

MTG Generic Format Specification [GFS]

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Document Change Record

Version	Date of Version	DCR Number	Description of changes
V2D	16/01/12	N/A	Initial version
V2K	23/11/12	N/A	Updated document signature table Added table number and captions for all tables Updated TBC, TBD and TBW lists in line with other changes and added or updated proposed resolution times where necessary. Re-ordered sections for clarity, generic specifications now coming before format-specific and level specific specifications. Updated Document Structure description accordingly. Table 1-1 – added Enumerated type to replace Boolean which only allowed two options. Table 1-4 – Corrected [NCD] to standard [NAMING] document acronym Table 1-4 – Added [MPDDA] as an applicable document Table 1-5 - Added [UDUNITS] and [netCDFUsersGuide] as reference documents Section 3.3 Changed use of minus sign for underscore in the freeformat section consistent with definitions elsewhere. Table 4-2 – Added PROCESSOR_PATH_VERSION and ALGORITHM_MAJOR_VERSION and ALGORITHM_MINOR_VERSION (PDR action) Table 4-2 – Updated field sizes in line with other changes Table 4-2 – Added GTT option for FACILITY_OR_TOOL to replace longer string. Table 4-2 – Removed ALG option – now covered by DEV Table 4-2 – Processing Levels through document now standardised as zero-padded for 02 and 00. Table 4-2 – COMPRESSION_OR_SUBSETTING field split into two fields; INTERNAL_COMPRESSION and SUBSETTING. Use of fields defined to allow multiple types of compression and subsetting. Table 4-2 – CONTINUITY_COUNTER added as per [NAMING] recommendation 3. Table 4-5 added to show breakdown of product name components. Section 4.3 added to describe netCDF conventions and best practises Section 4.3.4 - Non-netCDF-standard CCSDS time formats removed. Description of standard netCDF time practises added. Section 4.3.2 and 4.3.3 – Added definitions for atomic and user-defined netCDF types. Applied these new definitions where applicable e.g. to generic global attributes, description of Generic Level 0+ format, etc. Section 4.5.5.1 - updated Recipient Type definitions and removed reference to requirement [IDPF] DAF 45210 which no longer exists. Table 5.2 – Updated in line with changes to Table 4-2. Updated cross-references to this table. Corrected case of the attribute names in line with [CF]. Table 5.2 – added FORMAT_VERSION

			Table 5-3 – updated in line with Table 5.2 Section 4.5.5.1 - Updated usage of recipient type attribute Section 6 – Added for “Other Format Conventions” Removed redundant Appendix A Common Names Appendix B – Updated definition of PRODUCTID. Changed order of components to reflect differences in underlying formats. Separated components by minus signs for ease of parsing and clarity. Appendix B - Removed "no well defined" coverage option and made coverage a compulsory field. Added [TBD] for other cases not yet defined. Appendix B - Made TYPE a fixed size field and added reference to [MPDDA] for complete list of possible values. Appendix B – added product type code to TYPE field to remove ambiguity where a dataset/product exists with different underlying formats. Appendix B – Updated example in line with above changes. General editorial corrections – typo corrections, clarifications, etc.”
V2L	05/12/12		Updates from mini-RIDs Editorial fixes for typos and cross-references Section 4.4 – Clarified occurrence of groups in products/datasets. Appendix A – In dimension specification tables, change column title from “size” to “value Updated reference to WMO 306 in Reference Documents table Section 4,4,2 – Removed items from status data that are already present in dataset/product as global attributes Table 3.2 and Section 1.,4 – Added TBD for the precise use of the continuity counter field Section 1.6.3 – Removed metadata terminology definitions as the terms are not used in the document. Table 5.3 and Table 5.6 – Clarified dimensions/sizing of NC_VLEN type arrays. Section 4.3.3.1 – Clarified that this section is about user-defined compound data types and not all netCDF-4 user-defined types.
V2M	12/12/12		Signature table updated in line with MTG Documents Signature Loop EUM/MTG/WP/12/1140. Minor editorial corrections including broken cross-references. Removed ENG as a potential environment for product creation in Table 3-1 Expanded dataset/product name fields. Changed time used as a global attribute to NC_STRING Added repeat_cycle_counter and in_repeat_cycle_counter. Section 4.3.4 – Updated the section to provide a specification rather than just guidance. Examples added for greater clarity. Appendix A - Updated the section to distinguish specification from rationale.
V2N	08/05/13		Change netCDF to netCDF-4 where appropriate throughout document to avoid possibility of confusion with netCDF classic.

			Add Section 1.9 Open Issues Added section for Level 2 products. Moved Appendices A and B into main body of document. Moved group definitions into Appendices to create data dictionaries for generic groups common to all levels and generic groups specific to Level 0+/1/2 datasets/products. Clarified section 4.4 on the use of groups within products. Added nomenclature and a coding scheme to help identify types of groups and whether they should be defined in the GFS or individual format specification documents. Updated group overview and dataset example figures with new coding scheme. Added generic group figures for all datasets/products. Updated Level 0+ dataset specification to include auxiliary data as untouched binary blocks and not decoded into netCDF components. Added and detailed Level 1 generic groups. Converted OPAQUE arrays to VLENs of type NC_BYTE as OPAQUE cannot be used in ragged arrays
V2N	08/05/13	EUM/MTG/DCN/13/703244	New Issue
V2O			CCR RID Updates CCR-S-GFS-ESA-LH-004 – Correct Figure 4.1 CCR-S-GFS-ESA-LH-005 – Clarify use of virtual channels in Section 5.1. CCR-S-GFS-ESA-LH-006– Added Section 8 on generic aspects of DPPFs CCR-S-GFS-ESA-LH-007 – Correct contents of satellite group in Section B7 CCR-S-GFS-ESA-LH-008 – Add more detailed definition of state group to Sections B.2 and C.3 CCR-S-GFS-ESA-LH-009 – Section C6 – Clarify that the iRefinedOrbitParameters ADU contains orbit parameters from INR. CCR-S-GFS-ESA-LH-010 - Add more detailed definition of state.aocs group to Sections B.6 and C.7 CCR-S-GFS-EUM-DL-003 – Added Section 2.3 Data Archival CCR-S-IRSLIFS-ESA-LH-038 – Added Section 4.3.5 with generic conventions for latitude and longitude Changed MPDDA from Applicable Document to Reference Document
V3	02/09/13		Shortened naming convention Level 0+ datasets changed from netCDF files with embedded files to a tar archive of files. Updated text where necessary and removed netCDF L0 description. Added generic handling of missing data in netCDF files using _FillValue attribute Extended use of 16-bit integers for latitude/longitude storage Update naming convention to add IQT flavour, remove format from ProductID, remove redundant processing level. Updated PRODUCTID TYPE values table

