

SMARTHG ENERGY DEMAND AWARE OPEN SERVICES FOR SMART GRID INTELLIGENT AUTOMATION



OBJECTIVES

To devise **economically viable open** services for **Intelligent Home Automation**

- **Economically viable**
Technology available for commercial buildings too expensive for residential users
- **Openness** to avoid vendor lock-in

APPROACH

To develop open software services yielding benefits to both

- **Distribution System Operator (DSO)**: by optimizing operation of the grid and returning part of attained saving to residential users via favorable energy price policies
- **Residential users**: reduce electricity costs by following DSO proposed price policies

AUTONOMOUS DEMAND RESPONSE (ADR)

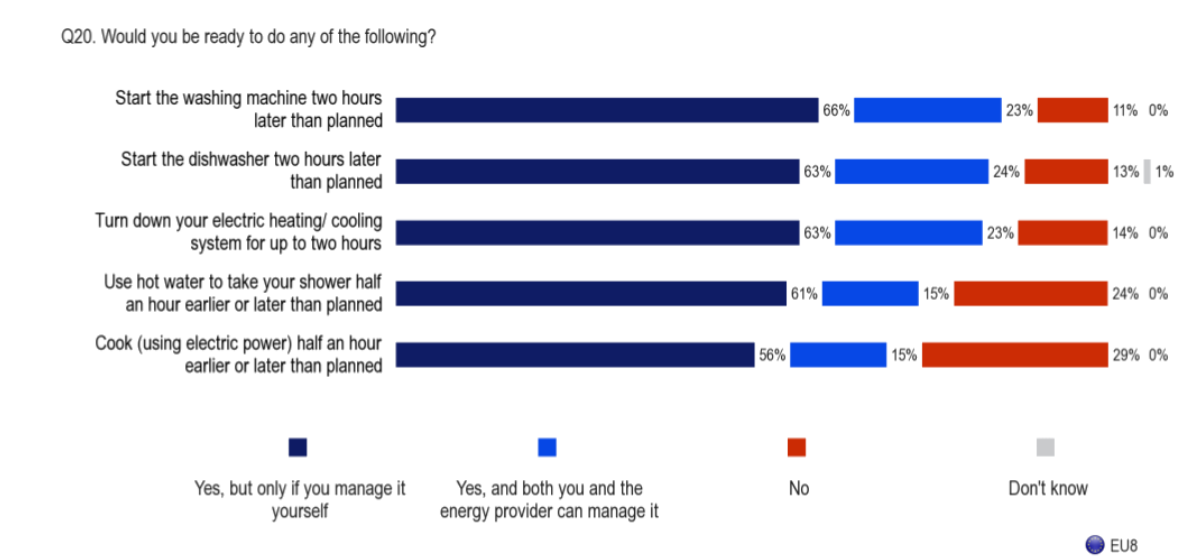
ADR moderately effective

ADR may move from 0 up to 25% of electrical energy demand, e.g.

- **UK Dept. of Energy & Climate change**, 2012 report
- **SEAS-NVE ADR Pilot** *Vind med nye elvaner* results

FP7 ADVANCED ADR Pilot

Citizens are ready for active demand BUT only if they manage it themselves



→ **Direct Load Control (DLC)** raises privacy and security issues

SMARTHG HIERARCHICAL APPROACH TO DEMAND RESPONSE

What

- Demand-aware
- Combines ADR and DLC benefits
- Provides a viable business model

