

Energy Management

Web-based embedded solution for monitoring of distributed conventional energy applications

Type Em²-Server



- Software solution with integrated database and web-server
- Monitoring and data management of up to 100 distributed installations
- Database replication from up to 100 VMU-C EM Web-servers
- Reliable and efficient communication from VMU-C EM to Em²-Server based on Web-Services

Product description

Em²-Server allows users to manage distributed installations. In each remote location one VMU-C EM unit is in charge of gathering data from the connected devices (Energy Meters and VMU-M, VMU-P, VMU-O units), store them inside its local DB, and transmit them to the Em²-Server, allowing to

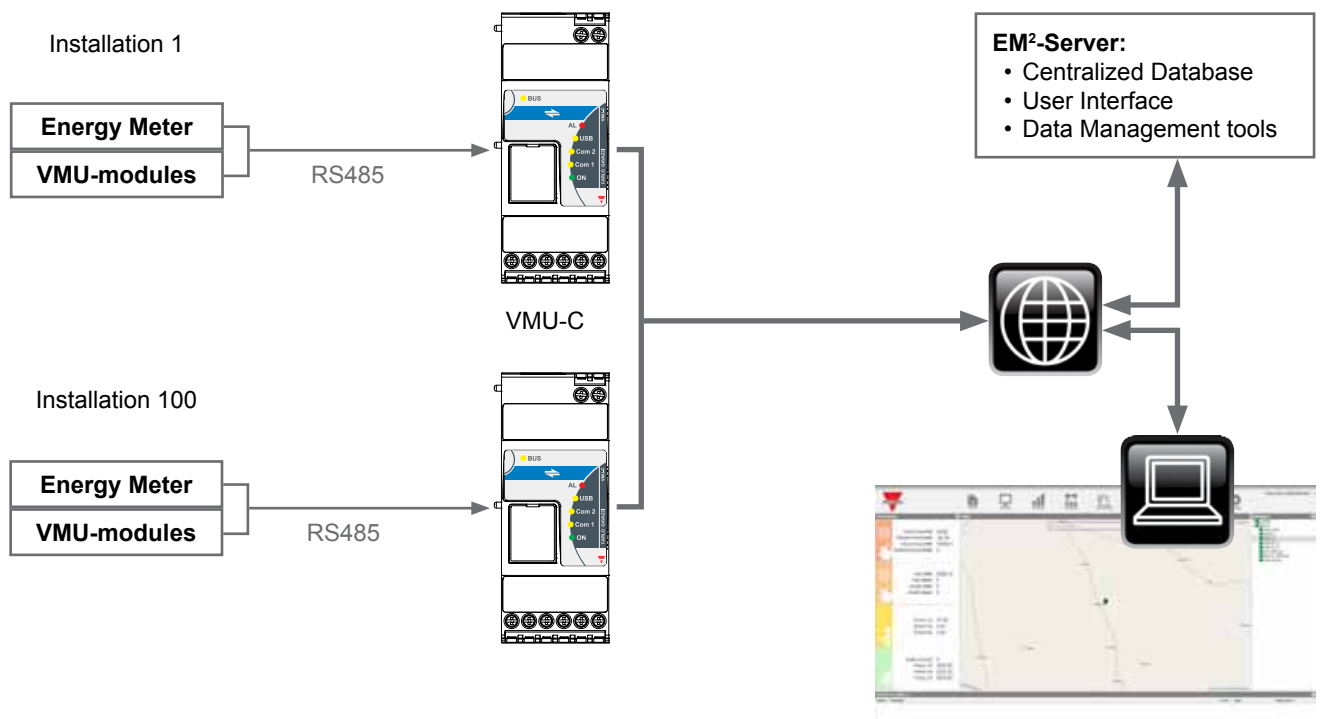
centralize in a single database and Web-Server, information from many plants, without the need of a dedicated PC. Data may be accessed by means of the Em²-Server's web interface.

Em²-Server package contents

- DVD with Em²-Server virtual machine in OVF format
- License code⁽¹⁾
- Instruction sheet

Notes:

(1): Em²-Server is software provided on a license base. See "Em²-Server Licensing" for details





Em²-Server software, Web-based embedded solution for Energy data management



- Software package with Web-server capability
- Distributed installations management (up to 100)
- Database replica from up to 100 remote or local VMU-C EM units
- AC,DC and environmental variables
- Alarms control with automatic emailing
- Data export in Excel ® format
- Deployment based on OVF format (Virtual Machine)

- DVD with VMware® compatible virtual machine, ready for use⁽¹⁾
- All in one VMware® compatible virtual machine including:
 - Operating system (Linux 64 bit)
 - Enterprise level database engine
 - Web-Server
 - Application software
- Flexible licensing plan

Notes:

(1): Carlo Gavazzi has not any technical or commercial agreement with VMware company, nonetheless, Em²-Server is available as OVF format and tested on most recent VMware® hosting platforms

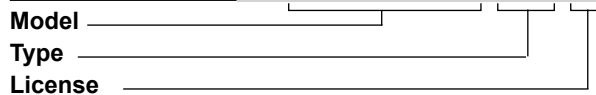
Product description

Em²-Server is a software package with Web-Server and Web-Services capabilities suitable to gather information from up to 100 VMU-C EM units. Em²-Server aggregates data from multiple installations in

single centralized database, allowing user to access them anywhere by a standard Web-browser, through a highly interactive interface. All data are available as charts, tables and reports based on XLS format.

