Networked Control for the Smart Grid

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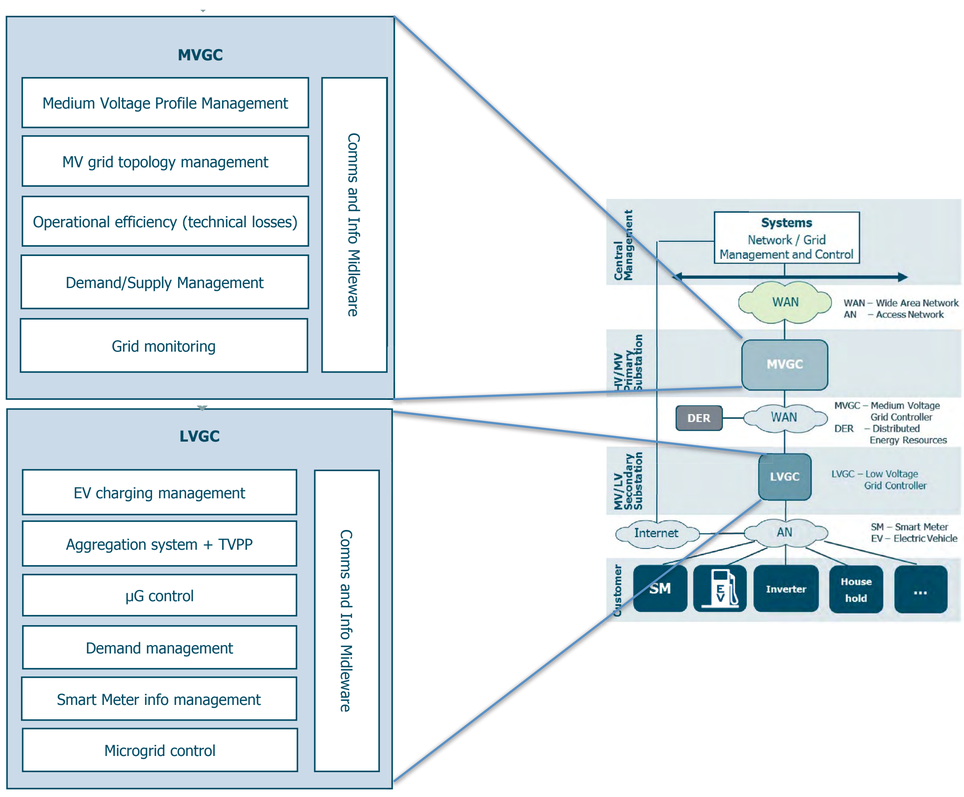
INTRODUCTION & BACKGROUND

Smart Grids are foreseen to ensure a high power quality and availability despite new challenging scenarios with a significant amount of distributed and fluctuating power generation and high demand loads e.g. from electric vehicle charging.
Besides automatically collecting grid data from a large number of sensors and devices, the smart grid is further expected to facilitate information exchange between aggregators, DSO and grid resources for providing economic efficiency, demand side management, demand response, etc.
A number of *networked* control components (such as the low/mid voltage grid controller LVGC/MVGC) are therefore needed in the middle voltage and low voltage grid to achieve the objectives of the DSO and the aggregators.

