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Smart Grids Interface for the connection of larger residential and small industrial prosumers

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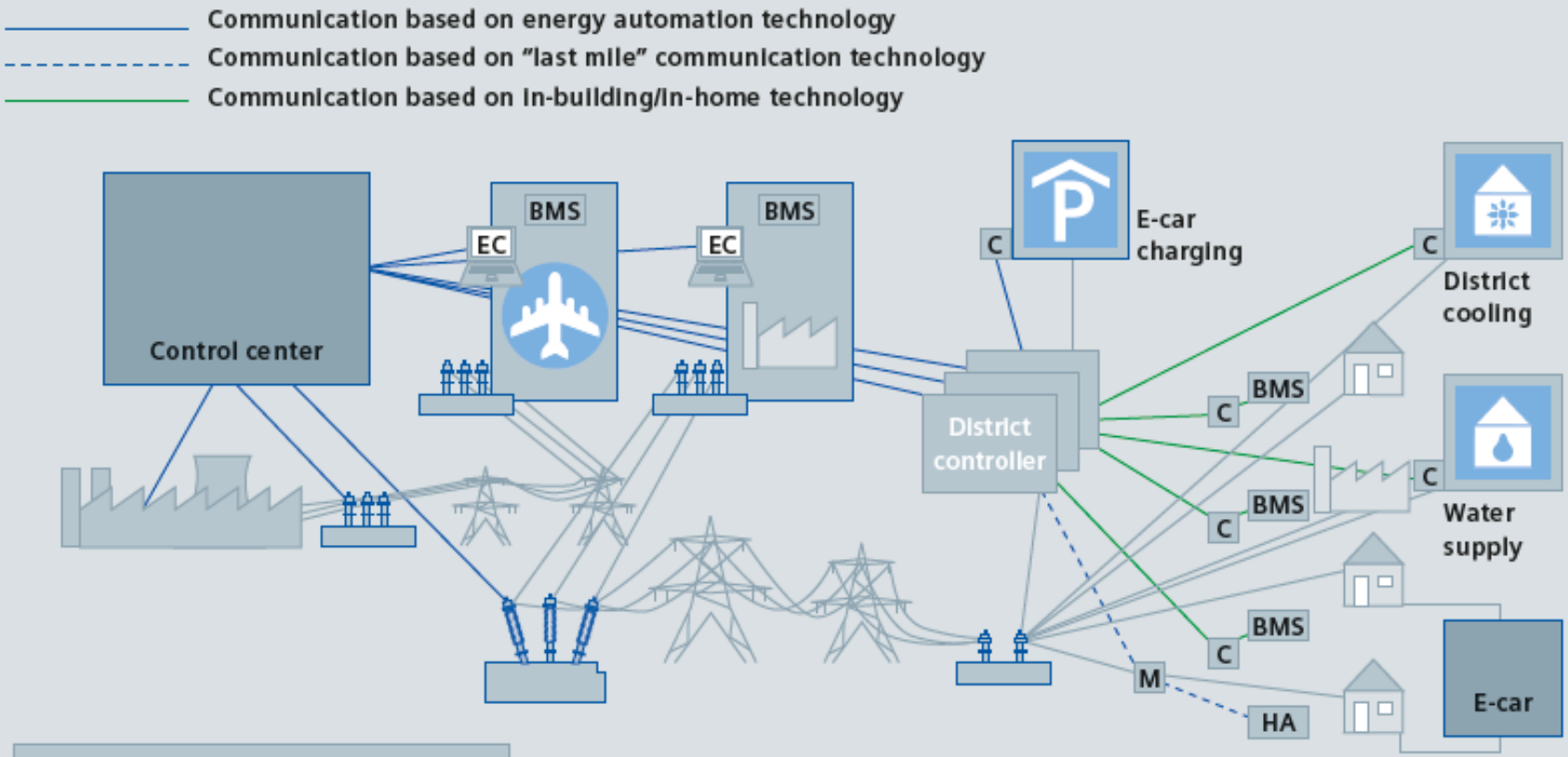
Smart-grid Interface

Challenges

- migration of the previously passive consumers to active “prosumers“
- increasing the percentage of renewables in energy mix
- real-time communication for monitoring and controlling the energy system

