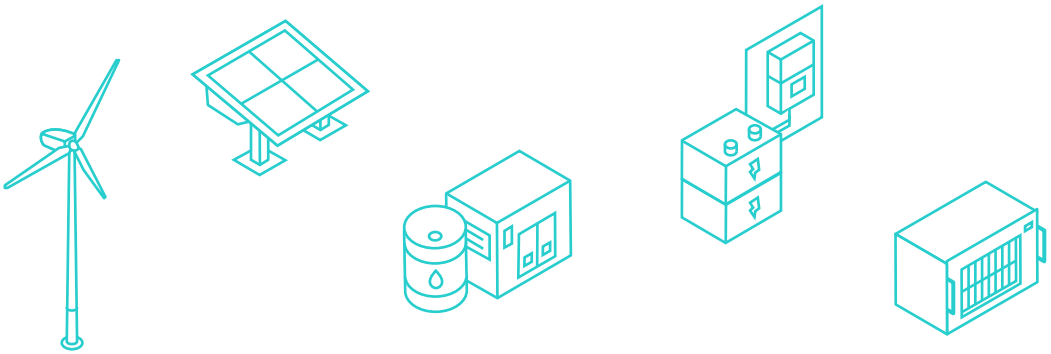
Enapter

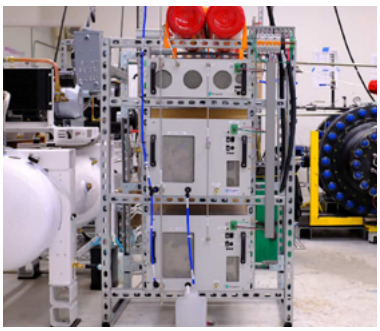
The Enapter Energy Management

Hardware diversity is welcome



Integrate any device into a unified energy network. Manage energy generation, storage and transmission with an intelligent, customisable solution toolkit.



