Reference: S2-PDGS-MPC-L2A-PFS-V14.2
Issue: 1.1
Date: 2017-06-23

S2 MPC

Level 2A Product Format Specification

Ref. S2-PDGS-MPC-L2A-PFS-V14.2
Authors Table

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<thead>
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<th></th>
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<th>Company</th>
<th>Responsibility</th>
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<td>Written by</td>
<td>J. Louis</td>
<td>TPZF</td>
<td>ESL_L2A Leader</td>
<td>2017-06-23</td>
<td></td>
</tr>
<tr>
<td>Verified by</td>
<td>O Devignot</td>
<td>CS</td>
<td>Quality Manager</td>
<td>2017-06-23</td>
<td></td>
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<tr>
<td>Approved by</td>
<td>L. Pessiot</td>
<td>CS</td>
<td>Service Manager</td>
<td>2017-06-23</td>
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Change Log

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<th>Section(s)</th>
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<td>Structure of Appendix A File naming convention has been updated. Two new sections have been created for User Product and PDI Naming conventions.</td>
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<td>3</td>
<td>Consolidation of references with glossary</td>
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<td>Added of new ANNEX C: Conversion formulae to indicate the conversion formulae to apply to image digital numbers (DN) to obtain physical values.</td>
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</tr>
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<td>Update of document structure section. Correction of missing Appendix B: XSDs Directory Structure. Insertion of new Appendix C: Conversion formulae</td>
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<td>The name of the folder containing the surface reflectance, aerosol optical thickness and water vapour tiles has been renamed: Atmospherically_Corrected_Tiles (folder)</td>
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<td>The folder containing the surface reflectance, aerosol optical thickness and water vapour tiles in the product tree has been removed and the name of directories containing the different resolutions of Image Data have been renamed respectively R10m, R20m, R30m.</td>
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</tr>
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<td>3.2.6</td>
</tr>
<tr>
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<td>Appendix D</td>
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<td>19</td>
<td>Update of Scene Classification class names not-vegetated and unclassified.</td>
<td>PSD files</td>
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1. Introduction

1.1 Purpose of the document

This document is produced in the context of the development and maintenance of the Level-2A prototype processor Sen2Cor. Its purpose is to define the organisation of the XSD schemas describing Sentinel-2 Level 2A Product Format Specifications. The XSD schemas structure is based on Sentinel-2 Level 2A Product Format Specifications [S2-PSD].

1.2 Document structure

The document is structured as follows:
Chapter 1: This introductive chapter
Chapter 2: Product format approach
Chapter 3: Organisation of XML Schema Definitions Files
Appendix A: The L2A File Naming Convention
Appendix B: XSDs Directory Structure
Appendix C: Conversion Formulae

1.3 References

The reference list of all project related documents with their version number and issue date is given in:

[L2A-GLODEF] S2PAD Project Glossary S2PAD-VEGA-GLO-0001, version 3.5, 22.05.2015

1.3.1 Normative Reference Documents

[GS-FFS] Ground Segment File Format Standard
[GS-FFS-TSM] Earth Observation GS File Format Standard - Tailoring for the Sentinel Missions PDGS

1.3.2 Informative Reference Documents

[ECMWF] ECMWF Deterministic Atmospheric Model Products, http://www.ecmwf.int/products/forecasts/
[GSCDA-DAP] GMES Space Component - Data Access Portfolio Requirement Document (DAP/R)
[S2-PDD] GMES Space Component – Sentinel-2 Payload Data Ground Segment (PDGS), Product Definition Document
[S2-PSD] Sentinel-2 Products Specification Document
[S2-MRD] Sentinel-2 Mission Requirements Document
[L2A-PDD] Sentinel-2 MSI – Level 2A Products Definition Technical Note
[L2A-ATBD] Sentinel-2 MSI - Level 2A Products, Algorithm Theoretical Basis Document
[L2A-DPM] Sentinel-2 MSI – Level 2A Detailed Processing Model

1.4 Relation to other Documents

The Sentinel-2 MSI - Level 2A Products Algorithm Theoretical Basis Document [L2A-ATBD] defines the algorithms used during Level 2A processing which are labelled as 2A-SC for Level 2A Scene Classification and 2A-AC for Level-2A Atmospheric Correction.

The Sentinel-2 MSI - Level 2A Products Definition [L2A-PDD] defines the content of the Sentinel-2 Level-2A product. It delivers a collection of the Level-2A related input and output data, covering Scenes, AOT and Water Vapour maps and Quality Indicators. The document has to be considered as a specialisation of the definition provided in [S2-PDD] for the Level-2A product.

1.5 Definitions of Terms and Conventions

Please refer to chapter 2 of [L2A-PDD] for the definitions required for comprehension of the document, e.g. Datatake, Datastrip, UTM Tiled Grid, etc....
2 Product Format approach

Please refer to section 1.7 of [S2-PSD] for more information on the Sentinel-2 Product Format.
3 Organisation of XML Schema Definition files (XSD)

A set of XML Schema Definition Files (XSD) is provided for the specification of Level-2A products. These XSD files can be divided in two groups:

1) XSD schemas with "_Structure" suffix, created to define the "physical organization" of each product components (PDI) on disk, described in section 3.1 (no XML are generated and validated using these schemas)

2) XSD schemas with "_Metadata" suffix that will be used to validate the XML main metadata file inside each product components (PDI, e.g. Datastrip and Tile) and User product described in section 3.2. As well as the evolution of the item2A.xsd and dimap2A.xsd schemas. The xfdu.xsd schema used to validate the SAFE Manifest for L2A User Product.

