This contribution describes metadata specifications. It has been edited taking into account the format of the parameters exchanged in IEEE 1900.6.

Some of them have the same definition in order to help the compatibility between the two standards.

# Informative: Metadata Specification

This appendix presents the structure of metadata used in the information message exchanged between Sensor Manager (SM) and Sensing Device (SD). First, metadata classification is reported in sub-clause A.1. Sub-clause A.2 elaborates on data types and structures required in formally describing metadata. Sub-clause A.3 then formally describes these parameters exchanged based on the data type descriptions given by A.2.

## Metadata categorization

This sub-clause addresses the main categories of metadata included in the messages exchanged between SD and SM. They are categorized into three main classes having different purposes: Class A (System Metadata), Class B (Sensor settings) and Class C (Sensing related metadata).



Figure A1: SSD model - Hardware layer components and Software layer processes with relevant metadata

### System Metadata

Class A (System Metadata) includes all factory information related pieces of data and remain constant for the entire lifespan of the component (SD). Taking into account the metadata reported in figure A1, Antenna Metadata, RF Front-End Metadata, Calibration Metadata, SDR Metadata, Host Metadata are included in this category.

Class A metadata is not subjected to any change since it is offered as a response to a specific query in SD association process.

### Current Status Metadata

Class B (Current Status Metadata) includes data describing the actual configuration of the device, in terms of hardware (positioning, antenna configuration, etc.) and software (frequency settings, sampling rate, sensing algorithm, etc.).

Class B metadata is provided to SM, after a specific user request, and can be subjected to modification and special settings by the Tasking Agent.

### Sensing related Metadata

Class C (Sensing related metadata), specifying parameters strictly related to performed sensing action (scanned time, timestamp, atmosphere conditions, etc.);

Class C metadata is not subjected to any change since it is offered as a response to a specific query in a Sensing request.

## Data Types

This sub-clause defines the primitive data types, simple data types, and derived data types used in the definition of metadata defined in A.3. The physical units used in this definition are based on the International System of Units (SI) and are summarized in Table 1.

Table A1: Units used in the description of Metadata

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit** | **Unit symbol** | **Value** | **Note** |
| second | s |  | SI unit |
| Hertz | Hz | 1 Hz = 1/s | SI derived unit |
| meter | m |  | SI unit |
| Watt | W | kg·m2/s3 | SI derived unit |
| Power ratio | dB | [dB]=10·log10(P1[W]/P2[W]) | dimensionless |
| Power ratio respect to 1 mW | dBm | [dBm]=10·log10(P1[W]/1 mW) | dimensionless |
| radian | rad | 1 rad = 180/π | SI derived unit, dimensionless |
| degree of arc | ° | 1° = π/180 rad | dimensionless |
| Power ratio respect to isotropic antenna | dBi | [dBi]=10·log10(P1[W]/Pisotropic[W]) | dimensionless |
| Kelvin | K |  | SI unit |

### Simple data type

In this sub-clause are summarized the simple data type considered in this document.

#### Boolean

A primitive logical data type having one of two values of “true” (1, nonzero) or “false” (0, zero).

#### Integer

A primitive integral data type representing natural numbers and their negatives. Note that common binary representations limit the number range due to machine word length restrictions. In this standard, the integer length is defined as 32-bit value.

#### Unsigned integer

A primitive data type representing non-negative integers.

#### Float

A primitive data type storing real numbers, usually as floating-point numbers. Floating-point number representations as defined in IEEE Std 754TM-2008 can be taken as an example.

#### Array

A simple data type storing a collection of data values of a specified type.

#### String

A simple data type storing a sequence of bytes or characters. A string is a special use of a one-dimensional array.

### Complex data types

This sub-clause summarizes complex data types such as structured types or types that rely on specific interpretation or restriction of the underlying simple type.

#### Enumeration

An enumeration is a listing of elements mapped to an index set consisting of natural numbers. That is, each element of the set is unambiguously represented by an ordinal value.

#### Cluster

A complex data type that aggregates a fixed set of labelled elements, possibly of different simple types, into a single element.

