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Smart City & Internet of Things

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Smart City & Internet of Things
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Siemens new organization
Following world megatrends

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Industry	Energy	Healthcare	Infrastructure & Cities
Industrial Automation	Fossil	Imaging & Therapy	Rail Systems
Drive Technologies	Oil & Gas	Clinical Products	Mobility and Logistics
Customer Services	Power Transmission	Diagnostics	Low & Medium Voltage
Metals Technology	Wind		**Smart Grid**
	Solar		Building Technologies

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Infractructure & Cities
Smart City Portfolio

Smart Grid

- Infrastructure & substation devices
- Supervision & control system
- Advanced algorithms: network state estimation, distributed generation forecast, load & generation profiling
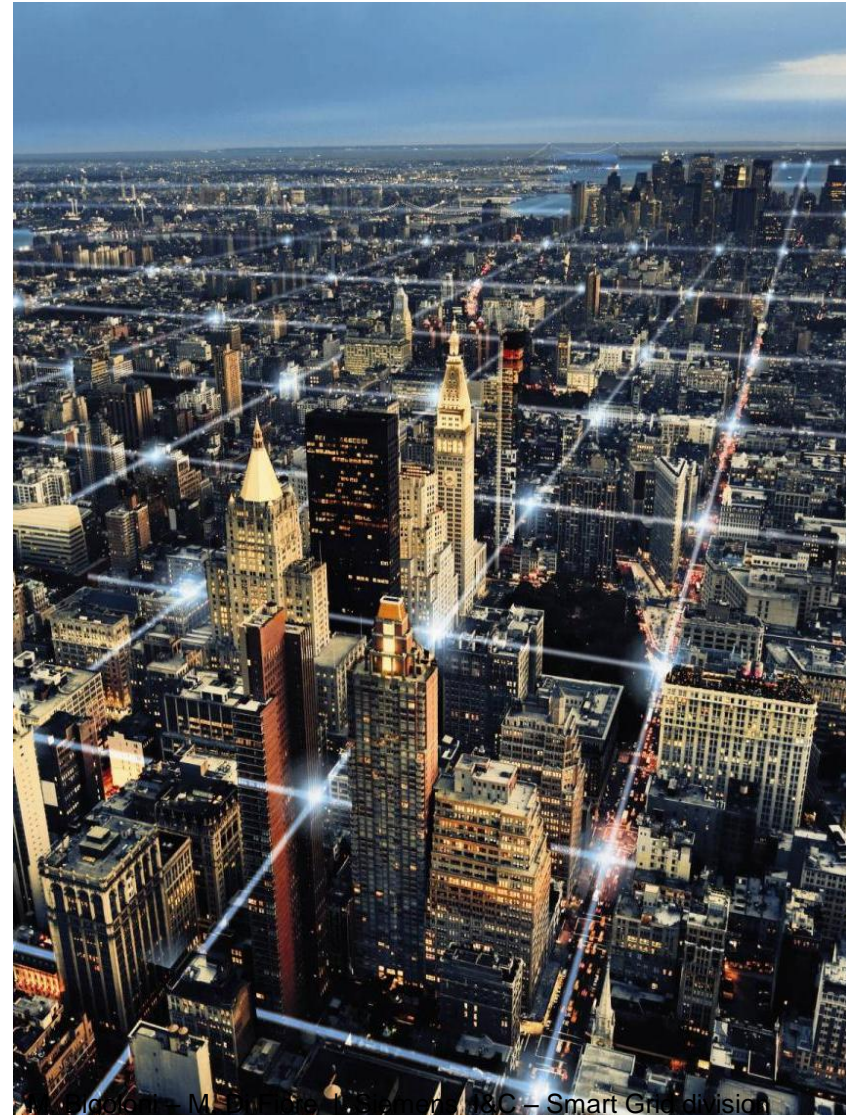- Network planning, O&M applications

