



NATIONAL & KAPODISTRIAN UNIVERSITY OF ATHENS

DIGITAL TWINS FOR EV & SMART GRIDS



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EU GREEN DEAL – EV & SMART GRIDS

**12 BRIEF LESSONS
ON EUROPE'S ENERGY
TRANSITION**

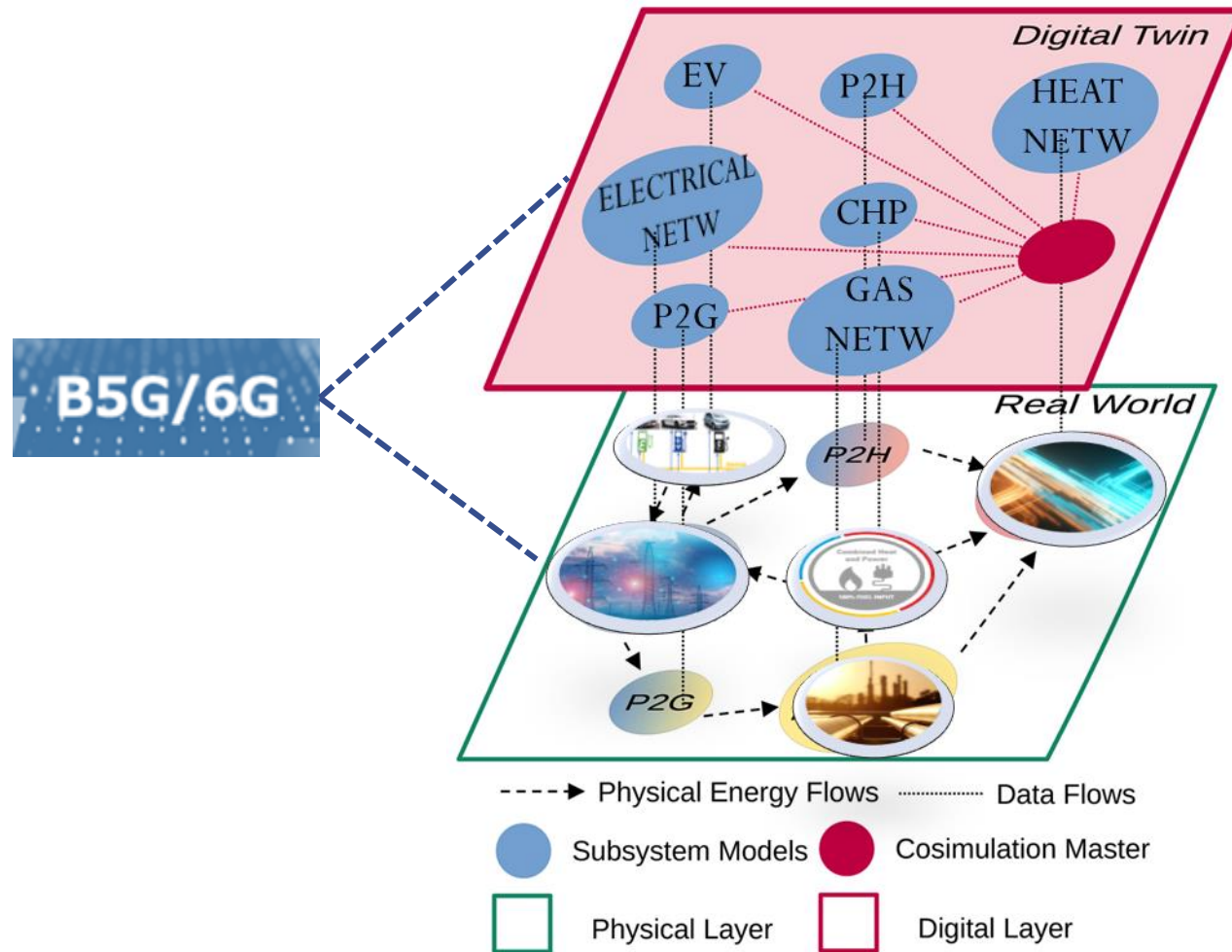
- 1 Energy has historically been a key driver of European **COOPERATION**. But current EU proposals are not enough. To comply with the Paris Climate Agreement, we **MUST GIVE UP** fossil fuels altogether by 2050.
- 2 A 100% renewable energy system in Europe is now technically possible using existing **STORAGE** and **DEMAND RESPONSE** technologies.
- 3 Stronger **INTERCONNECTIONS** of markets and infrastructure across Europe will make the energy transition cheaper for all Europeans.
- 4 The biggest potential lies in **INCREASING EFFICIENCY**. Europe-wide we could reduce our energy demand by half by 2050.
- 5 A switch to 100% renewables in Europe will trigger **SYSTEM CHANGE** – away from centralized, monopolistic utilities to decentralized, community power projects and innovative business models.
- 6 Framed by smart strategies and legislation, this system change can be driven by **CITIZENS, CITIES AND ENERGY COOPERATIVES**, leaving much more wealth in communities.

