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Title : **Sentinel 2 MSI - Level 2A Product Format Specifications
Technical Note**

Abstract : This document defines 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-PFS] (XSD DIMAP).

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AMENDMENT POLICY

This document shall be amended by releasing a new edition of the document in its entirety. The Amendment Record Sheet below records the history and issue status of this document.

AMENDMENT RECORD SHEET

ISSUE	DATE	REASON
1.0	15/01/2013	Initial Issue
1.1	08/02/2013	Updates to the L2A File Naming Convention
1.2	03/06/2013	Consolidation of references with glossary

DOCUMENT CHANGE RECORD

No.	Change in Issue	Description	Affected Section
1	1.1	Structure of Appendix A File naming convention has been updated. Two new sections have been created for User Product and PDI Naming conventions.	Appendix A
2	1.1	Based on S2PDGS PSD v.06, File naming conventions have been adapted to Level-2A product and PDI characteristics.	Appendix A
3	1.2	Consolidation of references with glossary	1.3

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1 INTRODUCTION

1.1 Purpose of the document

This document is produced in the context of the development of the Level-2A prototype processor. 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-PFS] (XSD DIMAP).

1.2 Structure of the Document

The document is structured as follows:

Chapter 1: This introductory chapter

Chapter 2: The product format approach

Chapter 3: The organisation of XML Schema Definitions Files

Appendix A: The product naming schema

1.3 Documentation and Definitions

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 3.1,
01.07.2013

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-PFS] Sentinel-2 Product Specification

[S2-MRD] Sentinel-2 Mission Requirements Document

[L2A-PFS] Sentinel-2 MSI – Level 2A Product Format Specification Technical Note

[L2A-ATBD]	Sentinel-2 MSI - Level 2A Products, Algorithm Theoretical Basis Document
[L2A-DPM]	Sentinel-2 MSI – Level 2A Detailed Processing Model
[L2A-SUM]	Sentinel-2 MSI – Level 2A Prototype Processor Installation and User Manual

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-PFS] 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 section 1.8 of [L2A-PFS] 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 1.6 of [L2A-PFS]. Here is an extract concerning DIMAP Format:

“The DIMAP v1 format [DIMAP] referenced here is the DIMAP version 1.1 dated 12/2004. This DIMAP format, developed by CNES, has been introduced for the SPOT-5 launch in May 2002 and it is used for SPOT products. It is a public format for describing geographic data. Although it was specially designed for image data, it can also handle vector data. SPOT products in DIMAP format now consist of two parts, one for the image and one for a description of the image, i.e. metadata.

Note that the DIMAP v1 is not applicable for a user product which has different characteristics than SPOT products i.e. for a user product that does not contain only image data files and one metadata file. If the DIMAP format have to be foreseen for a Sentinel-2 User Product (including other product components in addition to a one image file e one metadata file) an evolution of DIMAP v1 (i.e. DIMAP v2) have to be confirmed and accepted ([TBC-1]).”

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 created to define the "physical organization" of each product components (PDI) on disk, described in section 0 (no XML are generated and validated using these schemas)
- 2) XSD schemas with "DIMAP_" prefix 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 *logical_definitions2A.xsd* and *dimap2A.xsd* schemas.