			Add section “Subsettable Groups” to introduce a generic subsetting mechanism datasets based on a global attribute Marked generic groups for removal where they are not required by any L1/L2 datasets and are therefore redundant. Updated signature table Removed closed Open Issues Removed Section “Recipient type” Updated section “Data Interpretation” to generalise the reference method.. Updated 2.1 Overview to bring in line with updated Level 0 format. Add Section “Archive Format” to describe Submission Information Packet for archive. Added global attributes <code>instrument_configuration_id</code> and <code>instrument_configuration_id_version</code> to root
V3E	01/07/14		Draft version for review
V3F	22/08/14		Add VC01 iSatKaDumpReport to the Level 0+ dataset and created matching DUMP product ID Added leap second attributes to the time variable for netCDF datasets based on Jason 2 GDR format specification. Required for conversion between Julian Date and UTC. Added missing instrument and processor groups in Level 1 data dictionary. Add generic auxiliary data validity checks in processor group. Added header and trailer dataset chunk concept and details. Removed open issue on dataset re-chunking as closed by new format Draft version for review
V3G	26/09/14		Updated after review meeting on 26/08/14 and 27/08/14 at TAS, Cannes. CM-5: Typo corrected CM-6 & CM-7: SPECIAL_COMPRESSION and SUBSETTING fields added to the freeformat description in Table 3-1 CM-9: MOF Datasets 5.4.1.1 - iOrbitParametersOPM description updated to from Earth-Fixed to True of Date frame. CM-11 to CM-14: Added caption and reference for Table 5-4. Added expected update frequencies and number occurrences in L0+ dataset to table. CM-16: 6.4.6.2 <i>Missing Data</i> - Clarified use of <code>_FillValue</code> and <code>missing_value</code> attributes. CM-17: Removed redundant groups orbit, attitude and ephemerides (and child groups: solar, lunar and stellar) throughout document. Updated archetypal dataset figures to match. CM-20: Corrected the virtual channel for AOCS packets to VC2 in A.3 Added high-rate diagnostic TM and dump reports (HRMD) as a ProductID type to Table 3-6 Added high-rate diagnostic TM and dump reports to Level 0/0+ dataset in Section 0.

			Added note to Table 3-1, expanded in Section 0. to indicate that SENSING_START and SENSING_STOP does not put restrictions on the time range of other source packet datasets within the L0/L0+ dataset. Added an open issue on archiving of other source packets when instrument source packets are not being sent. CM-26: Clarified use of terminology “source packet dataset” and updated text to sure consistent usage. CM-28: Added reference document [CCSDS-NDM] CM-29: Confirmed that the OPM Data reference frame option selected for MTG will be TOD. CM-33: Clarify that the manifest for a particular processing level is also expected to include the generic manifest contents CM-30: Noted that the inclusion of solar pressure coefficient covariance in iOrbitParametersOPM is [TBD] CM-31: Noted that the inclusion of solar pressure coefficient covariance in iProcessedRange is [TBD] CM-35: Clarified in Section E.5 that manoeuvre information is derived from the scheduled manoeuvre data in the iOrbitParameters file. CM-36: Updated Section E.5 to bring operations group format description and tables in line and delete redundancies CM-37: Updated reference frame types for operations group. CM-38: Added source information for variables in the operations group. Inserted Section to describe annotation for source packets in a L0 dataset. Includes assumptions about Level 0 processing.
V3H	20/10/14		EUM/MTG/DCN/14/771950 Update to reflect requirement that chunking is to used to distribute network loads Removed concept of Level 0+ datasets. Replaced with individual L0 datasets per Virtual Channel and transmission of auxiliary files and quick looks independent of L0 data. Removed subtable_groups_removed global attribute. Added subtable_groups and subtable_groups_present to root description. Remove flavours from ProductID as these do not affect format. Removed flavour it is redundant with other product names and proliferation of flavours was restrictive and confusing. Split ProductID into ProductID_root and Coverage. ProductID_Root is sufficient to identify a particular format as a format should be Coverage-independent. Added xx as a region coverage option to indicate not applicable for instrument-independent datasets with WMO naming convention e.g. for INR and HKTM level 0 datasets. Added GROUP option for SUBSETTING field. Update descriptions of other values to indicate they are only expected when using a product-specific plug-in or tool for subsetting. Remove PC300 option for SPECIAL COMPRESSION field as redundant. The IRS-1B-PCC dataset is a stand-alone dataset with its own specific format and not a compressed version of the IRS-1B-SS dataset.