**Figure 3-1 Different types of XSD files**
3.1 Physical organisation XSD schemas:

1) S2_User_product_Level-2A_Structure.xsd

2) S2_PDI_Level-2A_DataStrip_Structure.xsd

3) S2_PDI_Level-2A_Tile_Structure.xsd

3.1.1 S2_User_product_Level-2A_Structure.xsd

This XML schema describes the physical structure and contents of the Level-2A User Product directory.

Figure 3-2 shows a partial view of the L2A user product structure.
3.1.2 S2_PDI_Level-2A_DataStrip_Structure.xsd

This XML schema describes the physical structure and contents of the Level-2A DataStrip directory.
Figure 3-3 shows a view of the structure.
3.1.3 S2_PDI_Level-2A_Tile_Structure.xsd

This XML schema describes the physical structure and contents of the Level-2A tile directory.

Figure 3-4 shows a partial view of the overall structure, except the IMG_DATA folder. This structure is common for both supported PSD Versions 13.1 and 14.2.

Figure 3-5 shows the IMG_DATA folder for PSD version 13.1. Here, the Scene Classification image is located at the level of the IMG_DATA folder, using the given resolution as part of the filename for identification.

Figure 3-6 shows the IMG_DATA folder for PSD version 14.2. Here, the Scene Classification image is located within the corresponding resolution subfolders and its file naming conventions are in accordance with the other images contained in this folder. Additionally, a new image labelled 'TCI' is present. This is a True Colour composite Image of bands B2, B3 and B4 at given resolution as specified for [S2-PSD] V.14.2.
Figure 3-4 Level-2A tile – physical organisation except IMG_DATA folder
Figure 3-5 Level-2A tile IMG_DATA – physical organisation PSD V 13.1
Figure 3-6 Level-2A tile IMG_DATA – physical organisation PSD V 14.2
3.2 Metadata XML validation schemas

1) S2_User_Product_Level-2A_Metadata.xsd
2) S2_PDI_Level-2A_DataStrip_Metadata.xsd
3) S2_PDI_Level-2A_Tile_Metadata.xsd
4) logical_definitions2A.xsd
5) item2A.xsd
6) xfdu.xsd

3.2.1 S2_User_Product_Level-2A_Metadata.xsd

Figure 3-7 XML Schema metadata file L2A A user product
3.2.2 S2_PDI_Level-2A_DataStrip_Metadata.xsd

![Diagram of Level-2A_Datastrip XML Schema](image)

**Figure 3-8 XML Schema metadata file L2A Datastrip**

3.2.3 S2_PDI_Level-2A_Tile_Metadata.xsd

![Diagram of Level-2A_Tile XML Schema](image)

**Figure 3-9 XML Schema metadata file L2A Tile**

3.2.4 Item2A.xsd

Item2A.xsd schema has been updated with 19 new simple Types that describe the L2A Product Data Items (Granule, Tile, Datastrip, GIPP, DEM, GRI, IERS, POD, ECMWF, HKTM, SAD):

**Table 1: XSD types added to logical_definitions2A.xsd**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SimpleType</td>
<td>DATASTRIP_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>DATATAKE_ID_2A</td>
<td>Datatake identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>DEM_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>ECMWF_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>GIPP_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>Type</td>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>SimpleType</td>
<td>GLOBAL_SAD_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>GRANULE_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>GRANULE_TILE_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>GRI_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>HKTM_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>IERS_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>IMAGE_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>Item_ID_2A</td>
<td>a PDI_ID_2A or a Product ID</td>
</tr>
<tr>
<td>SimpleType</td>
<td>PDI_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>POD_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>Product_ID_2A</td>
<td>Product Identifier in the archive (auxiliary, DEM,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GIPP,...)</td>
</tr>
<tr>
<td>SimpleType</td>
<td>Product_ID_1C</td>
<td>New for PSD 14.2: references the Product Identifier</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of the L1C parent product</td>
</tr>
<tr>
<td>SimpleType</td>
<td>PVI_ID_2A</td>
<td>Preview Image identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>SAD_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
<tr>
<td>SimpleType</td>
<td>TILE_ID_2A</td>
<td>Product Data Item identification</td>
</tr>
</tbody>
</table>

### 3.2.5 dimap2A.xsd

This XML schema has been updated with 16 new complex Types for the description L2A of XML metadata. The list of new complex types is given in Table 2 hereafter with a short description:

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ComplexType</td>
<td>A_GIPP_LIST_2A</td>
<td>General PDGS Product Information on Level 2A</td>
</tr>
<tr>
<td>ComplexType</td>
<td>A_PRODUCT_ORGANIZATION_2A</td>
<td>General PDGS Product Information</td>
</tr>
<tr>
<td>ComplexType</td>
<td>A_L2A_Product_Info</td>
<td>Common general Product Information</td>
</tr>
<tr>
<td>ComplexType</td>
<td>A_PRODUCT_INFO_USERL2A</td>
<td>General PDGS Product Information</td>
</tr>
<tr>
<td>ComplexType</td>
<td>A_L2A_SCENE_CLASSIFICATION_LIST</td>
<td>A list of L2A Scene Classification IDs</td>
</tr>
<tr>
<td>ComplexType</td>
<td>A_L2A_SCENE_CLASSIFICATION_ID</td>
<td>Pixel values assigned to L2A Scene Classification Image Data</td>
</tr>
<tr>
<td>ComplexType</td>
<td>AN_AUXILIARY_DATA_INFO_USERL2A</td>
<td>Auxiliary Data information L2A on product level</td>
</tr>
<tr>
<td>Type</td>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ComplexType</td>
<td>A_QUALITY_INDICATORS_INFO_USERL2A</td>
<td>Quality Indicators information on product level (L2A + L1C Technical assessment info)</td>
</tr>
<tr>
<td>ComplexType</td>
<td>AN_IMAGE_DATA_INFO_DSL1C_DSL2A</td>
<td>List of L2A tiles + L1C Geometric and Radiometric info</td>
</tr>
<tr>
<td>ComplexType</td>
<td>A_QUALITY_INDICATORS_INFO_DSL1B_DSL1C_DSL2A</td>
<td>Quality Indicators information on Datastrip level (L2A + L1C Geometric and Radiometric QI info)</td>
</tr>
<tr>
<td>ComplexType</td>
<td>AN_AUXILIARY_DATA_INFO_DSL1C_DSL2A</td>
<td>Auxiliary Data information on Datastrip level (L2A and L1C reference)</td>
</tr>
<tr>
<td>ComplexType</td>
<td>A_GENERAL_INFO_L2A</td>
<td>General information on L2A Tile</td>
</tr>
<tr>
<td>ComplexType</td>
<td>A_QUALITY_INDICATORS_INFO_TILE_L2A</td>
<td>Quality Indicators information on L2A Tile and Pixel level</td>
</tr>
<tr>
<td>ComplexType</td>
<td>A_L2A_IMG_CONTENT_QI</td>
<td>Image content Quality Indicators (percentages of pixel type)</td>
</tr>
<tr>
<td>ComplexType</td>
<td>A_L2A_PIXEL_LEVEL_QI_LIST</td>
<td>Filenames of L2A QI Masks (Cloud confidence map, Snow/Ice confidence map)</td>
</tr>
<tr>
<td>ComplexType</td>
<td>A_L1C_L2A_QUANTIFICATION_VALUES_LIST</td>
<td>A list of L1C, L2A quantification values for digital counts on pixel level</td>
</tr>
</tbody>
</table>
3.2.6 xfdu.xsd

Figure 3-10 presents the XFDUType structure of the xfdu.xsd schema used to validate the SAFE Manifest for L2A User Product.

Figure 3-10 XML Schema for validation of the SAFE Manifest

For more details about SAFE format please refer to section 1.7.2 of [S2 PFS].
Appendix A  

File Naming Convention

1.4 Level-2A User Product Naming Convention

1.4.1 Product Main Directory SAFE_STANDARD

Level-2A main product directory is identified according to the following syntax derived from [GS-FFS] and [GS-FFS-TSM]:

```
MMM_CCCC_TTTTTTTTTTTT_<Instance_ID>
```

Where: `<Instance_ID> = SSSS_[Creation Date]_ROOO_V[Start Time]_[End Time]`

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Length (max)</th>
<th>Example Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMM</td>
<td>Mission ID, e.g. S2A, S2B</td>
<td>3</td>
<td>S2A</td>
</tr>
<tr>
<td>n/a</td>
<td>Separator</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
| CCCC            | File Class, i.e. the type of activity for which the file is used. Examples include:  

- USER for L2A production with Sen2Cor or S2 Toolbox  
- OPER for routine operations

|                                                                 | 4            | USER                 |
| n/a             | Separator                                                                     | 1            |                     |
| TTTTTTTTTTTT     | File Type (File Category + File semantic) composed as follow: FFFFFDDDDDD, where:  

FFFF = File Category (PRD_)  
DDDDDD = Semantic Descriptor

|                                                                 | 10           | PRD_MSIL2A           |
| n/a             | Separator                                                                     | 1            |                     |
| SSSS            | Site Centre of the file originator                                            | 4            | PDMC                |
| n/a             | Separator                                                                     | 1            |                     |
| Creation Date   | UTC Date/Time of creation date with seconds resolution: YYYYMMDDThhmmss       | 15           | 20140814T102032     |
| n/a             | Separator                                                                     | 1            |                     |
| ROOO            | Orbit Number (Relative orbit number) R000-R143                                | 4            | R047                |
| n/a             | Separator                                                                     | 1            |                     |
| Start Time      | UTC Date/Time of observation start with seconds resolution: YYYYMMDDThhmmss    | 16           | V20140325T223444    |
| n/a             | Separator                                                                     | 1            |                     |
| End Time        | UTC Date/Time of observation end with seconds resolution: YYYYMMDDThhmmms     | 15           | 20140325T223747     |
Field | Signification | Length (max) | Example Value
--- | --- | --- | ---
Total length for main product directory name without extension. | 78 | |