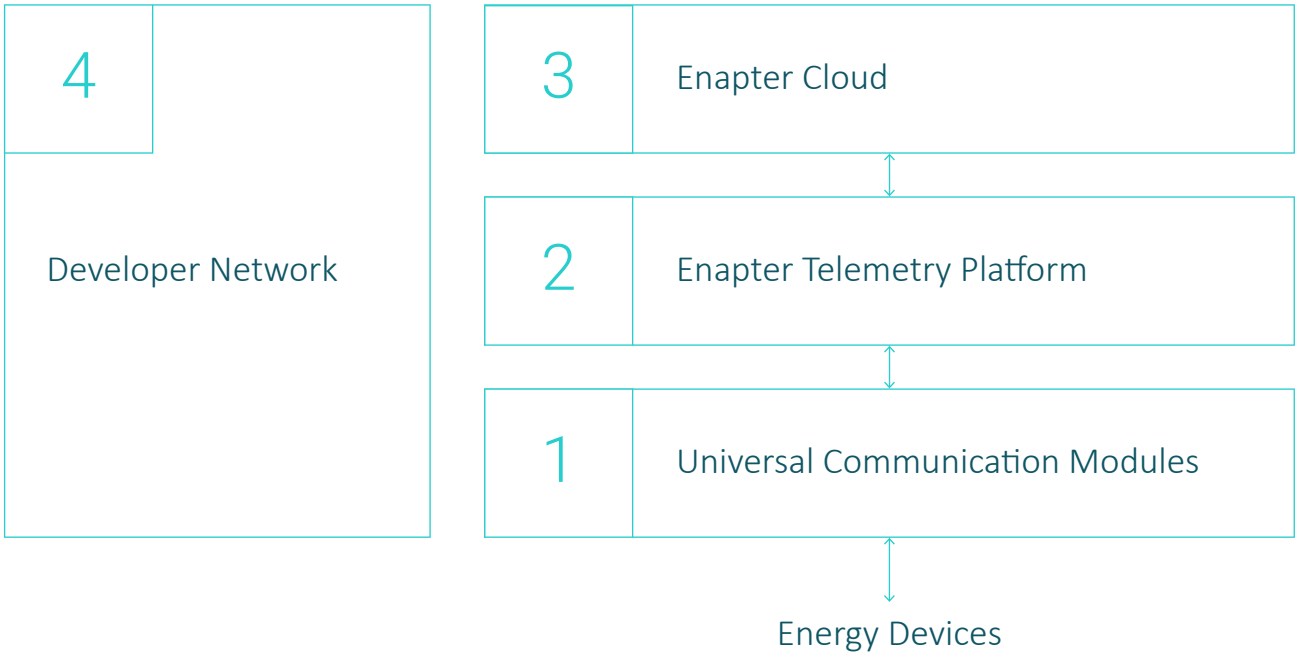
Use Case Overview

The Enapter Energy Management toolkit is a modular hardware and software solution. It helps people and businesses to plan and realise energy production, storage and consumption for residential or industrial systems of any size and complexity.

Small individual and business projects	Integrate your electrical components to monitor, control and automatically balance energy generation and consumption.
Residential and industrial control of hydrogen cycle	Remotely control and manage every step of your hydrogen production and storage to ensure efficient use of available energy resources and reliable power supply.
Public and industrial projects with widely distributed energy resources	Acquire, harmonise and receive telemetry data from heterogeneous components across dispersed facilities to enhance your control loop and substantiate management solutions.
Connected and off-grid facilities using renewable energy resources	Consistently plan, develop and improve operation objectives to ensure optimal equipment performance, yield desired business results and achieve sustainable energy goals.

Energy Management Toolkit

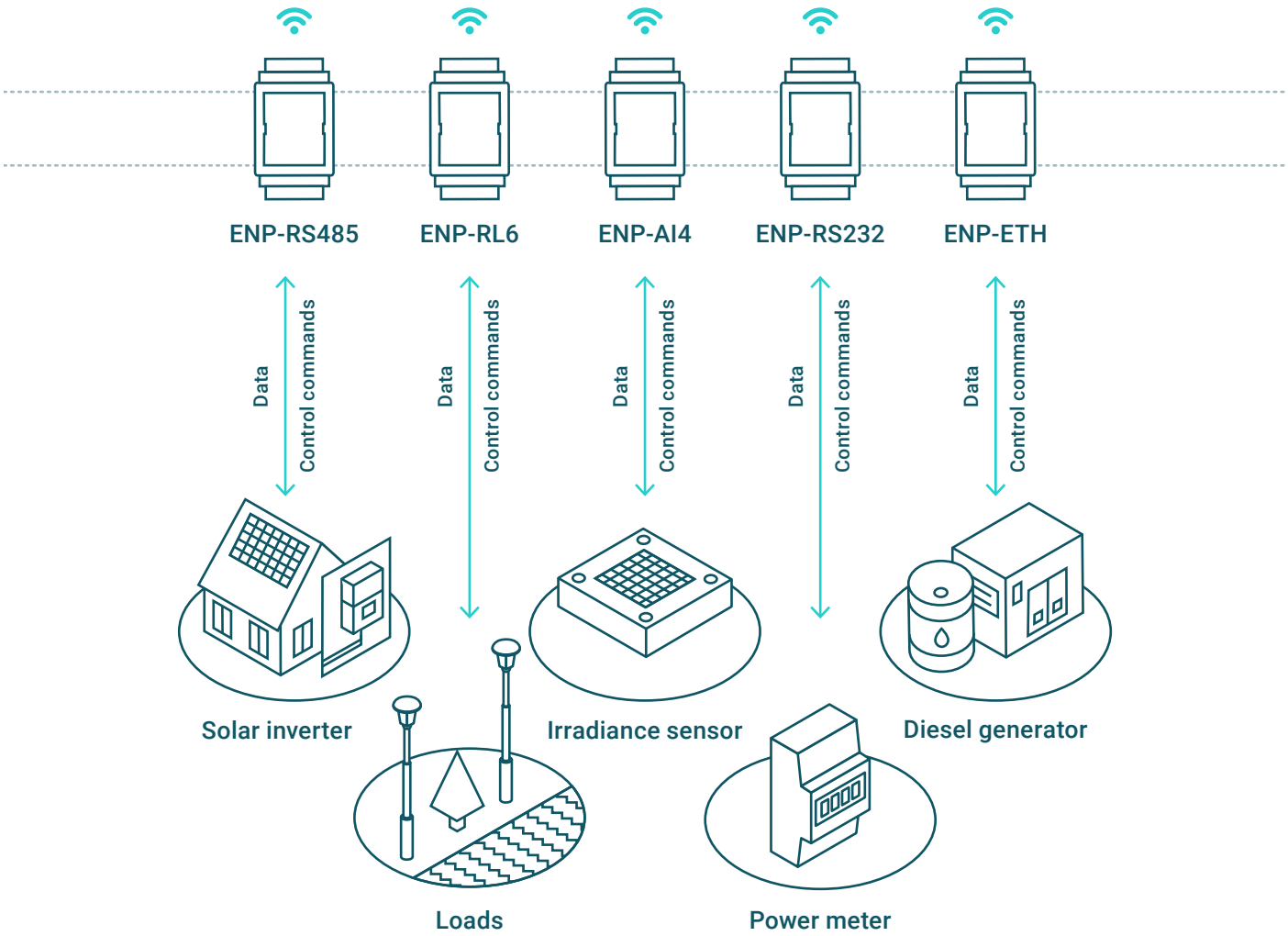
- Fits at any stage of your project without interfering with the existing infrastructure.
- Brings together technical and business objectives to achieve sustainable operation.
- Promotes best practices for energy management built upon industry standards to ensure reliability and security.
- Offers special support for renewables generation, energy efficiency, and hydrogen management.
- Supports customisation and extension from low-level hardware interfaces to high-level business goals.



