



## D5.1 - Integrated Emergency Profiles

<i>Due Date:</i>	November 30, 2016
<i>Actual Submission Date:</i>	
<i>Lead Beneficiary in charge of the Deliverable:</i>	SRDC
<i>Revision:</i>	V0.12
<i>Grant Agreement:</i>	607729
<i>Project Acronym:</i>	C2-SENSE
<i>Project Title:</i>	Interoperability Profiles for Command/Control Systems and Sensor Systems in Emergency Management
<i>Funding Scheme:</i>	SEC-2013.5.3-1
<i>Project Start Date:</i>	April 01, 2014
<i>Duration:</i>	42 months

Project co-funded by the European Commission within the Seventh Framework Programme (2007-2013)		
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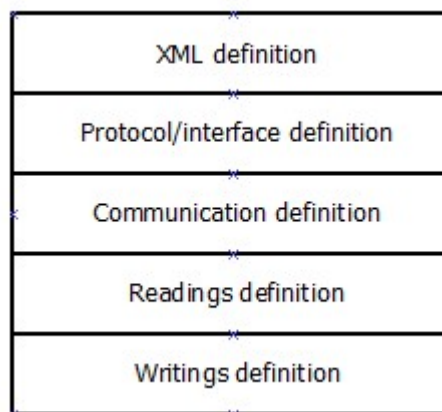
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# 1 PHYSICAL INTEROPERABILITY PROFILES

Physical Interoperability Profiles are the main part of Physical Interoperability Layer. They contain data and information about physical connection with the communication medium and specify the data acquisition procedure. Physical Interoperability Profiles match the interoperability definition and can successfully be used in Physical Interoperability Layer, as they allow connection of a large variety of devices with specified interface and protocol to systems such as C2-SENSE Framework.

Physical Interoperability Profiles are based on the XML data format. Its structure is universal for all the profiles and is represented in Figure 1. In this structure, all important components regarding physical communication with the device are included.



*Figure 1 Universal structure of physical profile*

Universal structure of physical profile includes all important information about device and data to be collected from the communication medium. Profile is strictly adapted to the physical interface and protocol. Information included in proper field (for example communication specification) are unlimited, so basically every detail of configuration can be specified in the profile.

Protocol/interface definition is required for recognizing the selected communication type and create new adapter in accordance to that choice. Communication definition contains all the important parameters, which should be included during interface and protocol configuration. Having these two definitions specified, it is possible to establish the connection between system and considered communication medium. Readings definition of data acquisition specifies details about data to read, e.g. variable type, number of bits to read or if it is signed or not, while writings definition provides specifications of values to be written in the communication device.

Physical Interoperability Profiles are not integrated with any other layer, because they are considered as hardware profiles and it makes more sense to treat them separately than Technical Interoperability Profiles and focus on seamless interfacing of physical devices with C2-SENSE components through these profiles.

Physical Interoperability Profiles include information about the interface and protocol necessary to link communication medium with IP based Gateway, which is equal with linking the communication medium with C2-SENSE. IP based Gateway includes set of libraries responsible for protocols and interfaces support. To sum up, this definition signalizes which library should be used during adapter creation process. However, every device has its own communication parameters (for example baud rate or parity in case of RS interfaces).

In C2-SENSE, 3 Physical Interoperability Profiles have been developed and tested:

1. GPRS modem, connected to the PC with RS232 interface and MODBUS RTU protocol
2. Device for electrical parameters measurement
3. 866MHz or 433 MHz Radio Transceivers

In these above described cases, three adapters are created automatically and they are in charge of following readings:

- Adapter 1 (GPRS) – two temperature measurements, two relative humidity measurements, two rainfall measurements.
- Adapter 2 (Power meter) – Network voltage, network frequency, THD (Total Harmonic Distortion).
- Adapter 3 (Radio) – three temperature measurements, three relative humidity measurements.