		Rename SENSING_START and END_TIME fields to START_TIME and END_TIME fields to better reflect that not all datasets/products include sensing data. Word template corrupted. Document move to new Word template. Review and update of Open Issues. Update CF conventions reference and add open issue on CF conventions and use of enhanced netCDF-4 features. Update of Manifest file description with reference to [ELTA-SIP]. Expansion of Appendix B to add details of manifest contents for MTG. Section 3.4: Update application of WMO naming convention in for products/datasets by adding a COMPONENT field to prevent conflicting usage of SUBSETTING field. Updated name of field <INSTRUMENT_OR_SAF> to <DATA_SOURCE>. Data may come from more sources than just instrument or SAF. Included SAT as an option for satellite data e.g. L0 HKTM. Add naming templates for SIPs Draft version snapshot for Compression Study kick-off.
V3I	31/10/14	Update annotation for Level 0 datasets to be in line with current assumptions about handling of missing/errored frames and missing/errored packets. Add FDHSI and HRFI as options for the SUBSETTING field to allow a specific fixed set of channel groups to be selected for FCI-1C-RRAD disseminated datasets. Remove annotation for Level 0 datasets in line with revised error handling for Ka-band data. Only good packets are included in Level 0 datasets and passed to Level 1 processing. Annex D.1.2 Remove in_repeat_cycle_counter and repeat_cycle_counter from the generic root description (and close corresponding open issue). Annex D.1.2. Replace continuity_counter with repeat_cycle_in_day attribute Annex D.1.2. Add group_tag attribute and definition. Table 3-3 Replace CONTINUITY_COUNTER with REPEAT_CYCLE_IN_DAY. Update other references to this name field throughout document. Appendices: Remove all root-level, non-conformance flags except for timeliness from E.1 level 1 dataset root and F.2 level 2 product root. These cannot be evaluated at chunk level and if required should be included at repeat cycle level in the trailer. Copy contents of E.9 event groups into E.8 celestial group and delete events group. Make celestial group extensible. Remove references to events group from document and update tables/diagrams as necessary. Copy contents of E.5 operations groups into E.4 platform group and delete operations group. Remove references to operations group from document and update tables/diagrams as necessary. D.2: Remove unused "processing" group and update tables/diagrams.

			Section 3.4.1 Remove information about “type” and “compression” extensions and refer reader to [NAMING]. Update Section 7 to remove references to SIP encapsulation on specific data streams. This is covered by ICD documents. Introduce concept of components and update naming convention for chunks. Indicate which chunks are optional. Section 6.4.6.4 Clarify use of subtable groups. In general, add captions/references to all tables and figures. Sections 7.5 and 7.6 updated with description of the header and trailer chunk formats. Section 8 updated to make chunking concept properly available to L2 datasets. Updated SIP naming convention to follow the contained data objects. Insert New Appendix D for Dictionary of External Auxiliary Datasets to describe external files required for L1 processing. Expand explanation of setting of subsetting field in the name for various conditions. Split Section 1.9 on open issues, into Section 1.9 Assumptions and and 1.0 Open Issues Section 1.10 Remove closed Open Issues and added a way forward on remaining issues.. Bring document in line with [CONV] update to include new term: <u>accumulation_interval</u>. Change <u>repeat_cycle_in_day</u> to <u>accumulation_interval_in_day</u>. In many cases, the accumulation interval will be the repeat cycle duration. Section 3.4.1.1 : Remove [TBC]s and [TBD]s on processing and disposition modes. Section 3.4.1.5 Remove currently unused data designators and their [TBD]s. Remove rationale section and related [TBD]/[TBC]s to justification document. Updated Section 2.2 with SIP accumulation interval and group accumulation interval definitions. Updated use “accumulation interval” in document with these more precise definitions. Added Appendix H with the most recent schema for the generic manifest file. Draft circulated for internal review.
V3J	20/11/14	EUM/MTG/DCN/14/771950	Updates in line with • DCR EUM/MTG/DCN/14/771950 • Internal Reviews • MTG Product File Register • Revision of ICDs Change from DATA component name to BODY to avoid confusion with CONV defined data chunks. Ensure usage of terms “data chunk”, “data segment” and “dataset” are consistent with CONV definitions. Corrected acronym for MTG PUS to [MTGPUS] Section 3.4. Replaced setting NONE or “x” with no character in the name.

