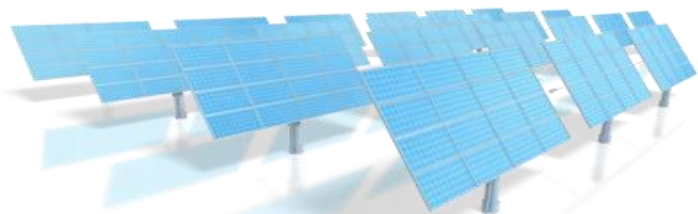


Internet of Energy

for Electric Mobility



IoE
Internet of Energy



Dr. Ovidiu Vermesan, Chief Scientist, SINTEF

26 October 2011, Scandic Marina Congress Center, Helsinki, Finland

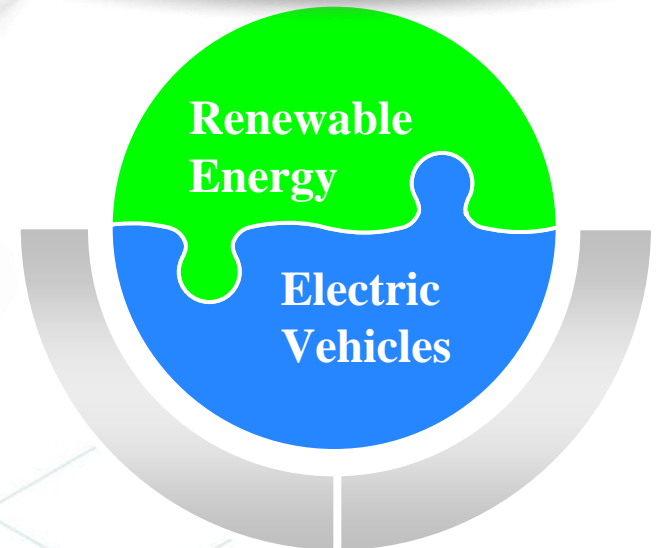
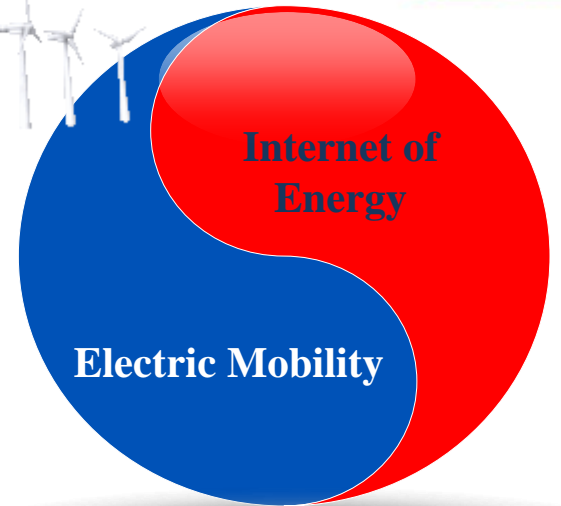


Advanced Research & Technology for Embedded Intelligence and Systems

Presentation Outline



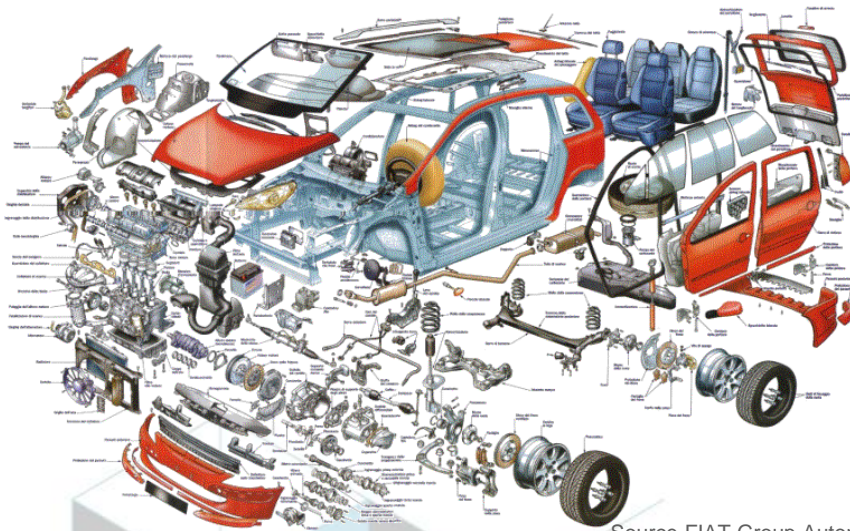
- ▶ Introduction
- ▶ Objectives
- ▶ Technological Challenges
- ▶ Partners
- ▶ Summary