#### Fixed-point

Fixed-point numbers are rational numbers with a fixed length mantissa and a fixed exponent. In contrast to a floating-point representation, using a fixed length but variable exponent, the value range is limited by the mantissa length, but the resolution is constant over the value range. They can be realized by using an integer value in conjunction with an implicit multiplier.

#### Unsigned fixed-point

Unsigned fixed-point numbers are non-negative fixed-point numbers.

## Description of metadata

Metadata descriptions are given in a tabular form throughout A.3.1 through A.3.20. They consist of the metadata name and ID, a short textual description, and a type and size specification, if needed.

⎯ **Metadata name and ID**

Metadata name provides a unique identification of the parameter in human readable form, whereas the numerical ID is given to unambiguously identify the metadata in the process of information exchange between SCOS entities.

⎯ **Metadata type and size**

Metadata types are of one of the types defined by A.2. Some parameters may be further restricted in their value range or magnitude. The size field of the parameter description is supplementary information that is either a fixed value, determined by the number of elements contained, or variable if at least one of the elements contained is optional, or is of variable size itself. To avoid implementation dependent specifications for metadata, size is always given in terms of the underlying type.

For metadata based on array types, the size is given as the number of elements stored in the array or as “variable” if the size of the array is unspecified. Note that variable size arrays demand for an implicit array length value in information exchange.

For cluster types, the aggregated size depends on the implementation of the elements enclosed and thus is omitted in the parameter description. The implementation then will decide on the binary representation, encoding, and size in terms of bits or bytes and any tag or length values needed.

Table 2 provides a summary of metadata and categorizes them into each of the three classes introduced in A.1.

Table A2: Summary of metadata

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ID** | **Metadata name** | **Sub-clause** | **Class A** | **Class B** | **Class C** |
| 001 | Antenna | A.3.1 | X |  |  |
| 002 | Curr.Azi.Beam.Dir. | A.3.2 |  | X |  |
| 003 | Curr.Elev.Beam.Dir. | A.3.3 |  | X |  |
| 004 | Front-End | A.3.4 | X |  |  |
| 005 | Cal | A.3.5 | X |  |  |
| 006 | SDR | A.3.6 | X |  |  |
| 007 | Host | A.3.7 | X |  |  |
| 008 | Env | A.3.8 |  |  | X |
| 009 | RGeolocation | A.3.9 |  |  | X |
| 010 | Frequency | A.3.10 |  | X |  |
| 011 | Sampl.Rate | A.3.11 |  | X |  |
| 012 | Bandwidth | A.3.12 |  | X |  |
| 013 | Timestamp | A.3.13 |  |  | X |
| 014 | Scan.Time | A.3.14 |  |  | X |
| 015 | Data.Typology | A.3.15 |  |  | X |
| 016 | Sens.Algorithm | A.3.16 |  | X |  |
| 017 | Priority | A.3.17 |  | X |  |
| 018 | Timing | A.3.18 |  | X |  |
| 019 | Compression | A.3.19 |  |  | X |
| 020 | Format | A.3.20 |  |  | X |
| 021 | SDName | A.3.21 | X |  |  |
| 022 | SCOSOperator | A.3.22 |  |  |  |
| 023 | SDMode | A.3.23 |  | X |  |
| 024 | SDType | A.3.24 | X |  |  |
| 025 | SDID | A.3.25 | X |  |  |
| 026 | SDCert | A.3.26 | X |  |  |

