

## Benefit

The dramatic progression of climate change, exacerbated by the current energy crisis in Europe, requires an accelerated move away from fossil fuels. In addition to the expansion of renewable energy, a reduction in overall energy consumption is of particular importance.

eMOS is a smart energy management system and reduces the use of energy with a holistic view. It implements smart grids and optimizes energy production and consumption in the assigned objects (eMOS cells) in a self-learning manner using artificial intelligence and weather forecasts.

With its holistic approach, eMOS considers all forms of energy such as heat, cold, electricity and electric / hydrogen / methanol mobility as well as optional units for energy storage and transformation.

For system manufacturers, eMOS offers the possibility of direct integration and additional use of eMOS to control and regulate their own system. The free programmability (PLC) has so far only offered professional features in a super-compact footprint that are usual in the industrial environment.

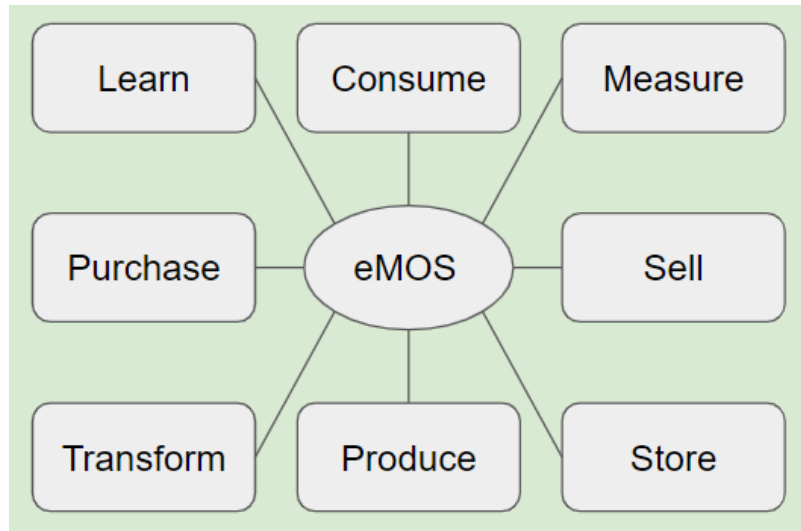
Existing systems can be easily connected via any fieldbus interface.

In addition to networking and data collection, the eMOS IoT platform enables the realization of energy communities.

All eMOS products impress with fanless operation, are available in series for at least 15 years and come with a 5-year warranty.

## Features

The functionality of eMOS is divided into the following areas:



eMOS Functional Structure

- **Measure**  
eMOS continuously measures all forms of generated and consumed energy. From this, the typical characteristics of the assigned cell are recognized and used for optimization.
- **Self-Learning**  
eMOS uses artificial intelligence to recognize the typical user behavior of the assigned energy cell. This enables planning and timely provision of the required forms of energy.
- **Sell & Purchase**  
Based on the recognized consumption patterns, eMOS automatically buys and sells required or excess energy to other energy communities. eMOS provides a complete IoT system including the central functionality.
- **Store**  
eMOS uses short-term and long-term storage units to store excess energy. Short-term storage is usually used in day/night mode, long-term storage in summer/winter mode.
- **Transform**  
eMOS uses existing transformers to convert electrical energy into other forms of energy. Conversion to heat/cold and hydrogen is currently supported. The conversion of energy is an essential key for the self-sufficient operation of energy cells over the summer/winter cycle.

- **Consume**  
eMOS enables the optimized consumption of electrical energy at assigned consumers. The need-based provision for the respective use is guaranteed.
- **Produce**  
eMOS enables the management and control of energy generation systems such as PV systems, wind turbines or combined heat and power plants for optimal use and marketing of the energy generated.

## Components and Structure

eMOS masters the management of energy networks of any size. It consists of the hardware platform and the associated software, has a hierarchical structure and is divided into unit, cell and community levels. Units are the consumers, producers, transformers or stores of a cell. Cells are smart grids that connect and manage the existing units. Communities are economically connected cells that jointly deliver and purchase energy to the outside world.