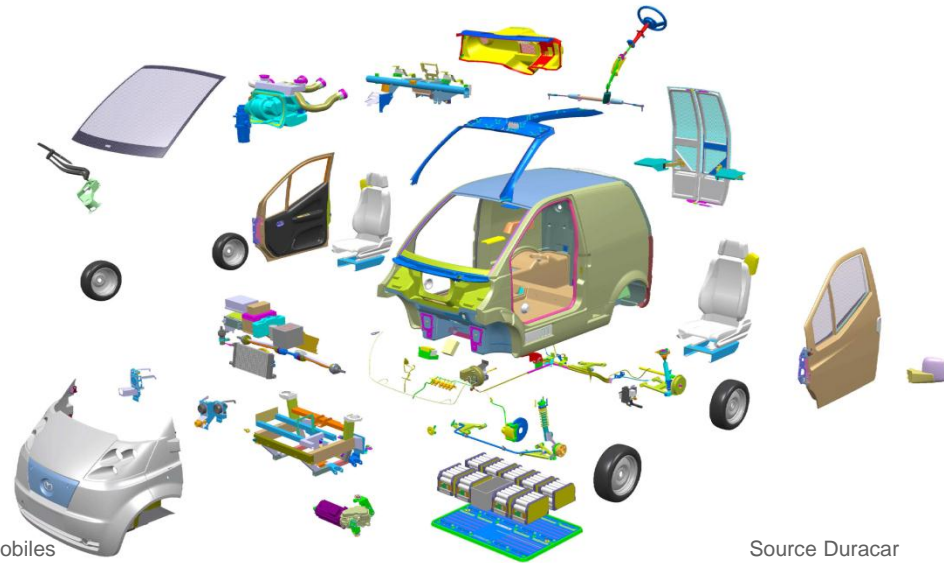
Future Vehicle



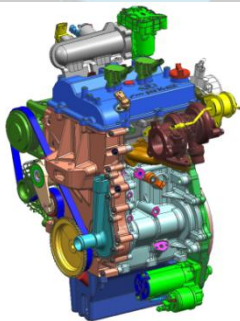
► From mechanics to mechatronics



Source FIAT Group Automobiles



Source Duracar



Mechanical
Craft

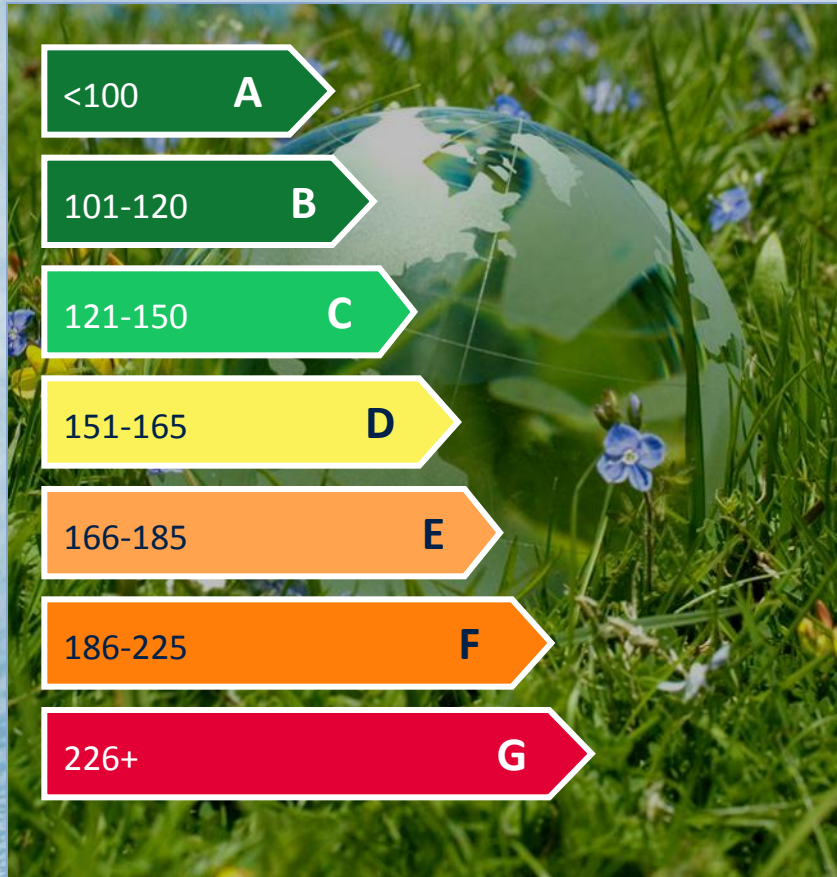


Computer on
Wheels



Internet of Energy

Emission of CO₂ g/km



- Electrification of cars and bikes
- Board Net Architecture
- Low Power/ Power on Demand

