Trial and service design document on FISMEP infrastructure

Version 0.1

D2.1 part I

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ERA-Net Smart Grids Plus | From local trials towards a European Knowledge Community

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About ERA-Net Smart Grids Plus

ERA-Net Smart Grids Plus is an initiative of 21 European countries and regions. The vision for Smart Grids in Europe is to create an electric power system that integrates renewable energies and enables flexible consumer and production technologies. This can help to shape an electricity grid with a high security of supply, coupled with low greenhouse gas emissions, at an affordable price. Our aim is to support the development of the technologies, market designs and customer adoptions that are necessary to reach this goal. The initiative is providing a hub for the collaboration of European member-states. It supports the coordination of funding partners, enabling joint funding of RDD projects. Beyond that ERA-Net SG+ builds up a knowledge community, involving key demo projects and experts from all over Europe, to organise the learning between projects and programs from the local level up to the European level.

www.eranet-smartgridsplus.eu

1 Backgroud

E.ON, Malmö City and Chalmers are the Swedish partners who participate in the project as a team. Within the international consortium, the Swedish team distinguishes itself with their focus on user-centered energy use and initiatives related to smart grids and energy optimization. E.ON, Malmö City and Chalmers will work towards the common goals set up and defined within the international application.

The project aims to further develop a software platform that can support interoperability to make technologies and services available for smart grid.

