

VMU-C EM FTP

FTP and HTTP COMMUNICATION PROTOCOL

rev. 1.0.5

From FW A9 onward

October 15th, 2015

Energy Management

1 Introduction

1.1 Abstract

The purpose of this new feature is to enable a FTP based communication from VMU-C EM to an external FTP server (in the hand of the customer), allowing to transmit in an easy and standard way a predefined set of data.

1.2 Software features

Data are gathered and logged by VMU-C EM according the existing rules. Following a schedule or a trigger, data are grouped into a file and uploaded to the defined FTP server; the upload action is a transaction and the final status must be managed so as to repeat the transaction in the case of failure.

As shown above, there are 2 ways for VMU-C EM to exchange data with another system:

- 1) FTP upload (started either as a response to an HTTP request or on a schedule basis)
- 2) HTTP response to an HTTP based query

HTTP and FTP based communication has been implemented on VMU-C EM according to the existing standards; please refer to the existing documentation about FTP, HTTP, and the TCP/IP stack for a detailed description of the existing standards.

2 Main parameters setup

The following minimum set of parameters must be configured by the user prior to be able to use either the FTP upload or the HTTP request/response methods :

Parameter	Description	Format
FTP Server address	Remote FTP server's address	Domain name address or IP address See Figure 1
Remote directory	Valid directory in the remote FTP server (if different from root / home directory)	\dir1\dir2\... See Figure 1
Server User and password	Valid credentials for the server login	See Figure 1
Client User and password	Valid credentials to be used to remotely submit queries to the VMU-C EM	See Figure 1
Upload time interval	Time interval between 2 scheduled uploads	hh:mm (from 10 min to 1 day) The real time interval is MAX(upload time interval, sample time interval) The delivery is synchronous to the sampling time base and the allowed upload time interval is a multiple of the sampling time interval See Figure 1
Alarms flag	Flag to enable alarms scheduled upload to the FTP server	See Figure 1
Measurement flag	Flag to enable measurement scheduled upload to the FTP server	See Figure 1
First delivery time/date	Time/date of the first delivery (Local time)	See Figure 1
TEST-connection BUTTON	To test the above FTP configuration	See Figure 1
Errors Log (FIFO)	Fifo log of the last 50 wrong FTP transactions	See Figure 2
OK Log (FIFO)	Fifo log of the last 50 correct FTP transactions	See Figure 3

Energy Management

This configuration is possible by adding an item to the following menu:

FTP SERVICE	
Enable FTP Service	<input checked="" type="checkbox"/>
Server Address	<input type="text"/>
Remote Directory	<input type="text"/>
Server User	<input type="text"/>
Server Password	<input type="text"/>
Client User	<input type="text"/>
Client Password	<input type="text"/>
Upload Time Interval	<input type="text" value="00"/> - <input type="text" value="00"/> (hh:mm)
Alarms Flag	<input type="checkbox"/>
Measurement Flag	<input type="checkbox"/>
First Delivery (Date / Time)	<input type="text"/> - <input type="text"/> - <input type="text"/> <input type="text"/> : <input type="text"/> : <input type="text"/>
<input type="button" value="Save Setting"/>	
<input type="button" value="Test Connection"/>	

Figure 1

LOGs ERROR				
	Date / Time	IP address	File	Details
1	2013-11-27 15:10:02	10.1.5.9	VMU-C_BN1700015001H_ALARM_2013-11-27-15-10-02_S.csv	Connection refused
2	2013-11-05 12:00:38	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-11-05-12-00-38_S.csv	Empty VAR file
3	2013-11-05 12:00:38	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-11-05-12-00-38_S.csv	FTP_VAR_QRY&@&1383644101&1383645900&ALL&ALL&2013-11-05-12-00-38&S
4	2013-11-05 12:00:38	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-11-05-12-00-38_S.csv	Status=0 (0)
5	2013-10-27 03:00:19	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-10-27-03-00-19_S.csv	Empty VAR file
6	2013-10-27 03:00:19	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-10-27-03-00-19_S.csv	FTP_VAR_QRY&@&1382834101&1382835900&ALL&ALL&2013-10-27-03-00-19&S
7	2013-10-27 03:00:19	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-10-27-03-00-19_S.csv	Status=0 (0)
8	2013-10-15 09:05:25	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-10-15-09-05-25_S.csv	Empty VAR file
9	2013-10-15 09:05:25	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-10-15-09-05-25_S.csv	FTP_VAR_QRY&@&1381270501&1381272300&ALL&ALL&2013-10-15-09-05-25&S