Micro Grid

- Supervision & control system
- Loads & Generators optimization

Smart Building

- Infrastructure & devices
- Supervision & control system

Electric Mobility

- Rechanrge infrastructure
- eBus & Metro
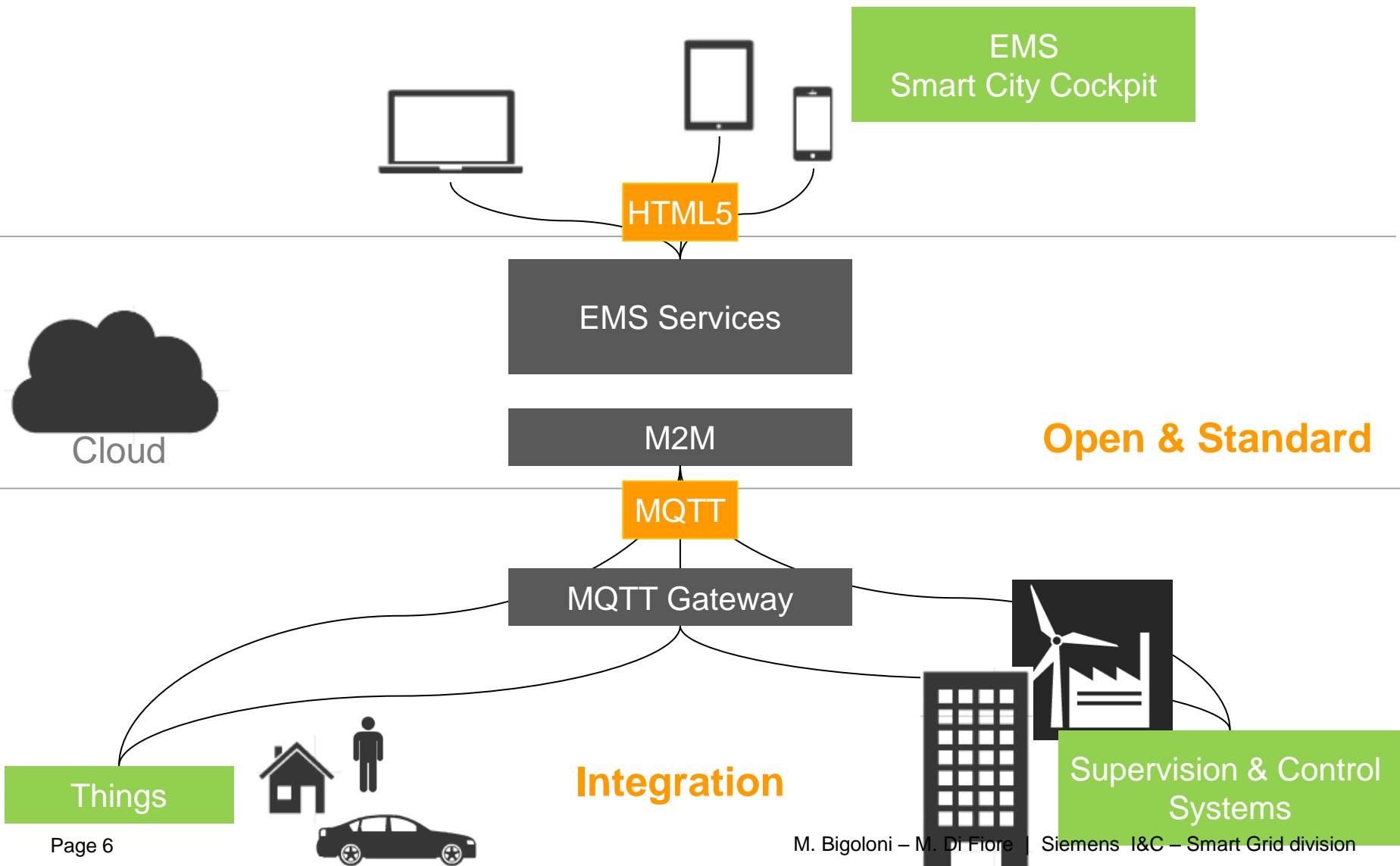- Supervision & control system

Smart City & Internet of Things
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- Siemens Infrastructure & Cities
- **Internet of Things & EMS System**
- Electric Mobility

Internal of Things
Strategy

EMS
Smart City Cockpit

HTML5

EMS Services

Cloud

M2M

Open & Standard

MQTT

MQTT Gateway

Things

Integration

Supervision & Control
Systems

EMS System
Introduction

EMS, Smart Grid Energy Management Cockpit

EMS is a *Cloud* platform providing set of services for Energy Monitoring and Energy Management following the *Software as a Service* model. Key features:

