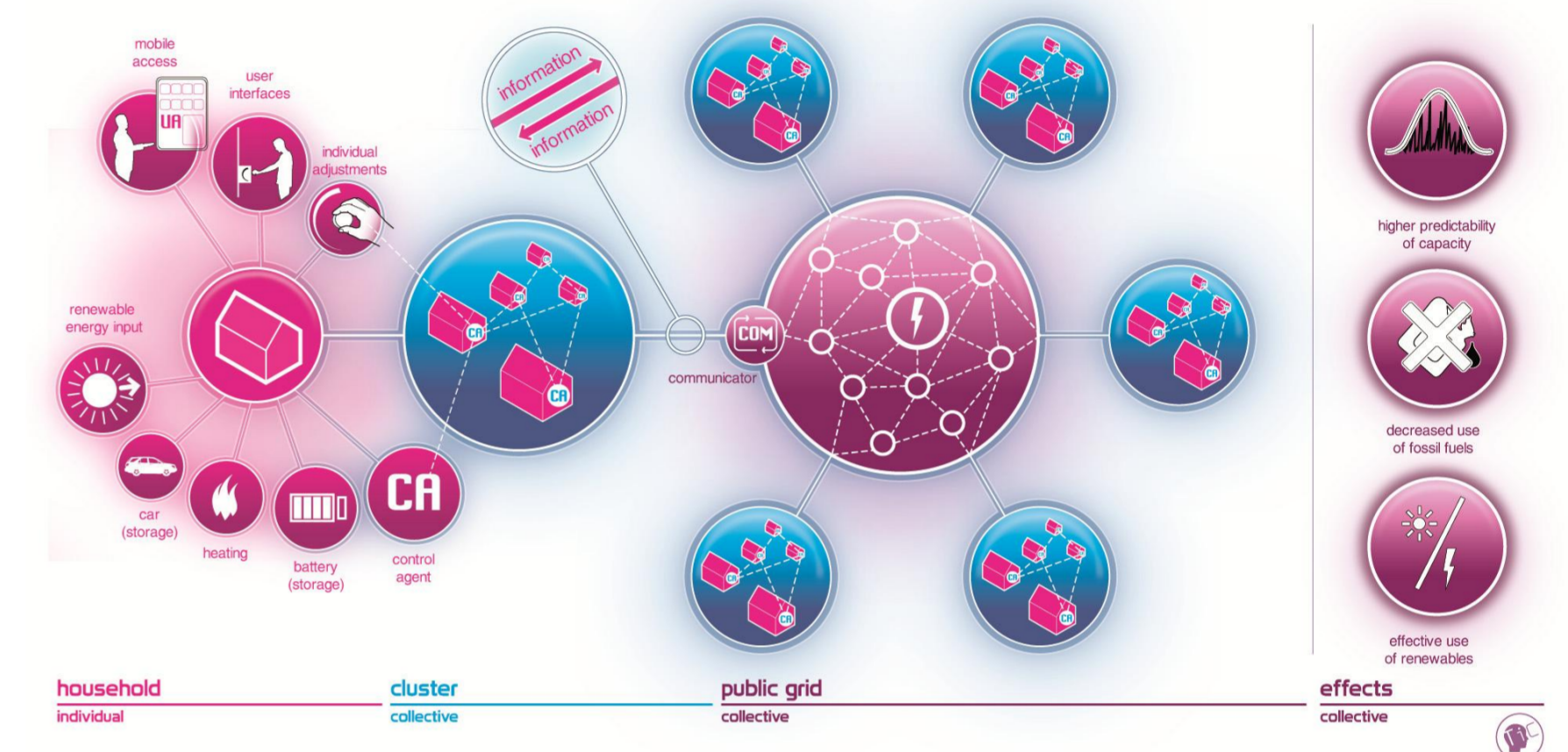
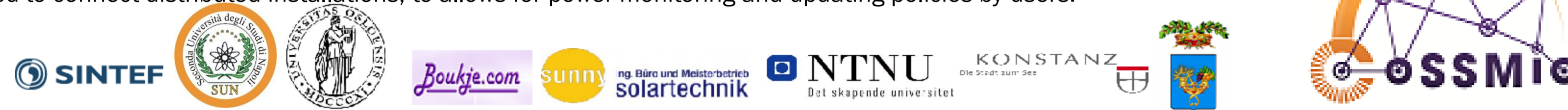