**European Commission
Priorities**

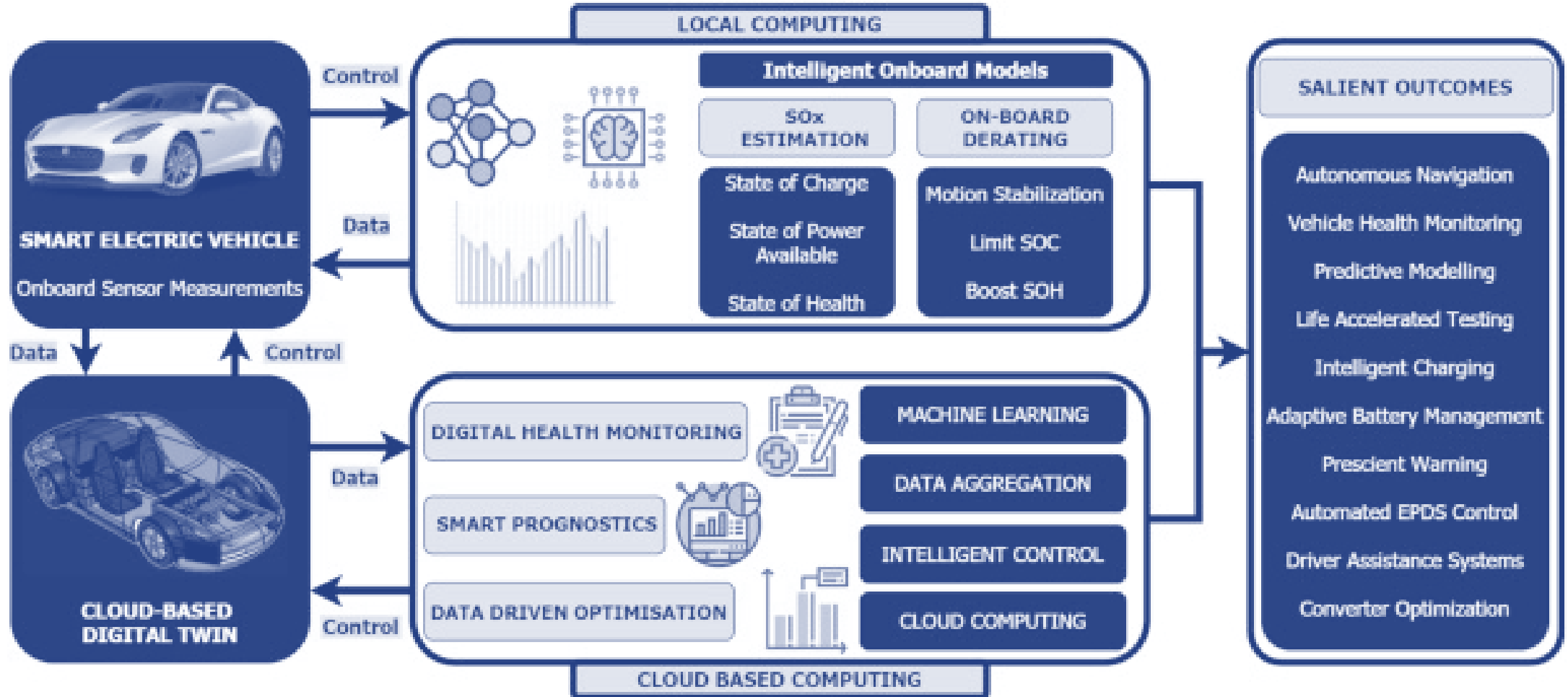
European Green Deal

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DIGITAL TWINS – ENERGY INDUSTRY