Source: Infineon

Energy and Propulsion Alternatives



Energy Resources

Oil

Coal

Natural Gas

Biomass

Other Renewable Energy
Hydro, Solar, Wind

Energy Carriers

Liquid Fuels

Gas Fuels

Electricity

Hydrogen

Propulsion Systems

Conventional ICE
Gasoline / Diesel

Gas ICE

ICE Hybrid

Plug-In Hybrid ICE

Electric Vehicle

Fuel-Cell Electric

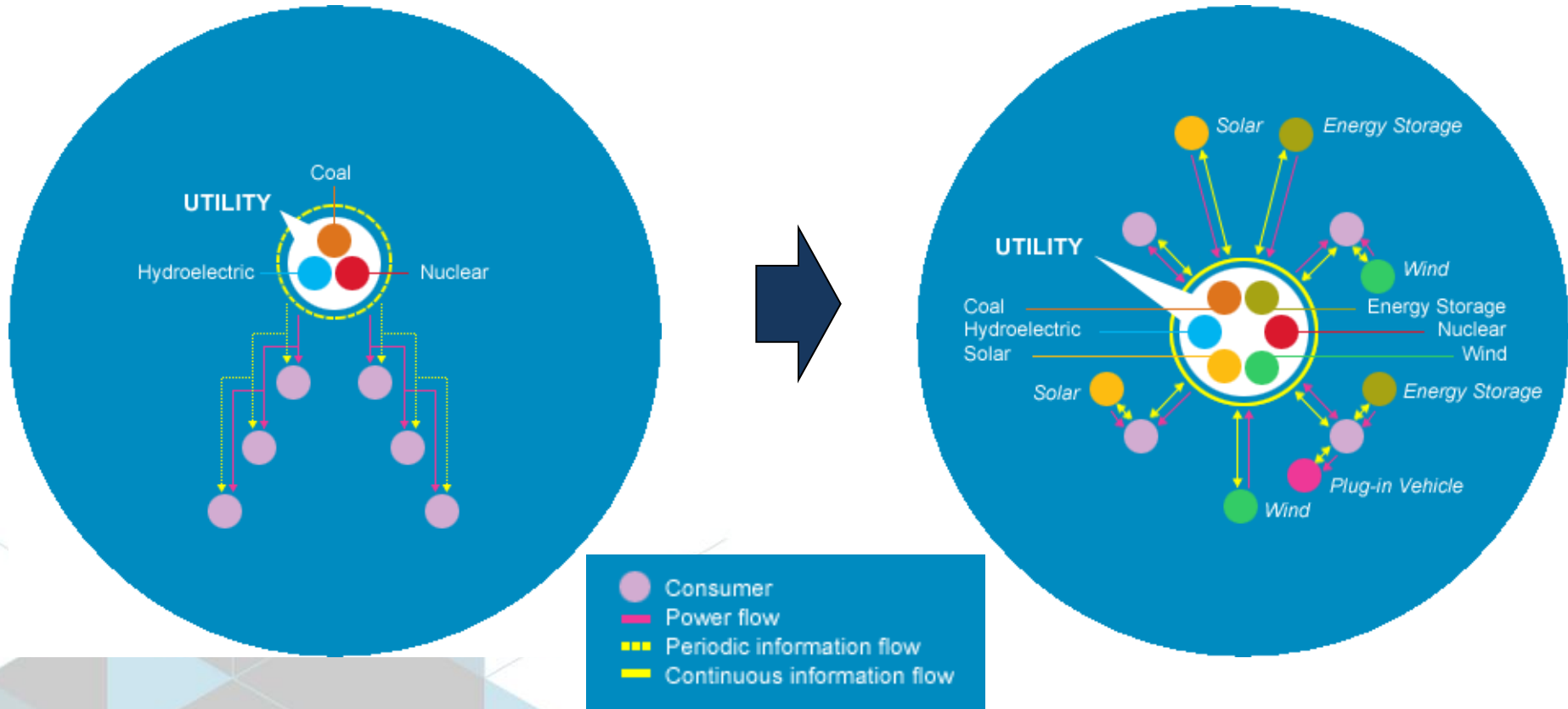
Battery

Electrification

Future Smart Grid