- Energy Efficiency
- Demand Response
- Grid Energy Cockpit

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EMS System
Applications

EMS Web Applications

EMS services are accessible via a set of state-of-the-art HTML5 web applications available on any OS and device (PC, Tablet, Smartphone).
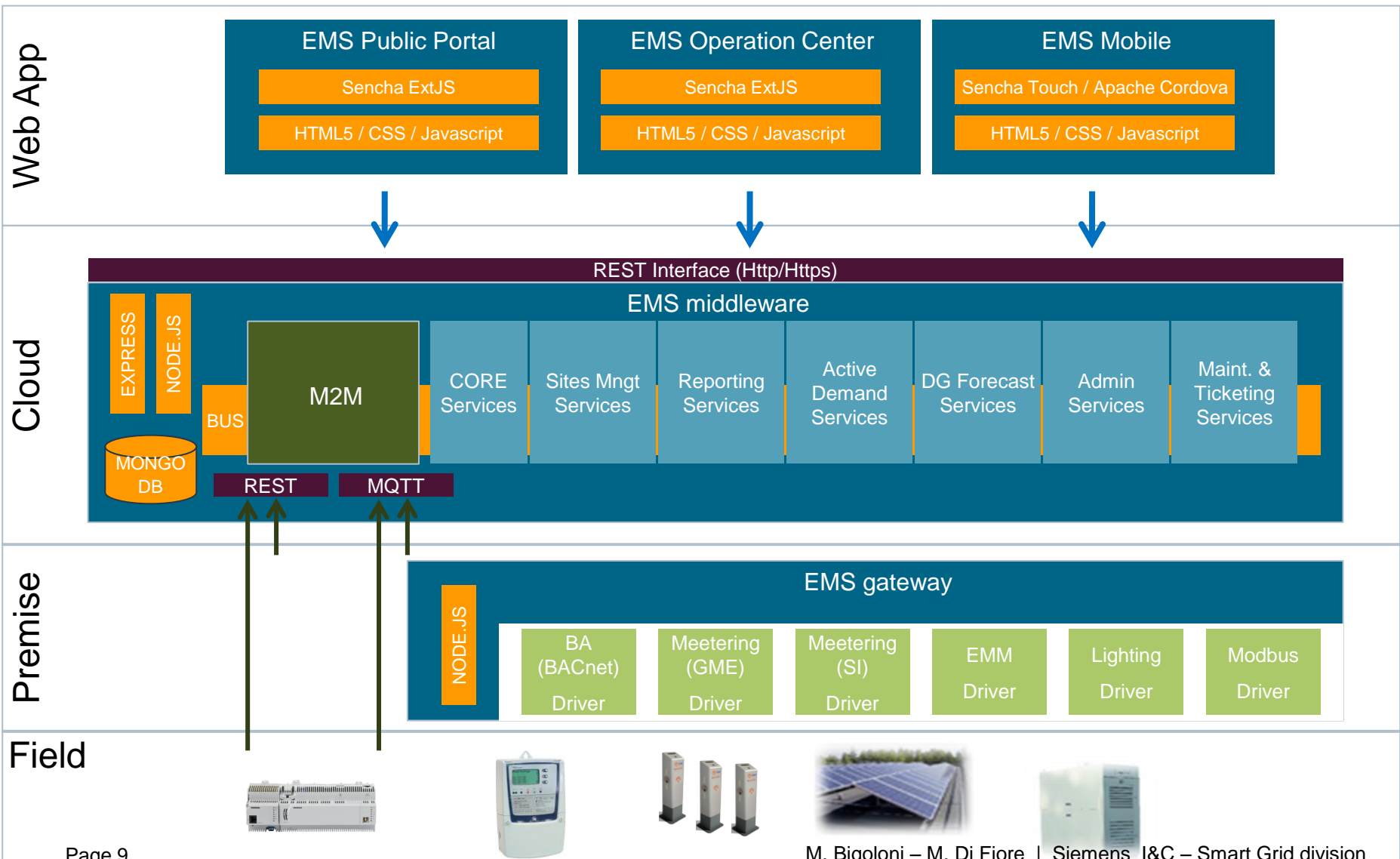
Support Business Decisions

EMS HMI is designed as a dashboard/cockpit to provide to users high-level information trough an intuitive user interface to supports business level decision.

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EMS System
Overall Architecture

Web App

EMS Public Portal	EMS Operation Center	EMS Mobile
Sencha ExtJS	Sencha ExtJS	Sencha Touch / Apache Cordova
HTML5 / CSS / Javascript	HTML5 / CSS / Javascript	HTML5 / CSS / Javascript

Cloud

REST Interface (Http/Https)

EMS middleware

EXPRESS | NODE.JS

BUS

M2M

MONGO DB

REST | MQTT

- CORE Services
- Sites Mngt Services
- Reporting Services
- Active Demand Services
- DG Forecast Services
- Admin Services
- Maint. & Ticketing Services

Premise

EMS gateway

NODE.JS

- BA (BACnet) Driver
- Meetering (GME) Driver
- Meetering (SI) Driver
- EMM Driver
- Lighting Driver
- Modbus Driver

Field

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EMS M2M
Key features & Technology

Key features
- data acquisition platform
- multi-disciplinary
- REST
- MQTT
- CoAP (*future*)

Technology
- Developed in JavaScript using **node.js**
- **MongoDB** as non-relational database

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EMS M2M
MQTT Protocol

"MQTT is a machine-to-machine (M2M)/"Internet of Things" connectivity protocol. It was designed as an extremely lightweight publish/subscribe messaging transport."