### Antenna

The Antenna metadata indicates specifications of the antenna as given by the manufacturer. The definition of each parameters and the related unit of measurements are reported in table A3.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Antenna** | **Meas. Unit:** | -------- | **Data type:** | Cluster |
| **ID:** | 001 | **Size:** | Variable |  |  |
| **Desc.:** | List of the Antenna specifications according to manufacturer specifications. |
| .0 | **Antenna.Model** | **Data type:** | String |
| .1 | **Antenna.Freq.min** | **Data type:** | Unsigned fixed-point |
| .2 | **Antenna.Freq.max** | **Data type:** | Unsigned fixed-point |
| .3 | **Antenna.Type** | **Data type:** | String |
| .4 | **Antenna.Gain** | **Data type:** | Float |
| .5 | **Antenna.Polarization** | **Data type:** | Enumeration |
| .6 | **Antenna.Height** | **Data type:** | Float |
| .7 | **Antenna.Horz.Beam.Width** | **Data type:** | Fixed-point |
| .8 | **Antenna.Vert.Beam.Width** | **Data type:** | Fixed-point |
| .9 | **Antenna.Min.Azi.Beam.Dir.** | **Data type:** | Unsigned fixed-point |
| .10 | **Antenna.Max.Azi.Beam.Dir.** | **Data type:** | Unsigned fixed-point |
| .11 | **Antenna.Min.Elev.Beam.Dir.** | **Data type:** | Fixed-point |
| .12 | **Antenna.Max.Elev.Beam.Dir.** | **Data type:** | Fixed-point |
| .13 | **Antenna.Cable.Loss** | **Data type:** | Float |
| .14 | **Reserved (for future use)** |  |  |

Table A3: Antenna metadata parameters description

|  |  |  |
| --- | --- | --- |
| **Name** | **Content** | **Meas. Unit:** |
| **Antenna.Model** | It contains a string with the model of the installed antenna | ----- |
| **Antenna.Freq.min** | Min input frequency value | Hz |
| **Antenna.Freq.max** | Max input frequency value | Hz |
| **Antenna.Type** | Antenna type | ----- |
| **Antenna.Gain** | Antenna gain | dBi |
| **Antenna.Polarization** | Antenna polarization  | ----- |
| EnumeratorEnumeratorEnumeratorEnumeratorEnumerator |  “VL”“HL”“LHC”“RHC”“Slant” | Value:Value:Value:Value:Value: | 01234 |
| **Antenna.Height** | Antenna height | m |
| **Antenna.Horz.Beam.Width** | Horizontal 3-dB beamwidth | ° (degree) |
| **Antenna.Vert.Beam.Width** | Vertical 3-dB beamwidth | ° (degree) |
| **Antenna.Min.Azi.Beam.Dir.** | minimum direction of main beam in azimuthal plane expressed in degrees from N | ° (degree) |
| **Antenna.Max.Azi.Beam.Dir.** | maximum direction of main beam in azimuthal plane expressed in degrees from N | ° (degree) |
| **Antenna.Min.Elev.Beam.Dir.** | minimum direction of main beam in elevation plane expressed in degrees from horizontal plane | ° (degree) |
| **Antenna.Max.Elev.Beam.Dir.** | maximum direction of main beam in elevation plane expressed in degrees from horizontal plane | ° (degree) |
| **Antenna.Cable.Loss** | Attenuation introduced by the cable that connects the antenna with the RF front-end | dB |

### Current Azimuth Beam Direction

Current Azimuth Beam Direction indicates the current direction of the antenna main beam in azimuthal plane. It is expressed in degrees from N and it is included in a range that has Antenna.Min.Azi.Beam.Dir. as lower boundary and Antenna.Max.Azi.Beam.Dir. as upper boundary.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Curr.Azi.Beam.Dir** | **Meas. Unit:** | ° (degree) | **Data type:** | Unsigned fixed-point |
| **ID:** | 002 | **Size:** | 1 |  |  |
| **Desc.:** | It indicates the current direction of the antenna main beam in azimuthal plane. |
|  | **Range (min/resolution/max)** | Antenna.Min.Azi.Beam.Dir. | 1° | Antenna.Max.Azi.Beam.Dir. |

### Current Elevation Beam Direction

Current elevation Beam Direction indicates the current direction of the antenna main beam in elevation plane. It is expressed in degrees from horizontal plane and it is included in a range that has Antenna.Min.Elev.Beam.Dir. as lower boundary and Antenna.Max.Elev.Beam.Dir. as upper boundary.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Curr.Azi.Beam.Dir** | **Meas. Unit:** | ° (degree) | **Data type:** | Fixed-point |
| **ID:** | 003 | **Size:** | 1 |  |  |
| **Desc.:** | It indicates the current direction of the antenna main beam in elevation plane. |
|  | **Range (min/resolution/max)** | Antenna.Min.Elev.Beam.Dir. | 1° | Antenna.Max.Elev.Beam.Dir. |