How to order

EM2SERVER STD L1



Type Selection

Model	Type	License
EM2SERVER: Em ² -Server	STD: Standard	L1: Base license (up to 20 VMU-C EM); L2: Extension license (additional 20 VMU-C EM) ⁽¹⁾

Notes:

(1): up to 100 VMU-C EM may be managed by a single Em²-Server instance



Em²-Server main software characteristics

Deployment Media Format Compatibility	DVD OVF standard format VMware® compatible virtual machine	Free disk space (min) Host operating system	
Virtual machine characteristics (target) Operating system Database engine Web-Server Application software	Linux 64 bit Standard SQL relational database Apache Carlo Gavazzi Em ² -Server	User interface Virtual machine installation Network configuration Application software (administration) Application software (use) Web-Browser compatibility	VMware ® software tools ⁽¹⁾ VMware ® console access Web-Browser Web-Browser Firefox, Chrome, Internet Explorer, Safari, Opera ⁽²⁾
Virtual machine's host characteristics CPU(min) RAM(min)		Backup Method	Virtual machine backup and snapshot based on VMware compliant backup tools ⁽³⁾

Notes:

- (1): Carlo Gavazzi has not any technical or commercial agreement with VMware®
- (2): Carlo Gavazzi tested Em²-Server with the latest versions of the named browsers as of **2014-April**
- (3): The user is responsible for data integrity and for putting in place any necessary action to grant that information are stored and managed in a reliable and safe way, including the necessary backup and disaster recovery procedures and solutions

Em²-Server memory format and data occupancy

Description	Value
Total available memory for database	According to available space in the server ⁽¹⁾
Maximum backup size	Depending on the tool and storage media of choice ⁽¹⁾
Resolution High resolution Low resolution	From 5 to 60 minutes interval according to configuration Daily interval
Database size management	Dynamic, based on: <ul style="list-style-type: none"> • Current number of VMU-C EM units which are replicating their database to Em²-Server • Total number of devices (Energy Meters and VMU-M units) connected to the VMU-C EM units • Number of Virtual meters created at Em²-Server level • Data resolution (from 5 to 60 minutes)
Range of historical data available with High resolution	Min.: 5 months Max: 10 years
Range of historical data available with Low resolution	30 years

Notes:

- (1): The user is responsible for data integrity (and for putting in place any necessary action to grant that information are stored and managed in a reliable and safe way, including the necessary IT architecture sizing and designing, and backup and disaster recovery procedures and solutions



Em²-Server TCP/IP networking

Inbound TCP/IP communication		
TCP/IP port number	TCP/IP port description	Purpose
80	HTTP	Access to the internal web-server
52325	SSH	Remote tunneling feature; connection from VMU-C to VMU-Y
from 1000 to 64000 (customer selected)	SSH	Remote tunneling feature; user access to remote VMU-C

Outbound TCP/IP communication		
TCP/IP port number	TCP/IP port description	Purpose
53	DNS	Domain name resolution
37	NTP	Network time services access
25	SMTP	Email message dispatching
443	HTTPS	Remote connection to licensing server



Em²-Server main functions

Overall features	Database replica from up to 100 VMU-C EM units; access by Web-interface to present real time and historical data for all the devices connected to the server		by VMU-C EM units and/or centralized alarm management (email) based on Em ² -Server is possible. Local alarm management is based on VMU-C EM functions ⁽¹⁾
Database synchronization			Centralized alarm management allows to send by email alarm queues coming from VMU-C EM units
Communication protocol	Carlo Gavazzi DP (Data Push) protocol based on Internet communication	Centralized emails Configuration	SMTP server configuration by Web interface
Replication interval	Configurable from 10 to 60 minutes (step 5 minutes)	Actions	Mail sent in case of
Replication direction	Data push from VMU-C EM to Em ² -Server so as to avoid firewall hassles		- Alarms as working status of the monitored plants
Internet connection			- Anomalies as working status of the monitoring system
Em ² -Server	Depending on the IT architecture		- Events as working status of devices connected through digital inputs
VMU-C	Wired or Mobile		
Configuration	The configuration of Em ² -Server can be carried by using its integrated Web-Server. No additional configuration software is needed. Configuration of VMU-C units which exchange data with Em ² -Server is made by connecting to the VMU-C's Web-Server ⁽¹⁾	Data access	
		User interface	Web-Server access by web-browser (Firefox, Chrome, Explorer, Opera, Safari supported)
		Data Export	Direct export from charts to CSV files Database export to XLS files
Clock		User management	
Functions	Universal clock and calendar with automatic synchronization through Internet connection (NTP server connection is mandatory so as to avoid a unique time shared between Em ² -Server and VMU-C)	Concurrent users	Up to 100 ⁽¹⁾
		Users profiling	Standard user with access to data and Administrators with access to configuration
		Internationalization	Data access configurable at single energy meter level
Data and Events logging		Data access tools	Multilingual interface
Memory size	Depending on the IT architecture	Monitor view	Real time and historical data from Energy Meters
Storage duration and interval	See "Em ² -Server memory format and data occupancy"	Analysis view	Multiple variable trends analysis
Storage data types	According to VMU-C EM ⁽¹⁾	Alarms View	Alarm monitoring and acknowledgement tool
Alarms management		Map view	Geographical location of target devices
Overview	Local alarm management (email and SMS) performed	Tree view	Hierarchical view of target devices
		Advanced features	