			Section 4.3 Updated SIP naming convention to handle the case of mixed data objects in a SIP. Section 3.4 Major Revisions to Naming conventions to bring Section in line with revised MTG product file register. Added new name components and revised existing components to match the underlying format structure and to ensure every ADU has a unique, unambiguous file name and ADU identifier. Reordered the section to be in line with the order of the name fields. Simplified tables to allow a more logical progression through the convention. Converted all data field names to lower case. Revised table of “types”. Added details of the underlying dataset format model Added table of identifiers to be used to link ICDs and FSs. Revised Table 3-22 showing the breakdown of the dataset filename components and related identifiers. Section E.1.2 Updated the root attributes by including relevant dataset name fields that were not available. Added mtg_name and alternative_name attributes. Section 6.4 Removed unused “processing” group from generic netCDF structure. Renamed Section 4 from Archive Formats to more correct Encapsulation Formats Sections 5, 7 and 8 Added ICD Reference Table as the first subsection in order to provide a link for ICDs referencing the GFS for the required format specification. Refined terminology section and introduced new CONV terms and derivative terms throughout the document. Clarified that segment and chunks are synonymous as far as formats go and removed references to segments to simplify text. Updates after internal review: Moved ICD documents from AD table to RD table Section 3.4.1 Rearranged name fields to have “format” after “purpose” Renamed “level” to “processing_level” in line with product register. Other updates made to keep consistency with these changes. Revised list of “types” in Table 3-6 in line with product register. Revised Reference Documents. Added MTG Product File Register. Sorted list alphabetically for easier use. Section 3.4.4 Clarified use of lower case “x” and suppression of the subsetting field in the Identifiers. Added section 3.4.5 on connection between dataset name fields and root attributes Table 3-22: Corrected identification of which data set name fields comprise a given identification tag. Document sent to contractor for review
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3K	16/02/15	Section 3.4.2.15 Subsetting. Remove FDHSI and HRFI as group subsetting values. Remove example using FDHSI. Section 3.4.2.10 Subtype: Add FDHSI and HRFI as subtypes for FCI L1C data Inesrted generic data dictionary for DPP files as Appendix H Update Appendix D by replacing the selection of external files with a single reference to IERS Bulletin A file. Added [IERS] reference. Added root attribute “count_in_accumulation_interval” to allow receiever to detect data gaps due to dissemination errors. Section 3.4 Update to the WMO naming convention by reordering the field components of the filename to match the ADU Identifier used in the ICD documents, and to match the ordder of components in the Product ID and Format ID. Remove Appendix I.1: Generic SIP schema. Document [ELTA-SIP] due for release and can be provided. Review and update Open Issues. Replace specific acronym HRDM (High Rate Data Memory dump) with more general REDU (Reports and Dumps) as product type in the relevant L0 SAT datasets. Add MTG Specficic metadata schema to Appendix I Removed TBC, TBD and TBW tables. These are indicated throughout doucment with tages [TBC], [TBD] and [TBW] as appropriate. Rename WMO naming convention name field <spacecraft> to <spacecraftid> in line with ICD documents. Document sent for contractor review
3L	11/05/15	Table 3-19. Replaced multiple dissemination options for purpose filed in the name with a single disemmination purpose setting – DIS. Table 3-20. Removed HDF file type (not needed for MTG products). Added tar file type for SIPs, etc. Extended bin file type to cover L0 datasets as well as WMO binary code forms. Removed definition of SIP accumulation interval as any accumulation will be performed in the AIP. Removed description and use of SIP accumualtion interval in Section 1.5.4 and 4.2. Table 3-7: Added options ZC and ZE as additional settings for the field name “coverage” for SAF usage. Section 3.2. Amended SS values in time string to include 60 which is used to indicate an added leap second (as per ISO 8601). Updated reference document location for NetCDF Attribute Convention for Dataset Discovery (ACDD) Section 6.3.4.2: Clarified usage of leap second attributes in time variables. Appendix E: Added ACDD geospatial discovery root attributes to root group.

			Several minor typo corrections Updates for evolution of manifest.xml file within the SIP encapsulation format from in-house solution to industry standard (OGS Earth Observation Product XML schema). - Removed [ELTA-SIP] as a reference. - Updated Section 1.9.4. Open Issue on manifest file schema - Updates in Appendix B to manifest file schema and contents. Appendix E: Removed deprecated root attribute Metadata_Conventions in line with [NACDD] evolution Added Appendix J indicating compliance to [NACDD] Section 1.8: Updated assumptions about DIA and SDWE modes. These should be separate L0 datasets. Added an Open Issue on the use of DPP files when a mix of warm and cold start parameters are required. Section 6.3.4 Updated details of the encoding of UTC times in a time variable in netCDF files in line with discussions on the CF-metadata mailing list entitled "How to define time coordinate in GPS?"
3M	12/05/15	DCR_25	Version for publication
3N	14/12/15	MTG_DCR_202	Updates from GFS review at Cannes (TAS/ESA/EUM) of 15/09/2015 - Section 3.2.4.15 Note added on setting environment field for IQT output - Table 3-1. Allow PURPOSE field to have variable size up to 3 characters (as "no value" is a possibility) - Make Geospatial Latitude/Longitude min/max attributes optional when geolocation data is unavailable or irrelevant. - General: Change use of accumulation interval to repeat cycle in text and field names for purposes of added clarity. For LI, repeat cycle is clarified as equivalent to the accumulation interval. - Modified eclipse_start_time and eclipse_end_time to correspond to the times within the dataset time span and not the span of the actual eclipse. Appendix J : Updated NACDD Compliance Table Section 6.4.3.2 Extensive reworking and extension of specification for time coordinate variables to handle UT1 time system required for some datasets. Section 6.4 Added the possibility to define a flat netCDF structure without groups. Added subsections 6.4.1 and 6.4.2. Minor updates throughout document to reflect this. Section 6.4.6.2. Clarified the _fillValue setting for enumerated and bitflag variables. Added [ELTA-SIP] as an applicable document. Added reference document [GSICS-NC] for GSICS NetCDF product formats. Renamed Appendix C to cover all Level 0 Auxiliary Datasets and added details of GSICS format. Appendix E: Moved geospatial attributes, boolean and trilean user types and timeliness conformance flag to generic root but set to optional inclusion only where appropriate.

			Appendix C.1 : Updated description of keyword SOLAR_RAD_COEFF. Appendix C.3: iProcessedRange . Updated datils for segment keyword. Added note for TDM Data section. Appendix E.1.2 Add <id> and <naming_authority> global attributes in line with NACDD and SIP needs. Appendix I: Major update to remove SIP metadata information in line with draft [ELTA-SIP] schema and replace with information in line with published [ELTA-SIP] schema. Added [GFSVSM] as a reference document Updated signature table Published
30	15/11/16	MTG_DCR_291	Table 3-8: Added note that the coverage type ZD is obsolete. DIA type products have undefined (xx) coverage. Table 3-6: Added missing IRS-1B product type SSS for Spectral Sounding Samples as used in [IRSL1FS]. Appendix E.1 Corrected CDL code attribute name from count_in_accumulation_interval to count_in_repeat_cycle Added [CCSDS-NDM] as a reference for further details of selected MOF auxiliary files. Table 3-1: Corrected data_source size from “3” to Variable (maximum 3 chars)” Updated 6.3.5. Corrected integer size to NC_SHORT and amended precision sizes. Added Section 6.3.3.2 notation convention for user defined types. Added Appendix K Dictionary of common variables Replaced NACDD reference with ACDD reference Appendix E: Updated global attributes. Renamed start_time, stop_time, spacecraft and processing_time according to [ACDD] conventions. Added additional ACCD attributes. General: Added a chunk counter (count_in_repeat_cycle) to the WMO compatible filename (as agreed in IWGM #44) Table 3-22: Corrected typo in format_ID Appendix B3: Removed use of optional checksum for MTG Moved content of redundant Appendix I to Appendix B (nboth were describing the SIP format). Updated Appendix B in line with updated [ELTA-SIP] schemas Add [S4HQ] as reference document Add additional productIDs in line wityh UVN L2 product evolution in [S4HQ] Added iCalFeedback_for_IDPF-S datasets to 5.4.1.2 and Appendix C.9 Section 6.3.5 Added use of CF grid_mapping parameters for geolocation Read Only Draft