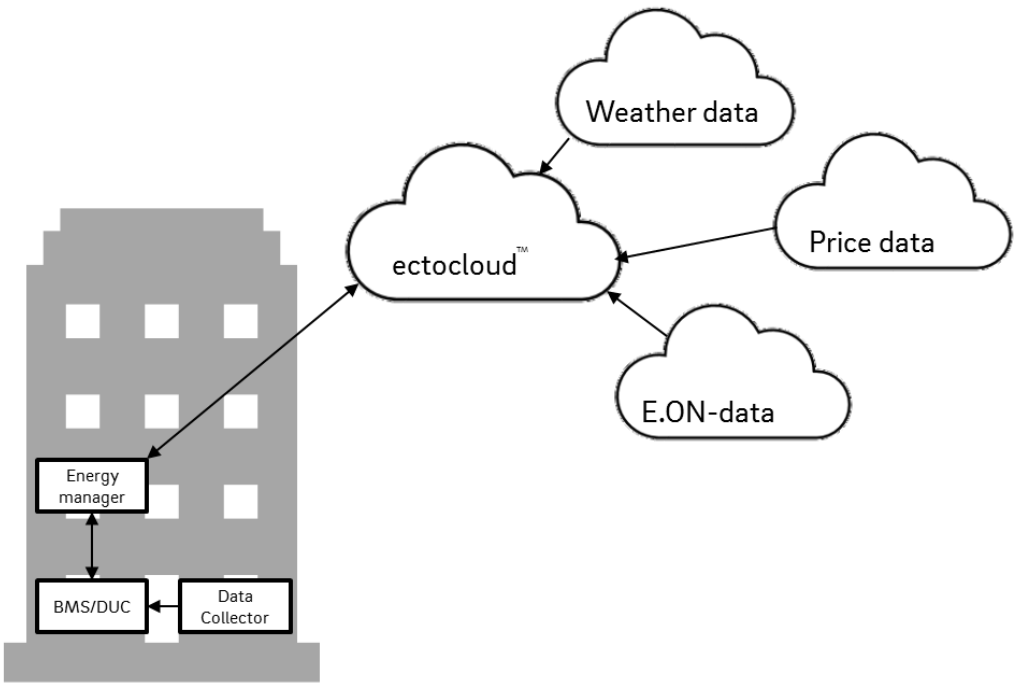
1.1 Purpose

1.1.1 Energy Efficiency Overview – E.ON

Our City – with power control

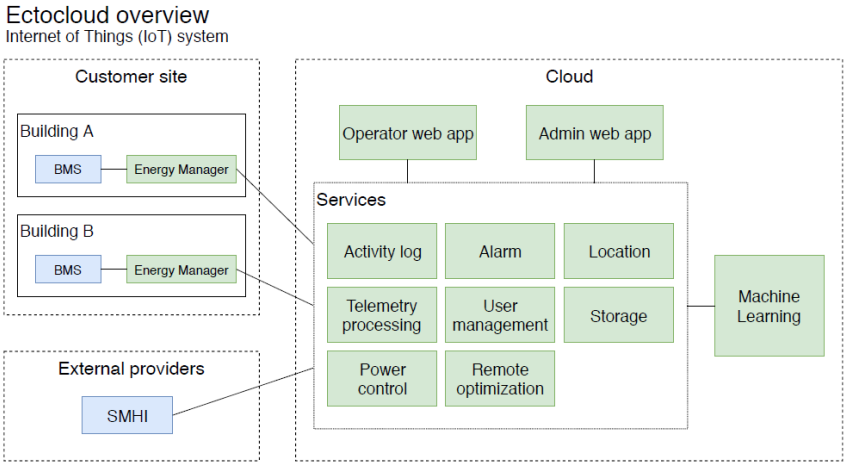
In the smart city, properties are connected and communicate with production and distribution systems. During shorter periods, the power output can be controlled in a cluster of properties to reduce peak production. Thanks to the property's thermal inertia, the indoor climate (+ -0.5 degrees) is kept below the short controls that usually last from one to a few hours. Power control also contributes to an improved delivery quality for the customer

A digital platform that is used both to optimize the district heating system and to offer energy services to connected customers. CESO consists of a local computer (energy manager) in the customer's property and a central, cloud-based system (portfolio manager) that communicates with each other to carry out the optimization. The energy manager communicates with the property's control system (BMS) via Modbus and manages the optimization at the property level.