► From centralised to distributed



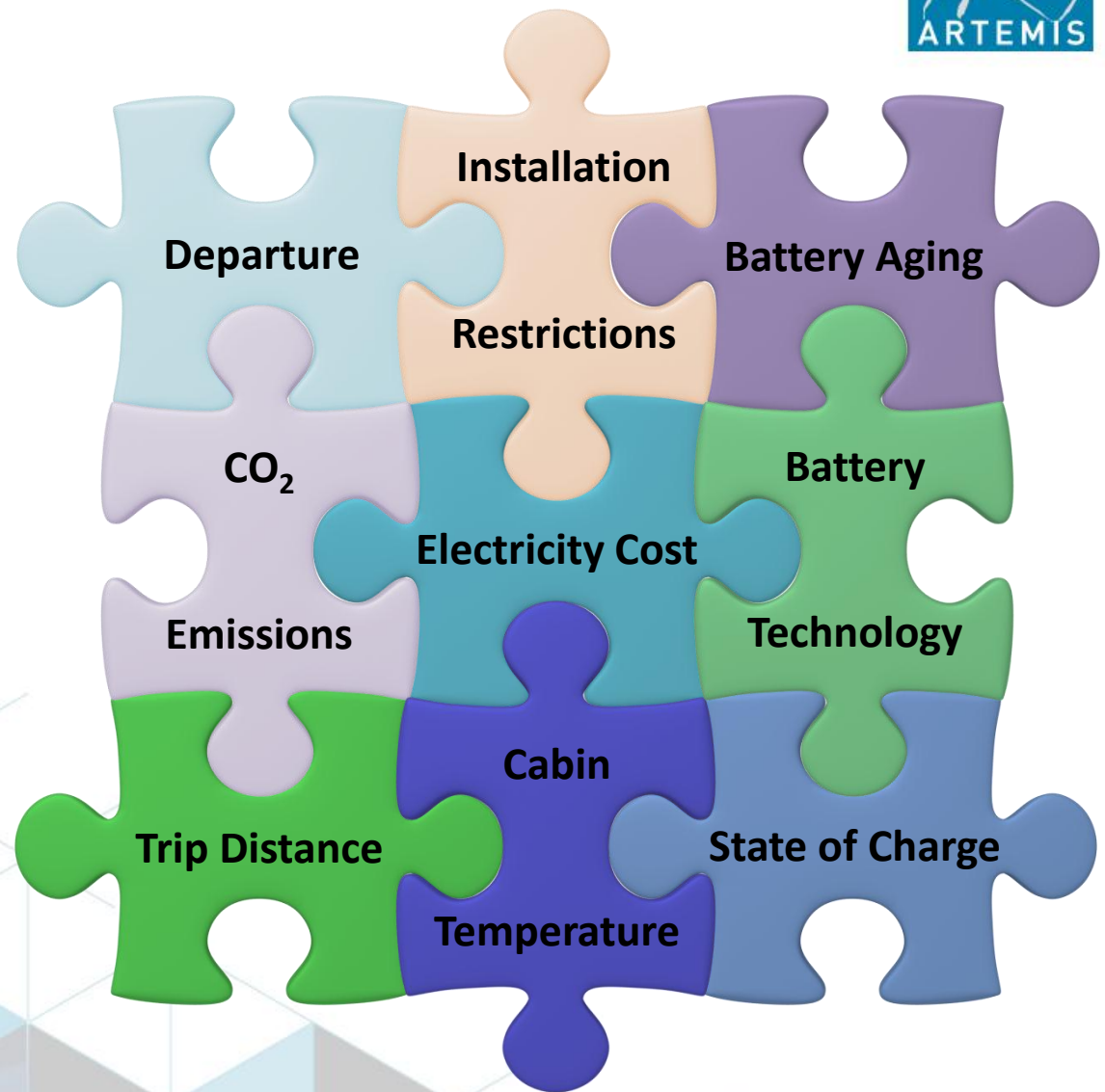
Source: IBM

Factors influencing charging profile

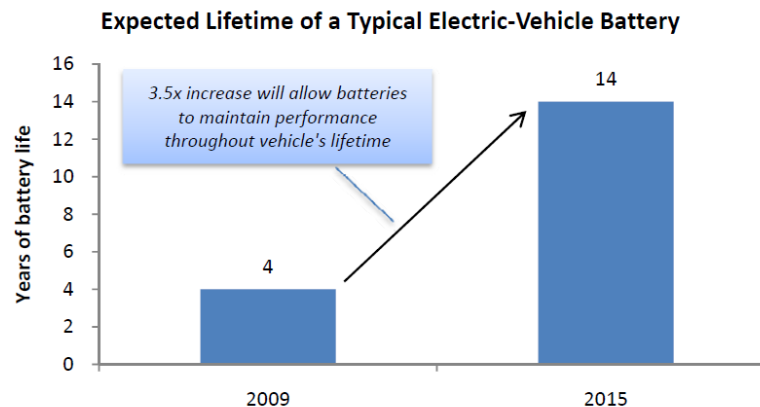
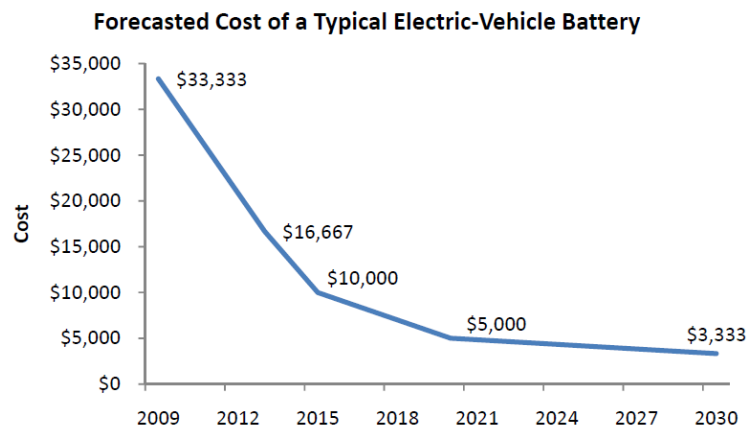
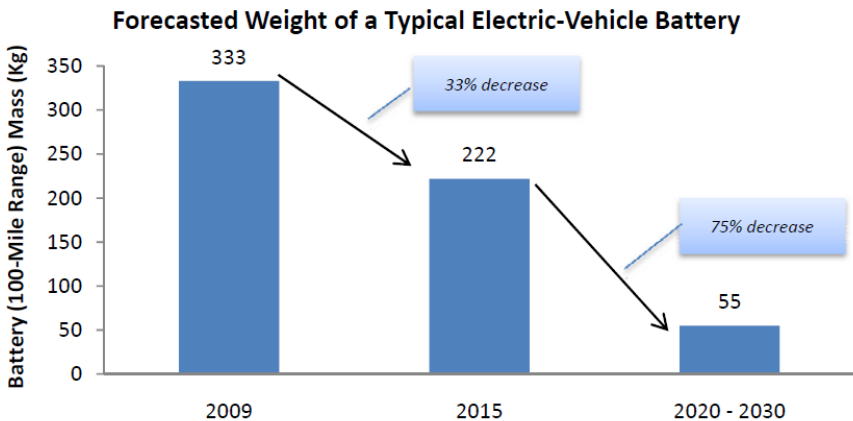
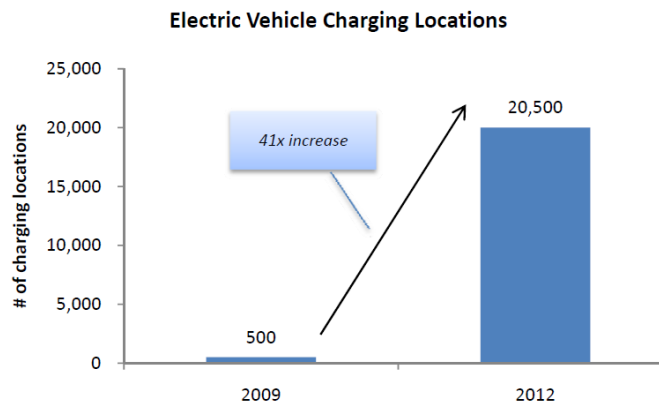
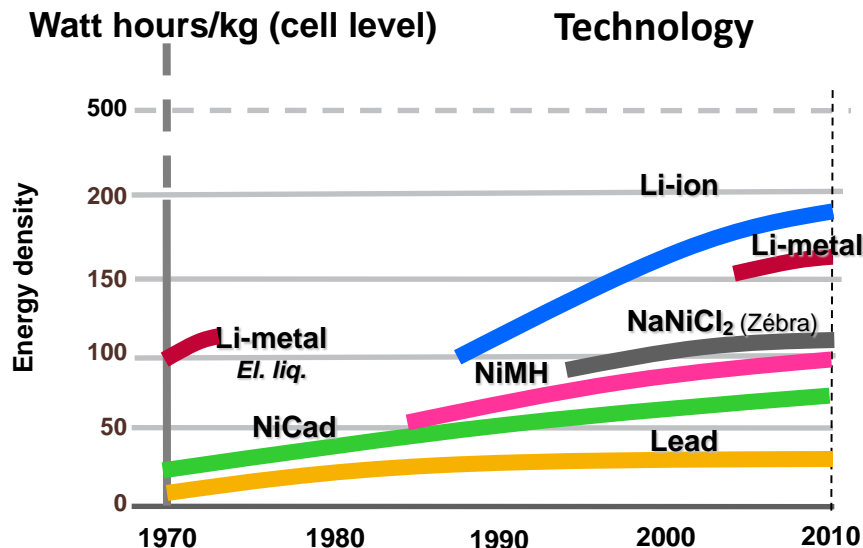


EVs Charging Puzzle

The decision how to charge optimally is taken within the vehicle.