3P	06/12/16	MTG_DCR_291	Section 6.3.5.2 Provided more details for grid_mapping usage Add Open Issue on format of time strings in global attributes Created Sections 5.4.2 and 5.4.3 to separate input and output auxiliary files for clarity Update Appendix B – SIP Encapsulation Format– in line with updated [ELTA-SIP]
3Q	19/03/17	MTG_DCR_363	E.1.2: Replaced global attributes that were accidentally deleted from CDL description E.1.3 Added description of product_id attribute D.1.2 Removed TBC on the filename format of the renamed Bulletin A file. Appendix D Moved iExtdata_for_flightdynamics to Appendix C as one of the Level 0 auxiliary datasets Changes resulting from EUM/MTG/EML/16/890252 • Add Section 11 - Generic MTG/Sentinel Level 2 Product structure as per S4-ESA-UVN-TN-0373 Changes resulting from IWG Meeting #50 EUM/MTG/MIN/17/904064 • Section 3.4.4 Added clarification note on filling non-applicable fields in IDs and product names. • Table 3-1 Changed definition of count_in_repeat_cycle to be expected count and not processed count. • Table 3-1 Clarified definition of repeat_cycle_in_day to be expected repeat cycle count and not processed repeat cycle count. • Section E.1 Added date_time_position and time_position metadata fields indicating the rounded date/time value removing minor offsets and variations from the planned observation start time. • Section E.1 Updated definition of group_tag value to be fully unique inline with [ELTA-SIP] • Section 7.3 Make use of trailer chunk compulsory for chunked netCDF datasets and include array of all preceding header and body chunks that have been produced during the repeat cycle. Updates resulting from IDPF-I PM#13 MTG-IDPF-TAS-MoM-383 • Appendix E: Add additional generic metadata to ensure all metadata required by the SIP can be found in the product. • Appendix B: Add specification requirement that all product specific metadata to be included in the SIP under extraInformation must be available as or easily derived from data in the product. • Appendix B: Added additional transformation details where data in the SIP XML is not an exact copy of data in the product but is derived from that data. • Appendix B Added DIP encapsulation format description. Appendices E to H: Remove unnecessary root group tags from CDL descriptions

			Added reference document “Determining the Expected Repeat Cycle for MTG Products”, EUM/MTG/TEN/17/905140 Appendix E.1.2: • Update instrument_configuration_id variable to reflect possibility of multiple ICIDs in product • Added available_body_chunks metadata to be included in trailer chunks. • Update contents of “source” attribute in line with CF Conventions • Add runtime_data and linked_data attributes to replace source attribute content Table 3-22 Correct ADU ID and Format ID examples Table 5-6 Corrected auxiliary data filenames in line with [NAMING] Update of Open Issues Removed redundant draft indicators from this document change record table Published
3R	23/08/17	MTG_DCR_389	Section 1.9 Review and closure of Open Issues Section 5.2 Strengthened description of Level 0 dataset as a purely binary dump of the relevant virtual channel. Updated [MOF-IDPF ICD] reference to [MOF-IDPFI ICD] and [MOF-IDPFS ICD] Section C.1 iOrbitParametersOPM – default REF_FRAME and COV_REF_FRAME set to TOD Section C.1 Remove TBD on solar radiation coefficients Section C.2 iOrbitParametersOEM – default REF_FRAME and COV_REF_FRAME set to TOD Section C.3 Updated description of iProcessdRange ADU format Section C.3 Remove TBD on covariance matrix Section C.4 Updated iCelestialBodiesEphemeris description. Files are only applicable for IDPF-S. Sec C.5 Updated description of iGeometricEvents Section C.6 Updated format description in line with [MOF-IDPFI ICD]/[MOF-IDPFS ICD] Section E.1.3 Added content for \<product_id> field Section B.3 Updated description of SIP fields, removed TBCs and TBDs, added content source and other information. Simplified tables by completely removing elements that are not used by MTG programme. Added initial XML format for extraInformation section in Metadata file. Update in line with latest document template
3S	19/01/18	MTG_DCR_415	Simplification of SIP metadata for MTG: • Section 1.4 Addition of term MTG-SIP and clarification of DIP based on [ELTA-SIP] • Section 4.2 Description of MTG-SIP Encapsulation and statement that it follows the generic SIP filename convention • Section 2.1, 4.1 & 7.1 Use of [MTG-SIP] for SIP produced by the Data Processing Facilities.