→ Standard (under OASIS standardization)
→ Open
→ Lightweight / Fast
→ Scalable
→ Support *offline* mode

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EMS MQTT Gateway
Key features & Technology

Key features

- Integrate systems and devices that are not IOT ready
- MQTT connection toward EMS
- Secure connection using MQTT over SSL
- Secure connection using VPN
- Scalable
- Independent from TLC infrastructure (GPRS, 3G, ADSL, Fiber)

Technology

- Developed in JavaScript using **node.js**
- Host drivers in any language

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EMS System
Energy Efficiency

EMS monitors and controls systems and devices of the following categories:

- Comfort
- Lighting
- Meters
- Loads
- Generators, DR forecast
- Storages
- Integration with MV network SCADA
- Integration with MicroGrid SCADA

EMS allows creating scenarios and defining calendars and it is able to maintain the system in **Efficiency** according to the constraints set by the user.

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EMS collect load and generation profiles and creates typical curves; the Service Provider of the EMS system (DSO, Aggregator) can define and assign load curves to the Customers (owners of the Sites).

A Customer can accept the target load curve for its Site and the system will "try" to automatically follow the curve acting on:

- Comfort – change the temperature set-point staying in the user defined range
- Lighting – change the light set-point staying in the user defined range
- Other Loads – moving or stopping loads (depending on the load type)

Reference Project
Campus Savona

Energy Management System

Meters	Building Mngt System	DEMS	eCar OC
• MV GME	• Comfort	• Photovoltaic	• Recharge Units
• LV GME	• Lighting	• 3 CSP	
• LV Meter	• Load control	• Micro-Turbine Gas	
		• Thermal Storage	
		• Chiller	
		• Energy Storage	

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- Internet of Things & EMS System

- **Electric Mobility**

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E-mobility as one of the main driver for Smart Cities development…

Globalization, demographic change as well as climate change are megatrends that will impact the future of cities.
To support the sustainable city development, technologies are fundamental to create efficient buildings, a reliable power grid and capable mobility solutions.

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..with a strong market forecast for the future..

At the end of 2012 total worldwide electric vehicle stock was over 180,000 units. Considering actual trends and urban phenomena, it is likely that this number will growth to at least to 20 million electric vehicles by 2020[1].

1) Global EV outlook (OECD/IEA, 2013)

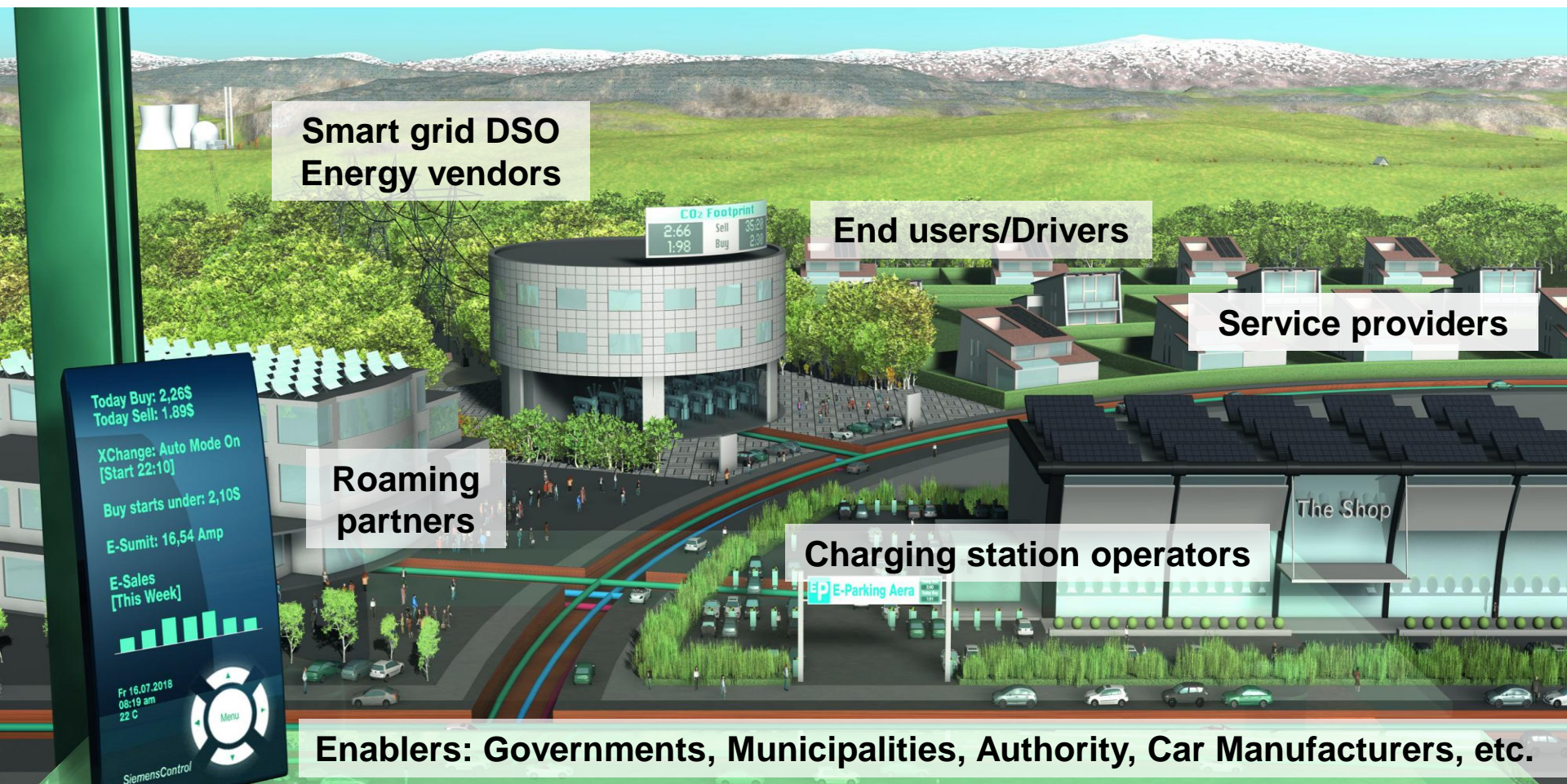M. Bigoloni – M. Di Fiore | Siemens I&C – Smart Grid division