- Cities are increasingly recognised for their ability to play a catalytic role in addressing climate and energy challenges using technologically innovative approaches.
- A shift to renewable energies is necessary, not only in order to save money, but also for the responsibility that the present population has towards future generations.
- A combination of IT and telecommunication technologies is necessary to enable the saving of energy and resources. ICT based solutions will allow peer-to-peer sharing of energy produced using renewable schemes allowing households to buy and sell energy.
- A Smart Grid is an electricity network that employs innovative products and services together with intelligent monitoring, control, communication, and self-healing technologies. The smart grid promises many benefits, including increased energy efficiency, reduced carbon emissions and improved power reliability.
- To reach these aims it is necessary to design and build an ICT architecture able to integrate different appliances such as smart meters, solar panels, batteries, etc.

CoSSMic is an ICT European project that aims at fostering a higher rate of self-consumption of decentralized renewable energy production, using innovative autonomic systems for management and control of power micro-grids on users behalf.

- A relevant challenge is the development of selfish agents that, driven by user's preferences, pursue some goals to improve the utility of their owners.
- We propose a modular, vendor agnostic, agent based architecture.
 - The agent based approach was chosen to run each software instance autonomously.
 - The design and development of such a framework should support the communication among agents over a peer-to-peer overlay to negotiate the scheduling of power sources to energy storages.
- Cloud services will be provided to connect distributed installations, to allows for power monitoring and updating policies by users.

