloTe SMEUR Green Routing App



5G dan, 23.09.2019.

Barcelona: primjer pametnog grada

e.g. environment



There are a total of **453** datasets in the Open Data Barcelona Catalogue



Territory



Population



City and Services

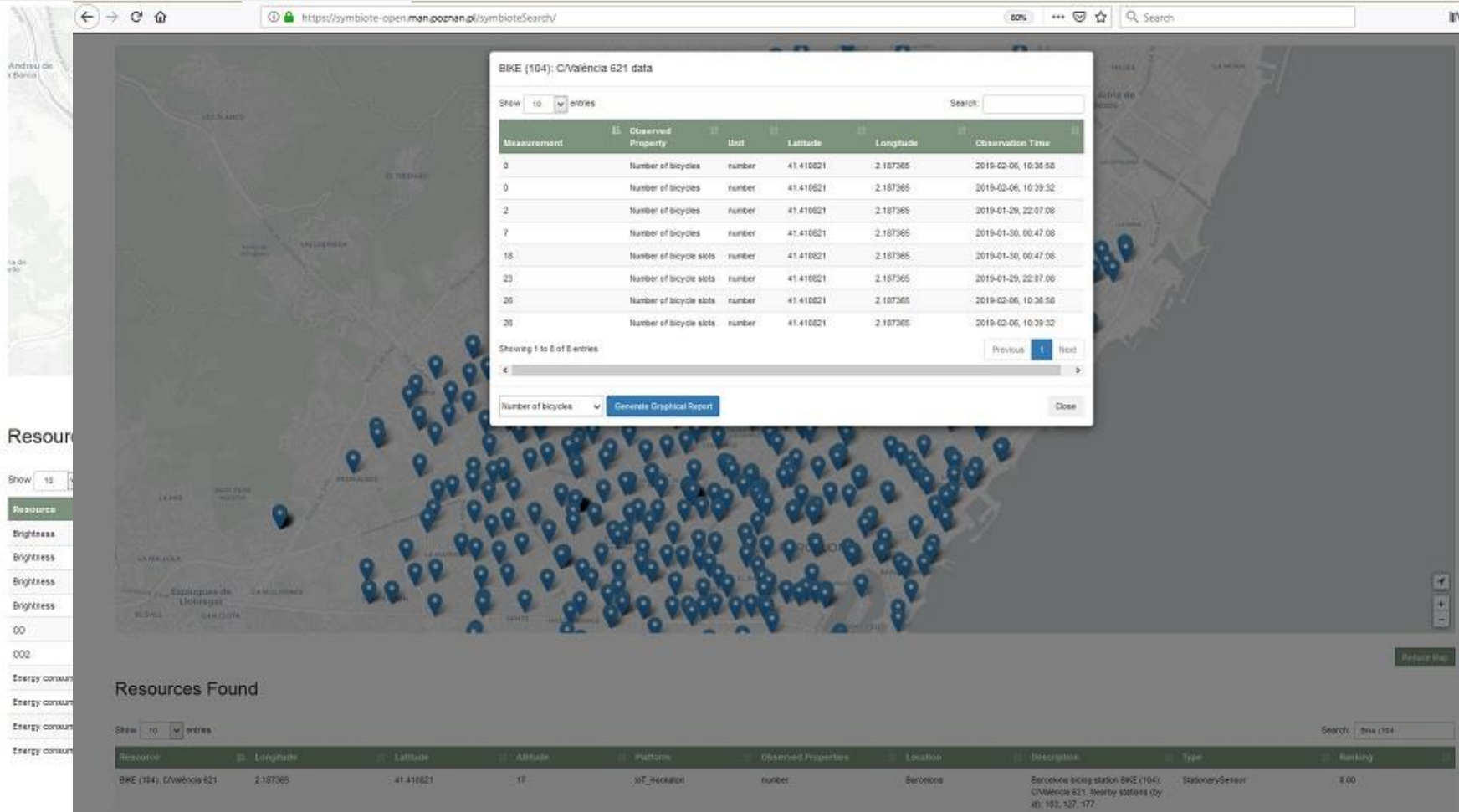


Administration



Economy and Business

symbloTe portal za Barcelonu



The screenshot shows the symbloTe portal interface. A map of Barcelona is displayed with numerous blue location pins. A popup window titled "BIKE (104): C/Valencia 621 data" is open, showing a table of bicycle data. The table has columns for Measurement, Observed Property, Unit, Latitude, Longitude, and Observation Time. Below the table, there are navigation controls and a "Generate Graphical Report" button. At the bottom of the screen, a "Resources Found" section shows a table with columns for Resource, Longitude, Latitude, Altitude, Platform, Observed Properties, Location, Description, Type, and Ranking.

Measurement	Observed Property	Unit	Latitude	Longitude	Observation Time
0	Number of bicycles	number	41.410821	2.187365	2019-02-06, 10:38:50
0	Number of bicycles	number	41.410821	2.187365	2019-02-06, 10:39:32
2	Number of bicycles	number	41.410821	2.187365	2019-01-29, 22:07:08
7	Number of bicycles	number	41.410821	2.187365	2019-01-30, 00:47:08
18	Number of bicycle slots	number	41.410821	2.187365	2019-01-30, 00:47:08
23	Number of bicycle slots	number	41.410821	2.187365	2019-01-29, 22:07:08
26	Number of bicycle slots	number	41.410821	2.187365	2019-02-06, 10:38:50
28	Number of bicycle slots	number	41.410821	2.187365	2019-02-06, 10:39:32

Resource	Longitude	Latitude	Altitude	Platform	Observed Properties	Location	Description	Type	Ranking
BIKE (104): C/Valencia 621	2.187365	41.410821	17	xt_location	number	Barcelona	Barcelona bicyc station BIKE (104): C/Valencia 621. Nearby stations (by ID): 103, 127, 177	StationarySensor	0.00



Laboratorij za Internet stvari IoT@FER



Istraživačka područja

- programske platforme za IoT i interoperabilnost, end-to-end rješenja
- energetska-učinkovita rješenja za IoT
- područja primjene: smart city, smart home, smart grid, smart agriculture...

Nastava: kolegij Internet stvari na diplomskom studiju, brojni studentski projekti/završni i diplomski radovi

- Članovi laboratorija: 8 istraživača u znanstveno-nastavnom zvanju, 1 poslijedoktorand, 7 doktoranada
- Istraživački projekti



HUTS



Za više informacija



www.iot.fer.hr
www.symbiote-h2020.eu



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[@ivanapodnar](https://twitter.com/ivanapodnar)



github.com/symbiote-h2020

Zahvale: prof. dr. sc. Mario Kušek,
prof. dr. sc. Gordan Ježić, dr. sc. Pavle Skočir