How

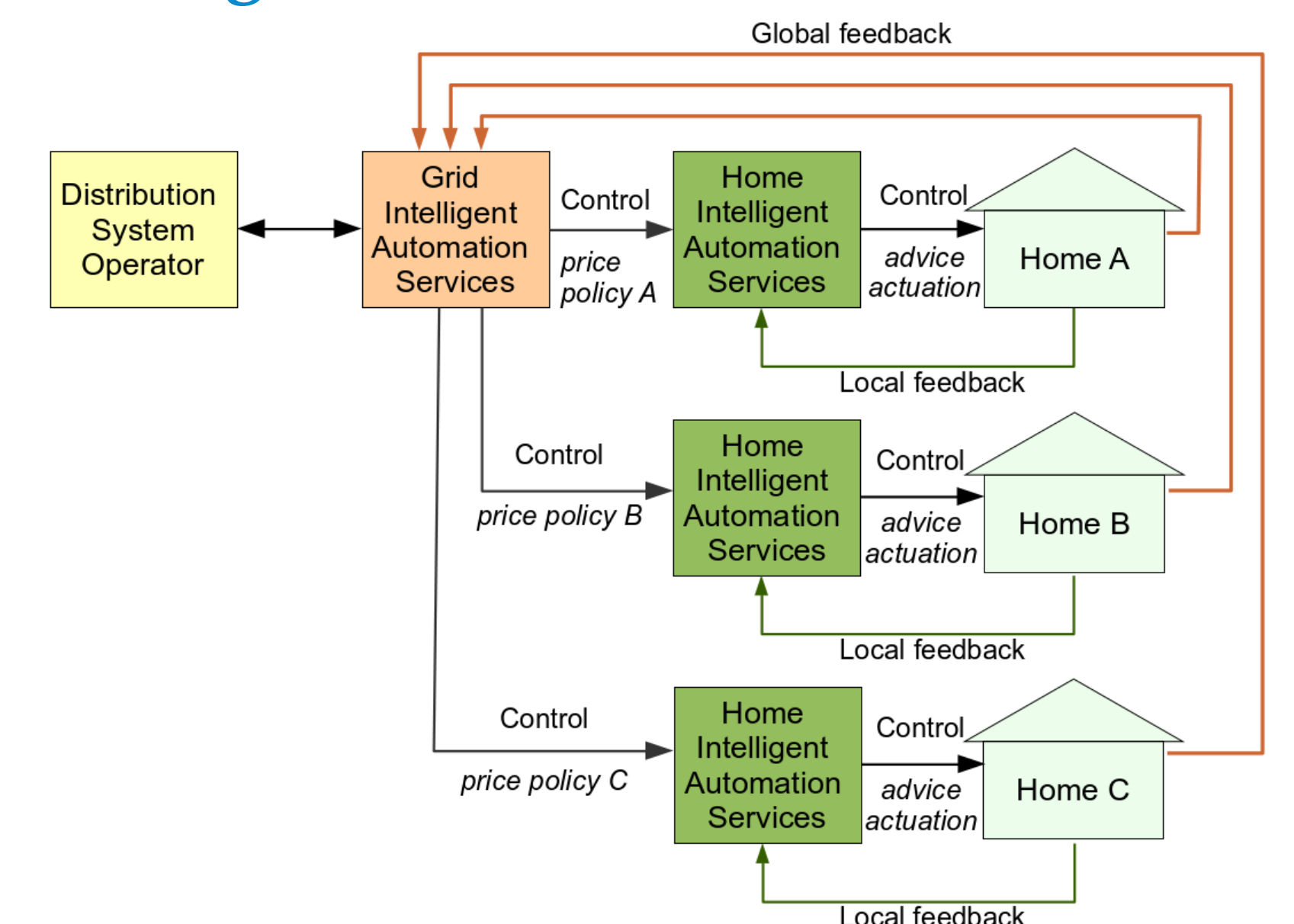
- Using energy demand (home meter level → no privacy issues)

- DSO computes fair power profiles to be followed by users
- Power profiles proposed to users via price policies
- Users follow price policies by using SmartHG services to manage home devices

