



OpenMotics

HEMS and LEC

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INTRODUCTION SPEAKERS





What is a HEMS?

'A home energy management system is a technology platform comprised of both **hardware**¹ and **software**² that allows the user to monitor energy usage and production and to **manually control and/or automate**³ the use of energy **within a household**.⁴'

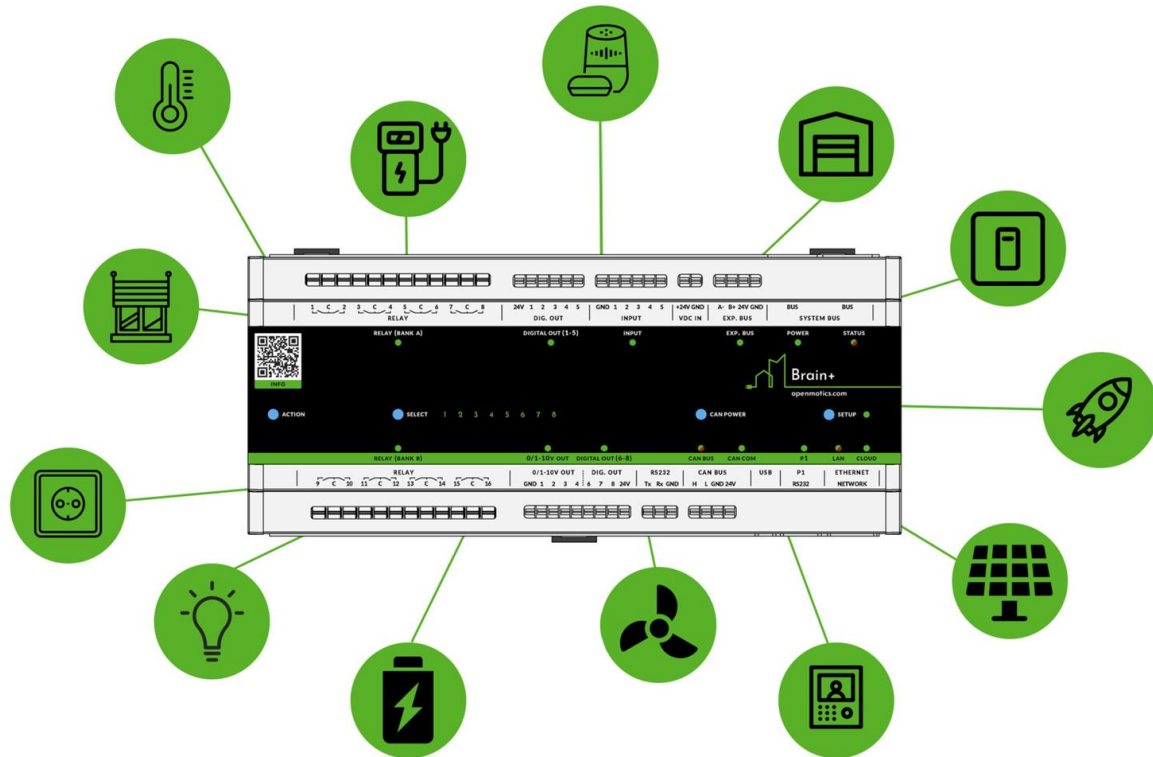
(Source: Sustainable Now)



Part I: Hardware

Every HEMS has a **central component** (Brain) which is responsible for:

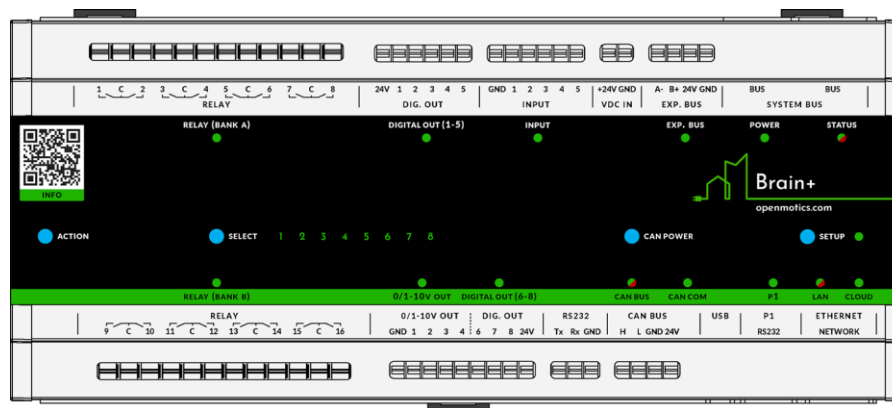
- Gathering all sensor data
- Creating a feedback loop to control actuators
- Run the local software stack





Part I: Hardware

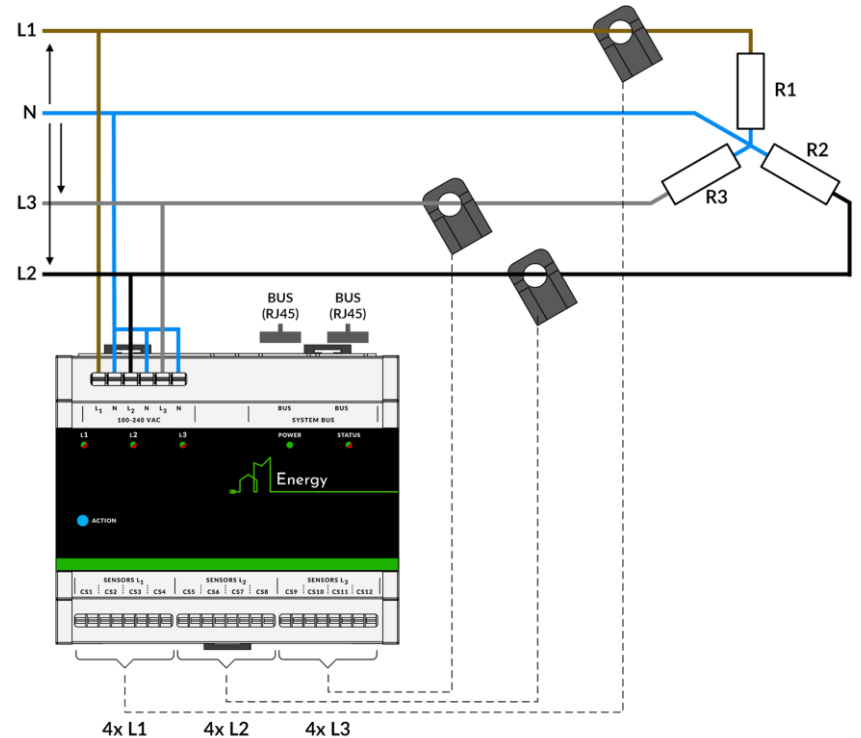
- Brain+ module
 - 16 bi-stable 230V relays
 - 8 digital outputs
 - 5 digital inputs
 - 4 0-10V outputs
 - CAN-bus
 - P1 port
 - Ethernet port
 - RS485 expansion bus
 - Modbus
 - Bacnet
 - Profibus
 - ...





Part I: Hardware

- Slave module: Energy Module
 - Mono or 3-phase connection
 - 12 measurements
 - Detailed insights





Part I: Hardware

Big **challenge** with household appliances!

