POWERCOM

**Subject**

**Gateway PRD**

Version 0.1

|  |  |  |  |
| --- | --- | --- | --- |
|  | Name | Date | Signature |
| Written by | Rami Zigdon | 19/7/2023 |  |
| Approved By | Yaniv Oren | 19/7/23 |  |
|  |  |  |  |
|  |  |  |  |

Table of Contents

1. Introduction
2. Consolidated requirements Table 1
3. List of requirements  
   3.1 – Version 1  
   3.2 - Version 2

# General

## Versions Management

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Version** | **Name** | **Date** |
|  | 0.01 | First draft | 19/7/23 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## Reference Doc.

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Version** | **Name** | **Date** |
|  |  | Tenders + existing GW |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## Changes and Additions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Version** | **Paragraph Number** | **Change / Addition** | **Date** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

1. **Introduction:**

The gateway target is to connect devices with Wirepas RF modem to the HES via cellular media.  
The gateway receives DLMS messages from the devices send them to the HES and vice versa. The Gateway-HES upstream communication is using a cellular modem. The Gateway-device downstream communication is based on Wirepas RF modems. As a second step a Wi-Fi / BT channel will be implemented for local debugging and maintenance.

The product will be placed either on a power pole or a wall, will be powered by solar energy and DC electrical connection and option to connect 3 phase 220V with ability to work even if 2 phases are lost.

The Gateway will stand external environmental conditions including direct sun and direct rain showers and strong winds.

The GW supports auto-detection to the HES and will enable automatic connection only with meters that are specified in the meters list. – why? It should connect to any meter transmitting. Please provide clarification…

The GW will not keep open port to the HES if GW IP changes, it will notify the HES with its new IP. – I think we need to revisit this issue and do farther checking. GW is not a meter. It should be available all the time…

Time sync is from the HES server or the Cellular network if there is no HES connection.

1. **Consolidated requirements  
   Table 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Subject | details 1 | Details 2 | Gateway | Notes |
| HW | backup data Memory |  | 10 days | Log period of messages, commands and events |
| rechargeable backup battery |  | 2 days | 10 years lifetime, replicable. |
| Solar stand alone |  | Y | AC 3Ph(working if only one 1ph is live) and Solar,85-500VAC ,3 meters cord 1.2KV isolation, 10KV surge protection |
| Mains |  | Y |
|  |  |  |  |
| Battery [Ah] |  | > 12 Ah | LiFePO4 / Li-SOCl2 (Charge:0 to 70 Celsius / Operation: -40-75) |
| Solar Pannel / Charger [Watt] |  | > 30W | To enable 8h full charging + operation |
| Temperature sensor |  | optional | Important in next version |
|  | USB/BT/Wi-Fi |  | y | To evaluate on the next version |
| SW | OS |  | RtOS |  |
|  |  |  |  |  |
|  | Communication Encryption |  | y | All communication is encrypted |
| communication security | RF (downstream) | RF Mesh (Wirepas) | DLMS HLS | Replicable module |
|  | Cellular (upstream) | Cellular() | DLMS HLS | Cellular support TLS 1.2 (AES , #DES, SHA-256,RSA) |
|  | User + Password | y |  |
|  |  |  |  |  |
| Communication | IPv4 |  | y |  |
|  | IPv6 |  | y |  |
|  | Cellular | 4G | y |  |
|  |  | 2G (fallback) | y |  |
| Remote | Remote Firmware update |  | y | Both for meters and for the gateway. (OTA) |
|  | Remote parameters update |  | y |
| Functionalities | Last gasp |  | y |  |
|  | Self-discovery + Self Registration up and down |  | y |  |
|  |  |  | y |  |
|  | Push/Pull capabilities (block/Events/Alerts) |  | y |  |
|  | configurable Periodic data collection |  | N | initiate tasks like 15', daily or monthly load profiles |
|  | Low Power Mode |  | TBD | Enter low power in pre-defined batt level |
| Time | RTC battery |  | Y |  |
|  | Time Sync |  | with HES server | How often? |
| Self-diagnostics | indications |  | y | Minimum - battery monitoring + connection |
| Indications LEDs |  |  |  |
|  |  |  |
| General | Lifetime |  | 20 years |  |
|  | Ip address awareness |  |  | Push IP address to the server if changed |
|  | IP65 + Direct sun |  | y |  |
|  | External Antennas mounted down for better sealing |  | y | For Wirepas and for cellular (option for internal) |
|  | Should support both wall and pole installation |  | y |  |
|  | Temperature | Temp = -20 to 75 Deg C |  | -10 to 50 if it is internal (charging is 0 – 65) |
|  | Field settings/debug tools |  | y | USB/Wi-Fi hot spot / BT/BLE |
|  | Regulatory approvals |  | CE | TBD |
|  | Tampering sensor |  | TBD |  |
|  | # of meters to support |  | <1,000 |  |
|  | Tamper indication |  | y | Cover open solar disconnect push alert |
|  |  |  |  |  |

