



1 Testing OGEMA in the laboratory

OGEMA: OPEN GATEWAY ENERGY MANAGEMENT

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The new Fraunhofer IWES was founded in 2009 and consists of the former Fraunhofer CWMT, Center für Windenergie und Meerestechnik in Bremerhaven and the former ISET, Institut für Solare Energieversorgungstechnik e.V. in Kassel. Furthermore two Fraunhofer project groups will be established with the universities of Hanover and Oldenburg.

The Open Gateway Energy Management Alliance

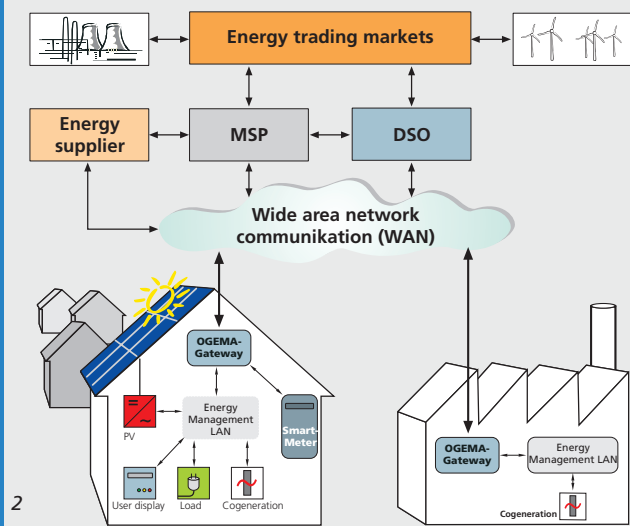
OGEMA provides an open software platform for energy management which links the customer's loads and generators to the control stations of the power supply system and includes a customer display for user interaction. In this way end customers are able to automatically observe the future variable price of electricity and shift energy consumption to times when the price is low. As the OGEMA Application Programming Interface (API) specification and reference implementation will be publicly available all developers and involved parties can turn their ideas for more efficient energy usage by automation into software for the gateway platform. Software applications from various sources can be executed on an embedded computer (the "gateway") running an OGEMA framework.

Connecting an arbitrary number of different home automation systems in parallel

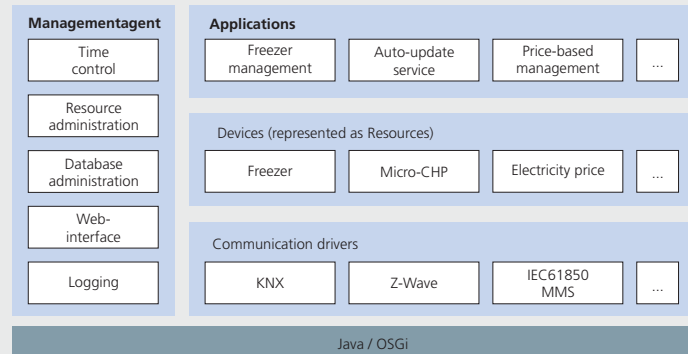
Principally all communication system and protocol can be connected to an OGEMA gateway by installing an appropriate software driver. Therefore the required hardware interfaces have to be provided at the gateway.

OGEMA connects the "Smart Grid" and the customer sphere

OGEMA offers data models for "smart grid data" such as variable energy prices, metering data and control signals. It includes also data models for control and supervision of devices inside the customer's premises. OGEMA connects to home and building automation systems as well as to Wide Area Networks (WAN).



OGEMA Framework



Independent development of applications and communication

Both applications and communication drivers connect to data models that are defined by the OGEMA specification. These data models act as a Hardware Abstraction Layer allowing both applications and drivers to be developed against this common interface definition (see figure 3).

New device types can be added to the framework dynamically by providing appropriate Java classes.

Java™ and OSGi

To be able to execute software applications from various sources on a single embedded computer a common execution environment has to be defined to which all these applications are deployed. OGEMA uses Java™ and OSGi as widely accepted software standards that provide a cross-platform execution environment. OSGi provides the functionality to execute different applications in parallel.

Representation of devices and common services by data models

The OGEMA framework provides a fixed number of services needed to register/unregister device types, representations of the devices installed, applications and communication drivers. Also services for the Plug & Play-functionality, for application runtime control, for logging and for getting information on components registered are included into this API. Finally methods for reading and writing device data are part of

this API. New device types can be installed just by adding new data structures to the framework, which can be read and written by the standard framework API. No extension of the framework itself is necessary to add device types.

Open interface for software applications and hardware/communication drivers

The entire API of the OGEMA framework including interfaces for software applications and communication drivers is made public on the OGEMA web site. Also sample source code for applications and communication drivers is provided as projects for the Eclipse™ development environment, which is also available as Open Source software. So starting the development of your own applications and software drivers for OGEMA is simple and free of cost for you. Applications and drivers can be any type of open or closed source. The license used by OGEMA allows you to offer commercial applications and drivers without restrictions. If you want to put the OGEMA logo on your product certification is required, though.

Plug & Play features

- Interface definition for hardware/communication drivers allows for various levels of automated device detection and installation of new devices depending on communication system capabilities
- The management agent brings together applications and devices available: Applications register the types of devices they are able to connect to. As soon as a suit-

able device is available the application is notified by the OGEMA framework and connected to the device.

- OGEMA device models use flexible components allowing for communication drivers and applications to be developed specifically for certain device elements that occur in various device types such as sensors, storage elements, switches etc.

Security

The gateway acts as a firewall between the public and the private communication systems allowing only the interaction between the systems as defined by the gateway configuration. User confidence and data privacy will be supported by the possibility to display data privacy statements for each data connection. Evaluation of applications by a certification authority is simplified by a declaration of Java-permissions needed by the application. Access to resources will be based on specific access permissions for each party deploying software to the framework.

- 2 Smart Grid operation using OGEMA gateways (MSP: Metering Service Provide, DSO: Distribution System Operator)
- 3 OGEMA Architecture