Demonstrating Smart Grid Component Prototypes
Smart Breaker and Customer Energy Management System

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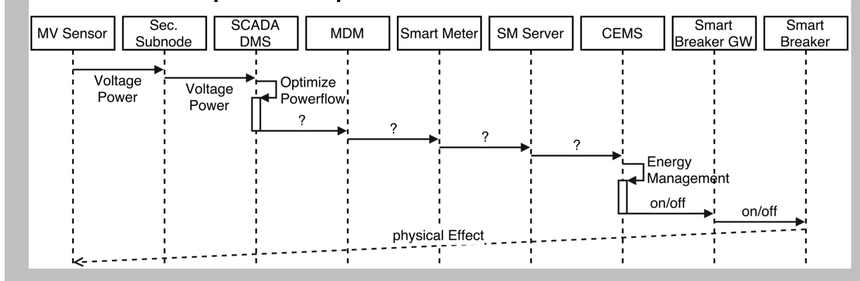
The shift towards massively distributed energy generation demands more decentralized flexibility to meet strict power quality constraints of the electric grid. A cyber-physical system such as a smart grid can provide increased flexibility by utilizing additional information and communication technologies to better monitor the medium and low voltage distribution networks and to actively control grid-connected resources, ranging from loads to distributed generation, to electric mobility but at the cost of increased complexity. Essential future functionalities such as dynamic management of line use, fault detection and fast service restoration are only possible with appropriate sensors and actuators in place. These missing sensors and actuators on the distribution level are being developed today. This poster presents a standards based, low cost, open source, ICT emulation platform setup to test necessary networking concepts of these smart grid component prototypes already in various stages of development. Preliminary development results of the first example applications chosen: Customer Energy Management System providing computational power for implementing local intelligence and a Smart Breaker are shown in this poster.

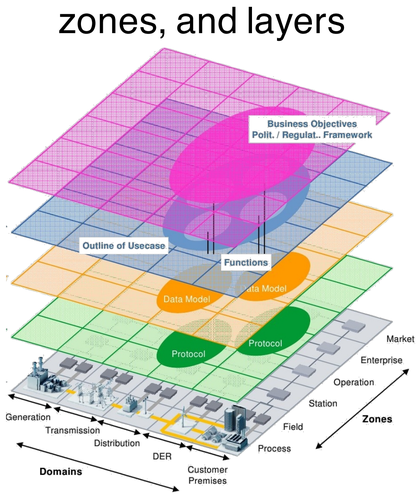
1

Problem
testing prototypes

Smart Grid Components
Communication requirement of closed loop example



Interdisciplinary
Challenges on all Smart Grid Architecture Model (SGAM) domains, zones, and layers



2

Research
existing frameworks

OpenMUC
Open Multi Utility Communication

OGMA 2.0
Open Gateway Energy Management

Testing Architecture
Using multi purpose devices, mocking multiple prototypes and their communication

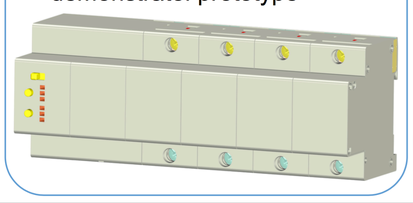
3

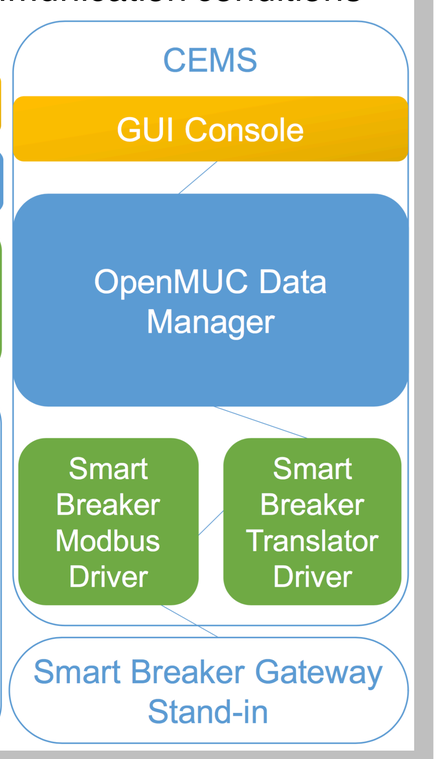
Concept
integration system

Test System
Secure information/automation architecture, using off-the-shelf devices, mocking or standing in for low availability prototype equipment under development