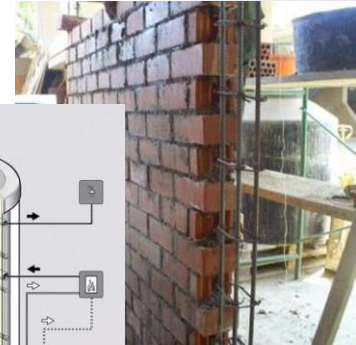
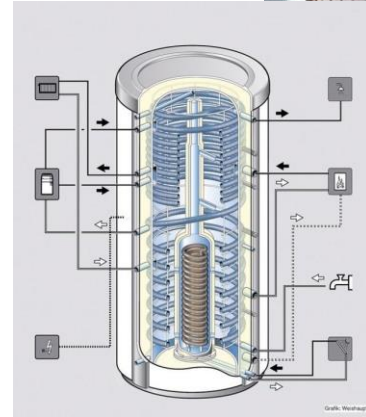
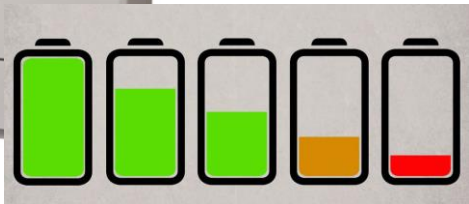
- Low adoption of smart household appliances due to high cost and low offering at the moment.
- Controlling them with smart (switched) outlets doesn't work well
- European initiatives started (eg. InterConnect/SAREF ontology) for better energy interoperability.





Part I: Hardware

- Huge opportunity for energy storage





Part II: Software

Hardware is nothing without software...

Edge computing happens on the gateway / hub itself and is responsible to

- Connect the different assets
- Process low latency actions
- Buffer data for internet hiccups
- Make sure local control works without functional internet connection

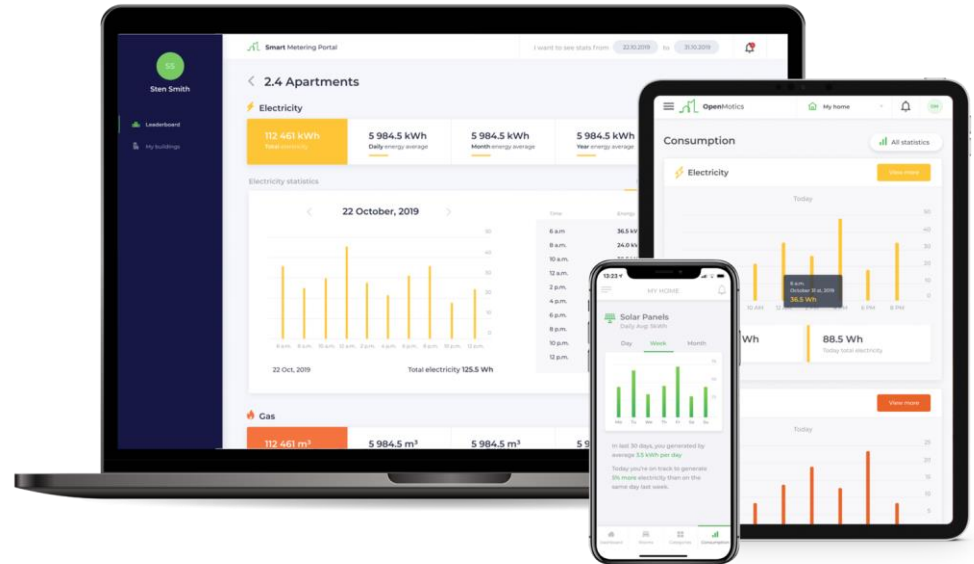
Gateway plugins allow to extend local functionality

- Triggers on input/output/events
- Background processes
- Push custom metrics to the cloud
- Can be provided by 3th parties



Part III: Manually and/or automatic

- Manual
 - Giving insights
 - Raise awareness
 - Gives input for manual interactions
 - Send push notifications on certain events
 - Source for gamification

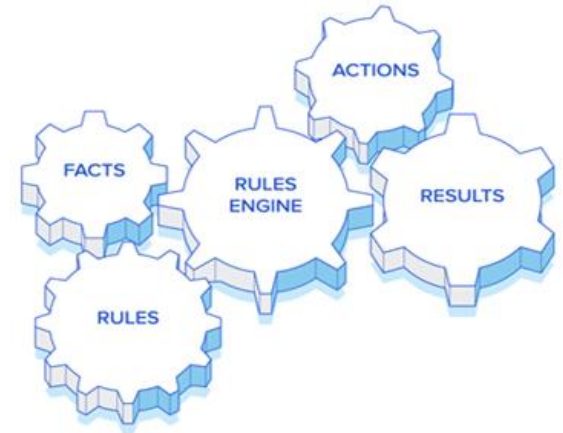




Part III: Manually and/or automatic

- **Automatic**
 - Energy flows became too difficult for manual interaction
 - Too much burden to always act as a result of a notification

