

Extending the HLAN for Energy Management in the Digital Home

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ReActivHome netwoRk-based Active Home energy efficiency

- 2010-2012 ANR Project
- Public research partners
 - CEA INES (solar energy)
 - Grenoble-INP/G-SCOP (optimization)
 - Grenoble-INP/G2ELab (power engineering)
 - LIG/Multicom (human interfaces)
- Industry partners
 - Orange Labs
 - Schneider Electric



Objectives : development and test of a comprehensive reactive, anticipative and adaptive system that jointly and contextually optimizes the local generation, storage and consumption of energy in home environments.

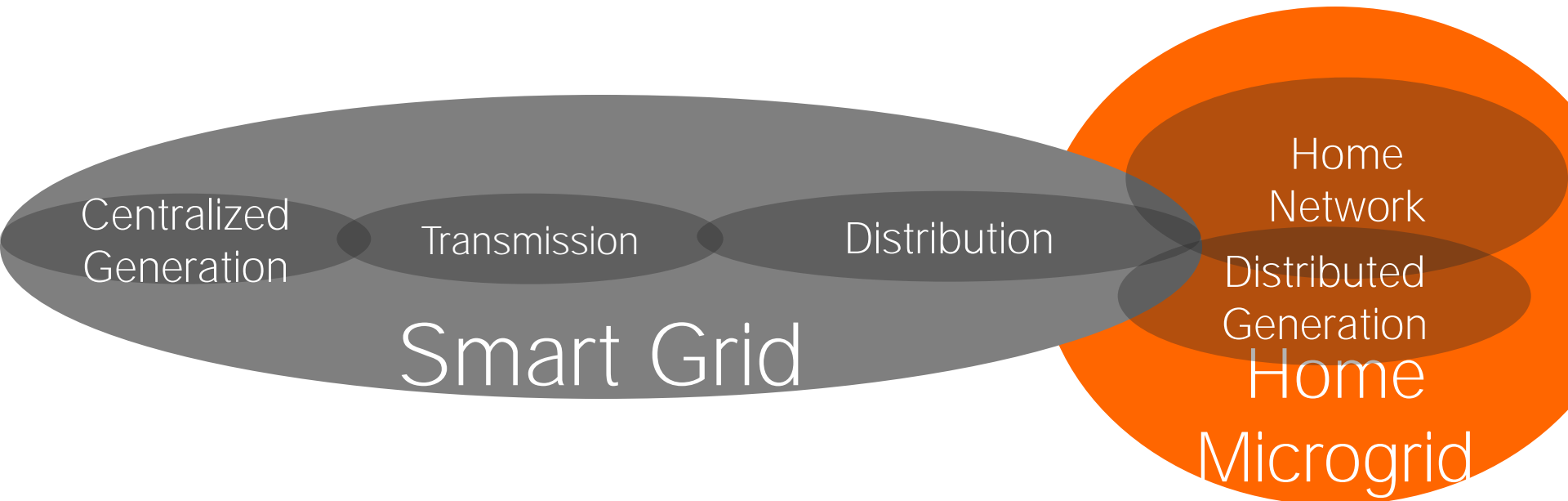
Principles & perimeter of a “prosumer” home energy management system

- Integrating in a comprehensive system :
 - All categories of mains-powered electrical devices & appliances
 - Local electrical generation and storage devices
 - Non-electrical active & passive energy sub-systems
- Monitoring and controlling it in real-time with joint targets of :
 - local optimization (local source/load adaptation)
 - grid-level optimization (mediated demand management/ peak leveling)

