

5G as Enabler for Real-Time Analysis and Control of Data-Driven IoT Systems

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West University

- ❖ Founded in 1944
- ❖ 11 faculties
- ❖ 15,000 students
- ❖ 700 teachers
- ❖ 350 administrative staff

Faculty of Mathematics and Computer Science:

- two departments
- around 1,500 students
 - 1,200 – first cycle
 - 300 – second cycle
 - 30 – third cycle (15 in Computer Science)
- 60 teachers



Research in Computer Science

Entities:

- **Research Center in Computer Science** (accredited at national level)

<http://research.info.uvt.ro>

- **Research Institute e-Austria** = partnership between

- West University of Timisoara
- “Politehnica” University of Timisoara
- Research Institute for Symbolic Computation, Linz, Austria

<http://www.ieat.ro>



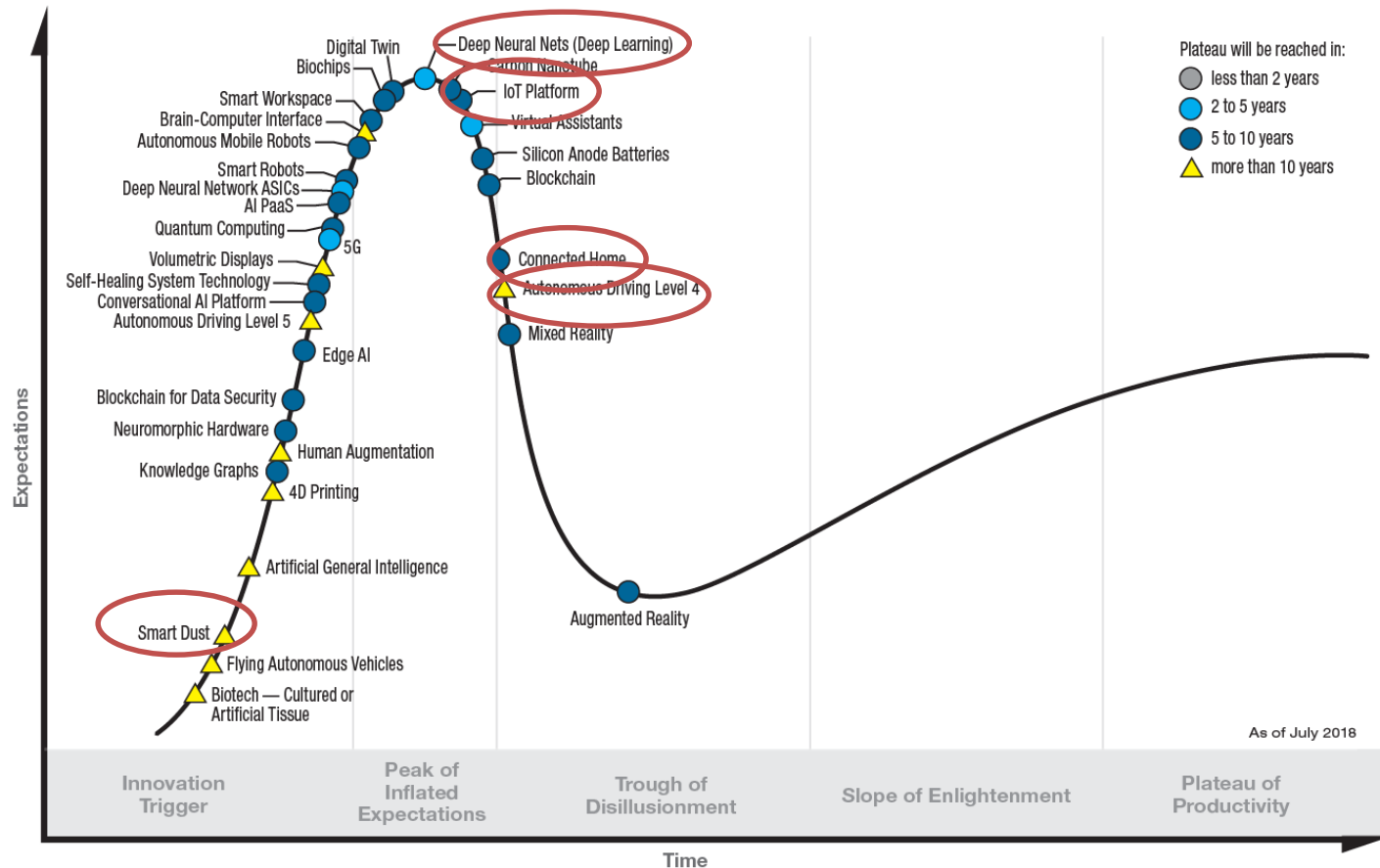
People:

- Around 40 permanent and associated staff
- 15 PhD students

Research directions

- Cloud Computing, High Performance Computing and IoT
- Big Data Analysis
- Artificial Intelligence and Machine Learning
- Applications in Earth Observation
- Theory of Computing
- Computational Mathematics

Hype Cycle for Emerging Technologies, 2018



gartner.com/SmarterWithGartner

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Gartner

Towards a smart interconnected world



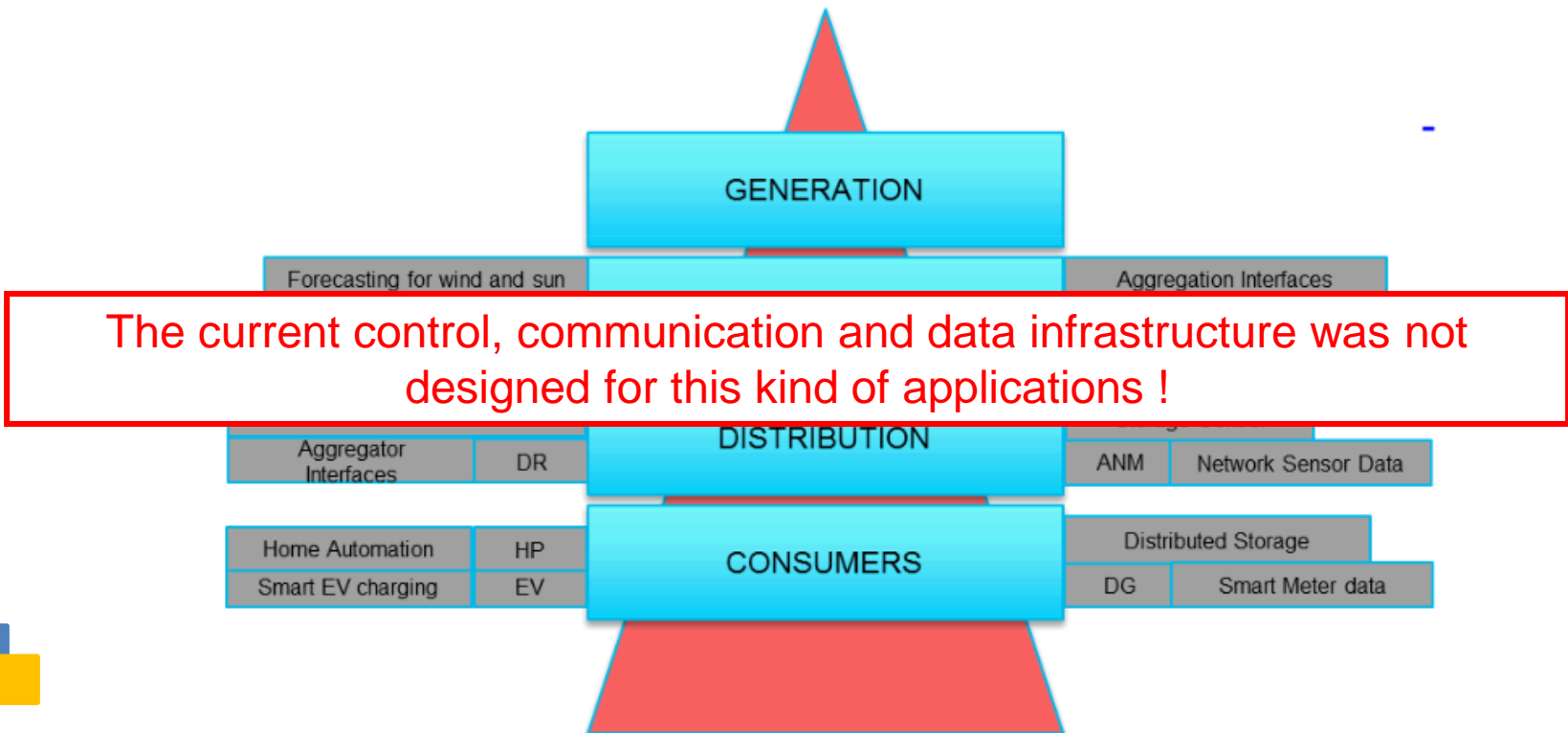
Real-Time Control

Use case smart grids:

Fast detection of **sudden changes** in energy demand caused by EVs and nomad devices (IoT)

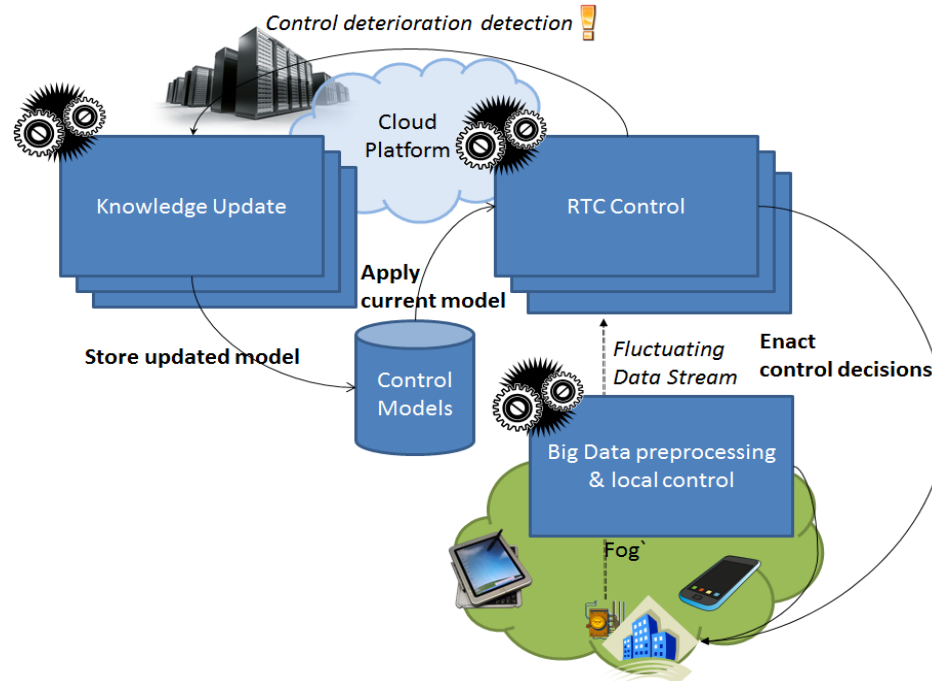
Real-time balancing of supply-demand as a result of introducing **prosumers** (consumers pushing back energy to the grid): photovoltaics, wind, heat pumps, EVs

Introduction of **dynamic pricing** based on real-time energy demand



The Future Smart Grid: Neural Grid

- A **platform** of soft and hard systems that **uses** heterogeneous **resources** available and **interconnected** through a network:
 - Cloud
 - Robotics
 - Artificial Intelligence
 - Edge/fog computing, and
 - IoT ubiquitous sensingto **analyze** energy (and not only) applications



Why do we need 5G ?

As the smart grid evolves **complex interactions** between the **communication** medium and **devices** at the edge (smart meters, IoT, etc.) or the datacenter evolve

The power grid **becomes** more **flexible** and **efficient** but depends on the **availability** of **high quality data** which must be **relayed** by smart meters and IoT to be analyzed for operations and marketing