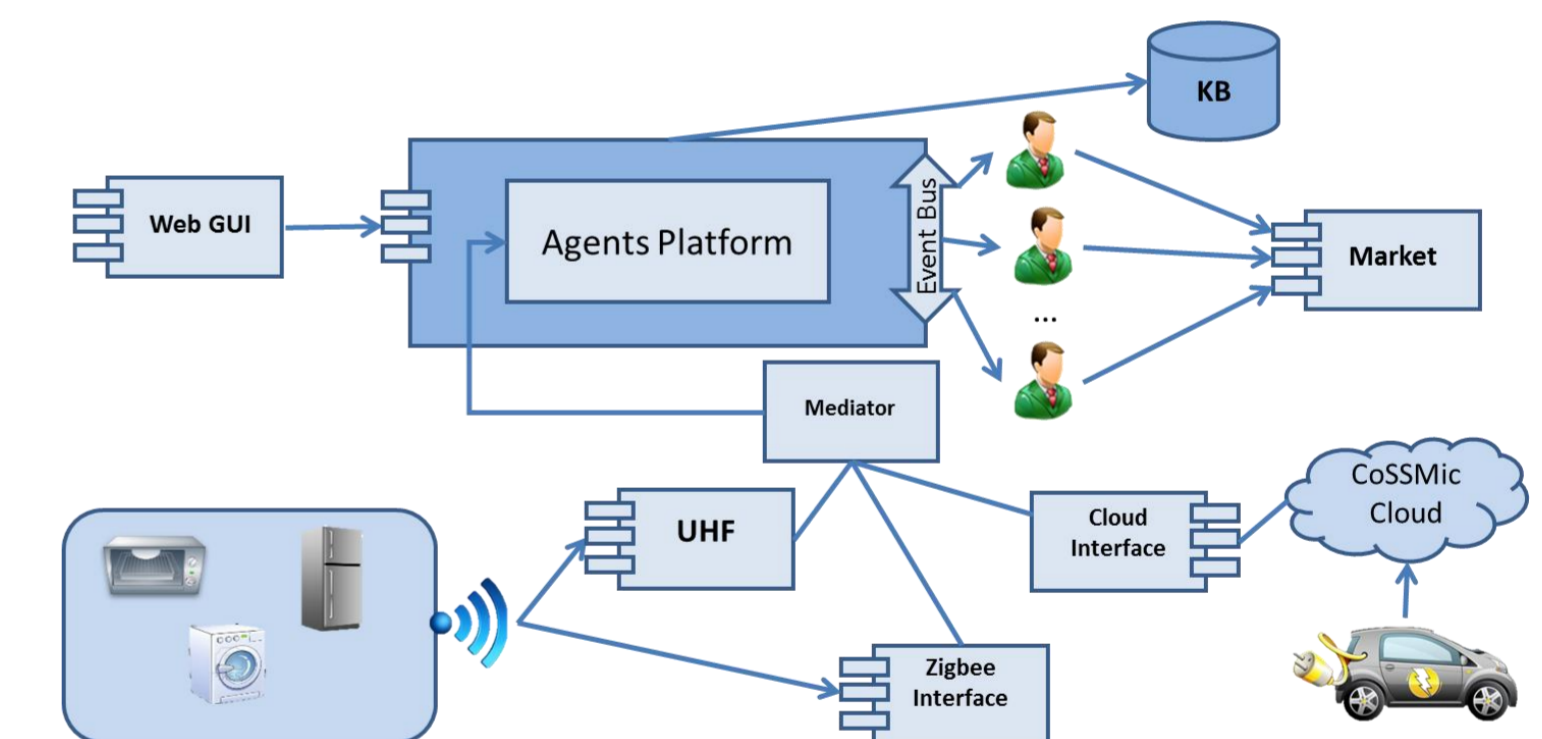
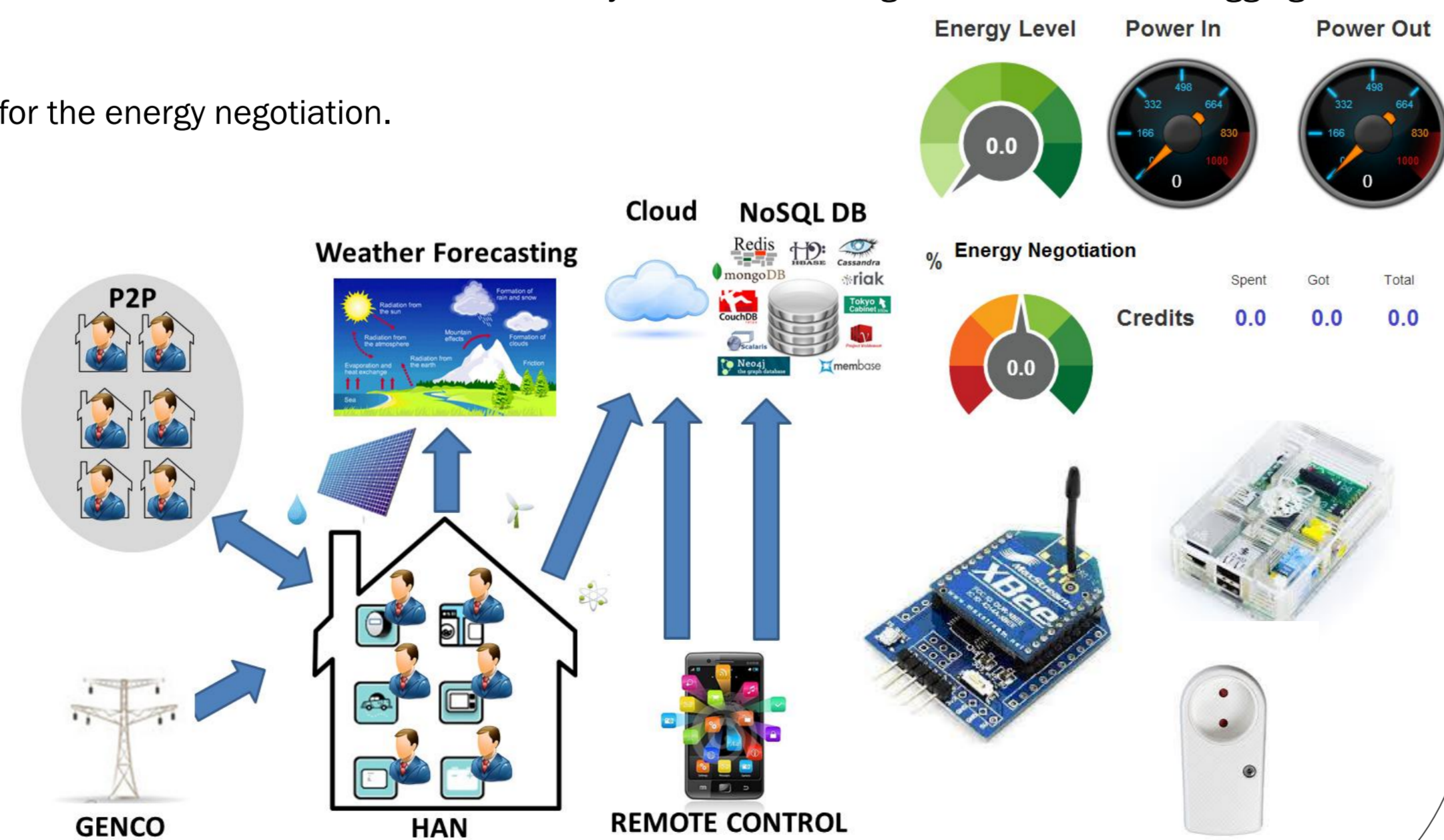