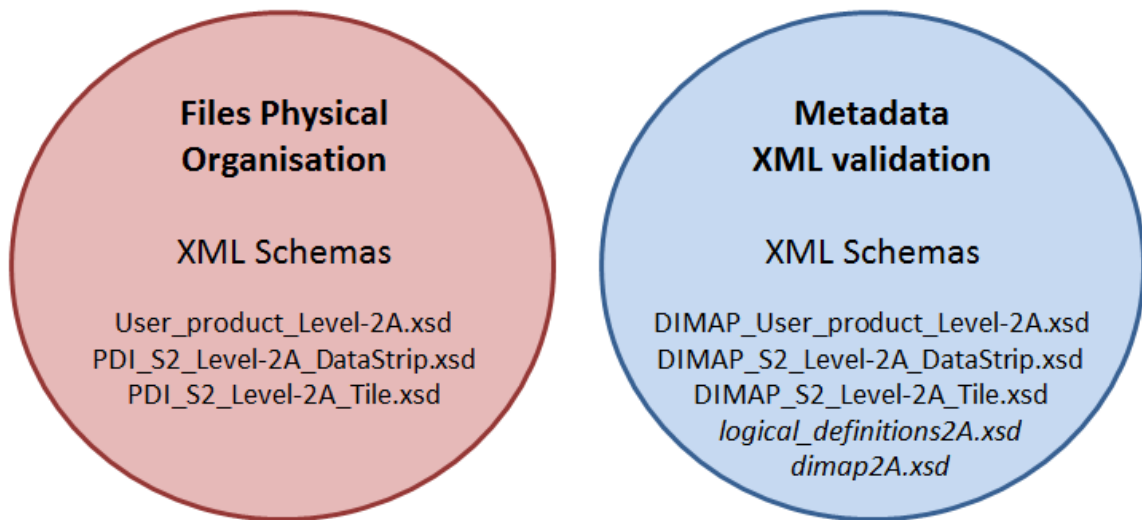


Figure 3-1 Different types of XSD files

3.1 Physical organisation XSD schemas:

- 1) User_product_Level-2A.xsd
- 2) PDI_S2_Level-2A_DataStrip.xsd
- 3) PDI_S2_Level-2A_Tile.xsd

3.1.1 User_product_Level-2A.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.

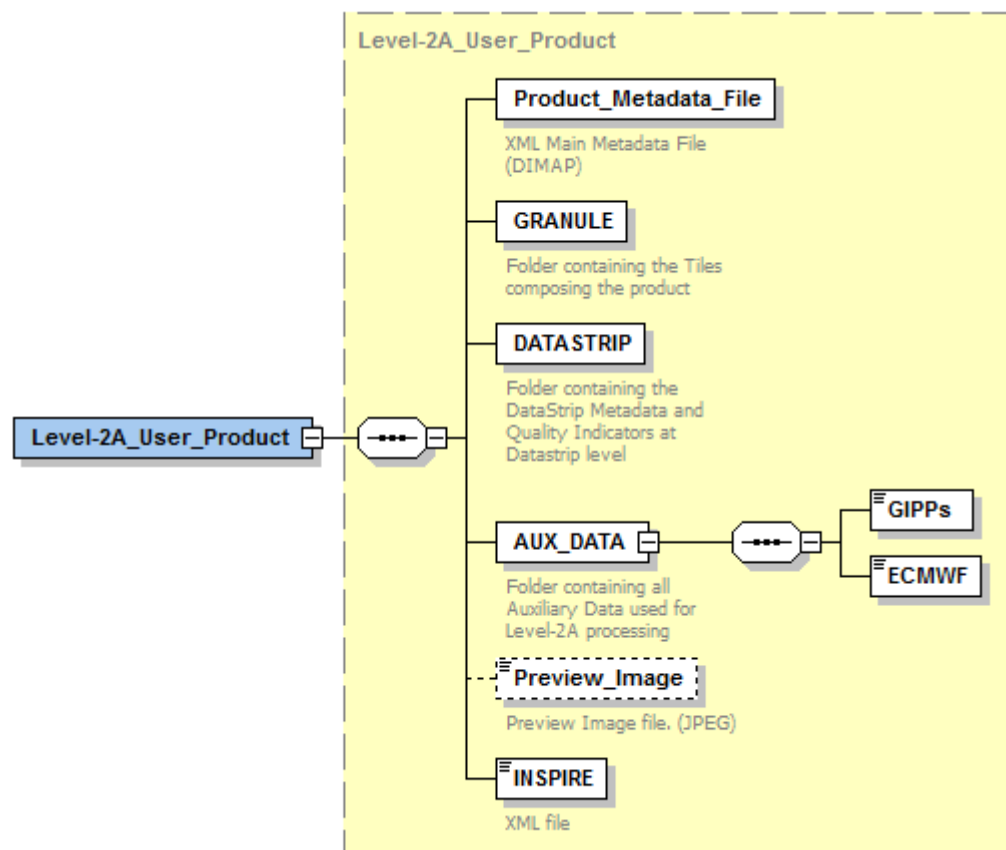


Figure 3-2 Level-2A user product – physical organisation

3.1.2 PDI_S2_Level-2A_DataStrip.xsd

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

Figure 3-3 shows a partial view of the structure.