EV – DIGITAL TWIN



BENEFITS - DTs FOR SMART GRIDS AND EV

PLANNING

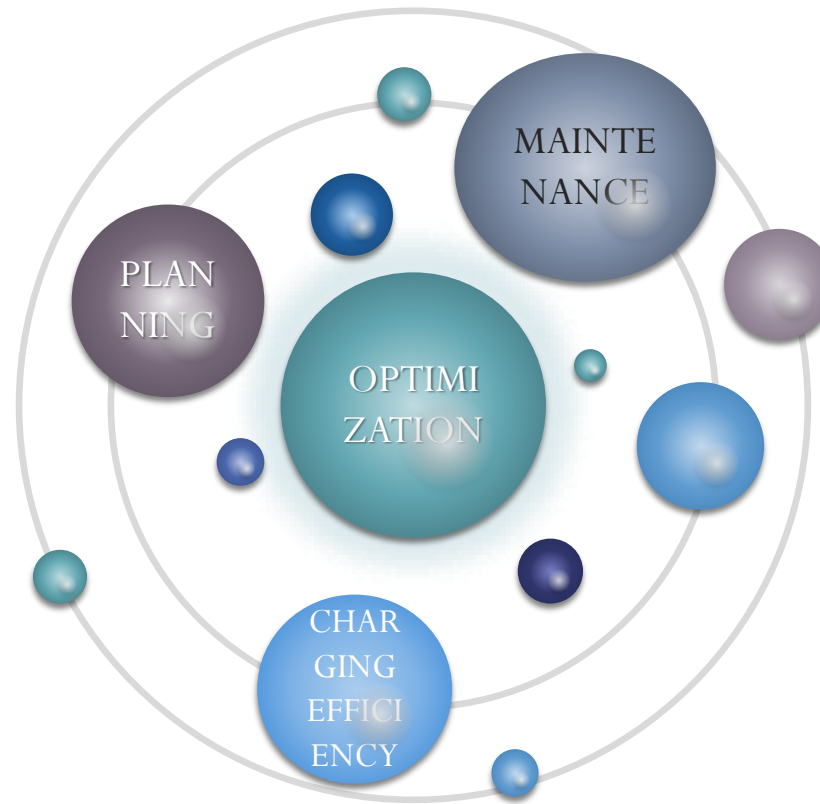
The mobility and distribution of EVs determine the charging demand and the load of power distribution grid. Then, dynamic traffic pattern of numerous interconnected EVs poses great impact on charging plans and charging infrastructure.

OPTIMIZATION

Optimize driving experience based on the availability and reachability of EV charging infrastructure. Energy consumption, charging capacity, charging frequency, and waiting time in queue

MAINTENANCE

Optimized maintenance, state update, predict repairs, .



CHARGING EFFICIENCY

Different EV navigation algorithms and charging algorithms of Internet of Vehicle can be evaluated in the dynamic simulation of the digital twins of the moving EVs and charging infrastructure.

INTERDEPENDENCIES

Relations between the scheduled charging operation of EVs and the deployment of piles

MONITORING

EV and Grid monitoring for status updates.



DIGITAL INNOVATION HUB - LIVINGTRAC

Candidate
EDIH
GREECE

LIVINGTRAC

<https://scan.di.uoa.gr/livingtrac/>

AIM

LIVINGTRAC EDIH will act as a one-stop-shop reference point to support the competitiveness of SMEs and the digital transformation of both production and development processes of services and applications in public and private sector, as well as for the integration and enhancement of innovative products and technologies. LIVINGTRAC covers the areas of Smart Health and Sustainable Living, Digital Transformation and Cybersecurity. Typical services that the Hub can support are the diffusion of know-how, pre-investment testing and networking of a business / know-how / living laboratory ecosystem in areas with different geographical, economic and cultural characteristics. The primary goal is the design and development of digital applications and services, as they will result from the interaction of between stakeholders. The co-creation between Municipalities, chambers, companies, SMEs and University. The development sectors concern applications of digital transformation (in central and local government, and businesses), applications of Smart Health, sustainable living and growth, interoperable processes in public and private sectors, with the possibility of testing through the Hub on a large population scale, ensuring the security of digital personal and professional data. Supported testbeds are AI/ML, 5G, IoT, HPC.