CoSSMic Framework will support sharing of information, scheduling of exchanges between power producers, consumers and energy storages in accordance with policies defined by owners, collection of data from weather stations, weather forecasts, and habits and plans of participants.

- The CoSSMic platform will run on embedded computer systems which will be provided to final users as a black box, to be plugged into the power network and connected to Internet.
- The Platform will be installed in every household and will join a community of other instances within the neighborhood.
- Instances of the platform communicate by a P2P overlay and with the Cloud to eventually exploit advanced services.
- User's information will be bounded to the private network of each household and will be forwarded outside only with the user's agreement and for debugging purpose.
- Each platform instance will communicate with other households only for the energy negotiation.

CoSSMic Platform is composed of :

- a Graphical User Interface (GUI) that allows users to interact with electronic devices through graphical icons and visual indicators;
- a Knowledge Base (KB) that is an information repository that provides a means for information to be collected, organized, shared, searched and utilized;
- a Multi Agent System (MAS) to allow for the deployment of agents of consumers and producers that will participate in the energy distribution;
- a Market for the energy negotiation within the neighborhood, and eventually with GenCO.



- Devices in the home can send information about electricity consumption through wireless interfaces (for example UHF or Zigbee) to the mediator.
- Mobile devices (e.g. electric cars) send information through the CoSSMic Cloud. In both cases the information, through a Mediator, reach the agent platform whose main actors are:
 - User Agent: associated to the user, interfaces with the GUI and with the DB Manager.
 - Event Bus: handles the various possible events. Control Agents subscribe to this event bus in order to receive events from devices.
 - DB Manager: interfaces with the Knowledge Base
 - Control Agent: manages the electric energy of all devices in the household. There are two types of control agent:
 - Consumer Agent: is associated to each electric device that absorbs electricity. Its task is to obtain the energy required from the device to operate.
 - Producer Agent is associated to each electric device that produces electricity and it tries to sell this energy to consumer agents.