- **Automate to**
 - Lower the risk of overheating (screens)
 - Align production vs consumption (PV and DHW)
 - 15 minute peak shaving (capacity rate)
 - Control assets in function of weather predictions (Smart scheduling of assets)





Part III: Manually and/or automatic



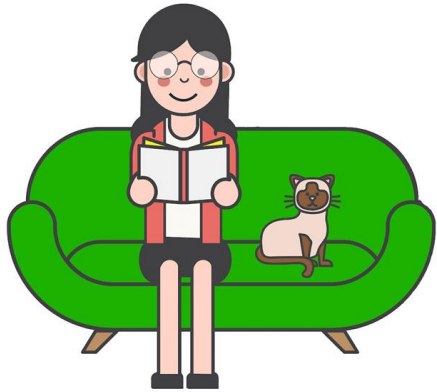


Part IV: Household

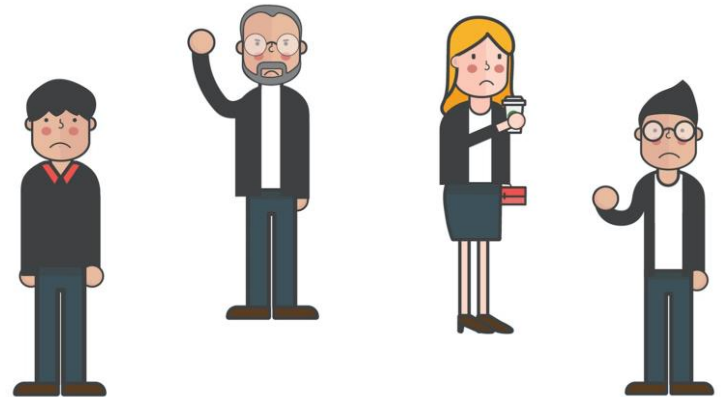
This is fine for residential units where all assets are privately controlled

BUT

what about shared assets?