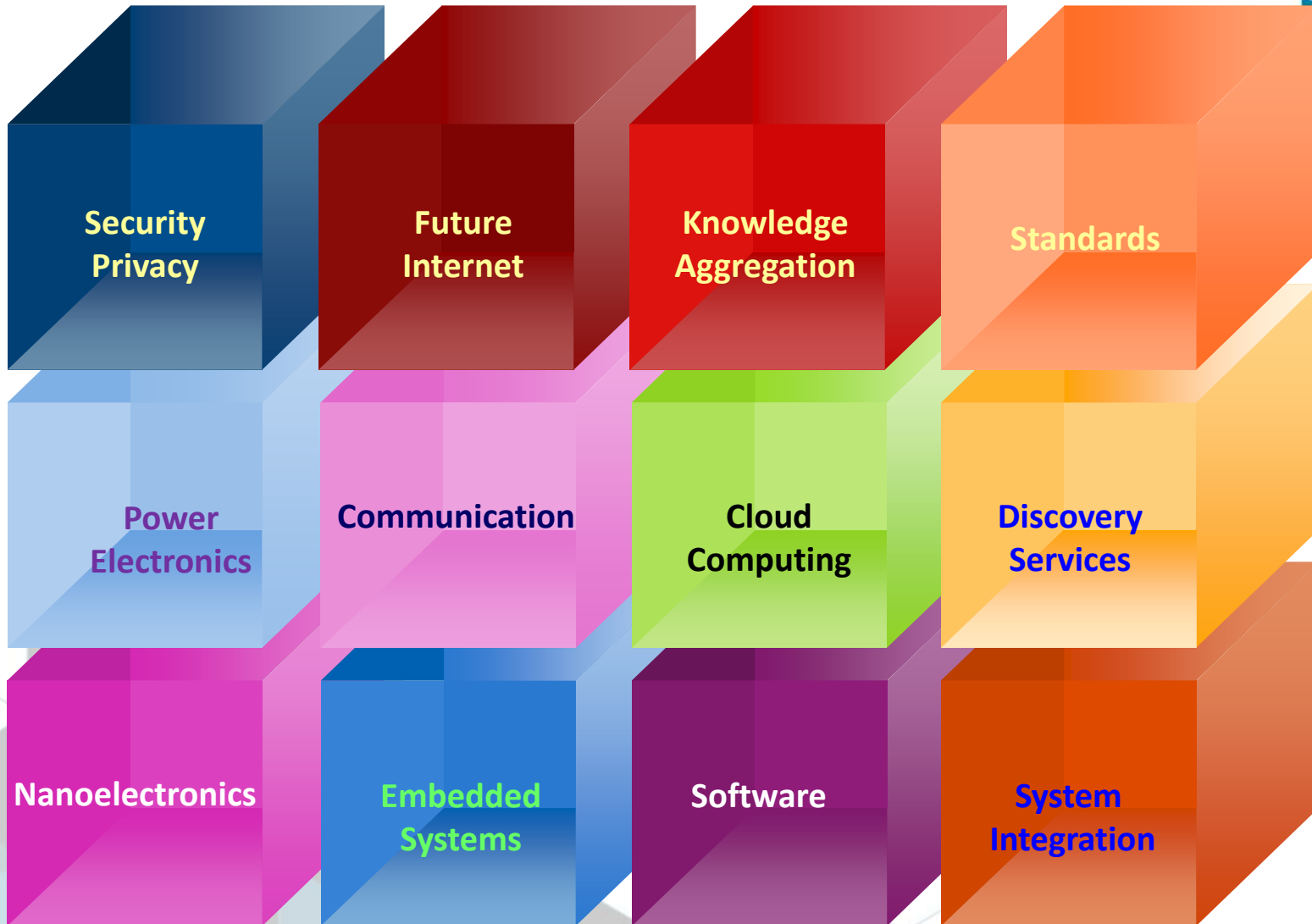


Future Batteries

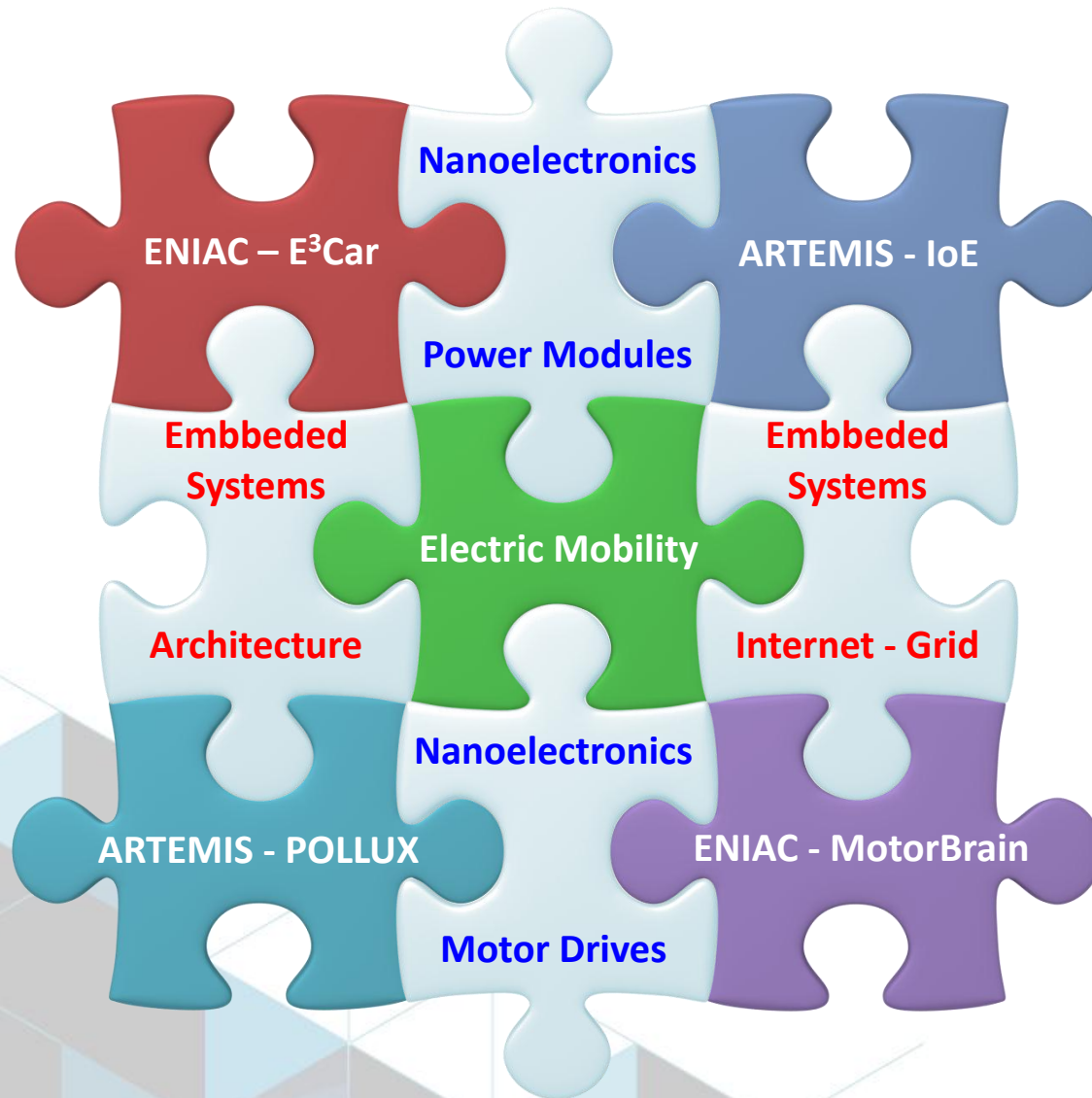


► Increasing expected lifetime, decreasing cost and weight

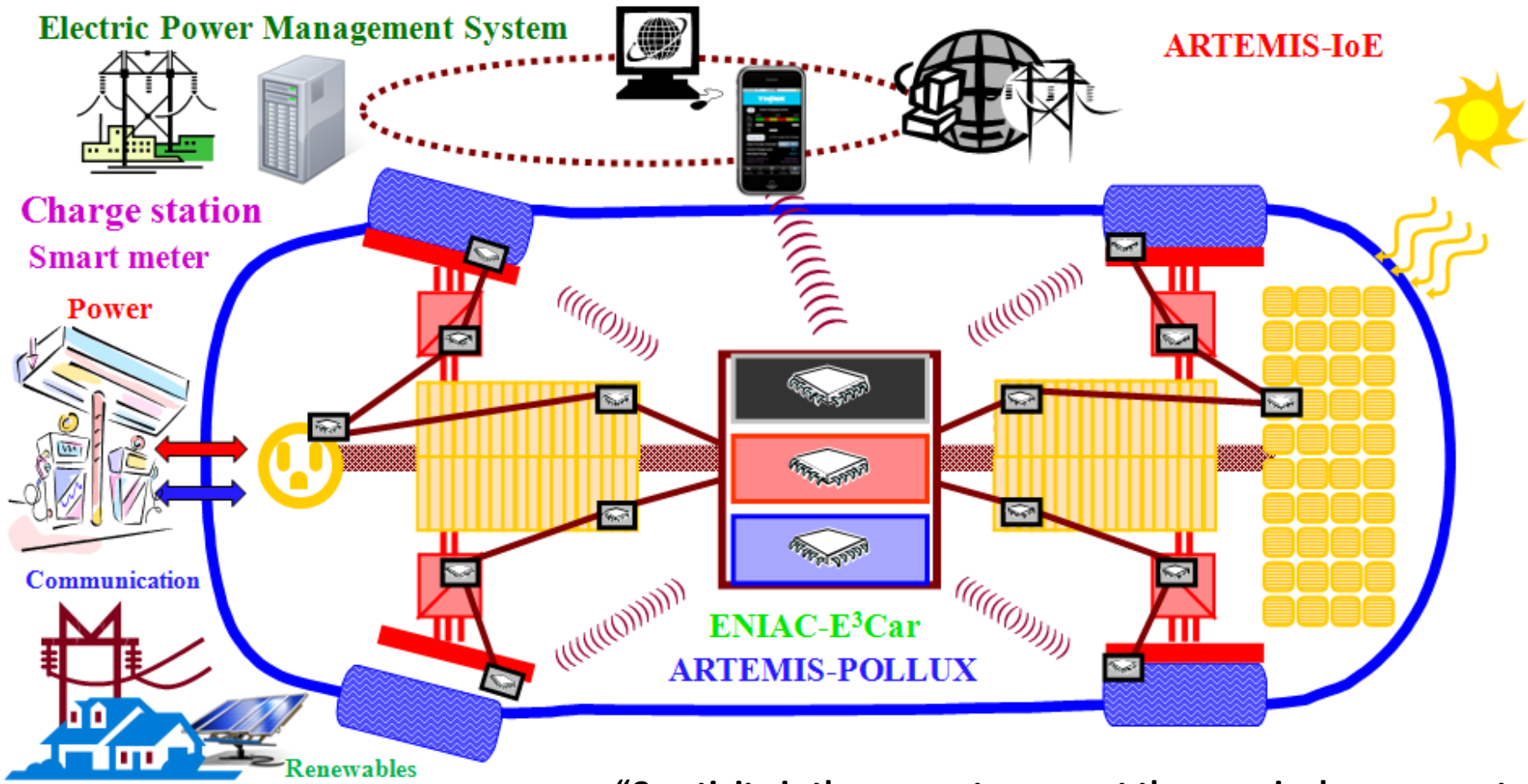