Example of S2 L2A product main directory:
S2A_USER_PRD_MSIL2A_PDMC_20140915T120000_R069_V20091211T165928_20091211T170025

1.4.2 Product Main Directory _SAFE_COMPACT_

Level-2A main product directory is identified according to the following syntax derived from section 4.0.10 of [S2_PSD] V 14.2:

**MMM_DDDDDD_<Instance_ID>**

Where: <Instance_ID> = [Datatake Sensing Time]_Nxxxy_ROOO_[Product Discriminator]

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Length (max)</th>
<th>Example Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMM</td>
<td>Mission ID, e.g. S2A, S2B</td>
<td>3</td>
<td>S2A</td>
</tr>
<tr>
<td>n/a</td>
<td>Separator</td>
<td>1</td>
<td>_</td>
</tr>
<tr>
<td>DDDDDD</td>
<td>Semantic Descriptor, fixed string to identify Level-2A products</td>
<td>6</td>
<td>MSIL2A</td>
</tr>
<tr>
<td>n/a</td>
<td>Separator</td>
<td>1</td>
<td>_</td>
</tr>
<tr>
<td>Datatake Sensing Time</td>
<td>UTC Date/Time with second’s resolution. Format: YYYYMMDDThhmmss</td>
<td>15</td>
<td>20160814T102032</td>
</tr>
<tr>
<td>n/a</td>
<td>Separator</td>
<td>1</td>
<td>_</td>
</tr>
<tr>
<td>Nxxxy</td>
<td>Production baseline</td>
<td>5</td>
<td>N0201</td>
</tr>
<tr>
<td>n/a</td>
<td>Separator</td>
<td>1</td>
<td>_</td>
</tr>
<tr>
<td>ROOO</td>
<td>Orbit Number (Relative orbit number) R000-R143</td>
<td>4</td>
<td>R047</td>
</tr>
<tr>
<td>n/a</td>
<td>Separator</td>
<td>1</td>
<td>_</td>
</tr>
<tr>
<td>Product Discriminator</td>
<td>Fixed string to distinguish different end user products associated to the same datatake. Format: YYYYMMDDThhmmss</td>
<td>15</td>
<td>20160803T124046</td>
</tr>
<tr>
<td>Total length for main product directory name without extension.</td>
<td>53</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example of S2 L2A product main directory:
S2A_MSIL2A_20160802T105414_N0102_R008_20160803T124046

The product directory contains the product main components shown in the Figure 3-2, listed in the following sections.
1.4.3 Product_Metadata_File SAFE_STANDARD (XML file)

The product metadata file name follows the same convention defined for the V13.1 L2A main product directory where the File Type field is defined in the following table:

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Length (max)</th>
<th>Example Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTTTTTTTTT</td>
<td>File Type (File Category + File semantic) composed as follow:</td>
<td>10</td>
<td>MTD_SAFL2A</td>
</tr>
<tr>
<td></td>
<td>FFFFFDDDDDD, where:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FFFF = File Category (MTD_)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DDDDDDD = Semantic Descriptor (SAFL2A for SAFE L2A )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example of S2 L2A product metadata in SAFE_STANDARD format file is:
S2A_USER_MTD_SAFL2A_PDMC_20140915T120000_R069_V20091211T165928_20091211T170025.xml

1.4.4 Product_Metadata_File SAFE_COMPACT (XML file)

The product metadata file name is combined by the two fields MMM + DDDDD separated with ‘_’.

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Length (max)</th>
<th>Example Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMM</td>
<td>MTD, fixed string to identify a metadata file</td>
<td>3</td>
<td>MTD</td>
</tr>
<tr>
<td>n/a</td>
<td>Separator</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>DDDDDD</td>
<td>Semantic Descriptor, fixed string to identify Level-2A products</td>
<td>6</td>
<td>MSIL2A</td>
</tr>
</tbody>
</table>

Fixed filename of S2 L2A product metadata in SAFE_COMPACT format is:
MTD_MSIL2A.xml

1.4.5 GRANULE (folder)

GRANULE folder contains a list of folders; each one corresponding to a tile composing the Level-2A user product. The file naming convention of its content is described in 1.5.

1.4.6 DATASTRIP (folder)

DATASTRIP folder contains the list of folders each one corresponding to the Datastrips composing the Level-2A user product. The name of each folder follows the syntax defined in the chapter 3 of [S2-PSD].
1.4.7 AUX DATA (folder)

AUX_DATA folder contains the auxiliary data files used for the processing. The naming convention used to identify each auxiliary file is defined in the chapter 3 for each PDI-Type Auxiliary:

- GIPP
- ECMWF
- DEM

1.4.8 Product Browse Image (optional, PNG file)

The product browse image is extracted from Level-1C product and follows therefore the same convention defined in [S2-PSD], where the file type definition is recalled in the table hereafter:

Table 7: Level-1C Product Preview image – Naming Convention

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Length (max)</th>
<th>Example Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTTTTTTTTTT</td>
<td>File Type (File Category + File semantic) composed as follow: FFFFFDDDDDD, where: FFFF = File Category (BWI_) DDDDD = Semantic Descriptor (MSIL1C for L1C product)</td>
<td>10</td>
<td>BWI_MSIL1C</td>
</tr>
</tbody>
</table>

Examples of S2 L1C product preview image file are:
S2A_OPER_BWI_MSIL1C_PDMC__20140915T120000_R069_V20091211T165928_20091211T170025.png

Note that Level-2A tile preview image files are available at tile level in the TILE/QI_DATA folder.
1.5 **Level-2A PDI Naming Convention**

1.5.1 **Datastrip_ID SAFE_STANDARD**

The PDI_ID (Datastrip ID) used to identify a Level-2A Datastrip PDI, follows the description provided in chapter 3 of [S2-PSD].

\[
\text{PDI_ID} = \text{MMM_CCCC_TTTTTTTTTT}_<\text{Instance_Id}>
\]

Where file type (TTTTTTTTTT) is **MSI_L2A_DS**.

\(<\text{Instance_Id}> = <\text{SiteCentre}>_<\text{CreationDate}>_S<\text{SensingTime}>_<\text{Processing Baseline}>
\)

Other sub-fields are described in the following table:

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Length (max)</th>
<th>Example Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation Date</td>
<td>UTC Date/Time of creation date with seconds resolution : YYYYMMDDThhmmss</td>
<td>15</td>
<td>201001020T102032</td>
</tr>
<tr>
<td>Sensing Time</td>
<td>This time refers to the sensing time of the first line of the PDI in UTC time. 14 digits, date and time separated by the character T.</td>
<td>15</td>
<td>201001020T102032</td>
</tr>
<tr>
<td>Processing Baseline</td>
<td>Nxx.yy where x,y={0;9}, An increase of the Processing Baseline code is generated by a change of the elements listed above. A major change is traced by the &quot;xx&quot; digits, a minor change is traced by the &quot;yy&quot; digits.</td>
<td>6</td>
<td>N01.02</td>
</tr>
</tbody>
</table>

Example of a S2 L2A Datastrip_ID name is:

S2A_USER_MSI_L2A_DS_MPS__20140915T120000_S20130707T171925_N01.01

1.5.2 **Datastrip_ID SAFE_COMPACT**

The PDI_ID (Datastrip ID) used to identify a Level-2A Datastrip PDI, follows the description provided in section 4.9.10 of [S2-PSD] V 14.2.

\[
\text{PDI_ID} = \text{DS}_<\text{Centre}>_<\text{CreationDate}>_S<\text{SensingStart}>
\]

The sub-fields are described in the following table:
Table 9: Level-2A Datastrip_ID – Instance_Id Naming Convention

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Length (max)</th>
<th>Example Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centre</td>
<td>Site Centre as listed for [S2-PSD] V 14.2, section 3.4.2</td>
<td>4</td>
<td>MPS_</td>
</tr>
<tr>
<td>Creation Date</td>
<td>UTC Date/Time of creation date with seconds resolution: YYYYMMDDThhmmss</td>
<td>15</td>
<td>20100120T120032</td>
</tr>
<tr>
<td>Sensing Start</td>
<td>This time refers to the sensing start time of the Datastrip in UTC time. 14 digits, date and time, preceded by the character 'S' and separated by the character 'T'.</td>
<td>15</td>
<td>20101020T120032</td>
</tr>
</tbody>
</table>

Example of a S2 L2A Datastrip_ID filename is:
DS_SGS__20150802T122135_S20150802T105331

1.5.3 Datastrip_Metadata File SAFE_STANDARD (XML file)

File naming convention = MMM_CCCC_TTTTTTTTTT_<Instance_Id>.xml
Where file type (TTTTTTTTTT) is MTD_L2A_DS.
<Instance_Id> = <SiteCentre>_ <Creation Date>_S<Sensing Time>
Where <Site Centre>, <Creation Date>, <Sensing Time> are inherited from the L2A Datastrip ID.
Example of S2 L2A Datastrip_Metadata filename:
S2A_USER_MTD_L2A_DS_MPS__20140915T120000_S20130707T171925.xml

1.5.4 Datastrip_Metadata File SAFE_COMPACT (XML file)

File naming = MTD_DS.xml. The name is fixed.

1.5.5 Tile_ID SAFE_STANDARD

The PDI_ID (Tile ID) used to identify a Level-2A Tile PDI, follows the description provided in chapter 3 of [S2-PSD].
Tile_ID = MMM_CCCC_TTTTTTTTTT_<Instance_Id>
Where the TTTTTTTTTT File Type field is defined in the following table:
Table 10: Level-2A Tile_ID – File Type Naming Convention

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Length (max)</th>
<th>Example Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTTTTTTTTT</td>
<td>File Type (File Category + File semantic) composed as follow: FFFFFDDDDDD, where: FFFF = File Category (MSI_). DDDDD = Semantic Descriptor (L2A_TL for L2A tile)</td>
<td>10</td>
<td>MSI_L2A_TL</td>
</tr>
</tbody>
</table>

The Tile Instance_ID is defined hereafter.