1. **List of requirements**

**3.1 Version 1 will include:**

1. Transparent transmit and receive DLMS messages from the HES (Cellular) and the meters (Wirepas RF).
2. GW firmware update.  
   - Firmware activation command from server to GW/4G India.
3. GW Events:   
    - Event Notification for last gasp and first breath.  
    - Event Notification for current GW/4G local IP (??? TBD)  
    - IP change notification  
    - Low Battery
4. Configuration:  
    - GW Server IP Configuration Get and Set Commands  
    - Meters List under GW Get/ Set and Clear Commands
5. GW Information  
    - get SW, HW version  
    - get/set Device Address  
    - Get/Set Datetime

* Signal quality of Cellular network- hourly
* Temp.

1. GW Data Collection:  
    - Scheduling for reading devices  
    - Push/Pull Setup Command Get and Set  
    - Get Load Profiles
2. Encryption :  
    - All the data and both direction is encrypted.

**3.2 Version 2 will include:**

3.2.1 Hardware requirements

1. 1.1 Environment  
    Outdoor operating: -20 to 75 C
2. 1.2 Communication  
    1.2.1 With the HES:  
    E-Sim  
    SIM  
    1.2.2 Downstream  
    RF (Lora, RF-mesh)  
    1.2.3 Local  
    Wi-Fi / BT optional on second step
3. 1.3 Electrical parameters   
    It will be powered by either solar panel or connection to 1phase or   
    3phase line charging an internal battery that will support 4 days of work.
4. If main power is chosen - AC 3Phase/1Phase power supply (should operate if only 1 Phase is connected). It should have 6 to 8 pins to incorporate AC or DC connection (from the PV), 100-300V AC.
5. Solar panel if a solar power source is chosen, that will stand direct sunlight and strong wind and rain.
6. BT and Wi-Fi communication for the local support and maintenance (second step)
7. USB/serial port for debugging
8. External sensors - temperature, humidity (optional)- need to be discussed.
9. Flash memory for the 30 days data
10. Low battery event
11. Low level reception/loss of signal of 4G event
12. One LEDs for status indication (visible externally)
13. 1.4 Lifetime   
     Replicable battery with 10 years lifetime.  
     Life expectancy 20 years.
    1. Standards
       1. IP rating - IP65  
           Type approval CE (EMC)   
           IEEE 802 family, such as IEEE 802.15.4 for wireless  
           IEEE 802.3 for wired Ethernet  
           IEC 61850 for substation automation and IEC   
           61970/61968 for energy management.  
           NISTIR 7628 (Smart Grid Cybersecurity Guidelines)  
           IEC 62351 (Security for Power Utility Automation  
           Systems)  
           IEC 61968 (Common Information Model for  
           Distribution Systems)

3.2.2 Software requirements

* 1. 2.1 Operating system
     1. RTOS
     2. Push/Pull mode to the HES and to the endpoint device.
     3. Should support 1,000 meters.
  2. 2.2 Modules
     1. 2.2.1 Events

1. Option to define which events are coming in immediate push (such as tamper, low battery, lost communication) and which in pull mode.
2. Recording of No of packet failure, retry attempts, missed periodic reading, Failure to connect, Tamper events – per device and GW.
3. GW tampering (cover open/panel disconnection) immediate push
4. Power off – last gasp
5. Power on – first breath
6. Low battery voltage
7. Reboot
8. Communication module error (Cellular/RF/Wi-Fi/BT)
9. security/encrypt-decrypt alerts (according to the DLMS)
10. external sensors - temperature, humidity (optional)
11. Low % of connected devices.