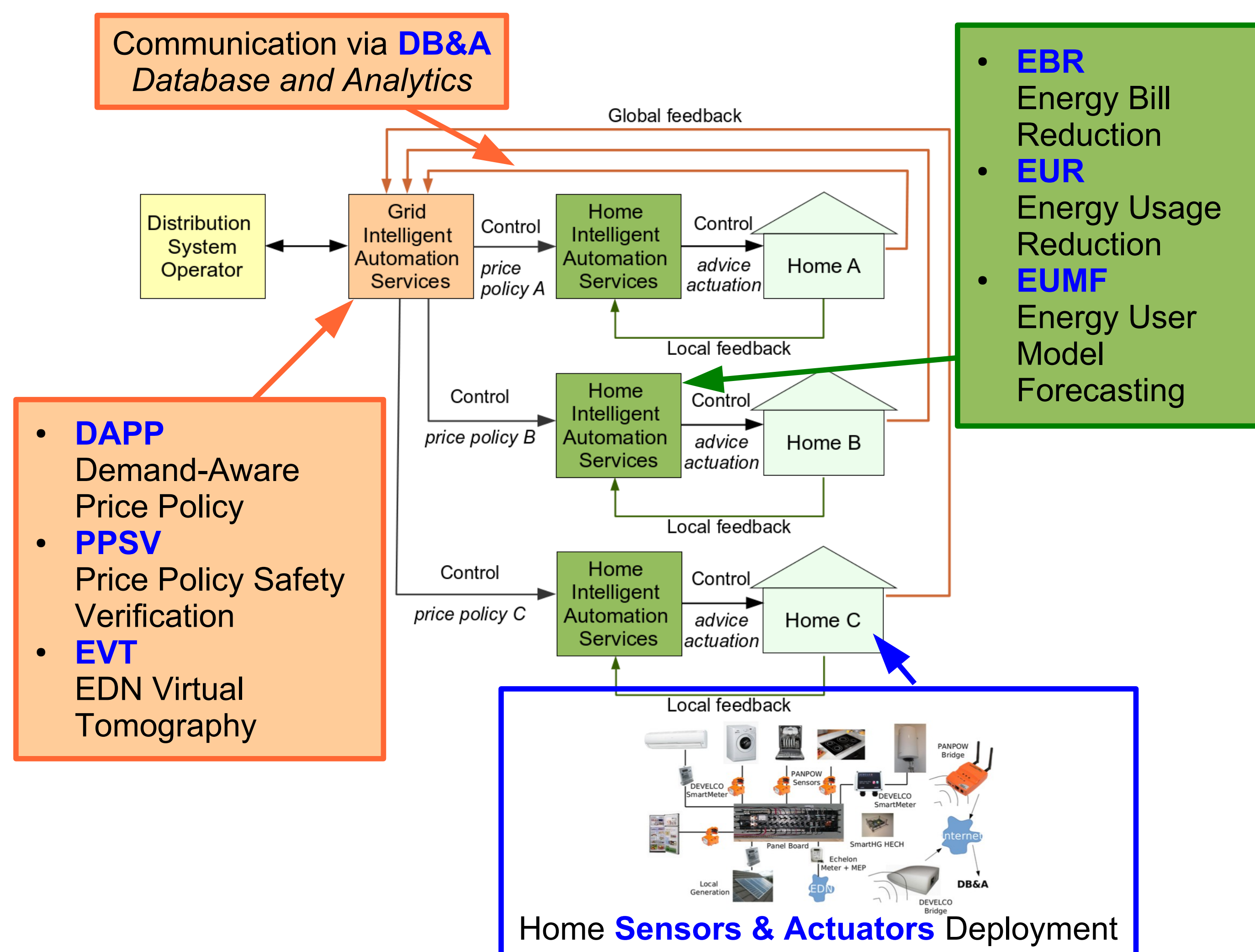
Advantages

- No home device data needs to be transferred to the DSO (as ADR)
→ **Security issues avoided**
- DSO does not directly control home devices (as ADR)
→ **Safety issues avoided**
- Home energy profile proposed by DSO (*soft* DLC)
- Home devices automatically managed by SmartHG services (*soft* DLC)