In the eMOS software, units, cells and communities are implemented in the form of control objects (COs). Control objects control, regulate, monitor and manage associated units, cells and communities. All control objects are executed on assigned eMOS controllers.

The eMOS hardware platform offers scalable controllers for running 2 ... 10,000 CO's per device.

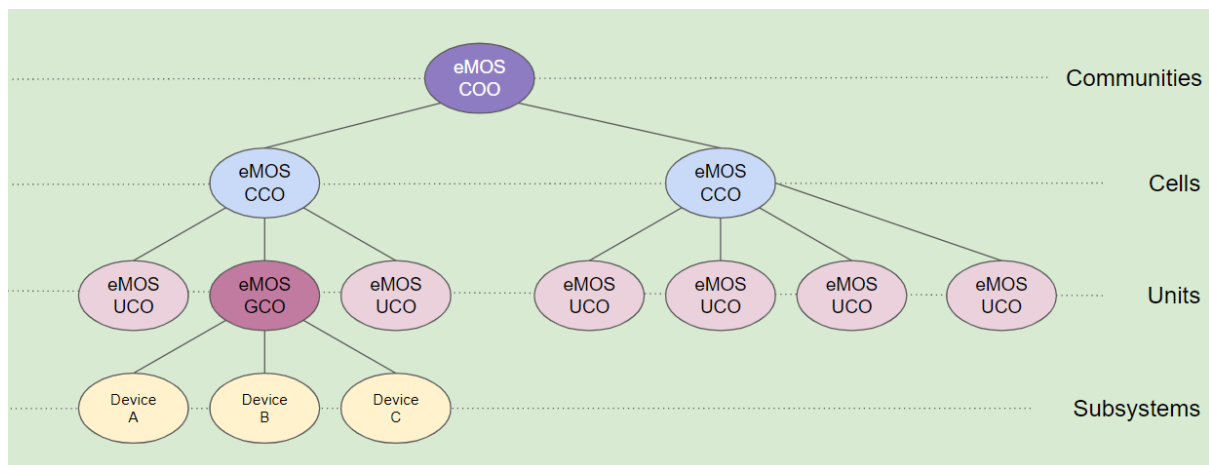
Unit Control Objects (UCOs) each represent a part of an energy cell, which consists of various units such as consumers, producers, transformer units and storage units.

Gateway Control Objects (GCOs) integrate units with proprietary controls via interfaces (digital or Modbus RTU, TCP).

Cell Control Objects (CCOs) manage the units of a cell.

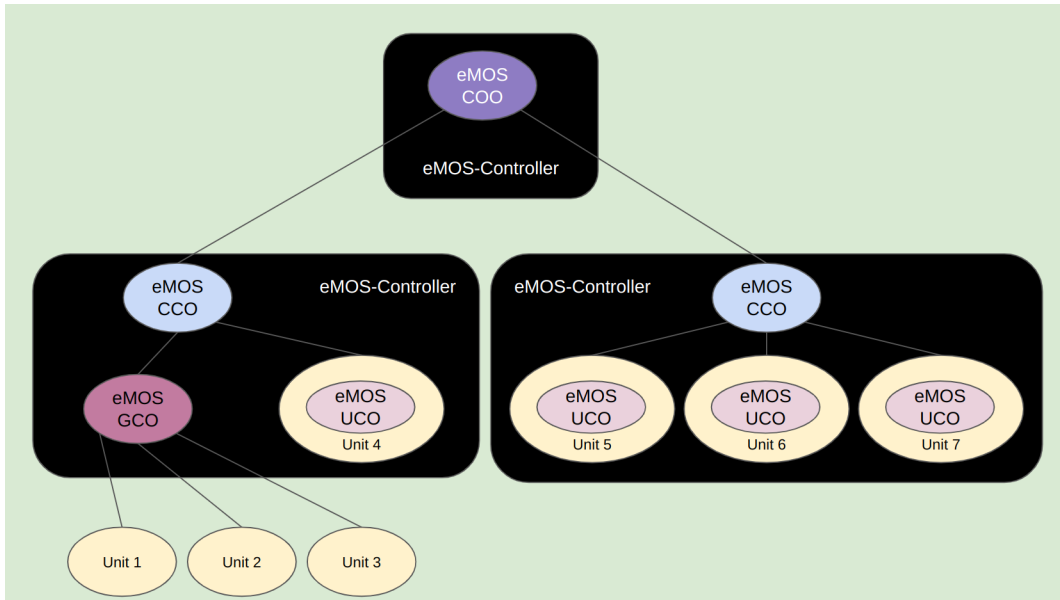
Community Control Objects (COOs) plan and manage the sale and purchase of energy between communities and public grid control systems.