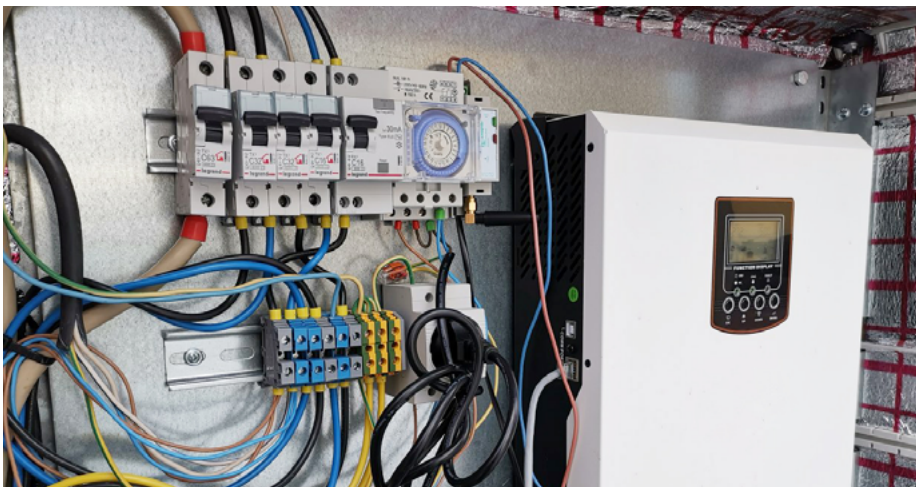
1. Universal Communication Modules

Connect a wide range of standard devices straight out of the box

Universal Communication Modules (UCMs) receive measurement data and send control commands to the connected device. Modules translate device protocols into a unified communication protocol (UCP), and send device measurement data to your energy management system (EMS).