Enabling Technologies



Synergies among European Programs



IoE - ENIAC E³Car - ARTEMIS POLLUX



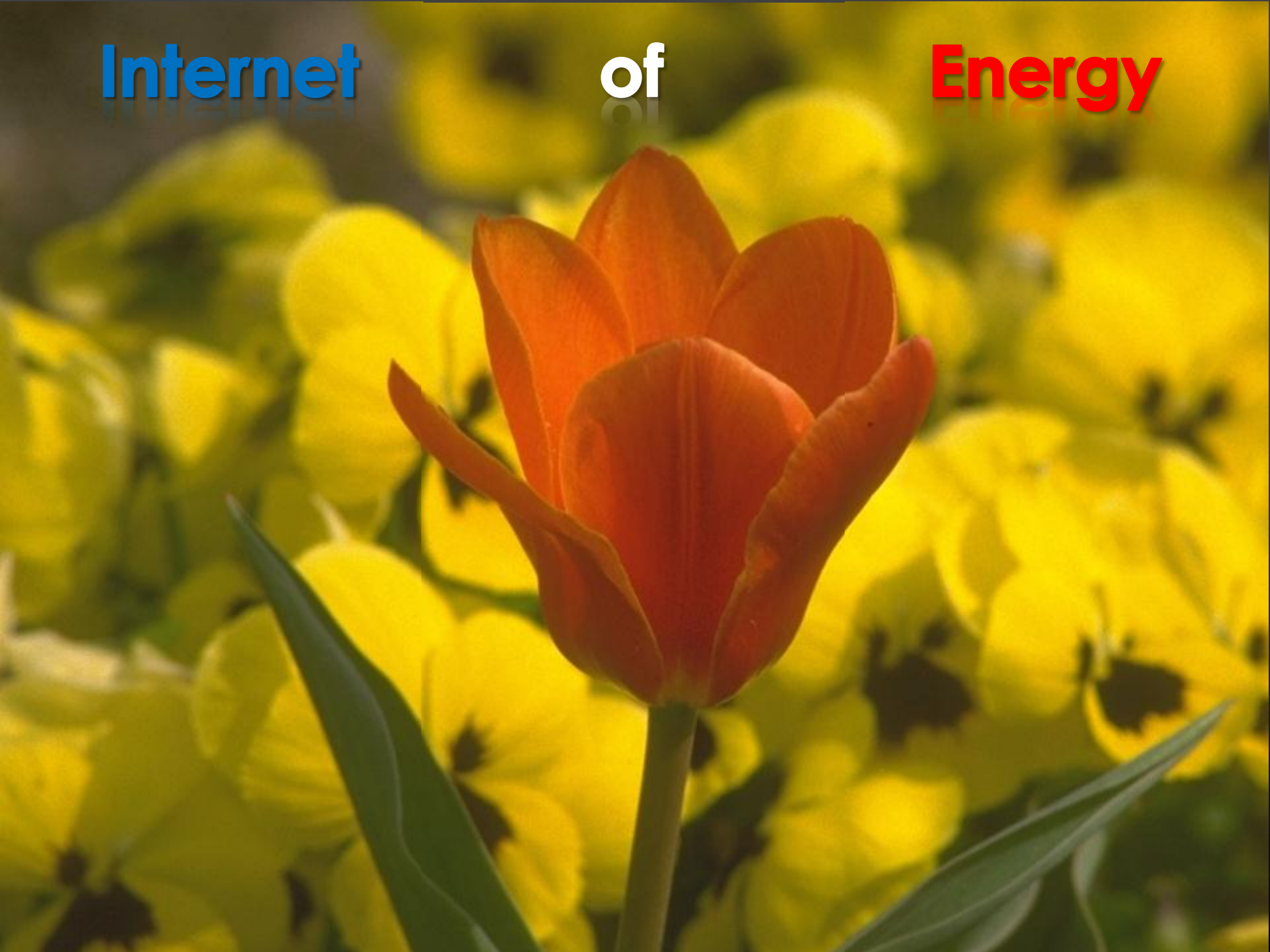
“Creativity is the power to connect the seemingly unconnected.”