### RF Front-End Metadata

The RF Front-End metadata indicates specifications of the RF front-end as given by the manufacturer. The definition of each parameters and the related unit of measurements are reported in table A4.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Front-End** | **Meas. Unit:** | -------- | **Data type:** | Cluster |
| **ID:** | 004 | **Size:** | Variable |  |  |
| **Desc.:** | List of the RF Front-End specifications according to manufacturer specifications. |
| .0 | **Front-End.Low.Freq.Passband** | **Data type:** | Unsigned fixed-point |
| .1 | **Front-End.High.Freq.Passband** | **Data type:** | Unsigned fixed-point |
| .2 | **Front-End.Low.Freq.Stopband** | **Data type:** | Unsigned fixed-point |
| .3 | **Front-End.High.Freq.Stopband** | **Data type:** | Unsigned fixed-point |
| .4 | **Front-End.LNA-Gain** | **Data type:** | Float |
| .5 | **Front-End.LNA-NF** | **Data type:** | Float |
| .6 | **Reserved (for future use)** |  |  |

Table A4: Front-End metadata parameters description

|  |  |  |
| --- | --- | --- |
| **Name** | **Content** | **Meas. Unit:** |
| **Front-End.Low.Freq.Passband** | Low passband frequency evaluated at -1 dB | Hz |
| **Front-End.High.Freq.Passband** | High passband frequency evaluated at -1 dB | Hz |
| **Front-End.Low.Freq.Stopband** | Low stopband frequency evaluated at -60 dB | Hz |
| **Front-End.High.Freq.Stopband** | High stopband frequency evaluated at -60 dB | Hz |
| **Front-End.LNA-Gain** | Low Noise Amplifier Gain | dB |
| **Front-End.LNA-NF** | Noise Figure of Low Noise Amplifier | dB |

### Calibration Metadata

Calibration metadata contains information about last calibration date of SD and, if it is able to execute self-calibration procedure, it also contains information about the reference signal generator built in. The definition of each parameters and the related unit of measurements are reported in table A5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Cal** | **Meas. Unit:** | -------- | **Data type:** | Cluster |
| **ID:** | 005 | **Size:** | Variable |  |  |
| **Desc.:** | List of calibration parameters according to manufacturer specifications. |
| .0 | **Cal.Last.Cal.Date** | **Data type:** | Unsigned integer |
| .1 | **Cal.Self.Cal.Flag** | **Data type:** | Boolean |
| .2 | **Cal.Sig.Freq** | **Data type:** | Unsigned fixed-point |
| .3 | **Cal.Sig.Ampl** | **Data type:** | Float |
| .4 | **Reserved (for future use)** |  |  |

Table A5: Calibration metadata parameters description

|  |  |  |
| --- | --- | --- |
| **Name** | **Content** | **Meas. Unit:** |
| **Cal.Last.Cal.Date** | The time stamp of the last calibration. It is denoted as a basic reference time value. Seconds since midnight (UTC) of January 1, 1970 absolute time. | s |
| **Cal.Self.Cal.Flag** | This is set to “1” if the sensor performs a periodical self-calibration procedure. Otherwise it is set to “0” if the self-calibration is performed after a user request. | ----- |
| **Cal.Sig.Freq** | Frequency of the internal calibration source. If the SD is not equipped with an internal calibration source this parameter is set to the default value 0. | Hz |
| **Cal.Sig.Ampl** | Amplitude of the internal calibration source. If the SD is not equipped with an internal calibration source this parameter is set to the default value 0. | dB |

### SDR Metadata

SDR metadata contains information about SD computing hardware specifications as given by the manufacturer. The definition of each parameters and the related unit of measurements are reported in table A6.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **SDR** | **Meas. Unit:** | -------- | **Data type:** | Cluster |
| **ID:** | 006 | **Size:** | Variable |  |  |
| **Desc.:** | List of SDR parameters according to manufacturer specifications. |
| .0 | **SDR.Manufacturer** | **Data type:** | String |
| .1 | **SDR.Model** | **Data type:** | String |
| .2 | **SDR.Firmware** | **Data type:** | String |
| .3 | **Reserved (for future use)** |  |  |