<Instance_Id> = <Site Centre>_<Creation Date>_<Absolute Orbit>_<Tile>_<Processing Baseline>

Other sub-fields are described in the following table:

Table 11: Level-2A Tile ID – Instance_Id Naming Convention

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Length (max)</th>
<th>Example Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute Orbit</td>
<td>Absolute Orbit Number A000000</td>
<td>7</td>
<td>A000469</td>
</tr>
<tr>
<td>Tile</td>
<td>According to US-MGRS naming convention. (Inherited from Level-1C tile)</td>
<td>6</td>
<td>T15SWC</td>
</tr>
<tr>
<td>Processing Baseline</td>
<td>Nxx.yy where x,y={0;9}, An increase of the Processing Baseline code is generated by a change of the elements listed above. A major change is traced by the “xx” digits, a minor change is traced by the “yy” digits.</td>
<td>6</td>
<td>N01.02</td>
</tr>
</tbody>
</table>

Example of a S2 L2A tile name (Tile ID) is:
S2A_USER_MSI_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_N01.01

The “N01.01” substring represents the processing baseline.

1.5.6 Tile_ID_SAFE_COMPACT

The PDI_ID (Tile ID) used to identify a Level-2A Tile PDI, follows the description provided in section 4.9.10 of [S2-PDS] V 14.2.

Tile_ID = L2A_<Tile>_<AbsoluteOrbit>_<TileDiscriminator>
as described in the following table:
### Table 12: Level-2A Tile ID – Naming Convention

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Length (max)</th>
<th>Example Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tile</td>
<td>According to US-MGRS naming convention. (Inherited from Level-1C tile)</td>
<td>6</td>
<td>T15SWC</td>
</tr>
<tr>
<td>Absolute Orbit</td>
<td>Absolute Orbit Number AOOOOOO</td>
<td>7</td>
<td>A000469</td>
</tr>
<tr>
<td>Tile Discriminator</td>
<td>String discriminator to distinguish between partial tiles generated out of the same datatake</td>
<td>15</td>
<td>20160302T190048</td>
</tr>
</tbody>
</table>

Example of S2 L2A tile name (Tile ID) is:
L2A_T15SWC_A000069_20160302T190048
The “N01.01” substring represents the processing baseline.

### 1.5.7 Tile_Metadata_File SAFE_STANDARD (XML file)

The tile metadata file name follows the convention defined for the L2A main product directory where the File Type field is defined in the following table:

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Length (max)</th>
<th>Example Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTTTTTTTTTTT</td>
<td>File Type (File Category + File semantic) composed as follow: FFFFDDDDDD, where: FFFF = File Category (MTD_) DDDDDDD = Semantic Descriptor (L2A_TL for L2A tile)</td>
<td>10</td>
<td>MTD_L2A_TL</td>
</tr>
</tbody>
</table>

Example of S2 L2A product metadata file:
S2A_USER_MTD_L2A_TL_MPS__20150302T190048_A000069_T14RMQ.xml

### 1.5.8 Tile_Metadata_File SAFE_COMPACT (XML file)

File naming = MTD_TL.xml. The name is fixed.

### 1.5.9 IMG_DATA (folder)

IMG_DATA folder contains the items listed in the following subsections.
1.5.9.1 **Three resolutions folders (R10m, R20m, R60m)**

1.5.9.1.1 **Surface Reflectance images (JPEG2000)**

**SAFE_STANDARD:**
File naming convention = `<Tile_ID>_ <Band_Index>_ <Resolution>.JP2`
Where:

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tile_ID</td>
<td>Tile_ID without Processing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseline sub-string</td>
<td></td>
</tr>
<tr>
<td>Band_Index</td>
<td>Bxx where: xx = 01, 02, 03, 04, 05, 06, 07, 08, 8A, 09, 10, 11, 12</td>
<td>Field identifying the spectral bands</td>
</tr>
<tr>
<td>Resolution</td>
<td>xxm where: xx = 10, 20, 60</td>
<td>Field identifying the resolution of the image.</td>
</tr>
</tbody>
</table>

Level-2A surface reflectance image filename:
S2A_USER_MSI_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_B03_10m.jp2

**SAFE_COMPACT:**
File naming convention = `L2A_<Tile>_ <Datatake_Sensing_Time>_ <Band_Index>_ <Resolution>.JP2`
Where:

<table>
<thead>
<tr>
<th>Field</th>
<th>Signification</th>
<th>Length (max)</th>
<th>Example Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tile</td>
<td>According to US-MGRS naming convention. (Inherited from Level-1C tile)</td>
<td>6</td>
<td>T15SWC</td>
</tr>
<tr>
<td>Datatake Sensing Time</td>
<td>This time refers to the sensing time of the first line of the PDI in UTC time. 15 digits, date and time, separated by the character T.</td>
<td>15</td>
<td>20101020T102032</td>
</tr>
<tr>
<td>Band_Index</td>
<td>Bxx where: xx = 01, 02, 03, 04, 05, 06, 07, 08, 8A, 09, 10, 11, 12</td>
<td>3</td>
<td>B01</td>
</tr>
<tr>
<td>Resolution</td>
<td>xxm where: xx = 10, 20, 60</td>
<td>3</td>
<td>60m</td>
</tr>
</tbody>
</table>

