

DEFINITION OF IFACTORY GLOBAL SPECIFICATIONS

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# REVISION

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# FUNCTIONNAL SPECIFICATIONS

DFM's I-FACTORY system is a software and hardware solution for creating and managing a private sensor network and offering an innovative solution.

The software solution must be "PLUG & PLAY" i.e. the deployment of the DFM solution must be done without the need for special knowledge by the customer himself. The software solution must be either directly deployed on a CLIENT LOCAL server over a WIFI / LAN connection or hosted on a dedicated server depending on the connection mode between the GATEWAY and the CLIENT server:



|  |
| --- |
| **WHY WIFI/LAN and GSM connection?**  BECAUSE our I-FACTORY system targets two different usages:   * Create and deploy a private network for IoTs within plants, companies, site of production: WIFI/LAN connection is available and for security/integrity of data, customers want to keep data private and not stored in external servers. * Propose private network outside targeting farming and external applications; the role of our GATEWAYs is to scan all the data from the sensors linked and sent by GSM. The GSM data transfer is a low-cost, secured data and one requires only one subscription for thousand of sensors. We are targeted **a low-cost operating system**. |

The DFM GATEWAYs must have WIFI/LAN/GSM mode of connection and during its developments, we would have to focus on electrical supply. In case of external applications (farming), solar loading systems may be a very attractive issue;

DFM GATEWAYs are expected to record up to 1000 sensors/gateway and the European frequency targeted is 868 Mhz. Other regions of the world are not centered on the same frequencies but we propose to develop GATEWAYs per region. In case we need GATEWAYs in VIETNAM, specific developments will be carried out. Developing a DFM-GATEWAY handling several frequencies will reduce its performance and possibly increase its price in the end.



We propose to make in parallel two kinds of DFM GATEWAYs, one for European market (centered on 868 MHz) and one for Vietnam market (779 MHz).

Connection from sensors to DFM-GATEWAYs will be then provided from LoRaWANTM technologies because the latter is a Low Power, Wide Area (LPWA) networking protocol designed to wirelessly connect battery operated ‘things’ to the internet in regional, national or global networks, and targets key Internet of Things (IoT) requirements such as bi-directional communication, end-to-end security, mobility and localization services.

LoRaWAN network architecture is deployed in a star-of-stars topology in which gateways relay messages between end-devices and a central network server. The gateways are connected to the network server via standard IP connections and act as a transparent bridge, simply converting RF packets to IP packets and vice versa. The wireless communication takes advantage of the Long Range characteristics of the LoRa® physical layer, allowing a single-hop link between the end-device and one or many gateways. All modes are capable of bi-directional communication, and there is support for multicast addressing groups to make efficient use of spectrum during tasks such as Firmware Over-The-Air (FOTA) upgrades or other mass distribution messages.

The specification defines the device-to-infrastructure (LoRa®) physical layer parameters & (LoRaWAN) protocol and so provides **seamless interoperability between manufacturers, as demonstrated via the device certification program**. While the specification defines the technical implementation, it does not define any commercial model or type of deployment (public, shared, private, enterprise) and so offers the industry the freedom to innovate and differentiate how it is used.

Under these conditions, the private network may be composed of **hybrid sensors** (our DFM sensors or any LORA sensor) and the **UP / DOWN mode will also act on the network and not just monitor it**. All these reasons make us choose LoRaWan technology.

# DEDICATED I-FACTORY SOFTWARE

## SENSOR DEFINITION

Sensor module: this module supports to measure some type attributes of environments. The module then sends the measured data to center system. The attributes could be temperature, humidity or oxygen proportion level... (but just temperature sensor is available at the moment, the other type of sensors will be coming soon)

Common features:

* Sensor module distance up to 800 meters communication to center gateway (Lora network)
* Keep track sensor data remotely via web browser or smart-phone application (require an internet connection).
* Sensor module is self-powered by rechargeable battery. It could be installed to location that is no power socket available.
* Alert support once sensor data value excess limitation (alert is sent to smart-phone)
* Support two types of user: administrator user could manage and configure system operations, guess user could view sensor data and get alert notification.
* Scalability: system could support other type of sensor with a reasonable development effort because of its scalable system architecture design.
* Location keep track: both sensor module and gateway are equipped with GPS device. This supports manage modules and gateway location

Manage sensor module:

* Sensor module could be installed dynamically to the system without restart the whole running system
* Sensor module could also be disable and removed from the system dynamically.
* Sensor module battery life (remain operation duration time) is also keep track
* The below functions are supports:
* Keep track device location: view location of gateway and sensor modules
* Keep track sensor data:
* ◦ Temperature sensor data:
* ▪ View temperature:
* View temperature chart of a group of devices at the current time.
* View history temperature chart of a device.
* View temperature of a device
* ▪ Alert:
* Support to setup temperature alert range (minimum value and maximum value ranges)
* Alert notification: once the temperature is excess limitation (the preset range), server will send an email to user and it also will notify user via smart-phone.