Table A6: SDR metadata parameters description

|  |  |  |
| --- | --- | --- |
| **Name** | **Content** | **Meas. Unit:** |
| **SDR.Manufacturer** | SD manufacturer | ----- |
| **SDR.Model** | SD model | ----- |
| **SDR.Firmware** | Current firmware version | ----- |

### Host Metadata

Host metadata contains information about the host controller of the SD. The host controller can be included in SD hardware or cab an external device that control and drives the sensor. The definition of each parameters and the related unit of measurements are reported in table A7.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Host** | **Meas. Unit:** | -------- | **Data type:** | Cluster |
| **ID:** | 007 | **Size:** | Variable |  |  |
| **Desc.:** | List of Host parameters according to manufacturer specifications and installation. |
| .0 | **Host.Manufacturer** | **Data type:** | String |
| .1 | **Host.Model** | **Data type:** | String |
| .2 | **Host.OS** | **Data type:** | String |
| .3 | **Host.Inst.Date** | **Data type:** | Unsigned integer |
| .4 | **Reserved (for future use)** |  |  |

Table A7: Host metadata parameters description

|  |  |  |
| --- | --- | --- |
| **Name** | **Content** | **Meas. Unit:** |
| **Host.Manufacturer** | Manufacturer of the host | ----- |
| **Host.Model** | Model of the host | ----- |
| **Host.OS** | Operating system installed on the host | ----- |
| **Host.Inst.Date** | The date when SD has been installed. It is denoted as a basic reference time value. Seconds since midnight (UTC) of January 1, 1970 absolute time. | s |

### Environmental Metadata

Environmental metadata reports information about the environmental conditions experienced during the measurement process. The definition of each parameters and the related unit of measurements are reported in table A8.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Env** | **Meas. Unit:** | -------- | **Data type:** | Cluster |
| **ID:** | 008 | **Size:** | Variable |  |  |
| **Desc.:** | List of Environment parameters. |
| .0 | **Env.Temperature** | **Data type:** | Float |
| .1 | **Env.Humidity** | **Data type:** | Float |
| .2 | **Reserved (for future use)** |  |  |

Table A8: Environmental metadata parameters description

|  |  |  |
| --- | --- | --- |
| **Name** | **Content** | **Meas. Unit:** |
| **Env.Temperature** | Environmental temperature | K |
| **Env.Humidity** | Environmental humidity | g/m3 |

### Reference Geolocation

This metadata indicates an absolute position of SD. This position is denoted considering the WGS 84 reference coordinate system or its successors (see National Imagery and Mapping Agency [ref]). The definition of each parameters and the related unit of measurements are reported in table A8.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **RGeolocation** | **Meas. Unit:** | -------- | **Data type:** | Cluster |
| **ID:** | 009 | **Size:** | 3 |  |  |
| **Desc.:** | Basic reference geolocation parameter indicating the absolute geolocation of a SD based on the WGS 84 reference coordinate system or its successors. |
| .0 | **RGeolocation.Elev** | **Data type:** | Integer |
| .1 | **RGeolocation.Lat** | **Data type:** | Fixed-point |
| .2 | **RGeolocation.Long** | **Data type:** | Fixed-point |

Table A9: Reference geolocation metadata parameters description

|  |  |  |
| --- | --- | --- |
| **Name** | **Content** | **Meas. Unit:** |
| **RGeolocation.Elev** | Elevation is the altitude with respect to sea level. | m |
| **RGeolocation.Lat** | Latitude | ° (degree) |
| **RGeolocation.Long** | Longitude | ° (degree) |

### Frequency

Frequency denotes the center frequency of the channel where the SD is currently tuned. This parameter is given in Hz. It is realized as an unsigned fixed-point value assuming a resolution of 1 Hz and a maximum range of 0 to 232–1 Hz (i.e., the equivalent of a 32-bit mantissa)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Frequency** | **Meas. Unit:** | Hz | **Data type:** | Unsigned fixed-point |
| **ID:** | 010 | **Size:** | 1 |  |  |
| **Desc.:** | It denotes the center frequency of the channel where the SD is currently tuned. |
|  | **Range (min/resolution/max)** | 0 Hz | 1 Hz | (232–1) Hz |