Notes:

(1): Please check the relevant VMU-C EM documentation for further information



Em²-Server main functions (cont.)

Tariffs and cost management	Multiple tariffs and energy contract can be configured Active Excel based consumption costs reports Contracts comparison tool		electrical power necessary to feed the installation starting from real consumption data
Virtual meters	Virtual meters can be configured by aggregating multiple real or virtual energy meters ⁽²⁾	Broadcast commands Description	Em ² -Server is allowed to send broadcast commands to one, some or all the VMU-C EM
Database Export tool	Tool allowing both exporting and charting of historical trends of whatever variable in the database	Available commands	Commands are processed during database synchronization
Synoptic view	Tool for real time ⁽³⁾ inspection of a plant, represented by a background (including a layout or a schematic) surrounded by icons representing the necessary energy meters		User add/delete NTP server configuration Email configuration Tunneling from VMU-C to Em ² -Server Firmware update Database reset Sampling interval setting VMU-C to VMU-C configuration copy Reboot
Load profile tool	Tool for statistical analysis of daily consumption profile at the DMD (demand) interval resolution; it allows to calculate the maximum		

Notes:

(2): Creation of virtual meters requires database space, thus reducing data retention time (see “Em²-Server memory format and data occupancy”)

(3): Real time is meant in compliancy with data replication interval time, so data refresh is possible with a maximum rate of once any 10 minutes

Em²-Server licensing

Licensing structure	
Standard base license: mandatory to activate the server instance; it allows to connect up to 20 VMU-C EM units to the target server instance.	
Standard extension license: necessary to extend the actual count of VMU-C EM units	
Licensing schema	
Managed VMU-C units	Necessary licenses
20	1 Standard base license
40	1 Standard base license + 1 Standard extension license
60	1 Standard base license + 2 Standard extension licenses
80	1 Standard base license + 3 Standard extension licenses
100	1 Standard base license + 4 Standard extension licenses
Licensing check	
A valid internet connection with outbound communication allowed on ports 80 and 443 is mandatory to activate the Em ² -Server’s licenses; Em ² -Server periodically checks license validity remotely with Carlo Gavazzi’s license servers. In the case license check is not possible or it ends with a not valid result, the relevant Em ² -Server instance will be disabled, and on data pushed by VMU-C EM units will be allowed to enter the Em ² -Server’s database	

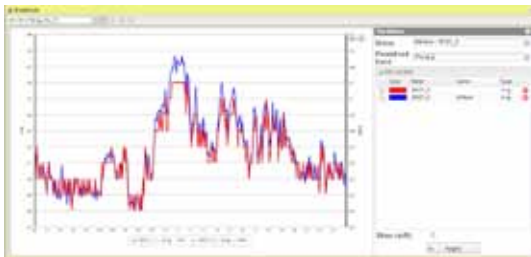
WEB-server



- Home page including:
- Main toolbar on the top
 - Hierarchical tree view on the right
 - Main variables boxes on the left
 - Alarms view at the bottom
 - Map view in the centre



- Monitor view
Each energy meter can be inspected about present and historical trends of any single variable, in the desired time interval



- Analysis view
Trends charting tool, allowing to show and compare any combination of variables from one or multiple energy meters



- Synoptic tool
It allows to check the present plant status by examining active instruments' icons placed on static images (uploaded by the user) representing layouts or schematics



- Load profile tool
It allows to calculate the daily consumption profile for the energy meter of choice, from the statistical analysis of consumption data in the desired interval, filtering day intervals according to the needs. Average, median, maximum and confidence interval may be charted or exported in a Excel ® file

WEB-server (cont.)



Export tool

Any variable from any table in the database may be chosen for charting or Excel exporting.
It is possible to select also combination of variables in the desired time interval.



Settings tool

It allows to configure the VMU-Y EM's settings and the tariff and contract management parameters.
It allows also to send broadcast commands to VMU-C EM units.