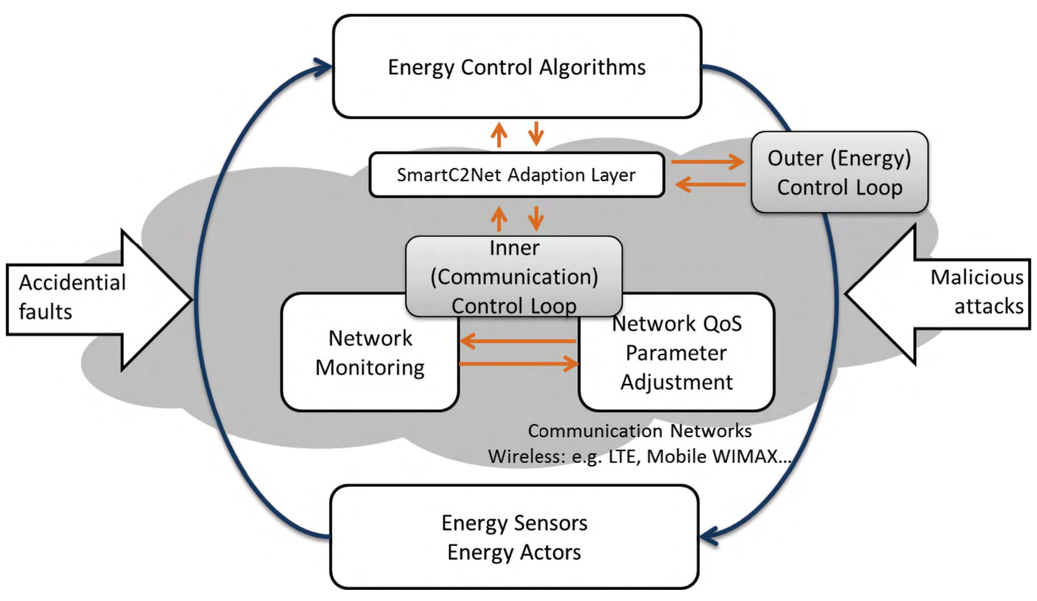


CHALLENGES

Smart grids are vulnerable to network traffic congestion, accidental faults and to attacks on the telecommunication infrastructure.

To meet this challenge, network quality parameters such as data latency and loss on various network paths are continuously monitored, and network adaptation mechanisms such as reconfiguration, alternate path activation are triggered. Alternatively, robust control strategies are initiated to limit errors and maintain stability.

The research goal of the FP7 **project SmartC2Net (2013-2015)** is to investigate the interacting control mechanisms depicted below and to demonstrate their operation in realistic low voltage and mid voltage grid scenarios.



USE CASES & ARCHITECTURE

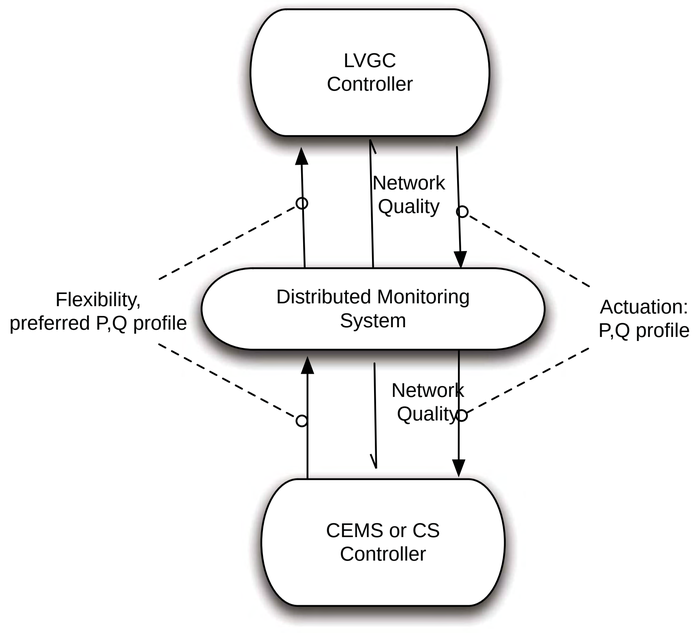
- 4 Use Cases
  - Synthetic views
    - Actors
    - SGAM mapping
  - Detailed IEC templates
    - Information flows
    - Control steps
- Requirements
- KPIs

CONTRIBUTIONS

▪ **Exchange flexibility information**
Each asset and controller reports estimated power and energy flexibility

▪ **Monitoring framework** for gathering network state and grid-related information over heterogeneous networks:
- distributed, agent based
- adapts to changing network QoS
- informs controllers

▪ **Controller modules** that adapt their strategy when communication deteriorates:
- Energy management at LV grid level using consumption flexibility due for instance to electrical or thermal storage
- Voltage control in the MV and LV grid
- Charging station controllers for EV parking lots
- Home energy management controllers



MORE INFORMATION

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SEVENTH FRAMEWORK PROGRAMME

SMARTC²NET