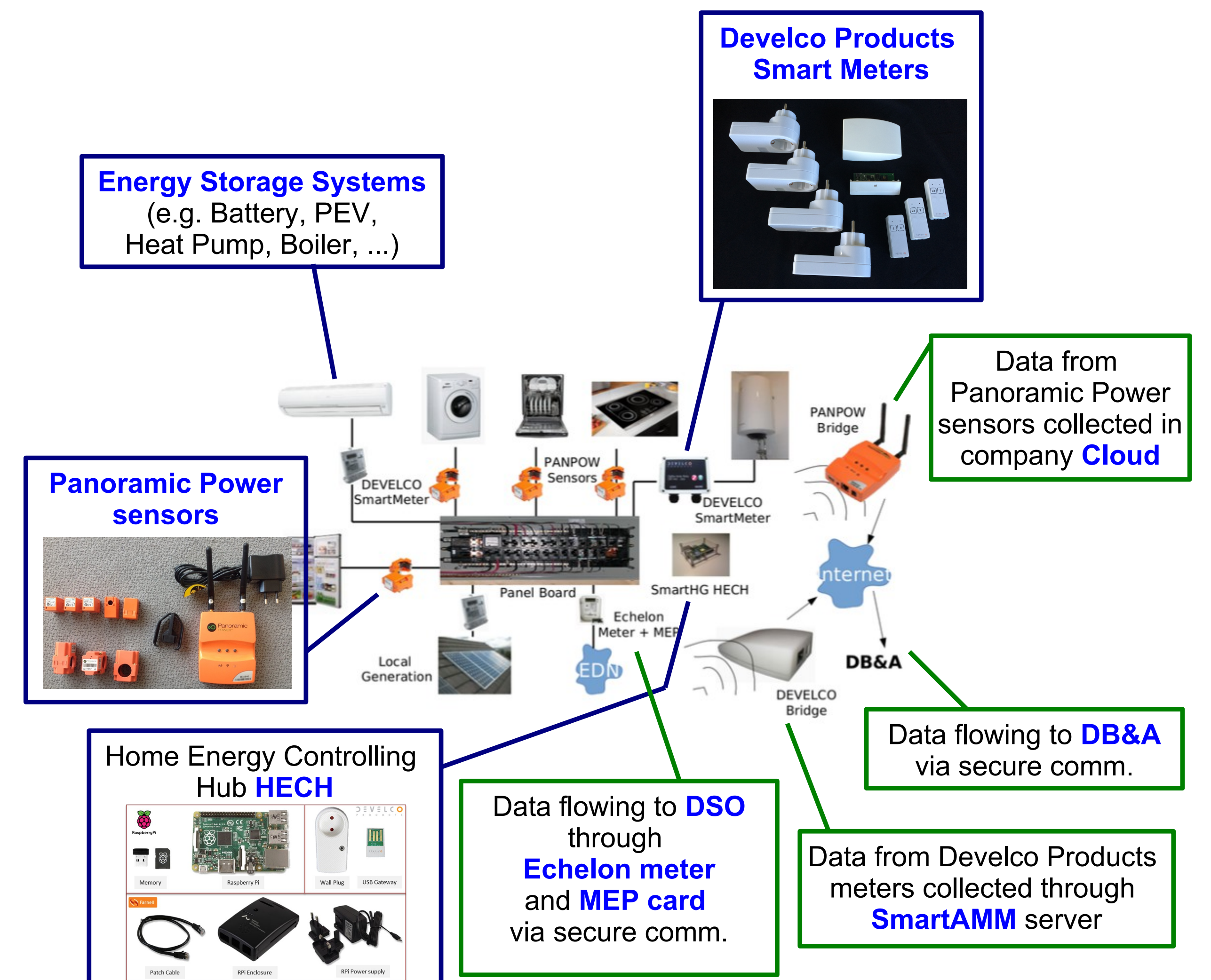
Intelligent Automation Services



SMARTHG ARCHITECTURE



HOME SENSORS & ACTUATORS DEPLOYMENT



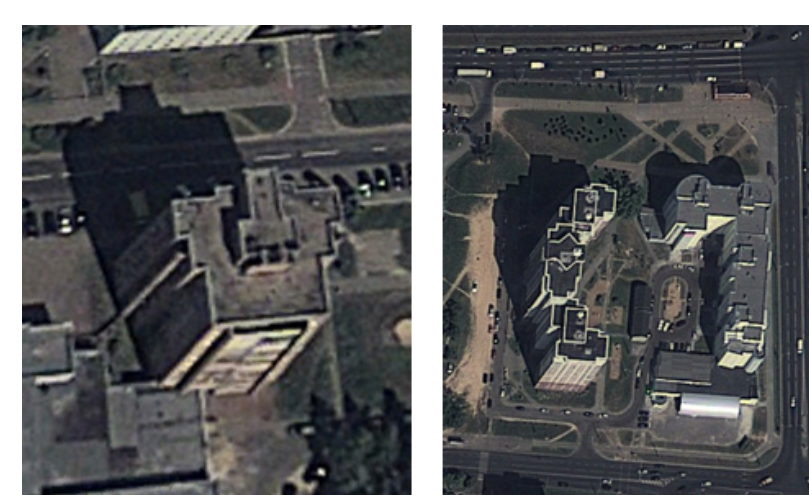
SMARTHG TEST-BEDS



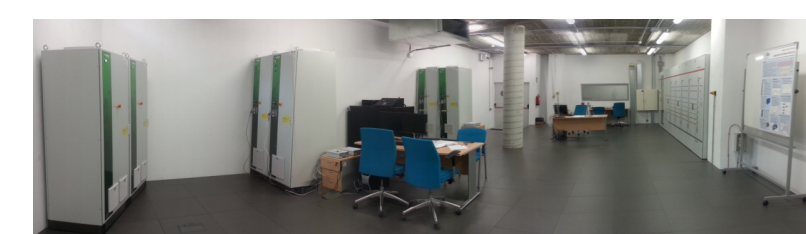
Svebølle, Kalundborg (Denmark)



Central District (Israel)



Minsk (Belarus)



IMDEA Smart Energy Integration Lab

- **Equipped with sensors and communication infrastructure** for collection of energy related data
- SmartHG services **run on current data** measured from sensors
- SmartHG services manage **Energy Storage Systems (ESS)** within houses (e.g., Plug-in Electrical Vehicles, batteries, heat pumps)
- SmartHG services **accessible via web** by DSO & residential users
- We use IMDEA Smart Energy Integration Lab **Micro Grid** to carry out **experiments with ESS**
- We use **test-bed data** to drive **Micro Grid** electronics loads and generators

PARTNERS



<http://smarthg.eu/>

EU FP7 PROJECT