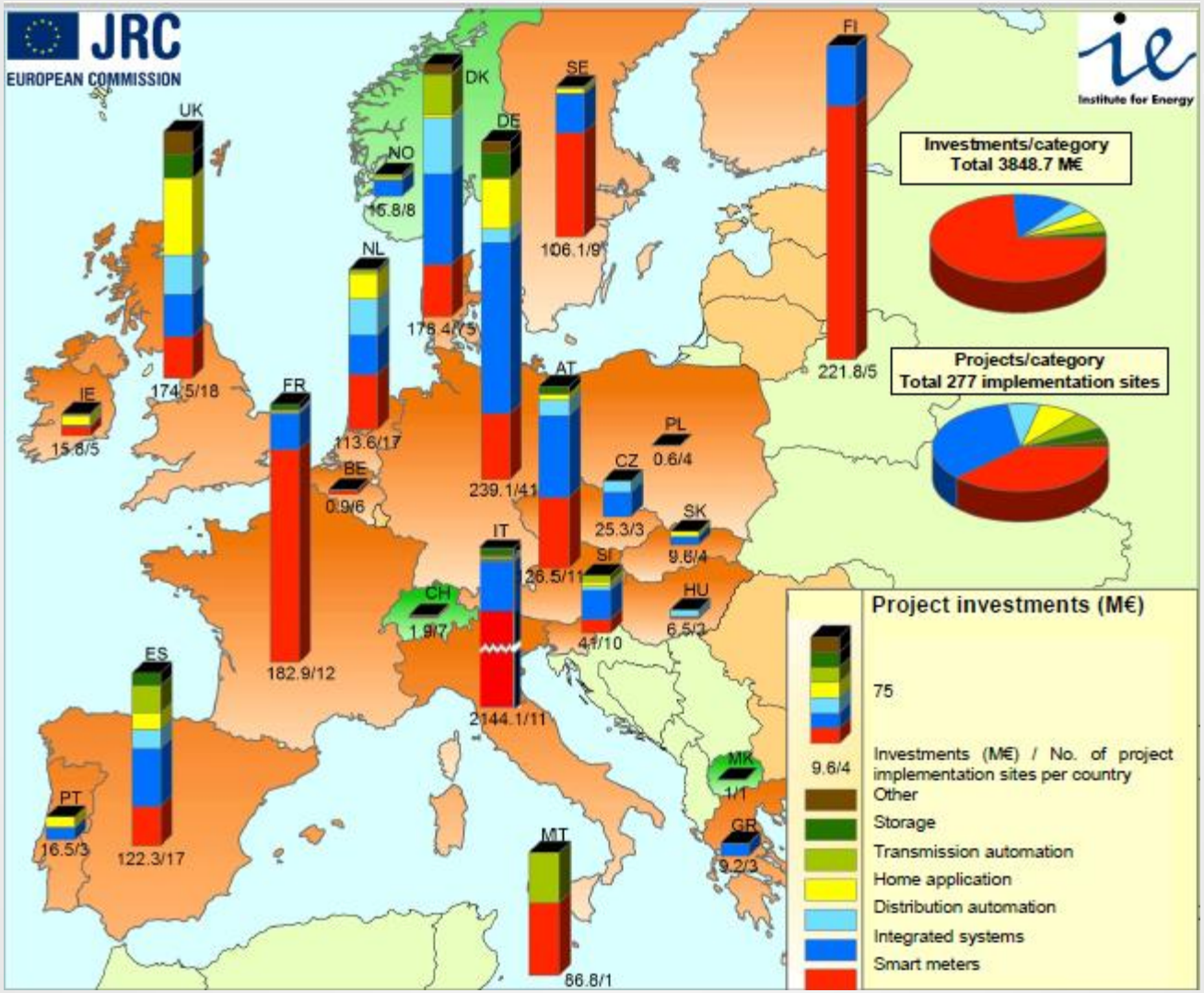
Smart-grid Interface

Communication Infrastructure



Smart-grid Interface

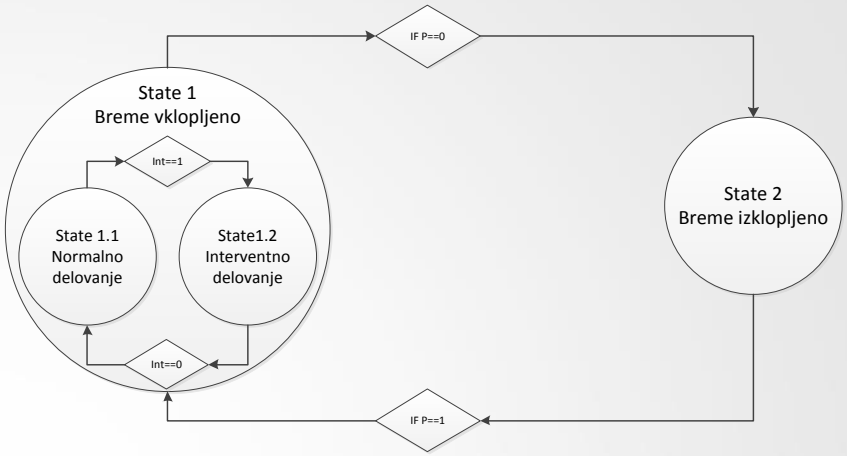
EU SmartGrid investements



Smart-grid Interface

Features

- Data collection from attached equipment
- Demand response algorithm
- Control of the connected equipment (heat pumps, boilers, ..)
- Communication with provider
- Optimization Algorithm:
  - Calculation of consumption
  - Preparation of consumer adaptation
  - Real Time Execution of adaptation
- Actions Recording