3.2.3 Data collecting

* Support on-demand/scheduling read of individual/group of meters.
* Two-way acknowledgment with the HES and devices
* Communication analytics for all meters need to be measured and stored (connect/disconnect …)

3.2.4 Tasks   
 TBD

3.2.5 Commands

* On-demand HES commands
* Broadcasting capability of all commands to all meters (i.e., date & time; time of use, critical, firmware update etc.)

3.2.6 Self-diagnostic

* 3.2.5.1 Watchdog   
  Reboot the GW if there is no connection to the HES.
* Reboot and Delete - Link the GW if the meters are not responding.
* Check solar panel voltage.

3.2.7 Monitoring

* Tampering???
* Daily amount of data between the GW and the HES
* Signal quality
* Baud rate
* Communication speed
* Tracking of connections/disconnections (RF and Cellular)
* Battery level – Entering a “low power mode” when reaching a pre-defined battery level.

3.2.8 Settings

* Ability to set securely the GW locally/remotely. To secure local setting process we need to have a token.
* Opportunity to read and set parameters locally (in a secure way).
* Ability to perform different reset/restart remotely/locally (Memory reset, Factory reset, Communication reset, Reboot,
* If less than XX% of meters are connected an alert should be set – not practical
* APN and Server IP

3.2.9 Remote firmware update

a. Meter

b. Confirmation of successful system update  
 c. Confirmation of each meter that it gets the right  
 software.  
 d. Broadcast option.

e. Confirmation from the GW an antiunification between the GW  
 and the HES  
 f. Only the delta (difference) should be updated (GW firmware should  
 be developed by modules)   
 g. Checks the firmware digital signature and confirm that both the   
 HES and the GW firmware are the same.   
 h. Should have smart logic to know retry and restore failed   
 firmware updates.

3.2.10 Security

* 1. 2.5.1 An option to connect the GW to the HES using VPN   
      2.5.2 Users and permissions   
      2.5.3 GW should connect to the HES in a secure way (by DLMS/Secure TCP/AES/etc.)  
     2.5.4 It shall be secure enough to avoid all cyber threats like DDoS, spoofing, malwares.
  2. 2.5.5 In field connection (direct connection) to the GW. OTP algorithm inside the GW and HHU.
  3. 2.5.6 Security for the SMS commands (optional)  
      2.5.7 *Optional (according to DLMS security)*

"- Bi-key & CSR generation: At registration time, an asymmetric key pair is generated by the HSM of the concentrator.????

- Sending of CSR: The concentrator keeps its private key secret and sends a certificate signing request (CSR) via the Certificate Management Protocol (CMP) to the RA. The CSR contains its public key and proof of identity/possession of the private key.

- CSR checking and certificate signing: The RA checks the CSR and passes it to the CA that signs it with its private key. The signed certificate is then stored in the HSM of the central system.

-Sending of signed certificate and certificate of the CA: The signed  
 certificate is sent back by the central system to the concentrator  
 along with the certificate of the CA  
 - Global authentication and broadcast encryption keys generation:   
 The “global broadcast encryption key” and the “global authentication   
 key” (defined in DSLM/COSEM security suite 0) are generated by the   
 HSM of the central system

Sending of keys:

The keys generated are sent encapsulated using the public key of the concentrator certificate and a key encapsulation algorithm by the central system to the concentrator."

3.2.11 Communication

* Self-registration at the HES (how to prevent fake GWs from connections to the HES ?)
* Authentication
* GW must notify on any IP change; the GW is responsible to check every settable time its IP and should notify the HES when there is any change in the IP.
* Master and backup IPs (need to define the logic with the HES) schedule when it should connect/reconnect. Should have an option to select local master and public master.
* Flexible link (only RF) - The link between a meter and GW does is not permanent - the GW can find the meter that was not defined to this DCU. It should bring the data with Alert.
* GW should support DLMS and should be able to communicate with different meters suppliers.
* Every X amount of time the GW should ping the server and update its information.
* Upload data policy (Example: All meter data of 15-minute blocks shall be polled once every 24 hours at XX:YY h)
* Minimum security connection will include password and user.