			• Appendix B New ‘MTG-SIP’ defined including schema • Removed duplicated description of DIP Encapsulation – it is described in [IDPF-I::MME_DAC ICD] • Appendix F: updated description and use of <code>_release_version</code> field.
4	20/06/18	MTG_DCR_449	Clarifications after MTG-SIP discussion with TAS on 23/01/2018: • Appendix B.2, Clarification for catalogueMappingId default • Appendix B.2.3.1.2 , Clarification that for products which are amalgamated within the MME_DAC, only the value from the last chunk is retained in the Archive. EUM/MTG/AR/639 – Section 3.2 Clarify that hours in a UTC string should run from 00 to 23 §6.4.6.5 Added “optional” group attribute for groups that may be specified in the format but dropped in the instance of a product.
4	20/06/18	MTG_DCR_505	NOTE: Release for IQT V2 datapack focussing on products relevant to the IQT Transfer of the contents of the GFSVSM to the GFS. Updates to the GFSVSM document were agreed at the IDPF-I Upfront Format Workshop. (EUM/MTG/MIN/18/986252). Split Geometric structures (optionally available to build L1 products) and Processor structures (compulsory audit trail for products) into separate appendices for clarity. CDL descriptions have been replaced by more detailed tabular descriptions generated directly from the GFSVSM. Group diagrams are also generated from the VSM. GFSVSM V3C was used to generate the content for this issue. Renamed Appendix on L1 NetCDF products to more general “geometric data”. Removed appendix on L2 products. Added appendix for processor information to clarify inclusion of information for groups and flat products. Updated Signature Table Table 3-1 Removed TBC and updated description for field <code>yyyyMMddhhmmss</code> Table 3-6: Removed TBC on Level 0 DIA data Table 5-1: Removed TBCs on Level 0 DIA and SDWE datasets and corrected coverage to xx Table 5-3: Removed TBCs on Level 0 DIA and SDWE datasets and corrected coverage to xx §5.3.1 Removed TBC and clarified setting of <code>start_time</code> and <code>end_time</code> fields from available packet time information.

			Table 5-4 Removed TBC and updated definition in line with IDPF-I::MOF ICD §6.4.6.3 Removed TBC and associated sentence on subsetting restrictions. Table 11-1 Removed TBCs/TBDs §B.2 Removed TBC and clarified extending mtg_manifest.xml for non-NetCDF products §C.4 Removed TBC on corrections for X, Y, Z components. §E2.1.1.1 Removed TBCs from table of global attributes. Update Table E-10 and remove TBCs to bring in line with the root metadata fields. Removed §E.2.1.2 and Table E-11 as redundant with new definition of “source” attribute. Figure 11-1. Removed TBD on the group structure. Table 3-8: Removed TBD on Zw values. These may be defined in lower level FS documents. Table 3-18. Removed TBD. Section 4.5 Rmeove TBD on DIP format/name and reference [ELTA-SIP] §5.4.1.1 Updated frequency of iCelestialBodiesEphemeris datastream in line with IDPF-S::MOF ICD §5.4.1.2 Removed TBD on naming of iCalFeedback_for_IDPF-I/S streams with reference to [GSICS] §6.4.5 Removed TBD on type of pointer. §6.4.6.1 Removed TBD on type of location reference §1.6 Sorted Applicable Documents alphabetically §1.7 Sorted Reference Documents alphabetically §A.3, A.4, A.5 replaced TBDs on Level 0 packet formats with references to the data handling ICDs Table 5-4 Number of iCelestialBodiesEphemeris files corrected. ADUs established against [ADU] V4 [ADU], added as a reference document Fixed outline levels of Appendices for correct Navigation display in Word §C: Aligned file formats with latest IDPF-I::MOF ICD document (iInstrSchedule format updated) Added [PRDI] and [PRDS] as reference documents §2.1 Corrected omission of IRS BUFR product at Level 1 Table 3.4.2.3 Added AC – Atmospheric Composition SAF Table 3.2.4.5 Updated definition of acronym AFA General: Removed obsolete IRS-0-SDWE products in line with [ADU] §F1.1.4 Added index coordinate_variable and index_offset variable
		MTG_DCR_577 MTG_DCR_581 MTG_DCR_555	MTG_DCR_577 Changes resulting from ICD Datapack Review as per EUM/MTG/BD/18/1036873 ADS-GFS-01: Fixed broken Word cross-references

			ADS-GFS-02: Fixed typos on p33 and p43. ADS-GFS-04: §3.4.2.4 fixed typo in subsection title MTG_DCR_581 New Level 0 Format; PKT & FBIN §3.4.2.13 Addition of FBIN and ATF options for Format field §5.2 Description of the generic FBIN ADU MTG_DCR_555 Added UVN L2 product types to Table 3.6 Additional §B: Correction of MTG-SIP description to bring in line with xsd specification that the manifest may contain multiple dataObjects entries if the SIP contains multiple data objects
4B	26/07/21	MTG_DCR_783	Update of GFS to cover African products. No impact on IDPF or L2PF. 1. Section 3.4.2.5 Add RGB to product name type field for FCI African RGB products 2. Section 3.4.2.7 Add AF to product name coverage field for FCI African RGB
		MTG_DCR_782	Appendix B Updates to Manifest Template 1. remove reference to Eumetsat namespace for mtg_manifest schema 2. Add nominalLongitude as a fixed field to the mtg_manifest.xml schema 3. Add rectificationLatitude as a fixed field to the mtg_manifest.xml schema 4. Add serviceIndicator as a fixed field to the mtg_manifest.xml schema 5. Add locationIndicator as a fixed field to the mtg_manifest.xml schema Appendix E.2.1.3 Root Group Attribute update 1. repeat_cycle_time_position reference in group_tag definition corrected to date_time_position
		MTG_DCR_781	Appendix E.1.1 Add an option “0 = undefined” to “reference_frame_type” enumerated type. Fixes netCDF reading error caused by having an undefined state for the default fill value of 0. Appendix E.2.1.3 Remove duplicate appearance of “comment” root attribute Correct attribute name “processed_count-in_repeat_cycle” to “processed_count_in_repeat_cycle”