$$E_{prd}(k) = E_{old} + P_{max}(k) \cdot (T_{drt} - T_{smp} \cdot k)$$
$$T_{end}(k) = (T_{drt} - T_{smp} \cdot k)$$

$$E_{avl\ red}(k) = \begin{cases} \Delta P \cdot T_{end}(k) & if \quad T_{end}(k) \le T_{frs\ int} \\ \Delta P \cdot T_{frs\ int} + round(a) \cdot \Delta P \cdot T_{int} + e & if \quad T_{end}(k) > T_{frs\ int} \end{cases}$$

$$a = \frac{T_{end}(k) - T_{frs\ int}}{T_{int} + T_{no\ int}}$$

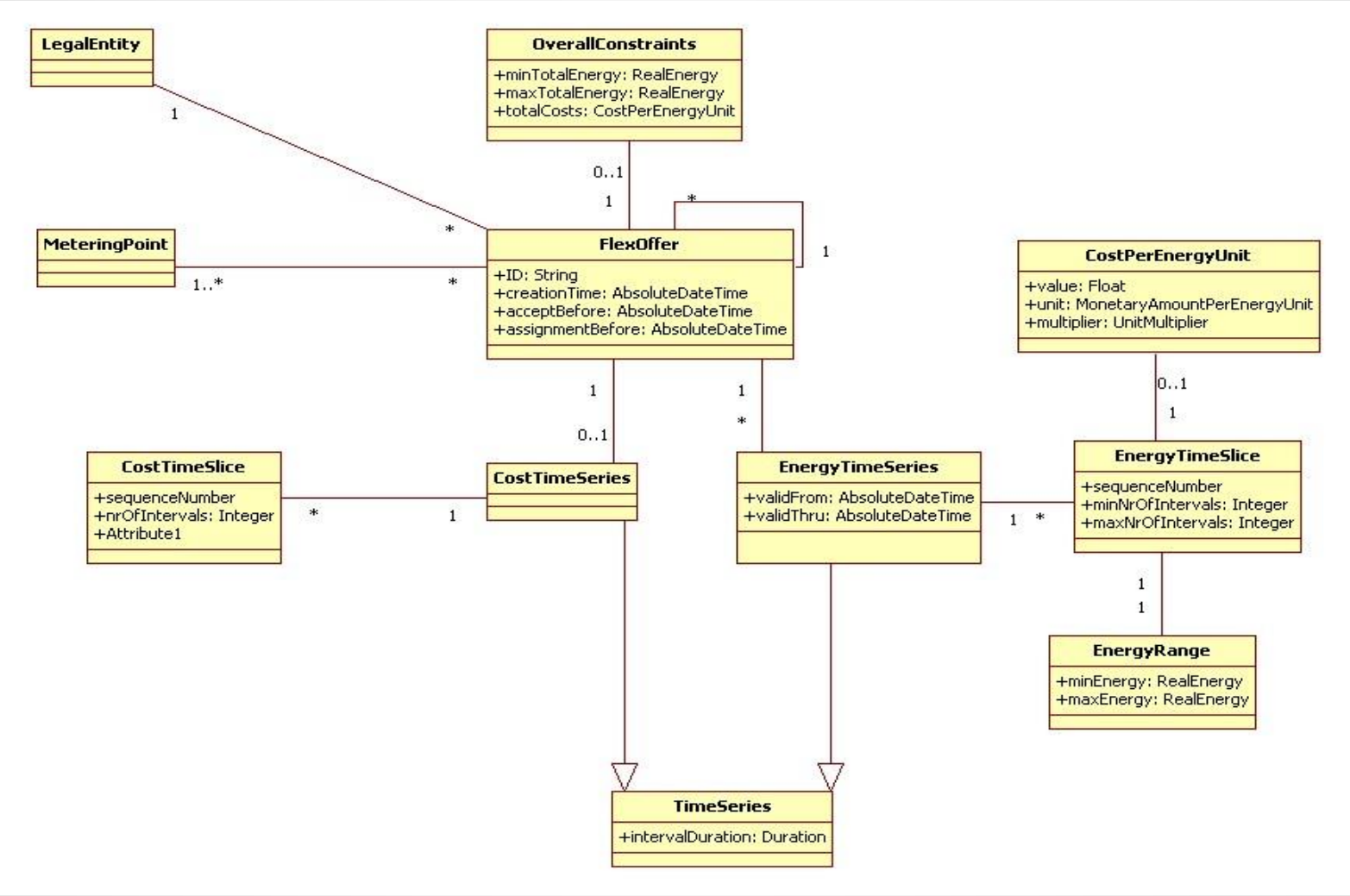
$$e = \begin{cases} 0 & if \quad a' \le T_{no\ int} \\ \Delta P \cdot (a' - T_{no\ int}) & if \quad a' > T_{no\ int} \end{cases}$$