Level-2A surface reflectance image file example name:
L2A_T15SWC_20160302T190048_B03_10m.jp2
1.5.9.1.2 Resampled_AOT images (JPEG2000)

SAFE_STANDARD:
File naming convention = MMM_CCCC_TTTTTTTTTTTT_<Instance_Id>.JP2
Where file type (TTTTTTTTTT) is AOT_L2A_TL.
<Instance_Id> = <Site Centre>_Creation
Date>_AbsoluteOrbit_<Tile>_Resolution
Where <Site Centre>, <Creation Date>, <AbsoluteOrbit> and <Tile> are
inherited from the L2A Tile ID. <Resolution> is described in Table 14.
Example of a S2 L2A AOT tile name:
S2A_USER_AOT_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_60m.jp2

SAFE_COMPACT:
File naming convention = L2A_<Tile>_Data_take_Sensing_Time_<Band_Index>_Resolution.JP2
Where: Band_Index = ‘AOT’, all other parameters as for Table 15.
Example of a S2 L2A AOT tile name:
L2A_T15SWC_20160302T190048_AOT_10m.jp2

1.5.9.1.3 Water_Vapour images (JPEG2000)

SAFE_STANDARD:
File naming convention = MMM_CCCC_TTTTTTTTTTTT_<Instance_Id>.JP2
Where file type (TTTTTTTTTT) is WVP_L2A_TL.
<Instance_Id> = <Site Centre>_Creation
Date>_AbsoluteOrbit_<Tile>_Resolution
Where <Site Centre>, <Creation Date>, <AbsoluteOrbit> and <Tile> are
inherited from the L2A Tile ID. <Resolution> is described in Table 14.
Example of S2 L2A Water Vapour tile name:
S2A_USER_WVP_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_20m.jp2

SAFE_COMPACT:
File naming convention = L2A_<Tile>_Data_take_Sensing_Time_<Band_Index>_Resolution.JP2
Where: Band_Index = ‘WVP’, all other parameters as for Table 15.
Examples of a S2 L2A Water Vapour tile name:
L2A_T15SWC_20160302T190048_WVP_20m.jp2
1.5.9.2 Scene Classification Tile (JPEG2000)

SAFE_STANDARD:
File naming convention =
MMM_CCCC_TTTTTTTTTTTT_<Instance_Id>_<Resolution>.JP2
Where file type (TTTTTTTTTTT) is SCL_L2A_TL.
<Instance_Id> = <Site Centre>_<Creation Date>_<AbsoluteOrbit>_<Tile>
Where <Site Centre>, <Creation Date>, <AbsoluteOrbit> and <Tile> are inherited from the L2A Tile ID.
Examples of S2 L2A Scene_Classification_Tile:
S2A_USER_SCL_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_20m.jp2
S2A_USER_SCL_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_60m.jp2

SAFE_COMPACT:
File naming convention =
L2A_<Tile>_Datatake_Sensing_Time_<Band_Index>_<Resolution>.JP2
Where: Band_Index = 'SCL', all other parameters as for Table 15.
Examples of S2 L2A Scene_Classification_Tile:
L2A_T15SWC_20160302T190048_SCL_20m.jp2
L2A_T15SWC_20160302T190048_SCL_60m.jp2

1.5.9.3 True Color Images (JPEG2000)

Only present with PSD V >= 14.2

SAFE_STANDARD:
File naming convention =
MMM_CCCC_TTTTTTTTTTTT_<Instance_Id>_<Resolution>.JP2
Where file type (TTTTTTTTTTT) is TCI_L2A_TL.
<Instance_Id> = <Site Centre>_<Creation Date>_<AbsoluteOrbit>_<Tile>
Where <Site Centre>, <Creation Date>, <AbsoluteOrbit> and <Tile> are inherited from the L2A Tile ID.
Examples of S2 L2A TCI filename:
S2A_USER_TCI_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_20m.jp2
S2A_USER_TCI_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_60m.jp2

SAFE_COMPACT:
File naming convention =
L2A_<Tile>_Datatake_Sensing_Time_<Band_Index>_<Resolution>.JP2
Where: Band_Index = 'TCI', all other parameters as for Table 15.
Level-2A surface reflectance image file example name:
L2A_T15SWC_20160302T190048_TCI_20m.jp2
1.5.10  QI_DATA (folder)

QI_DATA folder contains the items listed in the following subsections.

1.5.10.1  L1C Quality Masks

Their file naming convention is described in [S2-PSD].