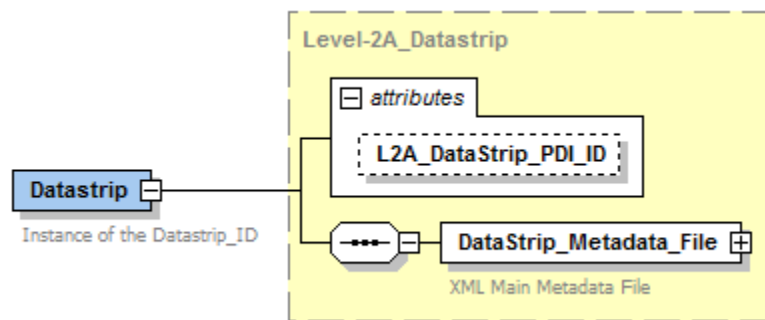


Figure 3-3 Level-2A Datastrip directory – physical organisation

3.1.3 PDI_S2_Level-2A_Tile.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 structure.

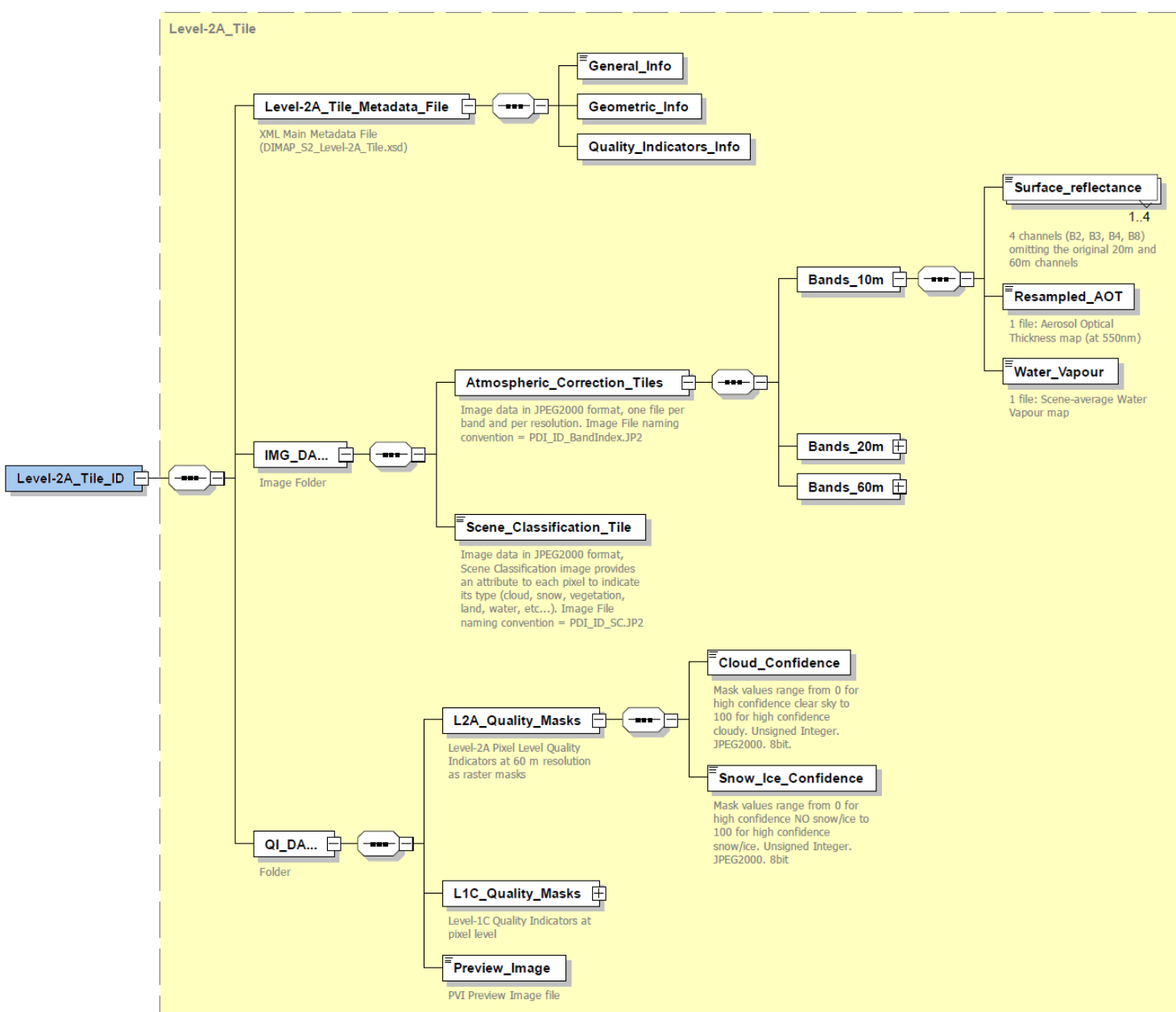


Figure 3-4 Level-2A tile – physical organisation

3.2 METADATA XML validation schemas

- 1) DIMAP_user_product_Level-2A.xsd
- 2) DIMAP_S2_Level-2A_DataStrip.xsd
- 3) DIMAP_S2_Level-2A_Tile.xsd
- 4) logical_definitions2A.xsd
- 5) dimap2A.xsd