..and new functionalities and uses

Electric vehicles are electricity storage devices which can be integrated in a Smart Grid.

Electric vehicles are also important because cities to be smart requires new and sustainable transport modes, like car sharing initiatives.

Which players will take part in this story?

Smart grid DSO
Energy vendors

End users/Drivers

Service providers

Roaming
partners

Charging station operators

Enablers: Governments, Municipalities, Authority, Car Manufacturers, etc.

Considering the important role of e-mobility inside urban spaces, the **infrastructure for electric mobility** must satisfy the requirements of the grid but also those of all the actors operating in a modern Smart City.
Drivers must be sure that they will be able to recharge their vehicles anywhere, and payment for electricity must be uniform across all distribution points.

Siemens answer: Siemens E-car Operation Center

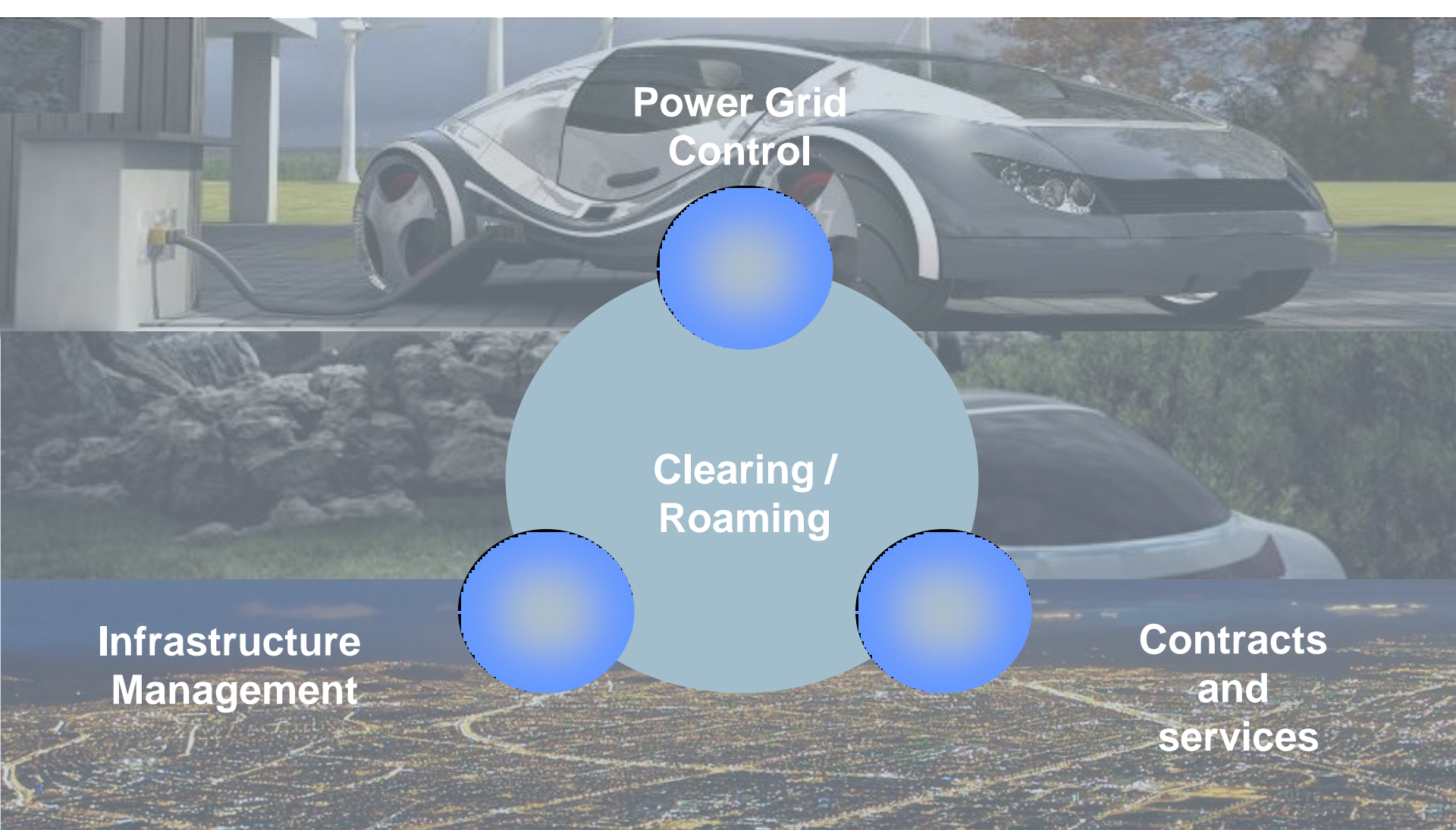# Siemens E-car Operation Center
Main Concepts