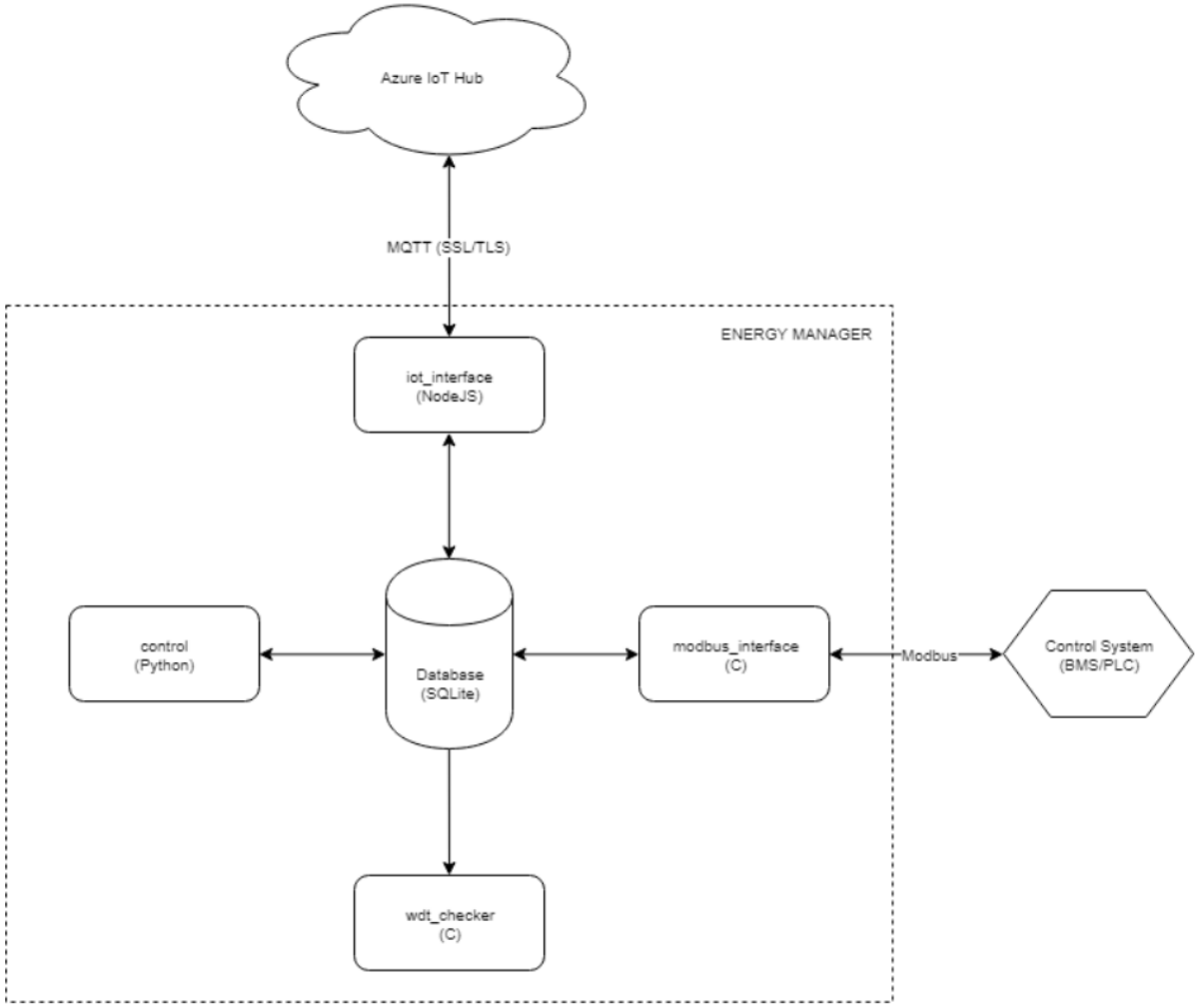
1.1.2 The platform - Ectocloud

ectocloud ™ is a cloud-based platform that is responsible for system optimization and for importing and distributing external data. The collection unit handles data from indoor temperature sensors and other measuring data equipment.



1.1.3 Energy Manager - Architecture

- Azure IoT Hub: Azure service providing device management, authentication and communication over several protocols (MQTT, AMQP, HTTP and more)
- iot_interface: Energy Manager software that connects transmits data to and from the Azure IoT hub and cloud solution. It is implemented in NodeJS and uses the Azure Device SDK.
- control: Energy Manager control algorithm module performing e.g. optimization.
- Database: Sqlite3 database used on the Energy Manager to store short-term data. Each application reads and writes to this central databse.
- modbus_interface: Energy Manager software providing Modbus commuication with external equipment such as PLC or BMS. It transfers Modbus data to the database and reads up data that is published over Modbus.
- wdt_checker: Energy Manager software that monitors the other services and can perform restart or reboot actions if needed (e.g. if communications go down for prolonged periods).
- Control System (BMS/PLC): External control systems to which the Energy Manager exchanges data over Modbus.



1.1.4 Ectocloud – ero (Fireware) integration

To be able to create value in FISMEP project according to the WP2 deliveries do we need to integrate the applications from E.ON and Chalmers, known as ectocloud and ero.
Ectocloud as forecast tool for District Heating producers have Machine Learning Models that can forecast the amount of energy that a connected building needs over the next 24hrs. The ML Model has from energy consumption and historical temperature extracted the part of energy that is used to heat the building as the total consumption includes tap-water, ventilation and other internal loads that cannot be regulated. The value received is called “Steerable Power” according to ectocloud.
The initial integration will be REST API:s communicated over a secure channel. E.ON will provide an API Gateway to which Chalmers can connect. The exposed API:s will be:

- OAUTH2 sign-in to get tokens for communication
- POST 24hrs forecast of building aggregated heating flexibility per hour
- GET 24hrs Steerable power forecast for building

1.1.5 Status of development – integration Ectocloud - Fireware

The implementation of the cloud to cloud integration described in 1.1.4 will be implemented in March 2019. Reports of progress, risks and questions are made between Chalmers and E.ON in bi-weekly meetings.

1.2 Status of development - features CESO

1.2.1 Status 2019

Focus to build the **required** functionalities in our **new platform, ectocloud. Finalized** in Q4

- Control Panel
- Operator UI
- Visualization
- Power Control (the possibility of controlling the effect in buildings)
- Alarms
- Logs
- One-click flashing of Energy Manager
- One-click specification for Energy Manager integration
- Real-time view

1.3 Status of development – installations CESO

Number of installation done (January 2018)

Kundinstallationer per ort

Ort	Avtalade	Installerade	BMS-programmerade	Styrbara
Malmö	60	44	5	4
Örebro	0	0	0	0
Norrköping	6	4	4	0
Stockholm	0	0	0	0
Externt	9	7	7	3
Totalt CESO	**75**	**55**	**16**	**7**
Örebromodellen	26	26		26
Totalt CESO inkl Örebromodellen	**101**	**81**		**33**

1.4 Status of development – installations of CESO for FISMEP

Five properties will be identified in Malmö where CESO has been installed previously. Dialogue is conducted with property owners.