Setup for a renewable energy system with solar inverter connected with an **ENP-RS232 module mounted on 35mm DIN rail according to IEC 60715.**



Enapter's UCMs support the following protocols:

- Modbus RTU
- Modbus TCP and Sunspec
- Ethernet and SNMP
- MQTT
- RS-232 and RS-485
- CAN Bus
- HTTP/HTTPS and REST
- OPC UA

A wide of range of supported protocols allow connection with most standard devices, including diesel generators, boilers, battery charge controllers, battery and solar inverters, hydrogen generators, fuel cells, valves, compressors and pumps, irradiance sensors, and other digital and analog sensors.

We constantly expand the device and protocol support our modules provide. For non-standard components, anyone can develop and test custom interfaces using low-code development tools, provided SDKs and 3rd party connectors such as MQTT connector.

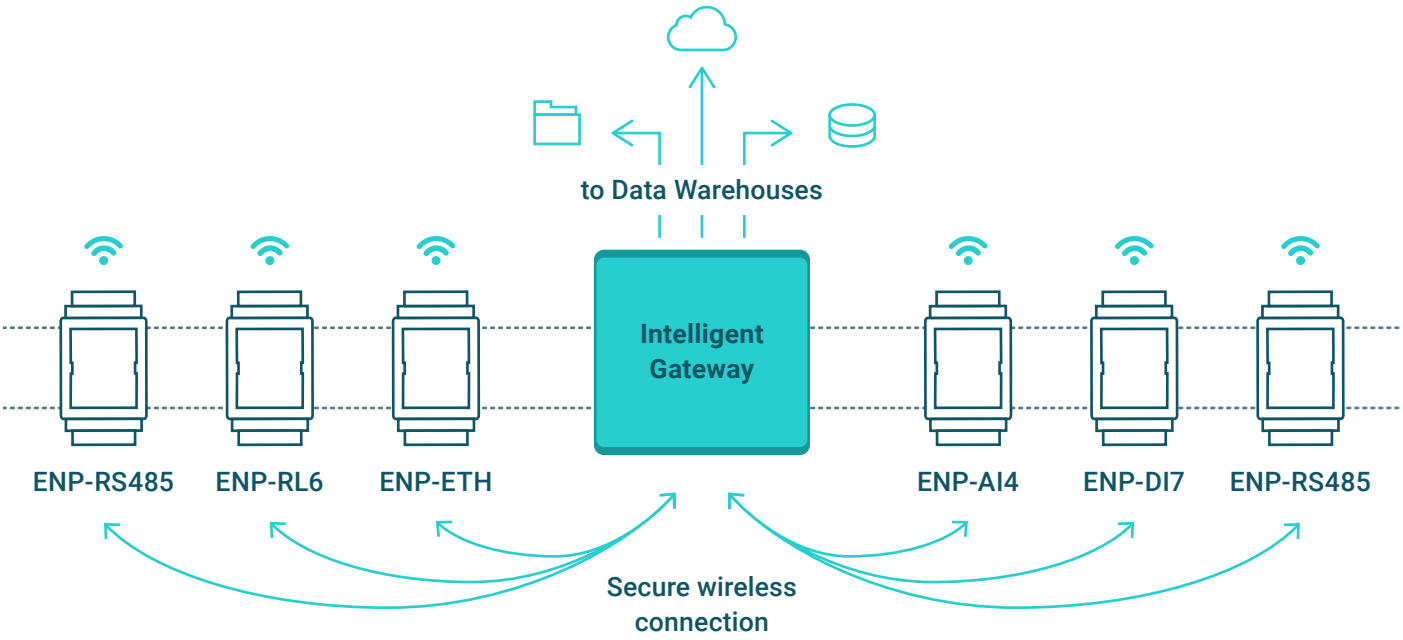
Mobility

Download the Enapter app on iOs and Android and try our demo.

No special gadgets are needed to set up, configure, control and manage your electrical components. All you need is your mobile phone or any device running iOS or Android. Integrators can bring on-the-go measurements and control features into your own notification and management systems. All firmware updates and upgrades can be managed over the air (OTA).