1.5.10.2  L2A Quality Masks (JPEG2000)

SAFE_STANDARD:
File naming convention = MMM_CCCC_TTTTTTTTTTT_<Instance_ID>.JP2
The two L2A Masks file types (TTTTTTTTTTT) are listed hereafter:

1. CLD_L2A_TL  (Confidence cloud mask files)
2. SNW_L2A_TL  (Confidence snow mask files)

<Instance_Id> = <Site Centre>_<Creation Date>_<AbsoluteOrbit>_<Tile>_<Resolution>
Where <Site Centre>, <Creation Date>, <AboluteOrbit>and <Tile> are inherited from the L2A Tile ID.
Examples of filenames:
S2A_USER_CLD_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_20m.jp2
S2A_USER_SNW_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_60m.jp2

SAFE_COMPACT:
File naming convention = L2A_<Tile>_<Datatake_Sensing_Time>_<Band_Index>_<Resolution>.JP2
Where: Band_Index = ‘CLD | SNW’, all other parameters as for Table 15.
Examples of filenames:
L2A_T15SWC_20160302T190048_CLD_60m.jp2
L2A_T15SWC_20160302T190048_SNW_20m.jp2

1.5.10.3  PVI Tile Preview Image (JPEG2000, GML)

SAFE_STANDARD:
File naming convention = MMM_CCCC_TTTTTTTTTTTTT_<Instance_ID>.JP2
Where file type (TTTTTTTTTTTT) is PVI_L2A_TL.
<Instance_Id> = <Site Centre>_<Creation Date>_<AbsoluteOrbit>_<Tile>
Where <Site Centre>, <Creation Date>, <AbsoluteOrbit>and <Tile> are inherited from the L2A Tile ID.
Example of S2 L2A preview image file:
S2A_USER_PVI_L2A_TL_MPS__20150302T190048_A000069_T14RMQ.jp2
SAFE_COMPACT:

File naming convention =
L2A_<Tile>_ <Datatake_Sensing_Time>_<Band_Index>.JP2

Where: Band_Index = ‘PVI’, all other parameters as for Table 15.

Example of S2 L2A preview image file:
L2A_T15SWC_20160302T190048_PVI_20m.jp2
Appendix B  XSDs Directory Structure


```
| S2-PDGS-MPC-L2A-PFS-V14.2.docx
| S2-PDGS-MPC-L2A-PFS-V14.2.pdf
\--- S2-PDGS-TAS-DI-PSD-V13.1_Schema
\--- S2-PDGS-TAS-DI-PSD-V14.2_Schema
  | S2_PDI_Level-2A_Datastrip_Metadata.xsd
  | S2_PDI_Level-2A_Tile_Metadata.xsd
  | S2_User_Product_Level-2A_Metadata.xsd
  | S2_PDI_Level-2A_Datastrip_Structure.xsd
  | S2_PDI_Level-2A_Tile_Structure.xsd
  | S2_User_Product_Level-2A_Structure.xsd
  |
\---DICO
  \---12
  \---14
    +---DataAccess
    |   +---item
    |   |   item.xsd
    |   |   item2A.xsd
    |
    +---DPC
    |
    +---FOS
    |
    +---GS
    |
    +---IPF
    |
    +---PDGS
    |   +---archive
    |   |
    |   +---base
    |   |
    |   +---center
    |   |
    |   +---component
    |
```
configuration

---
dimap
  dimap.xsd
  dimap2A.xsd

---
fileNameing

---
header

---
logical_definitions

---
spacecraft

--- station

--- SY
Appendix C  XFDU - L2A User Product SAFE Manifest

The xfdu.xsd file used to validate the L2A User Product Safe Manifest is located in:
S2-PDGS-TAS-DI-PSD-
V13.1_SAFE/resources/xsd/int/esa/safe/sentinel/1.1/sentinel-
2/msi/archive_l2a_user_product/xfdusd
S2-PDGS-TAS-DI-PSD-
V14.2_SAFE/resources/xsd/int/esa/safe/sentinel/1.1/sentinel-
2/msi/archive_l2a_user_product/xfdusd
## Appendix D  Conversion Formulae

The table below lists the conversion formulae to apply to image digital numbers (DN) to obtain physical values.

<table>
<thead>
<tr>
<th>Image Type</th>
<th>Conversion formula</th>
<th>Physical Units</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface_reflectance</td>
<td>SR = DN / 10000.</td>
<td>Unit less</td>
<td>Surface Reflectance values lies usually between 0.0 and 1.0. Specular effects on surface or clouds could lead to values higher than 1.0. The L2A Quantification Value is aligned with the L1C Quantification Value of the L1C product from which the L2A product is generated.</td>
</tr>
<tr>
<td>Resampled_AOT</td>
<td>AOT = DN / 1000.</td>
<td>Unit less</td>
<td>The aerosol optical thickness ($\tau$) is defined as the integrated extinction coefficient over a vertical column of atmosphere of unit cross section. Extinction coefficient is the fractional depletion of radiance per unit path length (also called attenuation for radar frequencies). Example in formula: $I = I_0(e^{-\tau})$</td>
</tr>
<tr>
<td>Water_Vapour</td>
<td>WVP = DN / 1000.</td>
<td>cm (or g.cm$^{-2}$)</td>
<td>Typical ranges of water vapour columns are (sea-level-to space): tropical conditions: $wvp = 3$-5 cm midlatitude summer: $wvp = 2$-3 cm dry summer, spring, fall: $wvp = 1$-1.5 cm dry desert or winter: $wvp = 0.3$-0.8 cm</td>
</tr>
<tr>
<td>Digital_Elevation_Map</td>
<td>DEM = DN - 10000.</td>
<td>m</td>
<td>OpenJPEG is only able to store unsigned integer values, thus an offset of +10.000 has been applied in order to allow negative heights. The scale of the DEM is thus (meter – 10.000).</td>
</tr>
</tbody>
</table>