

Group 5: Sivis - Smart Meter

Home Automation CodeCamp Spring 2018

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Existing problem

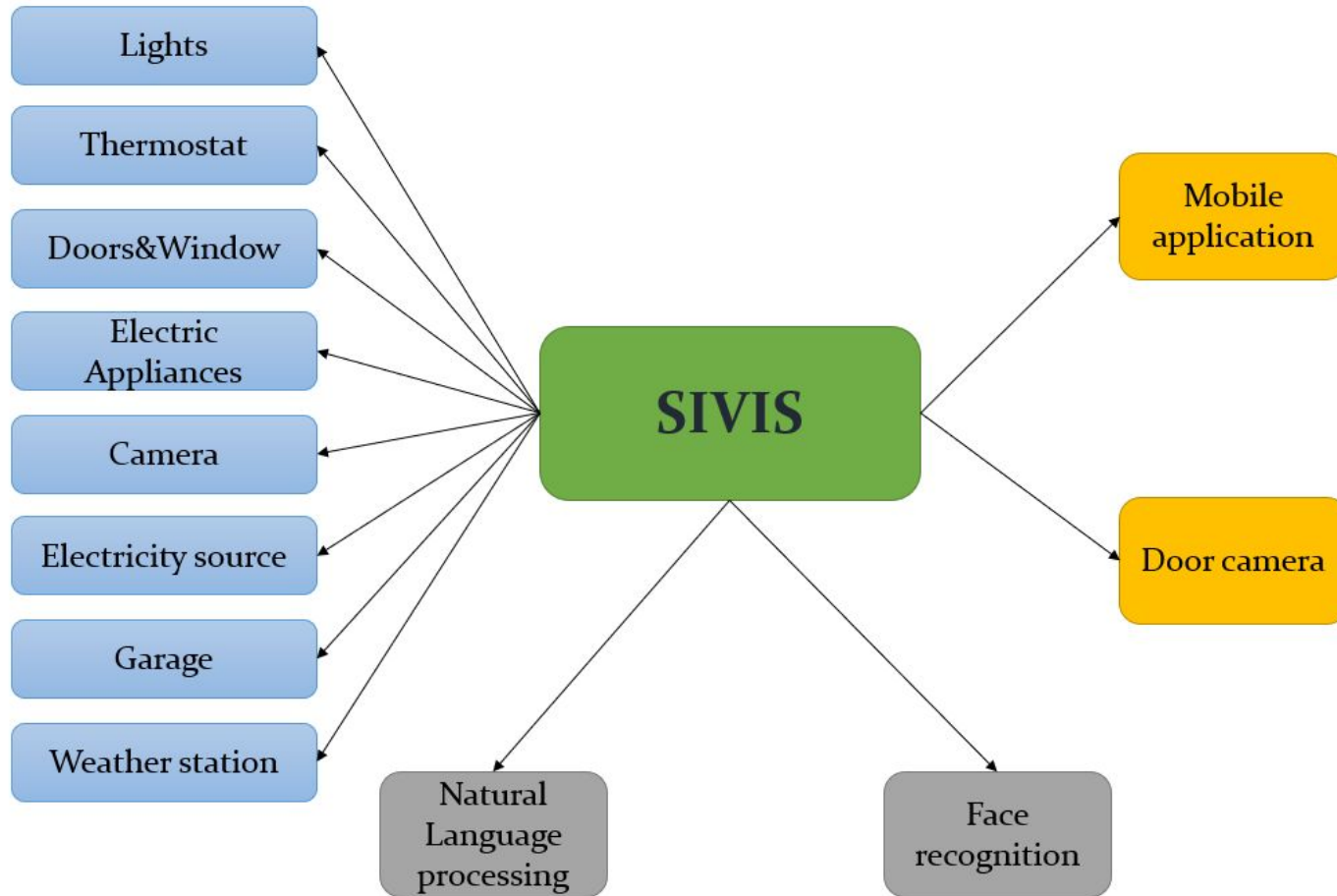
- Energy from renewable sources not being utilized properly
- Best time for running appliances is not known
- Wastage of energy
- No clear monitoring available at individual appliance level

Vision

Smart meter “**SIVIS**” which is an electric device will:

- Record the energy consumption of electrical devices.
- Change the source (from power grid to renewable energy).
- Supply unused renewable energy to power grid.
- Manage two way communication between power source and devices.