$$\Delta P = P_{max} - P_{min}$$

$$E_{avl\ enl}(k) = 0$$

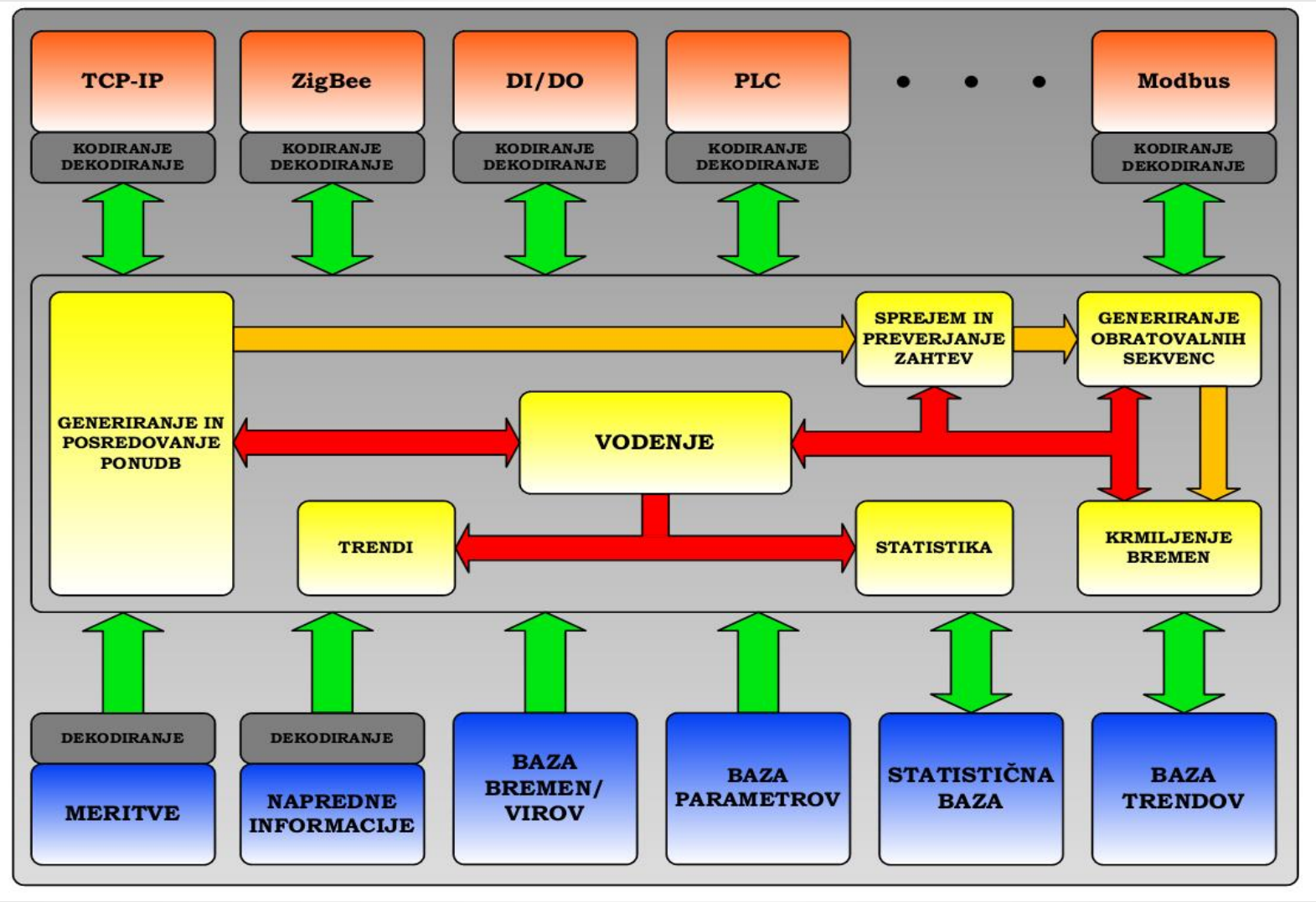
Smart-grid Interface

FlexOffer



Smart-grid Interface

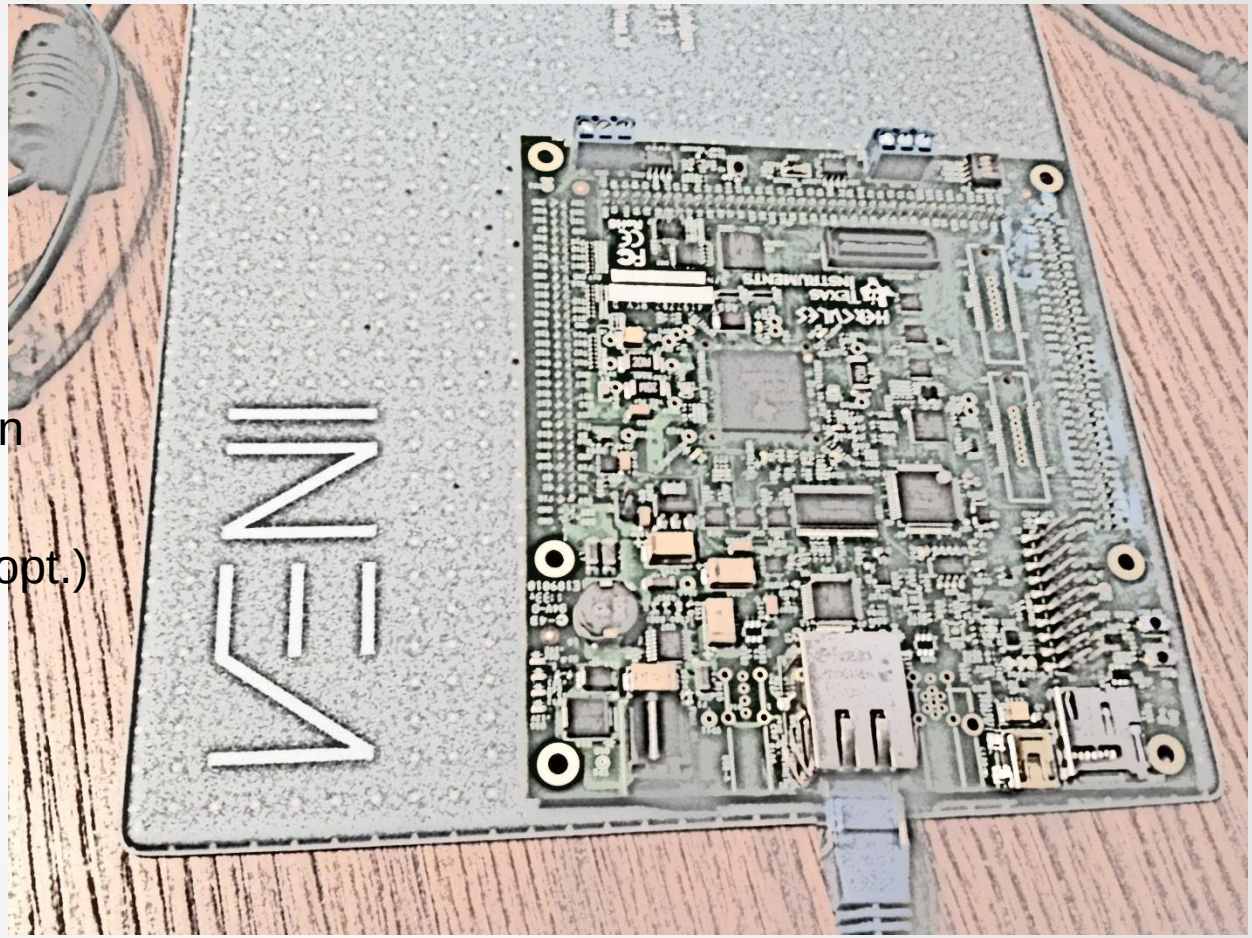
Sftw architecture



Smart-grid Interface

Laboratory Prototype

- Single board
- Cost effective
- ARM environment
- Ethernet communication
- Zigbee communication
- Other communication (opt.)



Thank You

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