Figure 2

Energy Management

LOGs OK				
	Date / Time	IP address	File	Details
1	2013-12-19 14:40:02	10.1.5.9	VMU-C_BN1700015001H_ALARM_2013-12-19-14-40-02_S.csv	
2	2013-12-19 14:30:22	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-12-19-14-30-22_S.csv	
3	2013-12-19 14:10:02	10.1.5.9	VMU-C_BN1700015001H_ALARM_2013-12-19-14-10-02_S.csv	
4	2013-12-19 14:00:22	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-12-19-14-00-22_S.csv	
5	2013-12-19 13:40:02	10.1.5.9	VMU-C_BN1700015001H_ALARM_2013-12-19-13-40-02_S.csv	
6	2013-12-19 13:30:23	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-12-19-13-30-23_S.csv	
7	2013-12-19 13:10:02	10.1.5.9	VMU-C_BN1700015001H_ALARM_2013-12-19-13-10-02_S.csv	
8	2013-12-19 13:00:22	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-12-19-13-00-22_S.csv	
9	2013-12-19 12:40:02	10.1.5.9	VMU-C_BN1700015001H_ALARM_2013-12-19-12-40-02_S.csv	
10	2013-12-19 12:30:22	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-12-19-12-30-22_S.csv	
11	2013-12-19 12:10:02	10.1.5.9	VMU-C_BN1700015001H_ALARM_2013-12-19-12-10-02_S.csv	
12	2013-12-19 12:00:22	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-12-19-12-00-22_S.csv	
13	2013-12-19 11:40:02	10.1.5.9	VMU-C_BN1700015001H_ALARM_2013-12-19-11-40-02_S.csv	
14	2013-12-19 11:30:22	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-12-19-11-30-22_S.csv	
15	2013-12-19 11:10:02	10.1.5.9	VMU-C_BN1700015001H_ALARM_2013-12-19-11-10-02_S.csv	
16	2013-12-19 11:00:22	10.1.5.9	VMU-C_BN1700015001H_VAR_2013-12-19-11-00-22_S.csv	

Figure 3

3 File formats

The file formats managed by the system are the following:

File	Description	File format
VAR	Variables logged in the last user defined period	FMT_V01
ALARM	Alarms logged in the last user defined period	FMT_A01
DEV	List of the connected devices	FMT_D01

3.1 FMT_V01

Section	Sub-Section	format
HEADER	Record-Type	AC (AVG values for AC meter) ACMIN (MIN values for AC meter) ACMAX (MAX values for AC meter) DC (AVG values for DC meter) DCMIN (MIN values for DC meter) DCMAX (MAX values for DC meter) EN (Environmental units) IO (I/O modules VMUO)
	Product-Type	Item identifier for the relevant product (e.g. EM21, EM23, EM24, EM26, EM33,WM30, WM40,VMU-E,VMU-P, VIRTUAL_AC_METER,VIRTUAL_DC_METER...)
	Item-S/N	(void when not managed)
	Item-label	Note: characters out of the alphanumeric range not allowed
	COM PORT	0 or 1 or 2 (0 for direct connection to VMU-C EM's local bus)
	MODBUS ADDRESS	Device's Modbus address
Timestamp	Timestamp-absolute (Epoch format)	UTC based timestamp (Epoch format)
	Timestamp-local(RFC3339 format)	Local time-zone timestamp (YYYY-MM-DD-hh:mm:ss) with UTC reference
Data	See the relevant data sub-format	

Energy Management

3.1.1 Data sub-format

POSITION	AC	DC	EN	IO ⁽¹⁾
1	kWh	kWh	Temperature 1	Input 1 status
2	kWh (-)	V	Temperature 2	Input 2 Status
3	VL-NSYS	A	Analogue input	Output 1 status
4	VL1-N	kW	Pulse rate input	Output 2 status
5	VL2-N			
6	VL3-N			
7	VL-LSYS			
8	VL1-L2			
9	VL2-L3			
10	VL3-L1			
11	A L1			
12	A L2			
13	A L3			
14	kW sys			
15	kW L1			
16	kW L2			
17	kW L3			
18	kvar sys			
19	kvar L1			
20	kvar L2			
21	kvar L3			
22	kVA sys			
23	kVA L1			
24	kVA L2			
25	kVA L3			
26	PF sys			