3.2.1 DIMAP_user_product_Level-2A.xsd

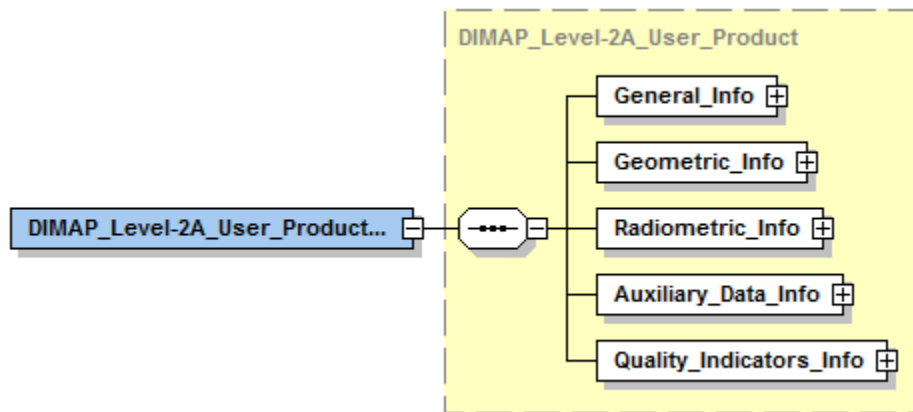


Figure 3-5 DIMAP XML metadata file L2A A user product

3.2.2 DIMAP_S2_Level-2A_DataStrip.xsd

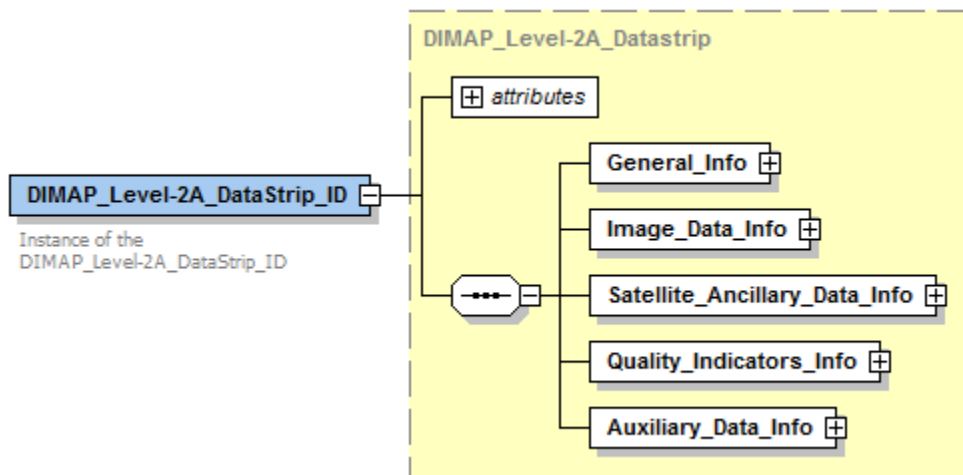


Figure 3-6 DIMAP XML metadata file L2A Datastrip

3.2.3 DIMAP_S2_Level-2A_Tile.xsd

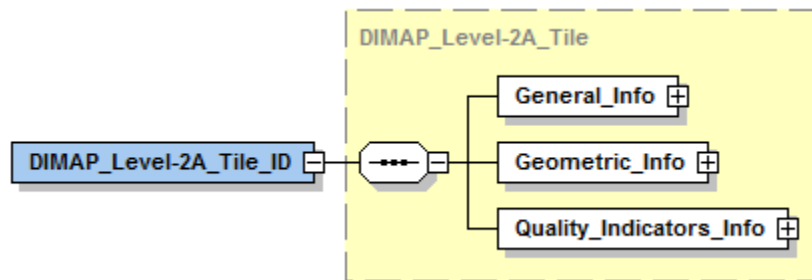


Figure 3-7 DIMAP XML metadata file L2A Tile

3.2.4 logical_definitions2A.xsd

Logical_definitions2A.xsd schema has been updated with 1 new simple Type that describes the L2A Datastrip ID naming used in PDI_S2_Level-2A_DataStrip.xsd:

Table 1: XSD types added to logical_definitions2A.xsd

Type	Name	Description
SimpleType	S2_PDI_L2A_ID	PDI L2A Granule and Datastrip identification string

3.2.5 dimap2A.xsd

This XML schema has been updated with 11 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 2: XSD types added to dimap2A.xsd

Type	Name	Description
ComplexType	A_PRODUCT_INFO_USERL2A	General PDGS Product Information for L2A user product
ComplexType	A_L2A_SCENE_CLASSIFICATION_VALUES	Pixel values assigned to L2A Scene Classification Image Data
ComplexType	AN_AUXILIARY_DATA_INFO_USERL2A	Auxiliary Data information L2A on product level