PRIVATELY CONTROLLED ASSETS



SHARED ASSETS



HEMS in a bigger picture

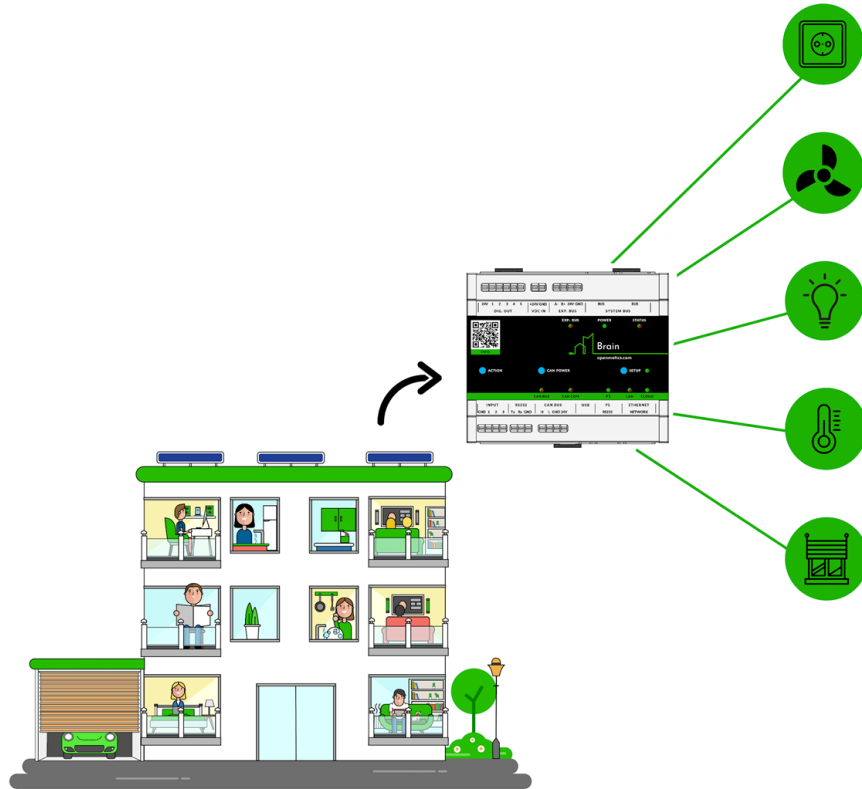




HEMS in a bigger picture

Local Attached Assets:

- Connected Thermostat
- Lights
- Screens
- Ventilation
- Outlets
- ...