Energy Management

27	PF L1			
28	PF L2			
29	PF L3			
30	Phase sequence			
31	Hz			
32	THD A L1 ⁽²⁾			
33	THD A L2			
34	THD A L3			
35	THD V L1-N ⁽³⁾			
36	THD V L2-N			
37	THD V L3-N			
38	W dmd			
39	W dmd Max			
40	kvarh			
41	kvarh (-)			
42	kvarh (C)			
43	kvarh (L)			
44	Totalizer 1			
45	Totalizer 2			
46	Totalizer 3			
47	kWh L1			
48	kWh L2			
49	kWh L3			
50	An			
51	Hour meter kWh			
52	A sys			
53	kvarh L1			

Energy Management

54	kvarh L2			
55	kvarh L3			
56	kvarh (-) L1			
57	kvarh (-) L2			
58	kvarh (-) L3			
59	kWh (-) L1			
60	kWh (-) L2			
61	kWh (-) L3			
62	kVAh L			
63	kVAh L1			
64	kVAh L2			
65	kVAh L3			
66	Hour meter kWh (-)			
67	var dmd			
68	VA dmd			

Notes:

(1) I/O data-logging and communication available in future software release.

(2) THDA1 became THDA when managing 1-phase counter.

(3) THDV1N became THDVLN when managing 1-phase counter.

3.1.2 Filename(scheduled upload)

[VMU-C S/N] _ VAR_[Timestamp(YYYY-MM-DD-hh-mm-ss)]_S.csv

3.1.3 Filename(triggered upload as a response to HTTP request)

[VMU-C S/N] _ VAR_[Timestamp(YYYY-MM-DD-hh-mm-ss)]_T_[RECORD_TYPE]_[PRODUCT_TYPE].csv

3.1.4 File format

CSV format.

Field separator = “;”

Decimal separator = “.”

Note: files have variable length (and variable number of fields)

VMU-C EM FTP Communication Protocol

3.2 FMT_A01

Section	Sub-Section	format
HEADER	Record-Type	ALARM ANOMALY EVENT
	Product-Type	Item identifier for the relevant product (e.g. EM21, EM23, EM24, EM26, EM33,WM30, WM40,VMU-E,VMU-P, VIRTUAL_AC_METER,VIRTUAL_DC_METER...)
	Item-S/N	(void when not managed)
	Item label	Note: characters out of the alphanumeric range are not allowed
Timestamp	Timestamp (opened) (Epoch format)	UTC Epoch time
	Timestamp(RFC3339)	Local time with UTC reference
Data	status	C (closed) or O (open)
	Description	
Timestamp_alarm_close	Timestamp(Epoch format)	UTC Epoch time
	Timestamp(RFC3339)	Local time with UTC reference

3.2.1 Filename(scheduled upload)

[VMU-C S/N] _ ALARM_[Timestamp(YYYY-MM-DD-hh-mm-ss)]_S.csv

3.2.2 Filename(triggered upload as a response to HTTP request)

[VMU-C S/N] _ ALARM_[Timestamp(YYYY-MM-DD-hh-mm-ss)]_T.csv

3.2.3 File format

CSV format.

Field separator = “;”

Decimal separator = “.”

Energy Management

Note: files have variable length (and variable number of fields)

Energy Management

3.3 FMT_D01

Section	Sub-Section	format
HEADER	Record-Type	DEVICE_LIST
Timestamp	Timestamp (request's timestamp)	UTC Epoch time
	Timestamp(request's timestamp)	Local time with UTC reference
Data	See Data Sub-format	

3.3.1 Data sub-format

POSITION	DEVICE_LIST
1	AC (only if AC variables are managed by this device, else void)
2	DC (only if DC variables are managed by this device, else void)
3	EN (only if EN variables are managed by this device, else void)
4	IO (only if IO variables are managed by this device, else void)
5	PRODUCT-TYPE
6	S/N
7	COM_PORT
8	MODBUS_ADDR
9	LABEL
10	BRAND
11	MODEL
12	
13	SUBMODULE1
14	SUBMODULE2
...	
32	SUBMODULE20

Energy Management

3.3.2 Filename(triggered upload as a response to HTTP request)

[VMU-C EM S/N] _ DEV _ [Timestamp(YYYY-MM-DD-hh-mm-ss)]_T.csv

3.3.3 File format

CSV format.