From top-down-**controlled home devices...**



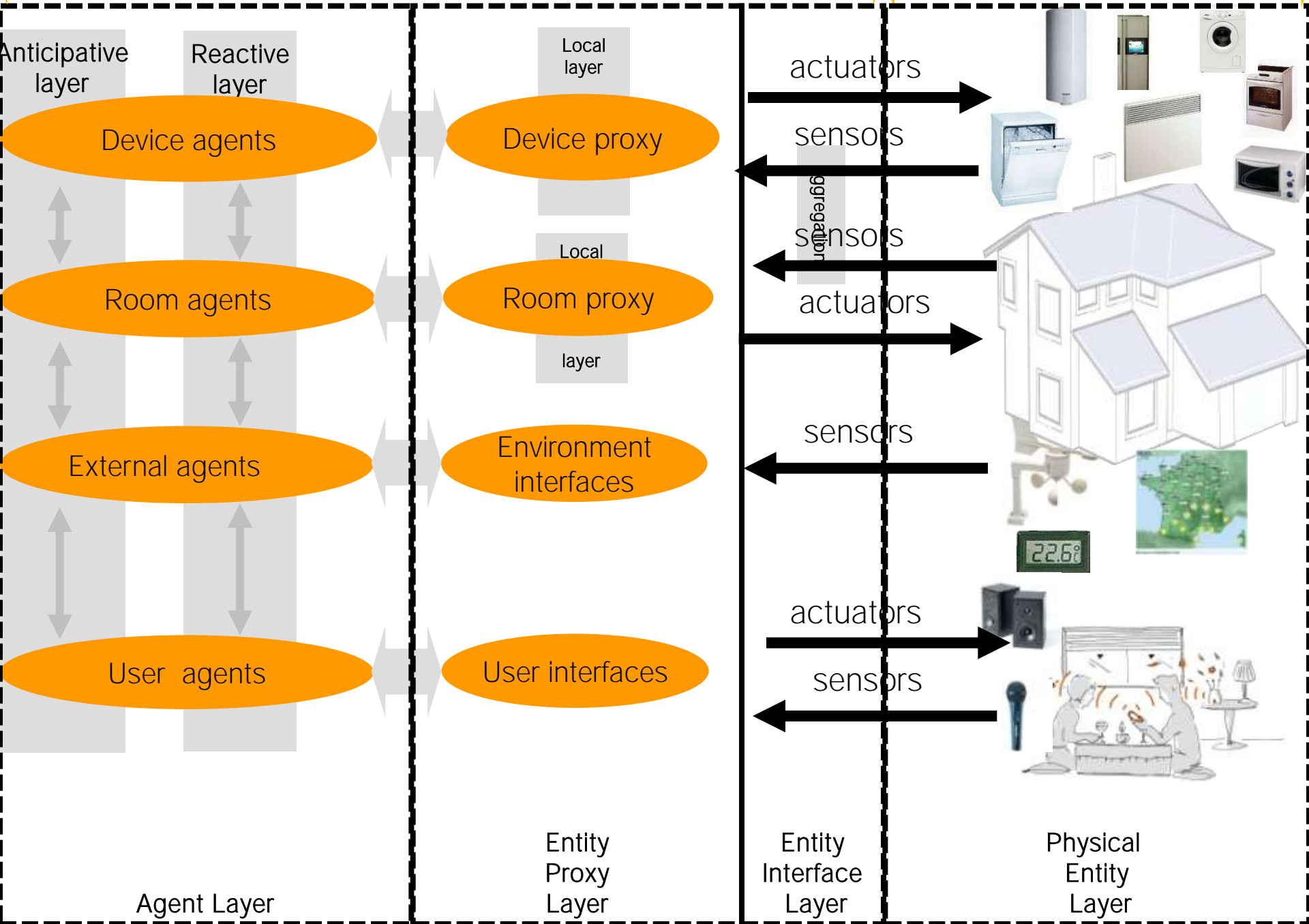
...to **semi**-autonomous « Home MicroGrid »





Home Smart Grid : extending the Home Area Network

- Envisioned indirect extensions of HAN for energy management
 - Legacy home appliances (white goods, HVAC, legacy ICT)
 - Energy generation devices
 - Energy storage devices
- The plug & play (interoperability/zeroconf) issue :
 - integrating these devices into the “smart home grid” as if they were plug&play computer peripherals
 - identifying them to a known category
 - monitoring them and controlling them, directly or indirectly
- Chosen solution
 - Sensors and actuators monitor and control legacy non-digital devices
 - Legacy devices become indirectly attached to HAN through these sensors-actuators :
 - represented by software proxies as if they were regular networked devices
 - Special secondary gateway (“Energy box”)
 - hides interface to legacy devices
 - may host local layers of ReActivHome system



The sensed-actuated home



Leveraging the sensed-actuated home

- Long-awaited offshoot of the long-running context-awareness research agenda (also under ubicomp/ambient intelligence)
 - The home equipped with sensors and actuators is a "smart space"
 - This sensor-actuator system may be used for both human and physical context interfaces
- Relevant elements of context/content acquired by sensors :
 - Internal state of non-digital appliances
 - From the environment
 - internal temperature, humidity, light, etc.
 - external atmospheric conditions and forecast
 - Status of users (present and future)
 - presence
 - level and nature of activity
- High-level fusion, aggregation and interpretation of overall context as a key enabler

Digital Home : in search of the killer app

- Presumptive killer apps that did not make it...
 - Ambient entertainment/AV communication
 - “Vintage” home automation/domotics
- Promising short to mid-term prospects :
 - Safety and security services
 - Assistance/monitoring fore elderly/handicapped people
 - Comprehensive energy management (>>monitoring, demand-response)
- Hurdles and hindrances to take-up
 - Legacy appliances, legacy homes...
 - High-level software interoperability still a pipe dream
 - Cost and complexity of configuration and calibration of smart home environment
- *Federation* of these services could be the potential killer app, sharing :
 - Service platforms
 - HAN infrastructure (gateways, software integration of attached devices)
 - Software functionalities (e.g. sensor data fusion, aggregation & interpretation)
 - Sensors and corresponding software enablers
 - User interfaces

thank you



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