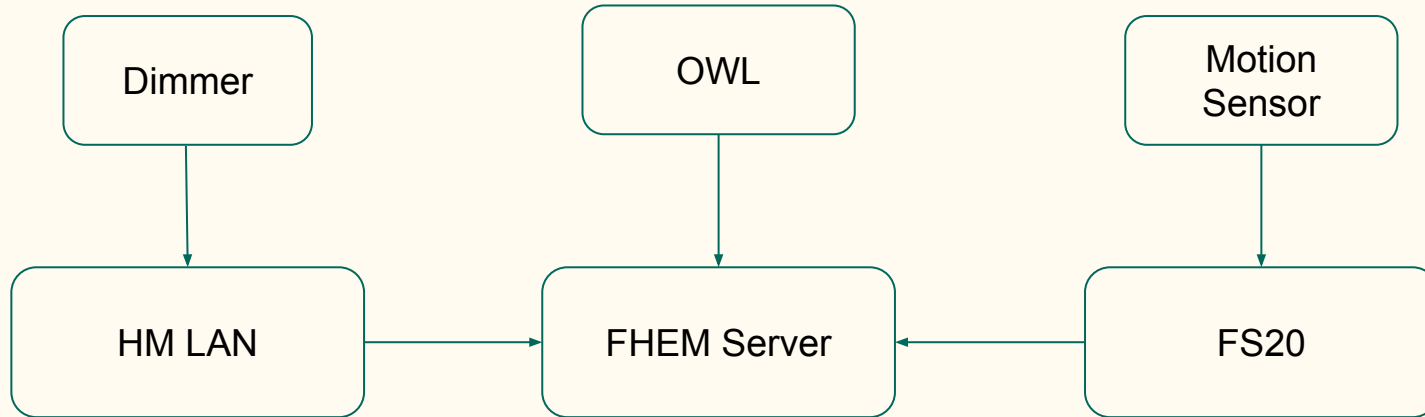
Feature



Technologies used

- Linux platform
- FHEM home automation server
- OWL wireless electricity monitor
- Motion detector
- Light sensor
- Dimmer
- Door sensor

Architecture



Scenario

- a) Tony wanted to do his laundry and he left his clothes in washing machine. **Sivis** will send the request to climate station to clarify the weather condition in the next few hours. Based on the weather condition, **SIVIS** will decide which source of energy to use (solar, wind or electrical). If the amount of the energy that can be accumulated within next hours from natural sources is considered to be enough to complete the laundry, **SIVIS** will use renewable energy, otherwise electrical energy will be used. Once **SIVIS** choose the source of energy it will be displayed on the screen on the meter.

- b) Tony has set his personal calendar for the upcoming month. As **SIVIS** has an access to the calendar of Tony, it will accomplish some home tasks without need of Tony (preferences done by Tony). For example, **SIVIS** detected that there is a party today night in Tony's flat. Thus, to make rooms more comfortable **sivis** will send requests to a vacuum cleaner to clean up the room, request to air conditioning to keep the room temperature 20° C, and make online order for beer.

Green aspects

- Renewable energy would be fully consumed i.e, no wastage of renewable energy
- System checks weather updates and runs the appliances when the renewable energy is available to run the appliance
- No storage of energy in batteries giving no scope for pollution when batteries are to be disposed
- Extra energy being supplied to power grids would reduce the necessity of energy from non-renewable sources of energy
- Reports of energy consumption is provided to user which can bring a change in user behaviour

Home Automation Protocol - KNX

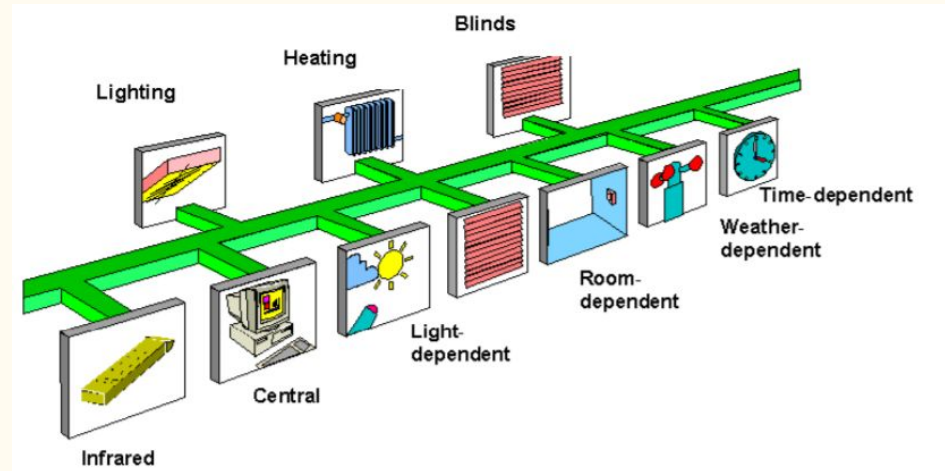


What is it ?