2. Enapter Telemetry Platform

- Collects telemetry data across distributed energy resources.
- Controls electrical components automatically or on demand, taking into account your grid configuration, operating conditions and history, and external data such as weather conditions and equipment specifications.
- Sends data to a warehouse: on the premises or in a private or public cloud.



In simple cases, a UCM can work stand-alone, allowing you to monitor the connected device and send basic commands to control device behavior. More typically, several UCMs work together to ensure consistent energy management across different energy system components.

Intelligent Gateway

The core of the platform is the Intelligent Gateway. It is standard x86 PC which is running Linux based operation system.

- Temporary offline storage to prevent data loss in case of connectivity problems.
- Extensions for AI and efficient processing of edge workloads.
- The Rules Engine.

Following best practice for network router design, we isolate the updatable part of the OS, and put it in the read-only section to prevent unintentional damage and ensure system reliability.

You can configure your system using a command line interface (CLI) environment with a set of high-level commands, command autocompletion and built-in documentation.

Rule Engine

The Rules Engine handles everything you need to build, maintain, run and check low-level commands to achieve operational objectives and high-level goals.

In simple cases, this can be a set in the form of “What-if” rules that determine a straightforward workflow. More typically, however, you may want to feed it with external information coming from different data pools or use it to run simulations that model complex scenarios.

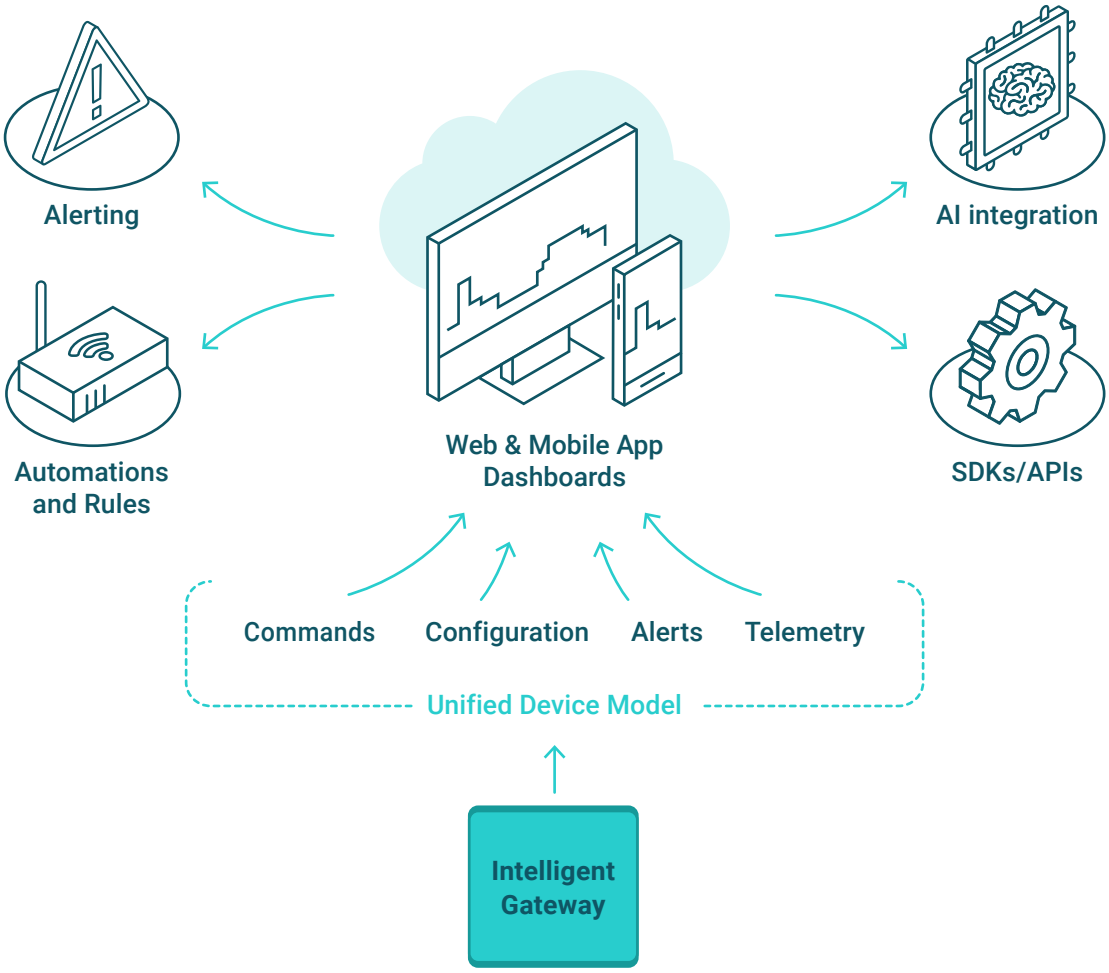
IF solar irradiance is > 600 WATT/SQM
THEN START Electrolyser.