			Appendix F.1.3.4 Correct variable name “recent_maneuvre_found” to “recent_manoevr_found” Correct variable name “upcoming_maneuvre_found” to “ upcoming_manoevr_found” Correct type of upcoming_manoevr_reference_frame from “reference_frame” to “reference_frame_type” Correct recent_manoevr_reference_frame attribute long_name text from “paramaters” to “parameters” Correct upcoming_manoevr_reference_frame attribute long_name text from “paramaters” to “parameters” Correct platform_altitude attribute long_name text from “altitiude” to “altitude” Appendix F.1.4.4 Correct name of variable sun_eclipse_by_earth attribute “titile” to “title” Correct name of variable sun_eclipse_by_moon attribute “titile” to “title” Correct typo in solar_azimuth long_name from “ange” to “angle” and close quotes on string Correct typo in solar_elevation long_name from ange to angle and close quotes on string Appendix G.3.1.4 Correct typo in auxiliary_dataset_identifier title from “axuliary” to “auxiliary” Correct typo in auxiliary_dataset_identifier long_name from “identifer” to “identifier”
		MTG_DCR_768	Section 1.7 Add IQT::MME ICD as reference document [IQT-MME-ICD] Appendix C.6 Remove obsolete OBTUTC file format specification in favour of reference to [IQT-MME-ICD]
		MTG_DCR_762	Appendix B.2.1.2 Update description of memberCounter from "Integer (non-negative)" to "Integer (greater than zero)"
			Appendix C.10.1.2 Align filename definition for IERS Bulletin with MOF::IDPF-I ICD – file retains original name of form YYYYMMDDHHMMSS-ser7.dat Section 6.3.5.2 Add clarification that GFS contain only example values and grid mapping values should be obtained from the relevant format specification document. Appendix C Reformatting on format specification tables to more compact form

			Update document change record table to align to latest template
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1 INTRODUCTION

1.1 Purpose and Scope

This is the Generic Format Specification for the Level 0 and Level 1 Datasets and Level 2 Products made by the MTG Mission Data Processing Facilities, including SAFs, and the various test tools.

It specifies the aspects that are common to all of the MTG Level 0 and Level 1 Datasets and Level 2 Products.

The text in this document shall be considered as specifying requirements applicable to all MTG datasets and products.

The document may be updated to reflect common fields and needs identified during the development of individual dataset/product format specifications.

This document will be updated in association with design reviews and algorithm review panels, including those of the IDPF and L2PF, at which point certain aspects may be changed.

It is complemented by the MTG format descriptions for L1 datasets and L2 products from each of the processing facilities in the MTG system.

Specifications for the format of datasets and products formatted in BUFR will be contained in the relevant agreements with the WMO.

1.2 Document Structure

Section 1 is this introduction, then addresses conventions and terminology used in the rest of the document and lists applicable and reference documents.

Section 2 introduces MTG Level 0 and Level 1 datasets and Level 2 products and some of the issues with regard to their formatting.

Section 3 sets out conventions that are applicable to all MTG Level 0 and Level 1 datasets and Level 2 products. This includes the naming convention used for these datasets and products.

Section 4 introduces the encapsulation formats related to submitting data objects to and retrieving data objects from the data archive.

Section 5 describes the generic attributes of Level 0 datasets.

Section 6 sets out the guiding principles behind the use of netCDF-4 in MTG datasets and products, and describes the overall structure common to all netCDF-4-formatted MTG datasets and products.

Sections 7 to 9 define the netCDF-4 format to be used for the generic L1 and DPP datasets and L2 products.

Section 10 sets out the guiding principles behind the use of other (non-netCDF) formats in MTG datasets.

The Appendices contain data dictionaries describing formats for Level 0 packets and for the netCDF groups in the datasets defined in Sections 7 to 9.

1.3 Conventions

Operation	Metacharacter(s)	Explanation	Example
Enumerated		A vertical bar separates alternatives	"IRS" "UVN" "FCI" "LI" designates one of "IRS", "UVN", "FCI" or "LI"
Grouping	()	Parentheses define scope and precedence	MTG_FCI_(FDSSx HRFIx)_E_1C designates either MTG_FCI_FDSSx_E_1C or MTG_FCI_HRFIx_E_1C
Character class	[]	Square brackets designate a set of possible characters to choose from	[1-3] matches 1, 2, or 3
Quantifiers	{min,max}	Curly brackets designate the minimum and maximum number of repetitions of the preceding group	(abcd){2,3} designates abcdabcd, or abcdabcdabcd
	?	The question mark indicates <i>zero or one</i> of the preceding element	(a)(x)? designates a or ax
	*	The asterisk indicates <i>zero or more</i> of the preceding element	(a)(x)* designates a, ax, axx, axxx, ...
	+	The plus sign indicates <i>one or more</i> of the preceding element.	(a)(x)+ designates ax, axx, axxx, ...
String	" "	Exact string	"Unidata Dataset Discovery v1.0"

Operation	Metacharacter(s)	Explanation	Example
			designates the string within the matched quotes
Character	\'	Exact character	\', ' designates the comma character
Range	< > ≤ ≥	The left and right angle brackets indicate “greater than” or “less than”, respectively. The other two symbols represent “greater than or equal to” and “less than or equal to”, respectively. These symbols may be used to indicate a valid range for a variable.	If X is an integer, then: $0 < X < 500$ designates a range for X of any integer value from 1 to 499. $0 \leq X \leq 500$ designates a range for X of any integer value from 0 to 500. $0 \leq X$ designates a range for X of any positive integer or 0. $X < 0$ designates a range for X of any negative integer If Y is a real value, then: $0 \leq X \leq 500$ designates a range for Y of any value between 0 and 500.

Table 1-1 Conventions used in the document.