### Sample rate

It is the current sampling rate adopted during the signal acquisition process. This parameter is given in Hz. It is realized as an unsigned fixed-point value assuming a resolution of 1 Hz and a maximum range of 0 to 232–1 Hz (i.e., the equivalent of a 32-bit mantissa).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Samp.Rate** | **Meas. Unit:** | Hz | **Data type:** | Unsigned fixed-point |
| **ID:** | 011 | **Size:** | 1 |  |  |
| **Desc.:** | It denotes the current sampling rate adopted during the signal acquisition process. |
|  | **Range (min/resolution/max)** | 0 Hz | 1 Hz | (232–1) Hz |

### Bandwidth

Bandwidth denotes the width of the channel where the SD is currently tuned. This parameter is given in Hz. It is realized as an unsigned fixed-point value assuming a resolution of 1 Hz and a maximum range of 0 to 232–1 Hz (i.e., the equivalent of a 32-bit mantissa).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Bandwidth** | **Meas. Unit:** | Hz | **Data type:** | Unsigned fixed-point |
| **ID:** | 012 | **Size:** | 1 |  |  |
| **Desc.:** | It denotes the width of the channel where the SD is currently tuned. |
|  | **Range (min/resolution/max)** | 0 Hz | 1 Hz | (232–1) Hz |

### Timestamp

Timestamp denotes the time instant in which the SD has completed the acquisition.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Timestamp** | **Meas. Unit:** | s, s | **Data type:** | Cluster |
| **ID:** | 013 | **Size:** | 2 |  |  |
| **Desc.:** | It is the time instant in which the SD has completed the acquisition. It is denoted as a basic reference time value. Seconds since midnight (UTC) of January 1, 1970. |
| .0 | **Timestamp.s** | **Data type:** | Unsigned integer |
| .1 | **Timestamp.us** | **Data type:** | Unsigned integer |

### Scanned Time

This metadata denotes the amount of time that the SD has employed to perform the sensing operation in a channel or set of channels.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Scan.Time** | **Meas. Unit:** | ms | **Data type:** | Unsigned fixed-point |
| **ID:** | 014 | **Size:** | 1 |  |  |
| **Desc.:** | It denotes the amount of time that the SD has employed to perform the sensing operation in a channel or set of channels. |
|  | **Range (min/resolution/max)** | 0 ms | 1 ms | (232–1) ms |

### Data Typology

This metadata denotes the description of the received data domain.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Data.Typology** | **Meas. Unit:** | -------- | **Data type:** | Enumeration |
| **ID:** | 015 | **Size:** | 1 |  |  |
| **Desc.:** | Unique identification of the possible data typology of the received data. |
| Enumerator | **I/Q.Time** | **Value:** | 0 |
| Enumerator | **FFT** | **Value:** | 1 |
| Enumerator | **PSD** | **Value:** | 2 |
| Enumerator | **I/Q.Freq** | **Value:** | 3 |
| Enumerator | **Time.sample** | **Value:** | 4 |
| Enumerator | **Occupied** | **Value:** | 5 |
| Note: FFT stands for Fast Fourier Transform and PSD stands for Power Spectral Density. I/Q.Time and I/Q.Freq denote the I/Q sample in time domain and the spectrum of the I/Q component, respectively. Time.sample is the acquired signal and occupied is used if the output is Boolean variable (the SD has scanned only one channel) or an array of Boolean variables (the SD has scanned more than one channel). “1” means that the scanned channel is occupied “0” otherwise. |

### Sensing Technique

It denotes the sensing technique currently adopted by the SD.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Sens.Algorithm** | **Meas. Unit:** | -------- | **Data type:** | Enumeration |
| **ID:** | 016 | **Size:** | 1 |  |  |
| **Desc.:** | Unique identification of the sensing technique currently adopted by the SD. |
| Enumerator | **Cyclostationarity** | **Value:** | 0 |
| Enumerator | **Energy.detection** | **Value:** | 1 |
| Enumerator | **Custom** | **Value:** | 2 |