Our customer should be able to define all sensors in the list of his/her private network and in the sensor menu definition, we should have the following sub-menus:

IMPORT SENSOR:

Name of sensor\* Text mandatory

Profile 1 Text

Profile 2 Text

Profile 3 Text

Groupe Text

Keys the 3 keys (DevEUI,AppEUI,AppKEY)

Position 2 fields (longitudinal and lateral positions)

SENSOR PROFILS

Define type of sensors existing in an available list

Management of DOWNLINKS in case of controller issues

CODECS

API

Propose API to our users in case of use of DATA

## GATEWAYS

Gateway: this module collects sensor values in the factory and send them to server so that the data is internet or cloud available.

Setup gateway to configure gateway connecting to server with below information:

Server address: website url of the websites

Username/password setting: setup credential to connect gateway to webserver.

Mange gateway credential: change gateway credential (username/password). Once the credential is changed, the gateway need to be setup again.

Manage users: support add or remove users also support update user information (user type: administrator / guess, user credential)

## SERVER

it is a web-server that hosts a web-application. The web-application supports web-services and websites so that the gateway could upload its sensor data and users could manage and keep track their sensor data.

Smart phone: in the case websites could not be accessed because of PC browser available, the system could also be monitored via a smart-phone application. The alerts also are sent via this smart phone.

## A CLEVER INTERFACE

Create value - Innovate, create and enhance value-added services with advanced event management and scenario creation features and business application integration.

Alerts and notifications: Create very powerful fleet management or business event scenarios: message routing, consumption alerts, or network incidents. Quickly set up notifications sms, mail or http.

Tools and Analytics: With dashboards, visualizations and analysis reports, identify risks, take advantage of opportunities and gain in-depth knowledge of your business.

Integration of external applications: Create your own business application, integrate data or external applications with the DFM software development framework.

SENSOR/MEASUREMENT

Display by sensors

Display by PROFILES and/or GROUPS

## OTHER ISSUES

Add submenus such as ADMINISTRATION & SUPPORT

# summary of specifications

## Sensor

Use chip Semtech **sx1276** (433 Mhz, 868Mhz, 915Mhz) Global chip of semtech

Use protocol LoRaWan with 3 keys (DevEUI,AppEUI,AppKEY) to connect to gateway

## gateway

Multichannel (8 channel) => with 1 sms in 5 mins <=> 200 sensors per Gateway

(1000 sensors per Gateway <=> 1 sms in 25 mins)

Use **sx1308** (indoor) or sx1301 (outdoor) to manage RF

- 2 sx1257 (868Mhz)

- 2 sx1255 (433Mhz)

**- 1 sx1257 + 1 sx1255 (868/433Mhz)** => with 1 sms in 5 mins <=> 100 sensors per Gateway

Collect data from **sensors** with LoRaWan protocol (any sensor can be accepting to our system)

GPS sensor to localise gateway position

Ethernet, Wifi, 3G to send data to **Cloud** local

Battery chargeable by solar or supply direct 5V

## software

Manage **Gateways**: management of several **Gateways**

Manage **Sensors** : add new Sensors, remove Sensors from system

Manage Data from **Cloud** local :

application is modifiable by customer

allow custommer select type data (temperature for sensor A, humidity for sensor B,

Parking available or not for sensor C ......)

analyse some simple value in time

warning when the data sensor greater than a target value

## REFERENCE FOR COPYING / INSPIRING OURSELVERS

SOFTWARE for management sensors and application: *[spot.objenious.com](https://spot.objenious.com)*

DFM-Europe has a direct access for managing GEOSMART customers.

id: [manhhd@dfm-europe.com](mailto:manhhd@dfm-europe.com)

mdp: a%jZCqu04yJ0

SOFTWARE management for GATEWAYs: [www.loriot.io](http://www.loriot.io)

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