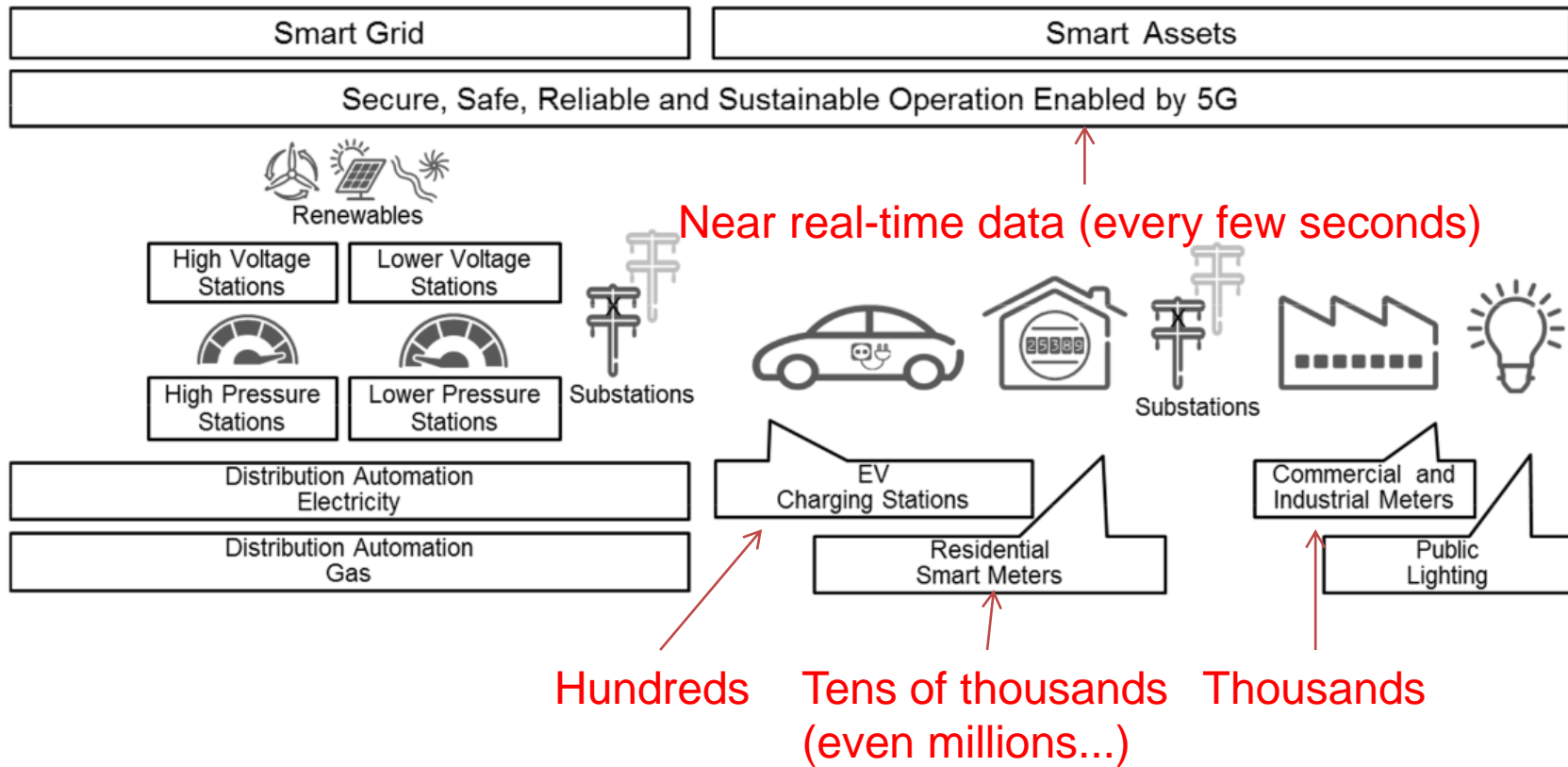


5G Benefits

Forecast of 12% reduction (in UK) of household consumption and up to 70% within public administrations (in UK) through:

- Introduction of **sensors** and 5G wireless technology for **street lights**
 - Telefónica in Spain
- **Dynamic choosing** of energy supplier through the **bidirectional communication** of the smart grid enabled by 5G
- **Reduction of losses** caused by blackouts or brownouts by **adapting in real-time** to fluctuations in demand and (cogenerative) supply
 - Fortum and Ericsson in Finland