- Common bus network of devices using the same transmission method.
- Manufacturer and application domains independent bus system.
- OSI based
- 27 years in the market

KNX

1. European Home System Protocol (EHSP)
2. European Installation Bus (EIB)
3. BatiBUS



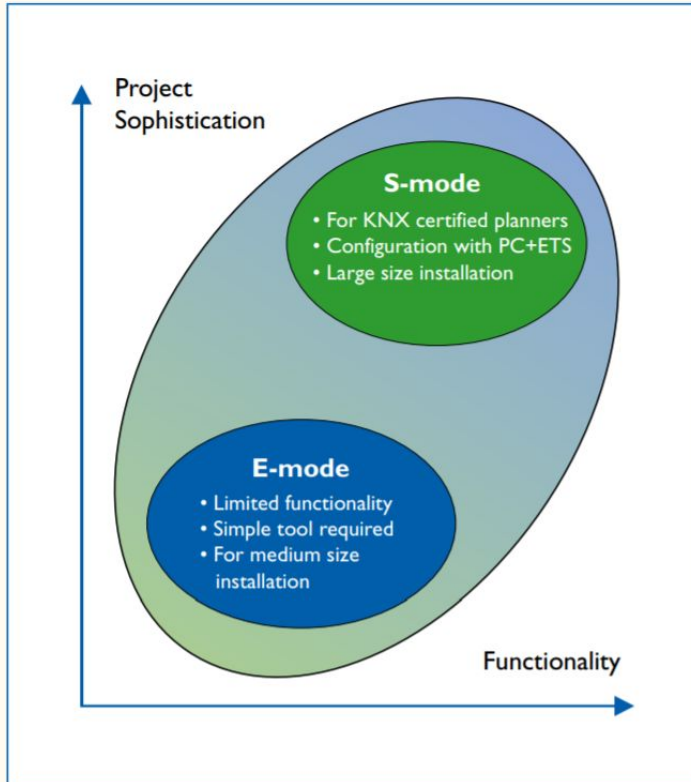


Why KNX ?

- Wide range of functions;
- Compatibility;
- Multi communication (IP/Ethernet, RF, PL, TP);
- International Standard (Europe, USA, Chine, Canada);
- Sustainability (Energy reduction [source](#));
- Multiconfiguration mode (A-mode, E-mode, S-mode);
- Hardware and software independent
- High quality certified products;
- Facility management;
- Security (AES128);
- Community support;
- Trainings;

The KNX configuration Modes:

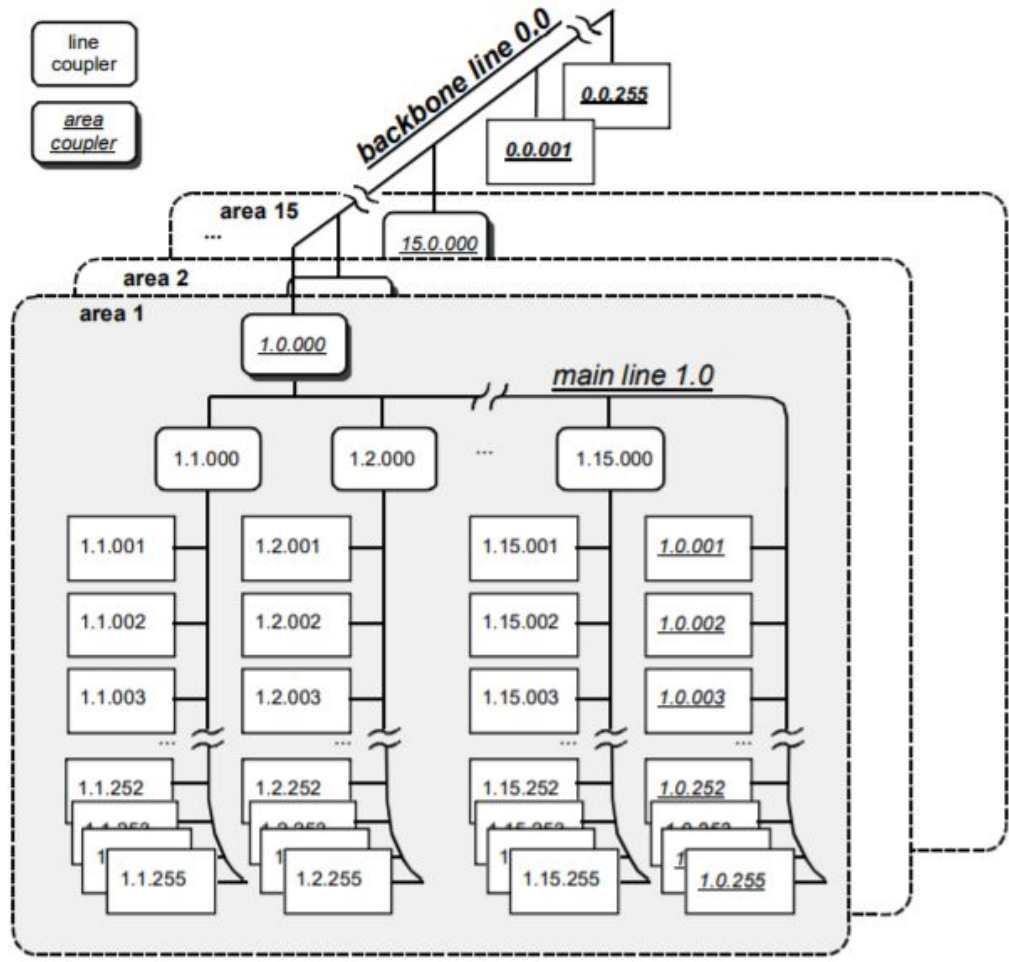
1. E-mode
2. S-mode



Communication media.



1. Twisted pair (TP), bitrate - 9600 bits/s;
2. Power line (PL), bitrate - 1200 bits/s,
3. RF- uses radio signals to transmit KNX telegrams. Frequency band - 868 MHz, Maximum power- 25 mW and bitrate- 16.384 kbps;
4. IP - encapsulated in IP telegrams.



- Distributed network of devices
- Maximum- 65536 devices in a 16 bit Individual Address space
- 256 devices on one line
- 16 areas in entire domain

Communication

1. Point-to-point
2. Broadcasting

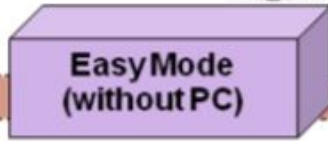
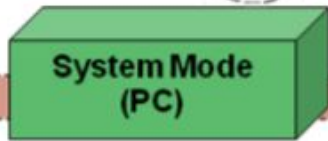
USN (Unique Serial Number)

ETS (Engineering Tool Software)/design and configure

Objects with standardized Data Point Types



Config. Interworking



Media Coupler

Results

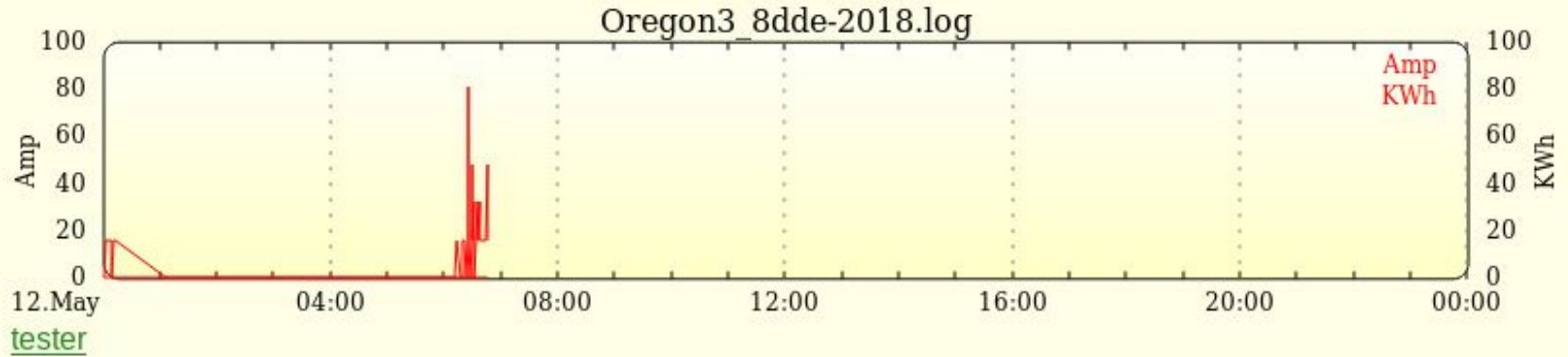


Fig.1 Energy consumption measurement

Disadvantages

- Smart Meter can be expensive (now)
- Time consuming in terms of generation and load of renewable energy
- Maintaining grid reliability requires precise synchronization of voltage and current.

Thank you!