William Plomer (African born English Writer, 1903-1973)

Internet

of

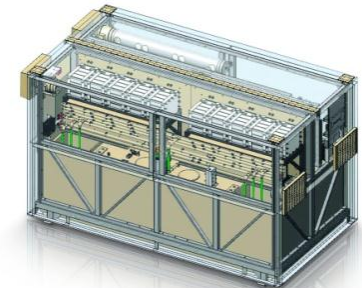
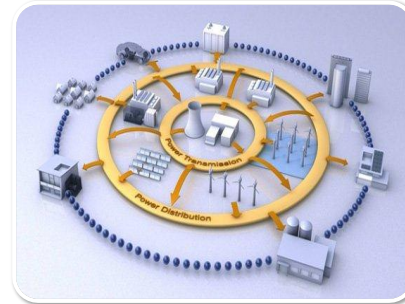
Energy



Why Internet of Energy?



Nanoelectronics and Embedded Systems *for Electric Mobility*



**Ubiquitous
Charging**

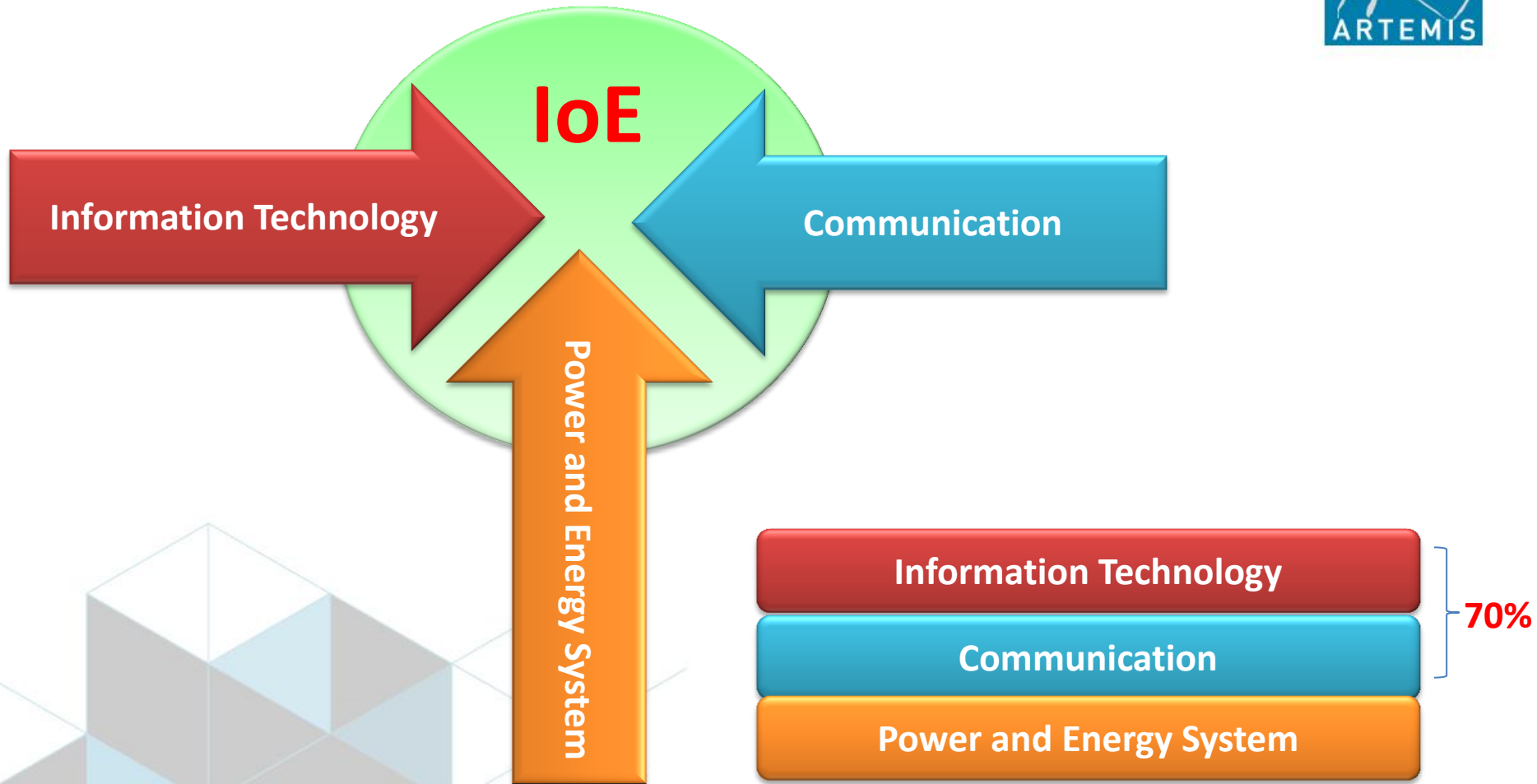
**Embedded
Systems**

**Communication
Smart Grid**

**Energy Storage
Systems**

Security, Privacy, Safety, Dependability

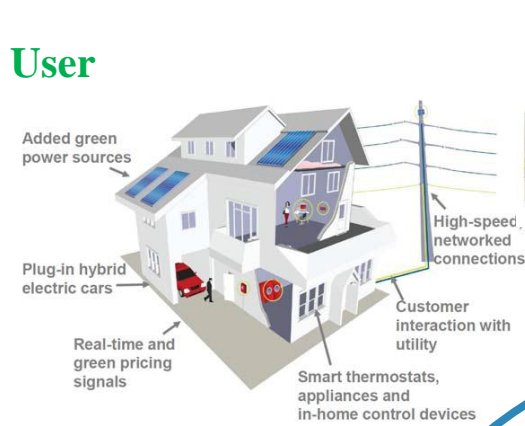
IoE Architecture Fundamental Layers



IoE - Overview



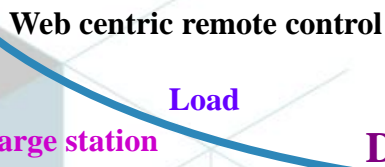
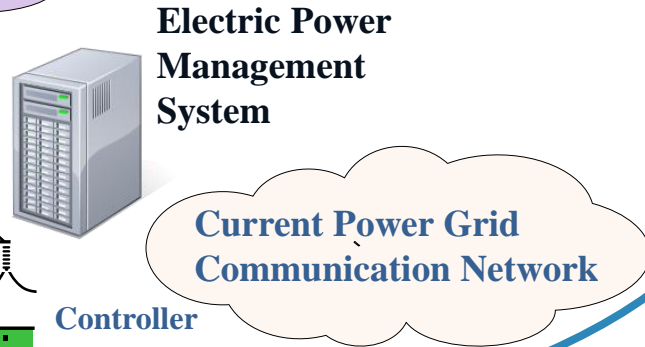
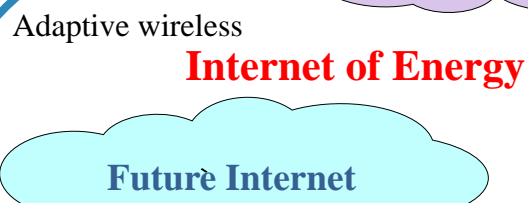
User