Smart Grid Ecosystem

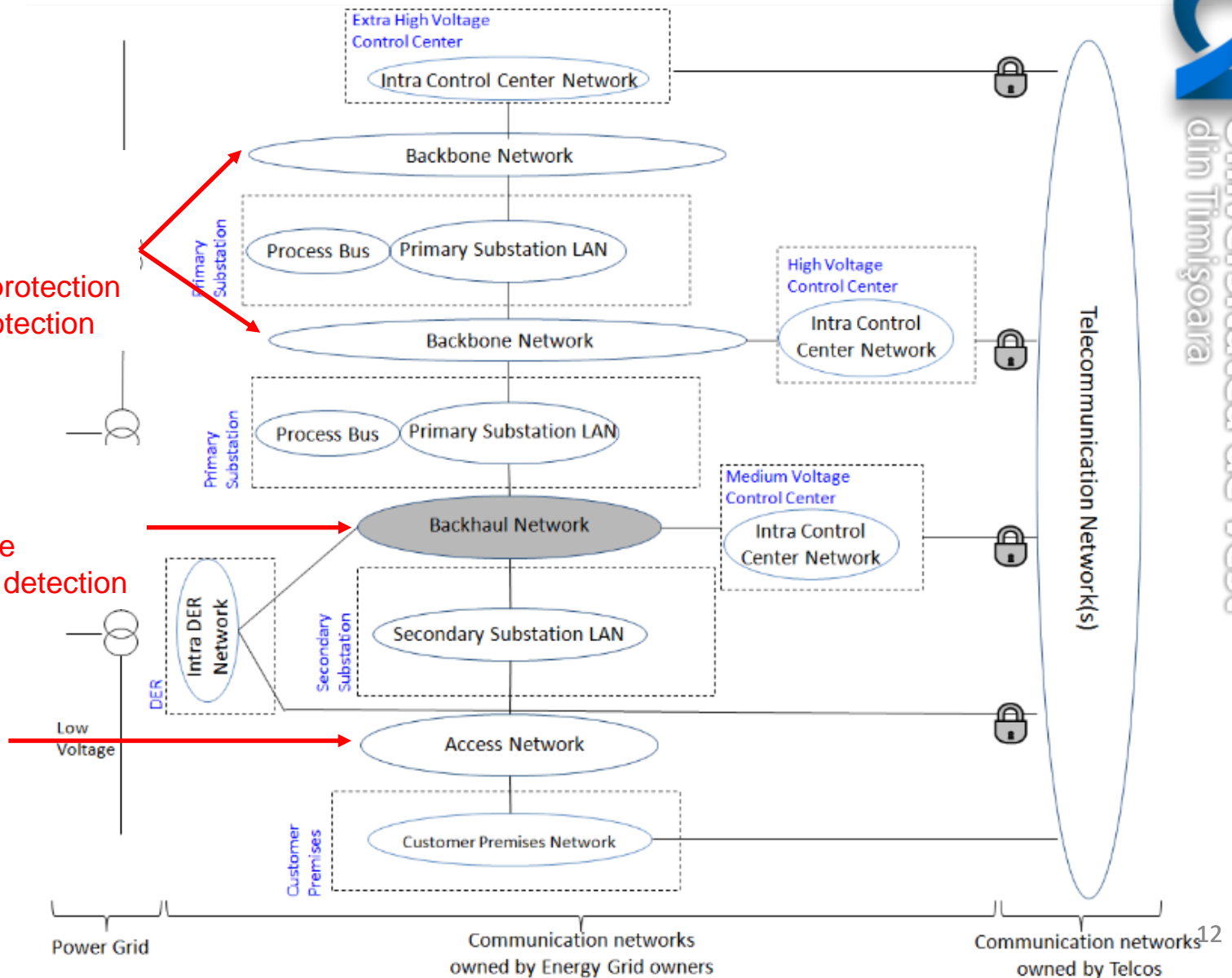


5G Technical Requirements

Gbps bandwidth
5ms latency
5min / y downtime
Critical apps: teleprotection
and differential protection

> Mbps bandwidth
1ms latency
50min / y downtime
Critical apps: fault detection

1 kbps bandwidth
1s latency
9h / y downtime
Noncritical apps



Thank You!

Questions?