### Priority

Priority denotes the scheduling scheme used for incoming request.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Priority** | **Meas. Unit:** | -------- | **Data type:** | Enumeration |
| **ID:** | 017 | **Size:** | 1 |  |  |
| **Desc.:** | Unique identification of the priority criterium currently employed by the SD. |
| Enumerator | **FCFS** | **Value:** | 0 |
| Enumerator | **RR** | **Value:** | 1 |
| Enumerator | **Custom** | **Value:** | 2 |
| Note: FCFS stands for First Come First Served and RR stands for Round Robin. |

### Timing

Timing metadata denotes how the SD currently manages the sensing request that it receives.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Timing** | **Meas. Unit:** | -------- | **Data type:** | Enumeration |
| **ID:** | 018 | **Size:** | 1 |  |  |
| **Desc.:** | Unique identification of the timing criterium currently employed by the SD. |
| Enumerator | **On.Demand** | **Value:** | 0 |
| Enumerator | **Timed.with.periodicity** | **Value:** | 1 |

### Compression

Compression metadata denotes the compression algorithm used in order to reduce the amount of data to transmit.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Compression** | **Meas. Unit:** | -------- | **Data type:** | Enumeration |
| **ID:** | 019 | **Size:** | 1 |  |  |
| **Desc.:** | Unique identification of the compression algorithm used by the SD in order to reduce the amount of data to transmit. |
| Enumerator | **LZ** | **Value:** | 0 |
| Enumerator | **DEFLATE** | **Value:** | 1 |
| Note: LZ is the Lempel-Ziv compression method. |

### Format

Format metadata denotes data transmission format used for data transmission by the SD.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **Format** | **Meas. Unit:** | -------- | **Data type:** | Enumeration |
| **ID:** | 020 | **Size:** | 1 |  |  |
| **Desc.:** | Unique identification of the data transmission format used for data transmission by the SD. |
| Enumerator | **Little.Endian** | **Value:** | 0 |
| Enumerator | **Big.Endian** | **Value:** | 1 |

### Sensing device name

This metadata denotes the name of the sensing device registered with SCOS operator.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **SDName** | **Meas. Unit:** | ----- | **Data type:** | String |
| **ID:** | 021 | **Size:** | 1 |  |  |
| **Desc.:** | It denotes the name of the sensing device registered with SCOS operator. |

### SCOS operator

It denotes the name of the SCOS operator.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **SCOSOperator** | **Meas. Unit:** | ----- | **Data type:** | String |
| **ID:** | 022 | **Size:** | 1 |  |  |
| **Desc.:** | It denotes the name of the SCOS operator. |

### SD Mode

This metadata indicates the mode in which the SD is currently operating.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **SDMode** | **Meas. Unit:** | -------- | **Data type:** | Enumeration |
| **ID:** | 023 | **Size:** | 1 |  |  |
| **Desc.:** | Unique identification of the mode in which the SD is currently operating. |
| Enumerator | **Online** | **Value:** | 0 |
| Enumerator | **Offline** | **Value:** | 1 |

### Type of the sensing device

This metadata indicates the type of SD.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **SDType** | **Meas. Unit:** | -------- | **Data type:** | Enumeration |
| **ID:** | 024 | **Size:** | 1 |  |  |
| **Desc.:** | Unique identification of the SD type. |
| Enumerator | **SD.Full** | **Value:** | 0 |
| Enumerator | **SD.Proxy** | **Value:** | 1 |

### Sensing Device ID

This metadata indicates the unique ID associated to the SD.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **SDID** | **Meas. Unit:** | -------- | **Data type:** | Unsigned integer |
| **ID:** | 025 | **Size:** | 1 |  |  |
| **Desc.:** | The unique ID assigned to the sensing device. |

### SD certificate file

This metadata gives information about certificate file of the considered SD.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metadata name:** | **SDCert** | **Meas. Unit:** | ----- | **Data type:** | Cluster |
| **ID:** | 026 | **Size:** | 3 |  |  |
| **Desc.:** | It gives information about certificate file of the considered SD. |
| .0 | **SDCert.Path** | **Data type:** | String |
| .1 | **SDCert.Name** | **Data type:** | String |
| .2 | **SDCert.Cert.Auth** | **Data type:** | String |