Components under Test
Networked devices, sensors and actuators and management Consoles like a “Smart Breaker” and Customer Energy Management System (CEMS) in varying communication conditions

- Market data input, grid codes...
- Customer energy management system
- Communication and application management
- Smart Breaker translator
- Protocols and driver
- Mock Smart Breaker Gateway
- Communication of Smart Breaker Gateway with Stand-in prototype (Raspberry Pi)
- Communication with real demonstrator prototype





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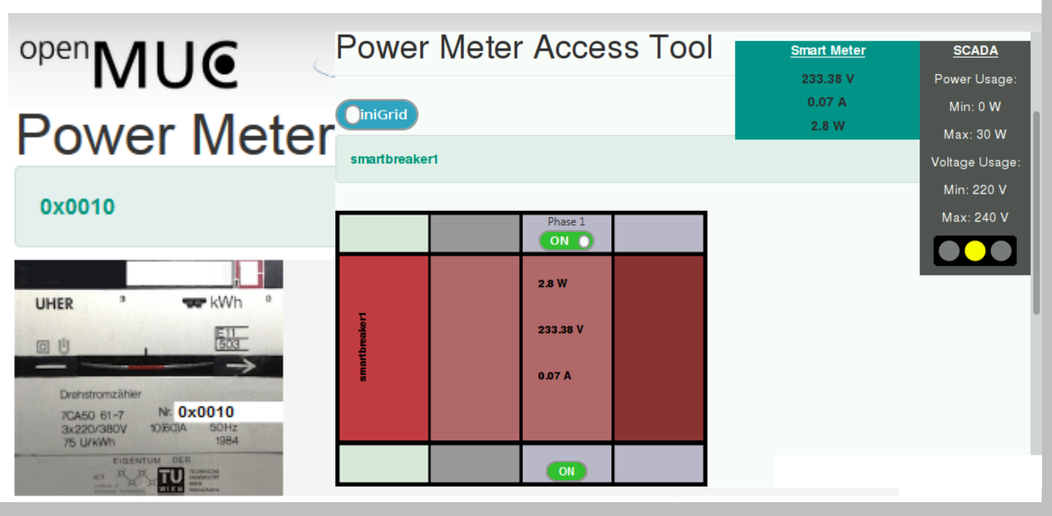
Realization
prototyping platform

Hardware Network
Some RaspberryPi 3, compatible to control device hardware SpreCon, running JAVA and OpenMUC, mocking a Smart Breaker (left) communicating with a CEMS (right)

Customer Premises User Interface
The Customer Energy Management System, based in OpenMUC, implemented with AngularJS, provides different HTML views based on live information received from smart meter and smart breaker



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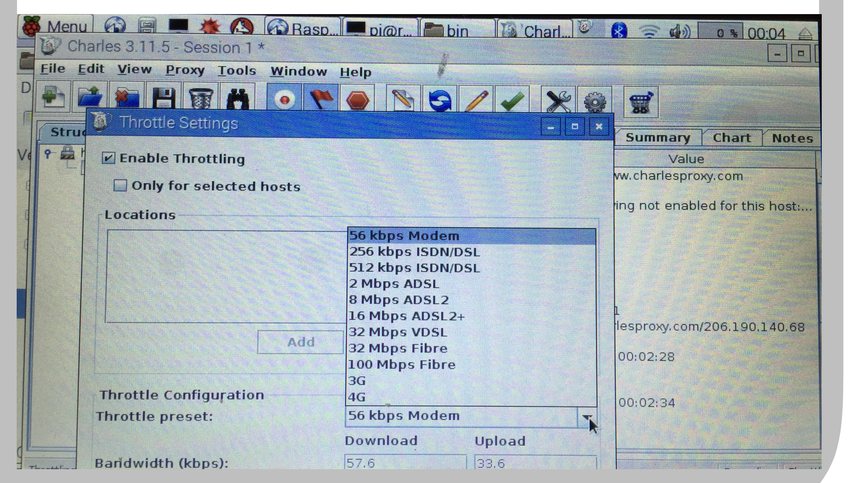
Testing
network emulation

Future Work
Demonstration of integrating existing and new components. Evaluating functionalities under test, as enabled by this platform (cyber security validation, latency compensation, bandwidth restriction, etc.)



This work is based on findings of the project *Integration of Innovative Distributed Sensors and Actuators in Smart Grids – Project iniGrid*, commissioned as flagship project by *Österreichische Forschungsförderungsgesellschaft mbH (FFG)* as part of *e!MISSION.at 4th call for proposals*.