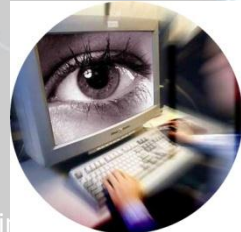
Generation



Transmission



Information



On phone

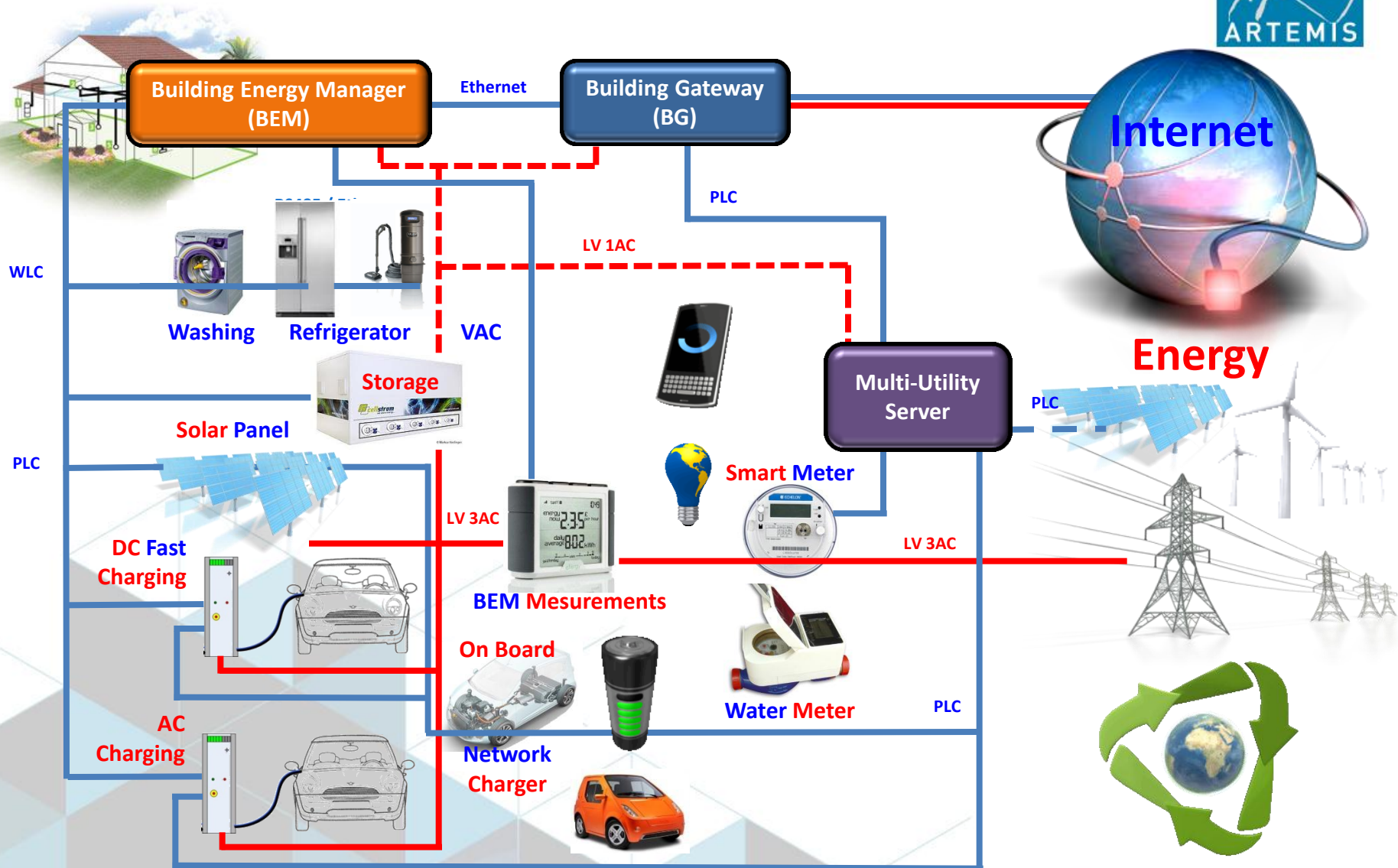


On Board



Internet of Energy

ARTEMIS IoE Architecture



IoE Applications



Electric Vehicles

Automotive

Network energy management



Automotive

Bidirectional fast charger



Automotive

Communicator ecosystem



IoE Architecture

IoE Architecture Renewables /Solar / Wind

Smart grid architecture



ICT Platform

Energy station platform



Internet

Security privacy dependability

IoE Infrastructure

Fast charging station



IoE Infrastructure

Energy storage station



Smart Buildings

Building energy gateway



NFC Communication

NFC identification station



PLC/Wireless Communication

Power line communication



PLC/Wireless Communication

Smart metering



Embedded Systems

Wireless/Wired Communication

ARTEMIS IoE Project Partners

- ▶ 10 European countries
- ▶ 45 Million € budget
- ▶ 42 partners



	 Germany			 Germany		
		 Italy		 ENERGY IN TUNE WITH YOU.	 renewable energies	
				 UK		
			 Inspiring Business		 Infraestructuras	 Austria
 Austria						

Norway	Germany	Italy	Netherlands	UK	Spain	Austria	Czech Republic	Belgium	Finland
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IoE Project Targets



IoE Devices Connected to the Smart Grid

E-Mobility (+3 Millions Evs) + 25% by infrastructure, seamless use, integration

Renewable Energy to Grid + 10% by need balance

Power Generation to Grid + 10% by control and flexibility of energy sources

Storage to Grid (Load/Generation) + 5% by grid reserve balancing

Household to Grid (Load) + 5% by demand control and cut peak energy

IoE Total Potential Weighted Mean Value +20%

Summary



- ▶ Internet of Energy is the answer to a number of the energy challenges related to electric mobility.



Bluecar
Source: Pininfarina/Bolloré



e-tron
Source: Audi



Phylla
Source: Fiat



Think City
Source: Think



Peugeot BB1
Source: Peugeot



Renault Electric Concepts
Source: Renault



Leaf
Source: Nissan



Buddy
Source: Pure Mobility AS



Thank you for your attention!

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Advanced Research & Technology for Embedded Intelligence and Systems