ComplexType	A_QUALITY_INDICATORS_INFO_USERL2A	Quality Indicators information on product level (L2A + L1C Technical assessment info)
ComplexType	AN_IMAGE_DATA_INFO_DSL1C_DSL2A	List of L2A tiles + L1C Geometric and Radiometric info

Type	Name	Description
ComplexType	A_QUALITY_INDICATORS_INFO_DSL1B_DSL1C_DSL2A	Quality Indicators information on Datastrip level (L2A + L1C Geometric and Radiometric QI info)
ComplexType	AN_AUXILIARY_DATA_INFO_DSL1C_DSL2A	Auxiliary Data information on Datastrip level (L2A and L1C reference)
ComplexType	A_GENERAL_INFO_L2A	General information on L2A Tile
ComplexType	A_QUALITY_INDICATORS_INFO_TILE_L2A	Quality Indicators information on L2A Tile and Pixel level
ComplexType	A_L2A_IMG_CONTENT_QI	Image content Quality Indicators (percentages of pixel type)
ComplexType	A_L2A_Pixel_Level_QI_LIST	Filenames of L2A QI Masks (Cloud confidence map, Snow/Ice confidence map)

APPENDIX A FILE NAMING CONVENTION

A.1 Level-2A User Product Naming Convention

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

MMM_CCCC_TTTTTTTTTT_<Instance_ID>

And <Instance_ID> = OOO_[Start Time]_[End Time]_[Creation Date]

Where:

Table 3: Level-2A Product name Nomenclature

Field	Signification	Length (max)	Example Value
MMM	Mission ID, e.g. S2A, S2B	3	S2A
n/a	Separator	1	_
CCCC	File Class, i.e. the type of activity for which the file is used. Examples include: - SVTx for SVT tests (x = 0, 1, 2, 3) - TDxx for processing Test Data Sets (xx = 00..99) - OPER for routine operations - TEST for internal tests	4	OPER
n/a	Separator	1	_
TTTTTTTTTT	File Type (File Category + File semantic) composed as follow: FFFDDDDDD, where: FFFF = File Category (PRD_) DDDDDD = Semantic Descriptor	10	PRD_MSIL2A
n/a	Separator	1	_
OOO	Orbit Number (Relative orbit number) 000-143	3	047
n/a	Separator	1	_
Start Time	UTC Date/Time of observation start with seconds resolution: YYYYMMDDHHMMSS	14	20101010223344
n/a	Separator	1	_
End Time	UTC Date/Time of observation end with seconds resolution : YYYYMMDDHHMMSS	14	20101010223344

Field	Signification	Length (max)	Example Value
n/a	Separator	1	_
Creation Date	UTC Date/Time of creation date with seconds resolution : YYYYMMDDThhmmss	15	20101020T102032
	Total length for main product directory name without DIMAP extension.	70	

Examples of S2 L2A product main directory are:

S2A_OPER_PRD_MSIL2A_047_20140417094512_201404171094728_20140417T102538.DIMAP

S2A_OPER_PRD_MSIL2A_048_20140417112512_201404171112728_20140417T142538.DIMAP

The product directory contains the product main components shown in the Figure 3-2, listed in the following sections:

A.1.1 Product_Metadata_File (mandatory, DIMAP XML file)

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

Table 4: Level-2A Product Metadata File – Naming Convention

Field	Signification	Length (max)	Example Value
TTTTTTTTTT	File Type (File Category + File semantic) composed as follow: FFFFDDDDDD, where: FFFF = File Category (MTD_) DDDDDD = Semantic Descriptor (DMPL2A for DIMAP L2A)	10	MTD_DMPL2A

Examples of S2 L2A product metadata file are:

S2A_OPER_MTD_DMPL2A_047_20140417094512_201404171094728_20140417T102538.xml

S2A_OPER_MTD_DMPL2A_048_20140417112512_201404171112728_20140417T142538.xml

A.1.2 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 0.

A.1.3 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-PFS].

A.1.4 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

A.1.5 Product Preview Image (optional, JPEG2000 file)

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

Table 5: Level-1C Product Preview image – Naming Convention

Field	Signification	Length (max)	Example Value
TTTTTTTTTT	File Type (File Category + File semantic) composed as follow: FFFFDDDDDD, where: FFFF = File Category (PVI_) DDDDDD = Semantic Descriptor (MSIL1C for L1C product)	10	PVI_MSIL1C

Examples of S2 L1C product preview image file are:

S2A_OPER_PVI_MSIL1C_048_201404171112512_201404171112728_20140417T102538.JP2

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

A.2 Level-2A PDI Naming Convention

A.2.1 Datastrip_ID

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

Tile_ID = MMM_CCCC_TTTTTTTTTT_<Instance_Id>.tar

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

<Instance_Id>=<SiteCentre>_<Creation Date>_<Sensing Time>_<Processing Baseline>

<Site Centre> in the case of the L2APP is set to "USER".

Other sub-fields are described in the following table:

Table 6: Level-2A Datastrip_ID – Instance_Id Naming Convention

Field	Signification	Length (max)	Example Value
Creation Date	UTC Date/Time of creation date with seconds resolution : YYYYMMDDThhmmss	15	20101020T102032
Sensing Time	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.	15	20101020T102032
Processing Baseline	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.	6	N01.02

Examples of S2 L2A Datastrip_ID template names are:

S2A_OPER_MSI_L2A_DS_USER_20141104T134012_20141104T134012_N01.02.tar

A.2.2 Datastrip_Metadata_File (mandatory, DIMAP XML file)

File naming convention = MMM_CCCC_TTTTTTTTTT_<Instance_Id>.xml

Where file type (TTTTTTTTTT) is **MTD_L2A_DS**.

<Instance_Id>=<SiteCentre>_<Creation Date>_<Sensing Time>

Where <Site Centre>, <Creation Date>, <Sensing Time> are inherited from the L2A Datastrip ID.