Field separator = “;”

Decimal separator = “.”

Note: files have variable length (and variable number of fields)

4 Schedules and requests

4.1 Scheduled actions

Data are pushed according to the schedule every “upload time interval”, the relevant file is uploaded to the FTP server; if the exit status is not OK, the transaction is added again to the queue.

4.2 Request/response actions

By means of an HTTP request sent to the VMU-C EM, it is possible to send messages to the VMU-C EM so as to execute query commands.

The response message contains the output of the query to the VMU-C EM database and can be delivered either as an HTTP response or as an FTP upload.

4.3 Request messages structure

The query messages, sent by means of TCP/IP communication as HTTP requests are structured as follows:

http://myVMUC.mydomain.com/special_page?command&user@password¶meter1&...parameterN

where

myVMUC.mydomain.com = VMUC’s DNS or IP address

special_page = web server VMU-C EM’s page capable to manage HTTP queries (see table below)

command= command for the needed query

user@password = credentials configured by user to enable remote queries (see Figure 1 above)

parameters= command parameters (according to the command; see the table “message commands”)

4.4 Messages’ parameters

Command	Description	Parameters (bold=mandatory)	Special page
FTP_ALARM_QRY	Starts an ftp upload using the configured parameters (alarms)	TIMESTAMP-START (Epoch UTC) TIMESTAMP-END(Epoch UTC) FLAG: (C,O,A = closed,open,all) LANGUAGE(OPTIONAL)	receiverftp.php
FTP_VAR_QRY	Starts an ftp upload using the configured parameters (variables)	TIMESTAMP-START(Epoch UTC)	receiverftp.php

Energy Management

		TIMESTAMP-END(Epoch UTC) RECORD TYPE PRODUCT TYPE	
FTP_DEV_QRY	Starts an ftp upload using the configured parameters (variables)		receiverftp.php
HTTP_ALARM_QRY	Opens a page in which alarms are put as a flat csv like file	TIMESTAMP-START(Epoch UTC) TIMESTAMP-END(Epoch UTC) FLAG: (C,O,A = closed,open,all) LANGUAGE(OPTIONAL)	receiverftp.php
HTTP_VAR_QRY	Opens a page in which data are put as a flat csv like file	TIMESTAMP-START(Epoch UTC) TIMESTAMP-END (Epoch UTC) RECORD TYPE PRODUCT TYPE LABEL	receiverftp.php
HTTP_DEV_QRY	Opens a page in which DEVICE_LIST data are put as a flat CSV file		receiverftp.php

Note: each HTTP_ xxx command has an equivalent HTML_ xxx command whose output is html-tagged

Energy Management

4.5 HTTP response to remote HTTP commands

Specification	Description	Notes
Output format	First row: OK / Error code Further rows: Data	
Data rows format	CSV <i>Field separator = “;”</i> <i>Decimal point = “.”</i>	
Supported languages (Language/PARAMETER)	Italian it English en German de Spanish es French fr Chinese zh Czech cs	

4.6 HTTP request messages examples

Example	
1	<pre>http://myVMUC.myDomain.com/receiverftp.php?HTTP_DEV_QRY&myUser@myPassword</pre> <p><u>Purpose:</u> to perform a request for the connected field devices (energy meters, Eos-Arrays,...)</p> <p><u>Parameters</u></p> <pre>myVMUC.myDomain.com = VMUC's DNS/IP address myUser= user defined "client user" myPassword= user defined "client password" HTTP_DEV_QRY= query for devices list; data are received as HTTP response</pre>