All control objects use a uniform, hardware-independent runtime environment, communicate via standardized interfaces and protocols (OPC-UA and MQTT) and are executed on eMOS controllers.



eMOS Hierarchical Architecture

Control objects for units, gateways and cells can be integrated into one or more controllers (hardware). The number of hardware controllers is defined based on requirements regarding availability, physical interfaces and performance.

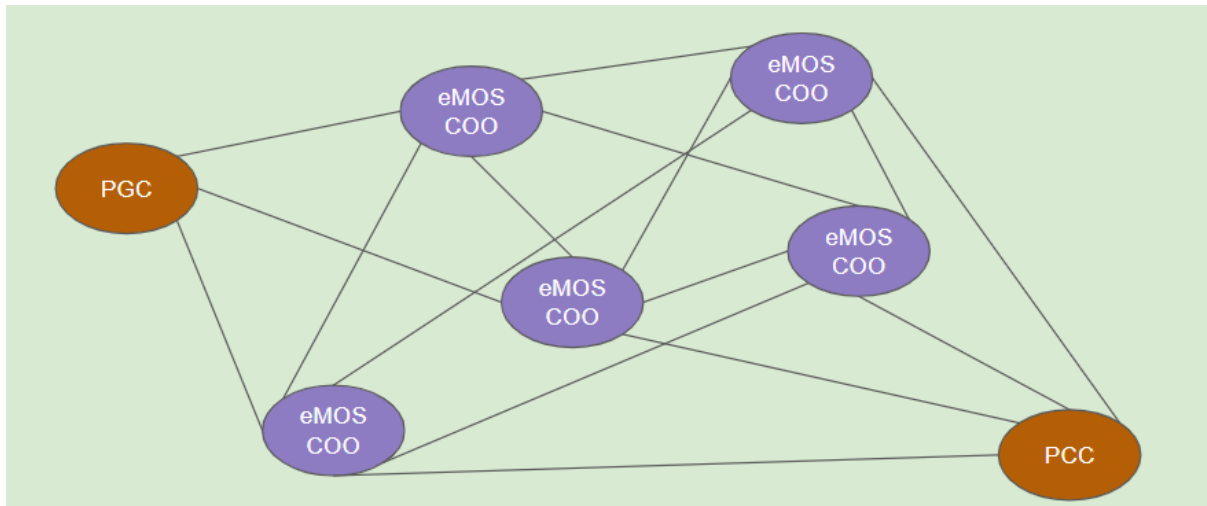


Example EMOS-Controller Software

At least one community controller is required per community for overarching management of multiple cells, AI-based planning, and commercial interfaces to other communities. He executes one COO at a time.

eMOS COOs provide the central IoT part of an eMOS network. eMOS community objects are optionally designed with high availability and implement a secure and multiple redundant network using the most modern and standardized communication standards.