Example of S2 L2A Datastrip_Metadata_File template name:

S2A_OPER_MTD_L2A_DS_USER_20141104T134012_20141104T134012.xml

A.2.3 Tile_ID

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

Tile_ID = MMM_CCCC_TTTTTTTTTT_<Instance_Id>.tar

where the TTTTTTTTTT File Type field is defined in the following table:

Table 7: Level-2A Tile_ID – File Type Naming Convention

Field	Signification	Length (max)	Example Value
TTTTTTTTTT	File Type (File Category + File semantic) composed as follow: FFFFDDDDDD, where: FFFF = File Category (MSI_) DDDDDD = Semantic Descriptor (L2A_TL for L2A tile)	10	MSI_L2A_TL

The Tile Instance_ID is defined hereafter.

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

<Site Centre> in the case of the L2APP is set to “USER”

Other sub-fields are described in the following table:

Table 8: Level-2A Tile ID – Instance_Id Naming Convention

Field	Signification	Length (max)	Example Value
Rel Orbit	Relative Orbit Number 000-143	3	012
Tile	According to US-MGRS naming convention. (Inherited from Level-1C tile)	5	15SWC
Processing Baseline	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.	6	N01.02

Example of S2 L2A tile template name (Tile ID):

S2A_OPER_MSI_L2A_TL_USER_20141104T134012_012_15SWC_N01.02.tar

The “N01.02” substring represents the processing baseline.

Note that the PDI_ID.tar is the physical name of the Tile PDI after the tar compression.

A.2.4 Tile_Metadata_File (mandatory, DIMAP 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 9: Level-2A Tile_Metadata_File – Naming Convention

Field	Signification	Length (max)	Example Value
TTTTTTTTTT	File Type (File Category + File semantic) composed as follow: FFFFDDDDDD, where: FFFF = File Category (MTD_) DDDDDD = Semantic Descriptor (L2A_TL for L2A tile)	10	MTD_L2A_TL

Examples of S2 L2A product metadata file are:

S2A_OPER_MTD_L2A_TL_USER_20140417T094512_012_15SWC.xml

S2A_OPER_MTD_L2A_TL_USER_20140417T112512_012_15SWC.xml

A.2.5 IMG_DATA (folder)

IMG_DATA folder contains the items listed in the following subsections.

A.2.5.1 Atmospheric_Correction_Tiles (folder)

A.2.5.1.1 Surface_Reflectance images (JPEG2000)

File naming convention = <Tile_ID>_<Band_Index>_<Resolution>.JP2

Where:

Table 10: Level-2A Image files – Naming Convention

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

IMG_DATA/Level-2A surface reflectance image file template name:

S2A_OPER_MSI_L2A_TL_USER_20141104T134012_012_15SWC_B03_10m.JP2

A.2.5.1.2 Resampled_AOT images (JPEG2000)

File naming convention = MMM_CCCC_TTTTTTTTTT_<Instance_Id>.JP2

Where file type (TTTTTTTTTTT) is **AOT_L2A_TL**.

<Instance_Id> = <Site Centre>_<Creation Date>_<RelOrbit>_<Tile>_<Resolution>

Where <Site Centre>, <Creation Date>, <RelOrbit> and <Tile> are inherited from the L2A Tile ID. <Resolution> is described in Table 10.

Examples of S2 L2A AOT tile template names are:

S2A_OPER_ AOT_L2A_TL_USER_20140417T094512_123_15SWC_60m.JP2

S2A_OPER_ AOT_L2A_TL_USER_20140417T112512_123_15SWC_60m.JP2

A.2.5.1.3 Water_Vapour images (JPEG2000)

File naming convention = MMM_CCCC_TTTTTTTTTT_<Instance_Id>.JP2

Where file type (TTTTTTTTTTT) is **WVP_L2A_TL**.

<Instance_Id> = <Site Centre>_<Creation Date>_<RelOrbit>_<Tile>_<Resolution>

Where <Site Centre>, <Creation Date>, <RelOrbit> and <Tile> are inherited from the L2A Tile ID. <Resolution> is described in Table 10.