Possible applications include:

- Optimisation of H2-H2 control based on excess energy.
- Demand side management; load control/load shedding based on energy levels.
- Automated scheduling like fuel cell control based on battery energy shortage.

3. Enapter Cloud

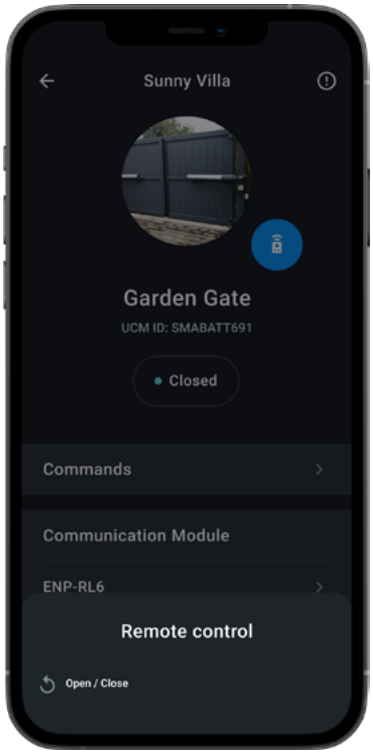
Provides device-cloud communication, collecting performance and error data from the Intelligent Gateway and all connected UCMs. It stores the data in a time series database, providing you with real-time or on-demand visualisation of collected data on customisable dashboards.



The Enapter Cloud delivers:

- Overall management of your device fleet and energy objectives.
- Efficient long-term storage for your data and administrative tools to ensure availability, integrity, and confidentiality of your information.
- Customised integration with external data pools.
- AI-powered tools for data analysis, modeling and visualisation.
- Notification and reporting instruments to ensure responsiveness, accountability and compliance.

4. Enapter Developer Network



The Enapter Developer Network offers tools and documentation to help system integrators and component manufacturers integrate Enapter solutions into their products. Advanced users will also benefit from automation features enabling full control over devices, workflows, and processes.

```
Commands:
  open_close:
  group: control
  display_name: Open/close
  communiction_module: enp-rl6
```

YAML-based blueprints let you easily create integrated templates for UCMs, Intelligent Gateway, Enapter Cloud and user apps.

You can display and manage the connected device properties, available commands, telemetry data, current configuration, issue alerts, applicable automation rules, and interoperability strategy. Your blueprints can address scenarios from low-level technical problems to high-level management goals.

For third-party suppliers this helps with rapid development, streamlined deployment and strong support of end products in accordance with technical, business and compliance requirements.

We also provide open-source SDKs and orchestration tools to:

- Help you program low-level tasks.
- Precisely control your environment.
- Easily integrate custom solutions with best practices, standard languages and frameworks such as: Lua, Go, Ruby on Rails, Vue.js, React Native, Puppet and Kubernetes.

Contact our team and we'll make sure you have everything you need to connect any device to a unified energy network — and together build a sustainable energy future for one and all.

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