Applications

Smart applications for Health, Environment, Cities/Regions, Maritime, Agrifood, Industry 4.0, Public Safety are in scope of the HUB activities. COVID-19 traceability (e.g. fast testing and traceability in ports, airports, borders, islands, cities, ships) – high-speed data exchange, high-volume data analysis, IoT use, pre / postoperative patient monitoring (ophthalmological, dental cases, etc.) – (AR / VR assisted reality use, AI) etc., smart applications for sustainable living and development depending on the characteristics of the area (rural areas, rural / cities), the environment etc. – (IoT, AI), as well as for digital transformation in municipalities, decisions assisted by AI etc. – (interoperability, digital transformation (digital first & digital by default)) and data security issues – (cybersecurity, privacy (The Once-Only Principle, Privacy by Design and by Default).

Testbeds

Indoor and outdoor 5G Testbed

- Supported Technologies: GSM/UMTS, LTE/4G, 5G/5G-Advanced
- 5 New Antennas + 1 aggregated, Height 12 -20m, Local power output 10dBm or 30dBm
- Additional 5 200mW omnidirectional Small Cells
- Connectivity of radio and fiber-optical infrastructure through fiber optics, 100m Gbps

IoT, SDN and SDR Testbed

- SDN enabled Active network switch HPE Router supporting OpenFlow
- ETSI USRP X310 & SDR10 SDR device
- Dell Precision tower controllers
- IoT supporting variety of sensors

30+

Members

AI/ML

AI/ML

HPC

HPC

IoT

IoT

5G

5G

Coordinator:

HELLENIC REPUBLIC
National and Kapodistrian
University of Athens

LIVINGTRAC Members

- **National and Kapodistrian University of Athens (NKUA)**
Department of Informatics and Telecommunications (DIT), Medical School (Pathology, Ophthalmology etc. clinics of Attikon Hospital), Department of Physics, Dental School, Department of Economics and 'ARCHIMEDES' Center for Research, innovation and Entrepreneurship.
- **Institute of Accelerating Systems & Applications (IASA)**
- **University of Piraeus Research Center (UPRC)**
Laboratory of Digital Culture, Smart Cities, IoT and Advanced Digital Technologies & Services
- **University of the Aegean**
Department of Information and Communication Systems Engineering, Information Systems Laboratory (ISL)
- **University of Thessaly**
Department of Computer Science and Biomedical Informatics
- **National Observatory of Athens (NOA)**
- **City of Athens**
IT Company / Municipality of Athens (DAEM)
- **Municipality of Piraeus**
- **Municipality of Lokroi**
- **Municipality of Didymoteicho**
- **Municipality of Orestiada**
- **Region of Central Greece**
- **Hellenic Federation of Enterprises (SEV)**
- **Piraeus Chamber of Handicrafts**
- **Chamber of Evros**
- **Economic Chamber of Greece**
- **National Transparency Authority (NTA)**
- **Ministry of Health**
- **Ministry of Citizens' Protection / Hellenic Police**
- **Hellenic Telecommunications Organisation S.A (OTE)**
R & D Dept. (OTE/COSMOTE)
- **UNISYSTEMS S.A.**
- **HELLENIC LLOYD'S (LR)**
- **UNI-PHARMA S.A.**
- **Internet Business Hellas S.A.**
- **IEPBA/EAA -**
Ινστιτούτο Ερευνών Περιβάλλοντος και Βιώσιμης Ανάπτυξης
- **Code.Hub**
- **NANOPLASMAS P.C.**
- **NANOMETRISIS P.C.**
- **MINDVIEW S.A.**
- **Open Technologies Alliance (GFOSS)**
- **IMPACT HUB ATHENS**
- **Greek Network EIP on AHA**
European Innovation Partnership on Active and Healthy Ageing

one6G



TO LEARN MORE

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Thank you!

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