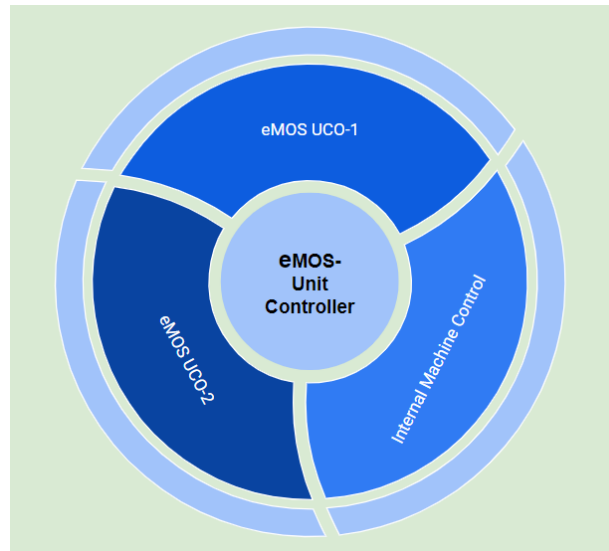
If required, eMOS COOs can also be connected to public grid control stations (Public Grid Control PGC).



eMOS Topology Community - Layer

## Integration of eMOS Controller

eMOS controllers offer manufacturers of energy systems the option of integrating their own automation. The functionally separate and freely programmable PLC cores can be used independently, optionally with discrete I/Os, fieldbus connection Modbus RTU / TCP and 7" touch display.



eMOS Shared Platform

The manufacturer thus saves on his own development costs, can use the eMOS functionality immediately, benefits from professional and simple programmability and minimal time-to-market. A customer-specific extension with interfaces or I/Os is also possible.

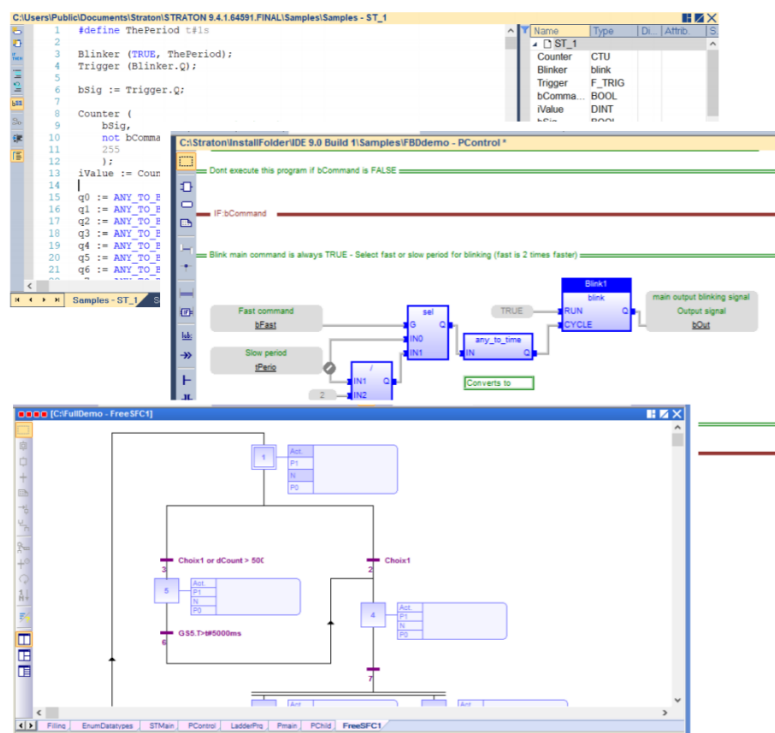


eMOS Examples of EMOS Controller UC-10

## eMOS Development Tool

eMOS provides a development tool for developing your own functionality. Programming is carried out using a multilingual development tool that provides all the usual IEC 61131-3 programming languages, including test and commissioning tools.

The software runs on any PC with Microsoft Windows 10/11 and a LAN/WLAN interface. The user interface can be switched to German, English, French, Italian and Spanish. The tool is multi-user capable and supports SVN or Git as a repository.



EMOS Development Portal

Function Block Diagram (FBD), Structured Text (ST), Instruction List (IL), Sequential Function Chart (SFC) and Ladder Diagram (LD), Python and Flask are available as programming languages.