The **eCar Operation Center** (aka OC) is the IT system to manage the entire **electromobility process.**
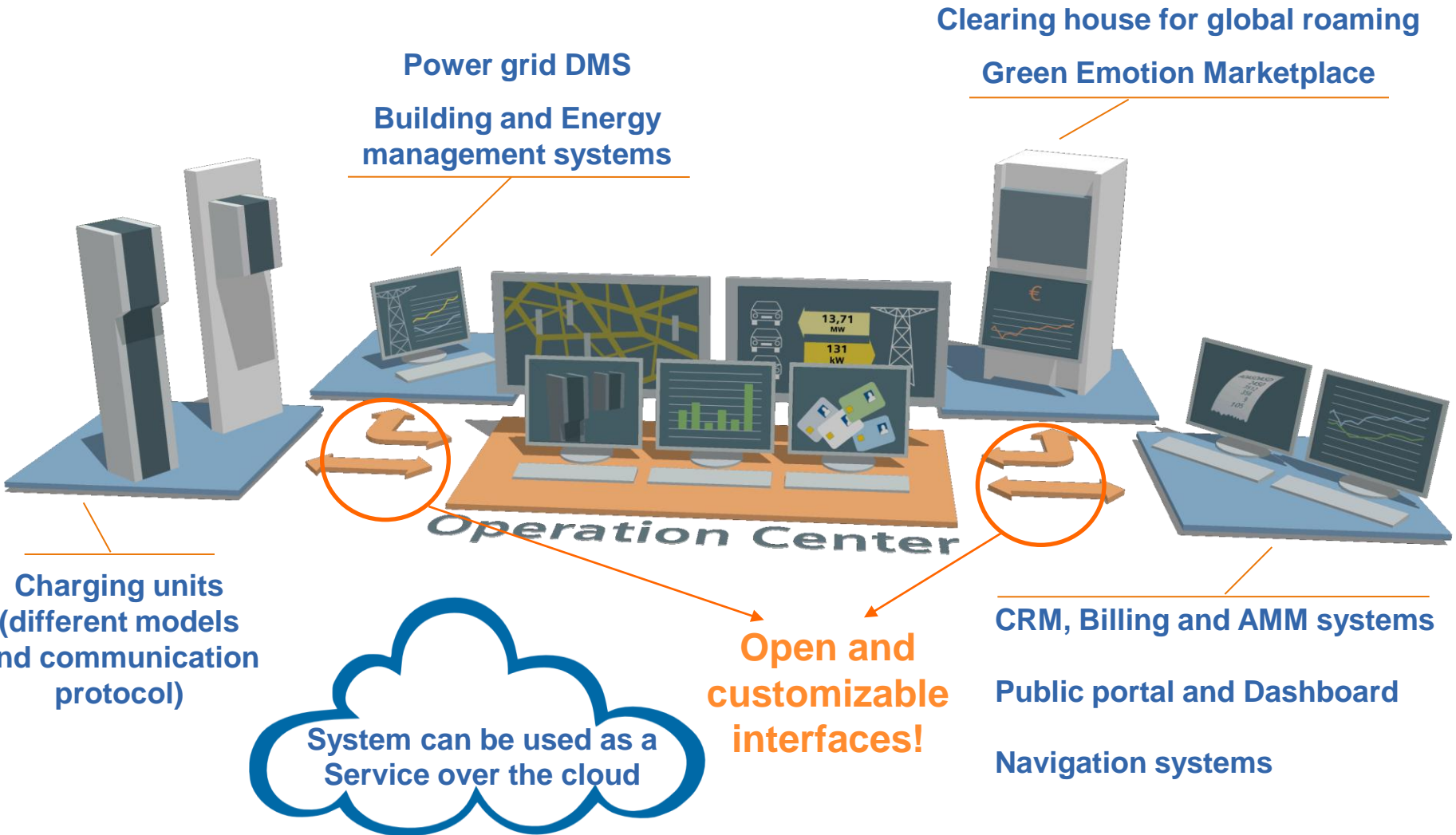
1. It **collects** all the **information from the field** and is aware of what's happening on the recharge infrastructure