## 2 PROFILE FOR RADIO TRANSCEIVER

Radio transceiver is used to collect data from the sensor network communicating via 868MHz radio frequency. In this case, IQRF TR-52D transceivers have been used. During the tests, 9 nodes have been designed. Every node contains radio transceiver (for communication) and SHT15 sensor for measurements of temperature and humidity. Additionally, coordinator has been designed, which is responsible for data acquisition from every node. It is also responsible for network management.

```
<?xml version="1.0"?>
<Device id="3">
  <Description>
    866MHz Radio Transceivers
  </Description>
  <Communication_spec type="RS">
    <serial_port>/dev/ttyUSB3</serial_port>
    <baud_rate>19200</baud_rate>
    <byte_size>EIGHTBITS</byte_size>
    <parity>PARITY_NONE</parity>
    <stopbits>STOPBITS_ONE</stopbits>
    <timeout>10</timeout>
    <dev_connected>3</dev_connected>
  </Communication_spec>
  <Readings>
    <!-->Read 1</!-->
    <Reading id="1">
      <!--> READ SPECIFICATION </!-->
      <read_type>line</read_type>
      <length>-1</length>
      <string_conv>True</string_conv>
      <recognition>[18,1]</recognition>
      <return_range>[2,7]</return_range>
      <!--> WORKFLOW SPECIFICATION </!-->
      <period>60</period>
      <mute>False</mute>
      <!--> DESCRIPTION SPECIFICATION </!-->
      <sensor_name>Temperature sensor 4</sensor_name>
```

```

        <phen_name>Temperature</phen_name>
        <description_phen>Temperature no. 4</description_phen>
        <unit>C</unit>
        <geo_location>[52.147,20.967]</geo_location>
    </Reading>
    <!-->Read 2</!-->
<Reading id="2">
    <!--> READ SPECIFICATION </!-->
        <read_type>line</read_type>
        <length>0</length>
        <string_conv>True</string_conv>
        <recognition>[18,1]</recognition>
        <return_range>[11,16]</return_range>
        <!--> WORKFLOW SPECIFICATION </!-->
        <period>60</period>
        <mute>False</mute>
        <!--> DESCRIPTION SPECIFICATION </!-->
        <sensor_name>Humidity sensor 4</sensor_name>
        <phen_name>Relative humidity</phen_name>
        <description_phen>Humidity no. 4</description_phen>
        <unit>%</unit>
        <geo_location>[52.147,20.967]</geo_location>
    </Reading>
    <!-->Read 1</!-->
<Reading id="3">
    <!--> READ SPECIFICATION </!-->
        <read_type>line</read_type>
        <length>-1</length>
        <string_conv>True</string_conv>
        <recognition>[18,2]</recognition>
        <return_range>[2,7]</return_range>
        <!--> WORKFLOW SPECIFICATION </!-->
        <period>60</period>
        <mute>False</mute>
        <!--> DESCRIPTION SPECIFICATION </!-->
        <sensor_name>Temperature sensor 5</sensor_name>
        <phen_name>Temperature</phen_name>
        <description_phen>Temperature no. 5</description_phen>
        <unit>C</unit>
        <geo_location>[52.147,20.967]</geo_location>
    </Reading>
    <!-->Read 2</!-->
<Reading id="4">
    <!--> READ SPECIFICATION </!-->
        <read_type>line</read_type>
        <length>0</length>
        <string_conv>True</string_conv>
        <recognition>[18,2]</recognition>
        <return_range>[11,16]</return_range>
        <!--> WORKFLOW SPECIFICATION </!-->
        <period>60</period>
        <mute>False</mute>
        <!--> DESCRIPTION SPECIFICATION </!-->
        <sensor_name>Humidity sensor 5</sensor_name>
        <phen_name>Relative humidity</phen_name>
        <description_phen>Humidity no. 5</description_phen>
        <unit>%</unit>
        <geo_location>[52.147,20.967]</geo_location>
    </Reading>

```

```

<!-->Read 1<!-->
<Reading id="5">
  <!--> READ SPECIFICATION <!-->
    <read_type>line</read_type>
    <length>-1</length>
    <string_conv>True</string_conv>
    <recognition>[18,3]</recognition>
    <return_range>[2,7]</return_range>
    <!--> WORKFLOW SPECIFICATION <!-->
    <period>60</period>
    <mute>False</mute>
    <!--> DESCRIPTION SPECIFICATION <!-->
    <sensor_name>Temperature sensor 6</sensor_name>
    <phen_name>Temperature</phen_name>
    <description_phen>Temperature no. 6</description_phen>
    <unit>C</unit>
    <geo_location>[52.147,20.967]</geo_location>
  </Reading>
  <!-->Read 2<!-->
<Reading id="6">
  <!--> READ SPECIFICATION <!-->
    <read_type>line</read_type>
    <length>0</length>
    <string_conv>True</string_conv>
    <recognition>[18,3]</recognition>
    <return_range>[11,16]</return_range>
    <!--> WORKFLOW SPECIFICATION <!-->
    <period>60</period>
    <mute>False</mute>
    <!--> DESCRIPTION SPECIFICATION <!-->
    <sensor_name>Humidity sensor 6</sensor_name>
    <phen_name>Relative humidity</phen_name>
    <description_phen>Humidity no. 6</description_phen>
    <unit>%</unit>
    <geo_location>[52.147,20.967]</geo_location>
  </Reading>
</Readings>
<Writings>
  <Writing id="1">
    <var_type>int</var_type>
    <bits>16</bits>
    <signed>True</signed>
    <value>1</value>
    <write_type>4</write_type>
    <register_address>6</register_address>
    <num_of_dec_reg>0</num_of_dec_reg>
  </Writing>
</Writings>
</Device>

```