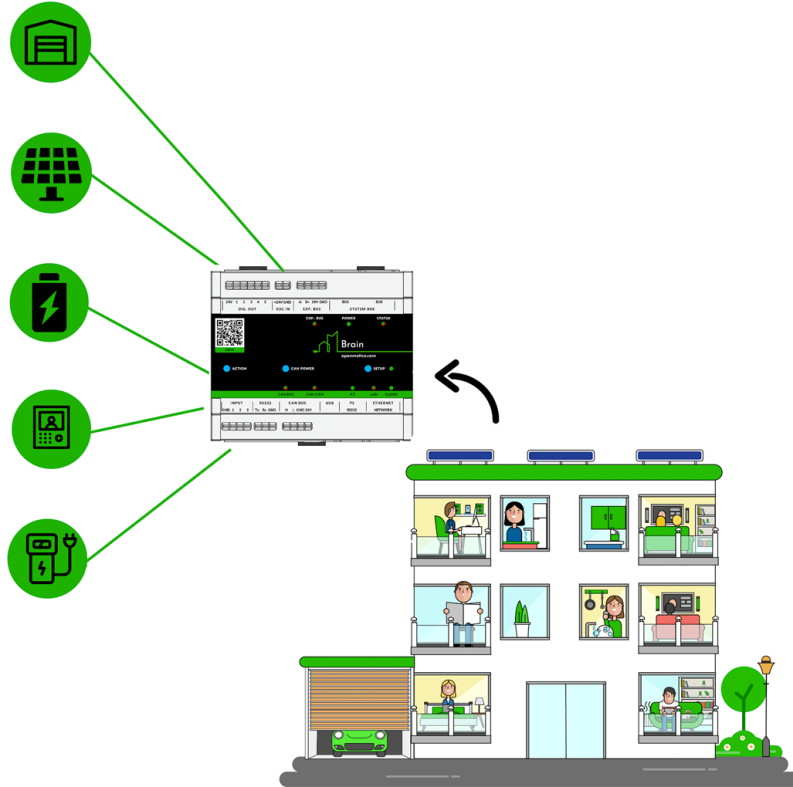


One brain in every unit



HEMS in a bigger picture

One central
brain in every
building

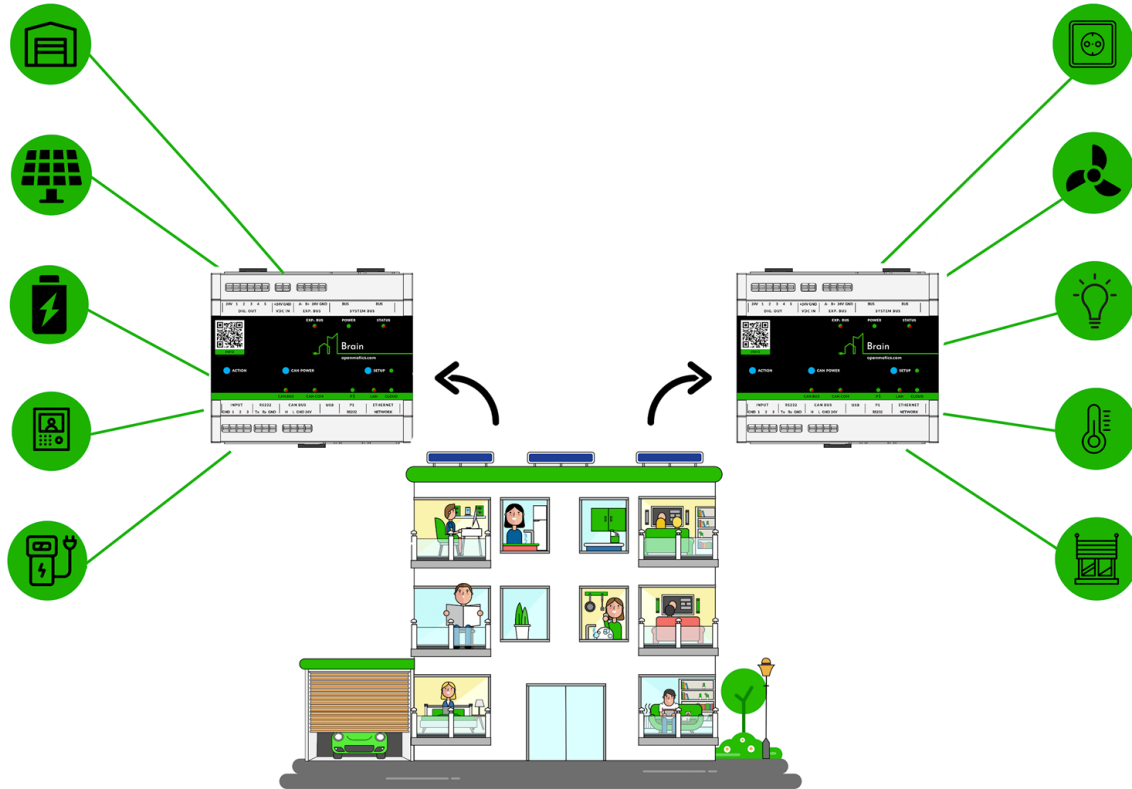


Centrally Attached Assets:

- Garage door
- Solar Panels
- Shared Battery
- Intercom
- Charging poles
- ...



HEMS in a bigger picture

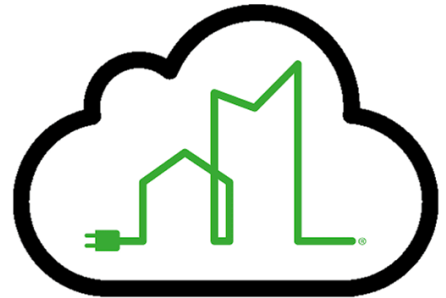




HEMS in a bigger picture

An open **Cloud platform** allows:

- People to control or get insights in their individual AND collective controlled resources
- Either from home or remote

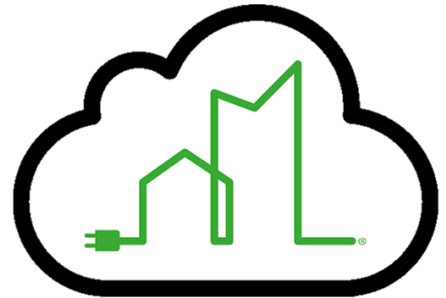




HEMS in a bigger picture

An open **Cloud platform** allows:

- Implementation of a CEMS instead of HEMS
 - This by combining centrally managed assets with privately managed assets
 - Centrally optimised assets with respect to individual comfort needs!
 - Eg. Centralised Screen control
 - Aligned heating curve
 - Helps for BREEAM





HEMS in a bigger picture

An open **Cloud platform** allows:

- Give the possibility for 3th parties to
 - Create custom dashboards using the metrics API's
 - Create invoices for the tenants based on measured utilities
 - Add extra services for further energy optimisations on a revenue share based model





HEMS in a bigger picture

An open **Cloud platform** allows:

- Support ESCO's
 - Create custom dashboards for assets in shared and individual spaces
 - Optimise central energy source (align the energy householding)
 - Give insights of centrally measured consumption to the end users.





(H/C)EMS and LEC go hand in hand!

SHARED (HAPPY) ASSETS