2. It makes all the **information available to** all the **electromobility actors/stakeholders**

3. It can be **integrated in the Smart Grid**

4. It supports **Global Roaming** and has **Open Interfaces**

Power Grid
Control

Clearing /
Roaming

Infrastructure
Management

Contracts
and
services

Power grid DMS

Building and Energy management systems

Clearing house for global roaming

Green Emotion Marketplace

Charging units (different models and communication protocol)

Open and customizable interfaces!

System can be used as a Service over the cloud

CRM, Billing and AMM systems

Public portal and Dashboard

Navigation systems

Siemens E-car Operation Center
Enabler of additional value added services

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EVs user

Integration with loyalty card

Service providers

Private

Usage Fees

Prepaid model

Fleet management

Public administrations and authority

Green dashboard

Smart management of distributed generation

Car sharing

Business

Energy Vendor and DSO

OEM

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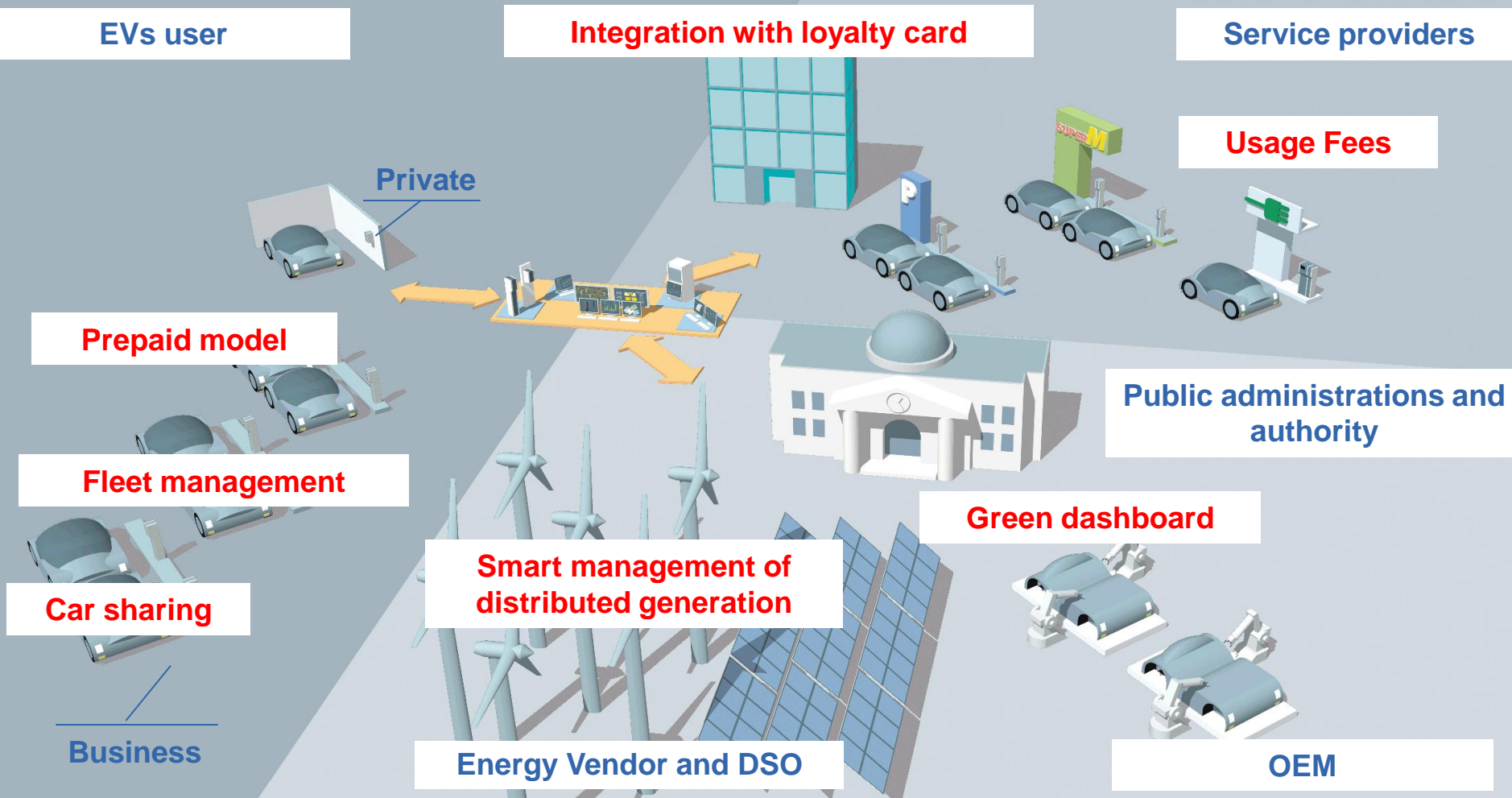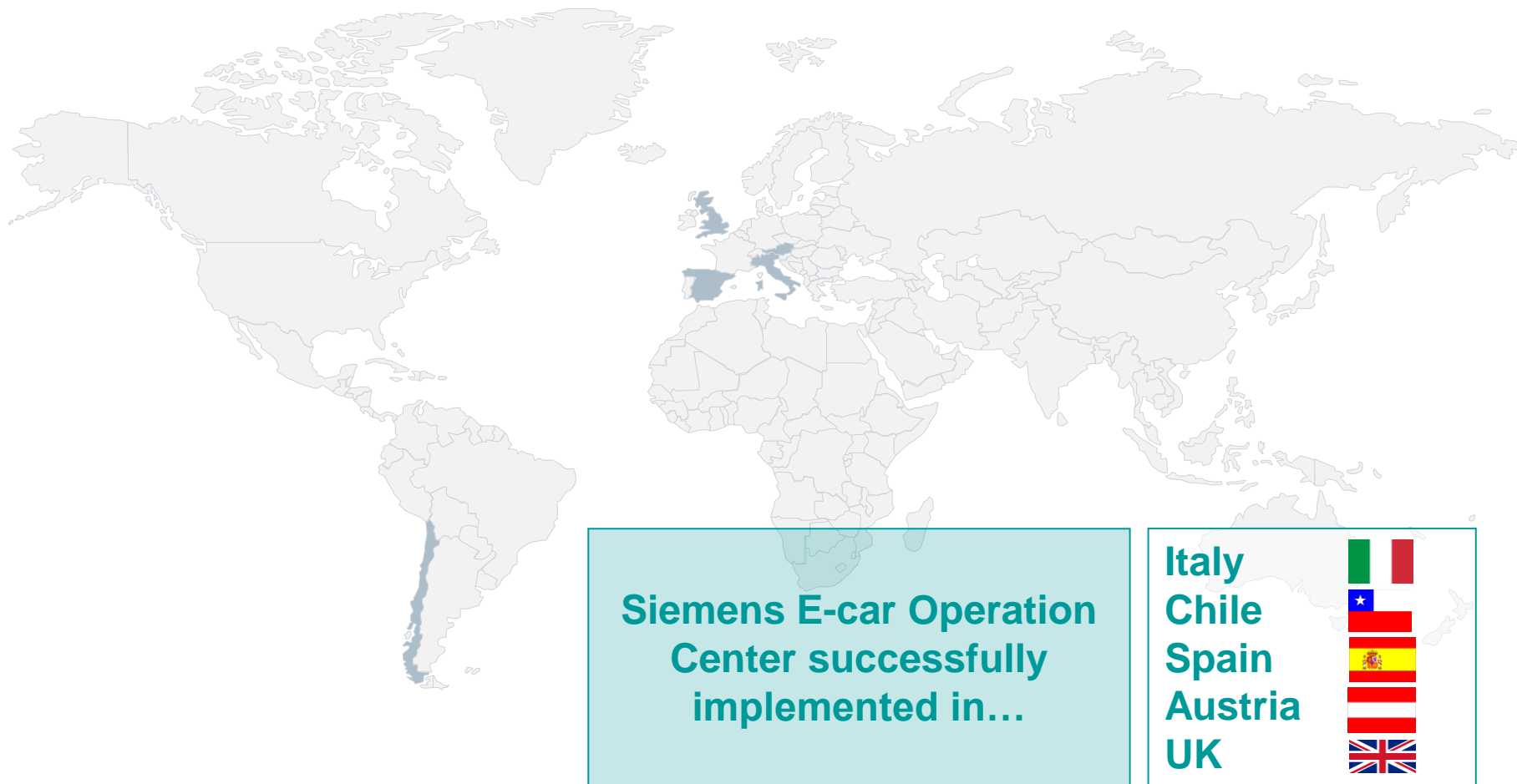
Thank you for your attention.

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