VMU-C EM FTP Communication Protocol

Energy Management

Example	
2	<p><code>http://myVMUC.myDomain.com/receiverftp.php?HTTP_ALARM_QRY&myUser@myPassword&000000000&999999999&A&it</code></p> <p><u>Purpose:</u> to perform a request for all (A) the alarms in all the system's history (lower and upper time limits), in Italian language (IT)</p> <p><u>Parameters</u></p> <p><code>myVMUC.myDomain.com</code> = VMUC's DNS/IP address</p> <p><code>myUser=</code> user defined "client user"</p> <p><code>myPassword=</code> user defined "client password"</p> <p><code>HTTP_ALARM_QRY</code> = query for alarms; data are received as HTTP response</p> <p><code>000000000</code>= lower time limit in Epoch UTC format</p> <p><code>999999999</code>= upper time limit in Epoch UTC format</p> <p><code>A</code>= ALL the alarms</p> <p><code>it</code>= Italian language</p>
3	<p><code>http://myVMUC.myDomain.com/receiverftp.php?HTTP_ALARM_QRY&myUser@myPassword&1352440800&1352451600&A&it</code></p> <p><u>Purpose:</u> to perform a request for all (A) the alarms in the desired time interval, in Italian language (IT)</p> <p><u>Parameters</u></p> <p><code>myVMUC.myDomain.com</code> = VMUC's DNS/IP address</p> <p><code>myUser=</code> user defined "client user"</p> <p><code>myPassword=</code> user defined "client password"</p> <p><code>HTTP_ALARM_QRY</code> = query for alarms; data are received as HTTP response</p> <p><code>1352440800</code>= Fri, 09 Nov 2012 06:00:00 in Epoch UTC format</p> <p><code>1352451600</code>= Fri, 09 Nov 2012 09:00:00 in Epoch UTC format</p> <p><code>A</code>= ALL the alarms</p> <p><code>it</code>= Italian language</p> <p><i>Note: UTC coincides with GMT</i></p>

Energy Management

Example	
4	<p><code>http:// myVMUC.myDomain.com/receiverftp.php?HTTP_VAR_QRY&myUser@myPassword&1352440800&1352451600&ALL&ALL</code></p> <p><u>Purpose:</u> to perform a request for all the record types and product types in the desired time interval; data are polled by HTTP</p> <p><u>Parameters</u></p> <p><code>myVMUC.myDomain.com</code> = VMUC's DNS/IP address</p> <p><code>myUser=</code> user defined "client user"</p> <p><code>myPassword=</code> user defined "client password"</p> <p><code>HTTP_VAR_QRY</code> = query for variables; data are received as HTTP response</p> <p><code>1352440800=</code> Fri, 09 Nov 2012 06:00:00 in Epoch UTC format</p> <p><code>1352451600=</code> Fri, 09 Nov 2012 09:00:00 in Epoch UTC format</p> <p><code>ALL=</code> all the record types</p> <p><code>ALL=</code> all the product types</p> <p><i>Note: UTC coincides with GMT</i></p>
5	<p><code>http://myVMUC.myDomain.com/receiverftp.php?FTP_VAR_QRY&myUser@myPassword&1352440800&1352451600&ALL&ALL</code></p> <p><u>Purpose:</u> to perform a request for all the record types and product types in the desired time interval; data are pushed to FTP server</p> <p><u>Parameters</u></p> <p><code>myVMUC.myDomain.com</code> = VMUC's DNS/IP address</p> <p><code>myUser=</code> user defined "client user"</p> <p><code>myPassword=</code> user defined "client password"</p> <p><code>FTP_VAR_QRY</code> = query for variables; data are sent to the FTP server according to the user defined FTP-server's parameters</p> <p><code>1352440800=</code> Fri, 09 Nov 2012 06:00:00 in Epoch UTC format</p> <p><code>1352451600=</code> Fri, 09 Nov 2012 09:00:00 in Epoch UTC format</p> <p><code>ALL=</code> all the record types</p> <p><code>ALL=</code> all the product types</p> <p><i>Note: UTC coincides with GMT</i></p>

Energy Management

Example	
6	<pre>wget --output-file=myLogFile --user-agent=MOZILLA --output-document=myOutputFile httpString</pre> <p><u>Purpose:</u> to use the freely available WGET software utility to remotely request data to VMU-C EM</p> <p><u>Parameters</u></p> <p>myLogFile= user defined log file to monitor WGET execution results</p> <p>myOutputFile= user defined file to contain the command output (data)</p> <p>myPassword= user defined "client password"</p> <p>httpString= http string containing the desired command; each of the above strings (examples 1-5) are examples of valid strings</p> <p>MOZILLA= user agent casting to avoid VMU-C EM security check</p> <p>Note: for further information about WGET please check: http://www.gnu.org/software/wget/</p>

5

Note: any software capable of managing HTTP request/response processes could be used to remotely pull VMU-C EM data (example of freely available software packages are WGET and CURL).

Data are then processed according to the application needs by means of the user's software.