Examples of S2 L2A Water Vapour tile template names are:

S2A_OPER_ WVP_L2A_TL_USER_20140417T094512_123_15SWC_20m.JP2

S2A_OPER_ WVP_L2A_TL_USER_20140417T112512_123_15SWC_20m.JP2

A.2.5.2 Scene_Classification_Tile (JPEG2000)

File naming convention = MMM_CCCC_TTTTTTTTTT_<Instance_Id>.JP2

Where file type (TTTTTTTTTTT) is **SCL_L2A_TL**.

<Instance_Id> = <Site Centre>_<Creation Date>_<RelOrbit>_<Tile>

Where <Site Centre>, <Creation Date>, <RelOrbit> and <Tile> are inherited from the L2A Tile ID.

Examples of S2 L2A Scene_Classification_Tile are:

S2A_OPER_SCL_L2A_TL_USER_20140417T094512_123_15SWC.JP2

S2A_OPER_SCL_L2A_TL_USER_20140417T112512_123_15SWC.JP2

A.2.6 QI_DATA (folder)

QI_DATA folder contains the items listed in the following subsections.

A.2.6.1 L1C Quality_Masks

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

A.2.6.2 L2A Quality_Masks (JPEG2000)

File naming convention = MMM_CCCC_TTTTTTTTTT_<Instance_ID>.JP2

The two L2A Masks file types (TTTTTTTTTT) are listed hereafter:

1. **MSK_CLD_TL** (Confidence cloud mask files)
2. **MSK_SNW_TL** (Confidence snow mask files)

<Instance_Id> = <Site Centre>_<Creation Date>_<RelOrbit>_<Tile>_<Product_Type>

Where <Site Centre>, <Creation Date>, <Rel Orbit>and <Tile> are inherited from the L2A Tile ID and <Product_Type> = "MSIL2A"

Examples of filename:

S2A_OPER_MSK_CLD_TL_USER_20141104T134012_012_15SWC_MSIL2A.JP2

S2A_OPER_MSK_SNW_TL_USER_20141104T134012_012_15SWC_MSIL2A.JP2

A.2.6.3 PVI Tile Preview Image (JPEG2000, GML)

File naming convention = MMM_CCCC_TTTTTTTTTT_<Instance_ID>.JP2

Where file type (TTTTTTTTTT) is **PVI_L2A_TL**.

<Instance_Id> = <Site Centre>_<Creation Date>_<RelOrbit>_<Tile>

Where <Site Centre>, <Creation Date>, <RelOrbit>and <Tile> are inherited from the L2A Tile ID.

Examples of S2 L2A preview image file are:

S2A_OPER_PVI_L2A_TL_USER_20140417T094512_123_15SWC.JP2

S2A_OPER_PVI_L2A_TL_USER_20140417T112512_123_15SWC.JP2

APPENDIX B XSD SCHEMAS DIRECTORY STRUCTURE

S2-L2APP-PSD-01-XSD directory structure: New or updated files appear in red italic.

```
| S2PAD-VEGA-TN-i1r0_L2A_PFS.docx
| S2PAD-VEGA-TN-i1r0_L2A_PFS.pdf
|
|--DIMAP
|   | DIMAP_S2_Level-2A_DataStrip.xsd
|   | DIMAP_S2_Level-2A_Tile.xsd
|   | DIMAP_user_product_Level-2A.xsd
|   | PDI_S2_Level-2A_DataStrip.xsd
|   | PDI_S2_Level-2A_Tile.xsd
|   | user_product_Level-2A.xsd
|
|--DICO
|   |--1.0
|       |--DataAccess
|       |
|       |--DPC
|       |
|       |--FOS
|       |
|       |--GS
|       |
|       |--IPF
|       |
|       |--PDGS
|           |--archive
|           |
|           |--base
|           |
|           |--center
|           |
|           |--component
|           |
|           |--configuration
|           |
|           |--dimap
|               |--dimap-S2-V06.xsd
|               |--dimap2A.xsd
|           |--fileNaming
|           |
|           |--header
|           |
|           |--logical_definitions
|               |--logical_definitions-S2-V06.xsd
|               |--logical_definitions2A.xsd
|           |--spacecraft
|           |
|           |--station
|
|--SY
```