1.4 Terms

Term	Explanation
CAP	Common Alerting Protocol, International Telecommunication Union ITU-T X.1303 Telecommunication Standardization sector of ITU (09/2007) Series X: data networks, open system communications and security, Telecommunication security, Common alerting protocol (CAP 1.1)
Space Packet	The terms “packet”, “source packet”, “telemetry packet” and “telemetry source packet” are used throughout the MTG document as synonyms for the term “space packet” as used in [CCSDS-SPS]
SIP	Submission Information Package [CCSDS-OAIS]. An Information Package that is delivered by the Producer to the OAIS for use in the construction or update of one or more AIPs Where the generic term [SIP] is used in this document, it applies to both [MTG-SIP] and [ELTA-SIP]
AIP	Archival Information Package [CCSDS-OAIS]. The Information Package preserved within an OAIS
DIP	Dissemination Information Package [CCSDS-OAIS]. The Information package provided by the OAIS to a Consumer. May contain all or part of an AIP. The DIP format and encapsulation are based on the [ELTA-SIP].
OAIS	Open Archival Information System [CCSDS-OAIS]. For MTG, this will be the Data Archive (MME_DAC)
MTG-SIP	The simplified MTG specific SIP produced by the MTG data processing facilities. The [MTG-SIP] is converted into an [ELTA-SIP] within the MME_DAC according to a product level/type dependent specification before submission to the Archive, and the MTG-SIP manifest will not be archived.

Table 1-2 Terms used in this document.

1.5 Terminology

1.5.1 Datasets, Products and Quick-Looks

Usage of the term **dataset** follows the [CONV] definition of “a logical grouping of data”. This is a fairly open definition that allows a wide variety of usage.

In contrast, the terms **Level 0 (L0) dataset**, **Level 1 (L1) dataset** and **Level 2 (L2) product** have strict definitions. These are special cases of a **dataset**.

The **L0 dataset** consists of:

- **Instrument Data** for a given instrument
- **Platform auxiliary data**
- **Housekeeping telemetry**

Although it is not stated explicitly in the [CONV], this document uses the definition that each **L0 dataset** consists of just one of the listed items. In line with the [CONV], the L0 dataset is composed of one or more **data chunks** collected over one **accumulation interval**. This **accumulation interval** is normally a **repeat cycle**.

The **L1 dataset** consists of **science data** at **level 1** and the **IDP auxiliary data**. In line with the [CONV], the **L1 dataset** is composed of one or more **data chunks** or **data segments** collected over one **accumulation interval** (which may again be a repeat cycle).

The **L2 product** consists of **science data** at **level 2** and the **AGP auxiliary data** collected over the product time span.

Note that in the [CONV], unlike the term **dataset**, the term product exists only as part of the **L2 product** and is not defined as a higher level concept.

1.5.2 Data Chunks and Data Segments

The term **data chunk** is used to denote a portion of a **dataset** in view of ground segment processing. The length of the **data chunk** is sized to meet timeliness and processing criteria.

The term **data segment** is used to denote a slice of a **dataset** in view of dissemination. The length of the data segment is sized to meet timeliness and processing criteria.

Within this document, **data chunks** and **data segments** follow the same formatting and naming rule so that a **data chunk** of a given duration will be identical to a **data segment** of the same duration. For that reason, within this document, the term **data chunk** is used as an inclusive term for both **data chunks** and **data segments**.

We also assume that the a dataset may be composed of differing types of data chunks need and have identified three possible data chunk types – the **header**, the **trailer** and the **body** - which will be described later.

1.5.3 Quick-Looks

The Level 0 datasets, L1 datasets and L2 products are composed of chunks [CONV]. However, each of these datasets/products may also have associated **quick-look** data when submitted to the data archive. **Quick-look** data are images or other visualisation formats related to a dataset that enable fast viewing for the purpose of selection or checking. These **quick-looks** are not part of the dataset/product (and therefore not chunks) and need not be disseminated with the dataset/product (**quick-looks** are not sent to MME_DIS or L2PF).

1.5.4 Accumulation Intervals

The **accumulation interval** is the elapsed time during which data are accumulated in view of further processing and archiving. This will normally correspond to a **repeat cycle**, but not all data has an appropriate **repeat cycle**. For such data, this document uses the term “**group accumulation interval**” to designate the interval used to group together chunks that relate to a single dataset or product. This interval is usually configurable. When the term **repeat cycle** is used in association with data that does not have a defined repeat cycle, then it should be understood to mean **group accumulation interval**.

1.6 Applicable Documents

Acronym	Reference Number	Title
[CONV]	EUM/MTG/DEF/08/0034	MTG Conventions & Terms Document
[ELTA-SIP]	EUM/TSS/TEN/14/761451	EUMETSAT Long Term Archive – Submission Information Package (SIP)
[GLOS]	EUM/MTG/DEF/07/0003	MTG Glossary of Acronyms
[NAMING]	EUM /MTG/SPE/11/0569	MTG Ground Segment Naming Convention Document

Table 1-3 Applicable documents

1.7 Reference Documents

Acronym	Reference Number	Title
[ACDD]	http://wiki.esipfed.org/index.php/Attribute_Convention_for_Data_Discovery	Attribute Convention for Dataset Discovery
[ADU]	EUM/MTG/TEN/16/866237	MTG List of ADUs per Product and Overall Data Rate
[CAP]	CAP-V1.1	Common Alerting Protocol, v. 1.1, OASIS Standard CAP-V1.1, October 2005
[CCSDS-NDM]	CCSDS 505.0-B-1	CCSDS XML Specification For Navigation Data Messages
[CCSDS-OAIS]	CCSDS 650.0-M-2	Reference Model for an Open Archival Information System (OAIS), June 2012
[CCSDS-ODM]	CCSDS 502.0-B-2	Orbit Data Messages. Recommended Standard, Issue 2, November 2009
[CCSDS-SPS]	CCSDS 133.0-B-1	Space Packet Protocol, Issue 1, September 2003

Acronym	Reference Number	Title
[CCSDS-TDM]	CCSDS 503.0-B-1	CCSDS Tracking Data Message (TDM), Issue 1 amended by CCSDS 503.0-B-1 Cor. 1, Issue 1C1
[CF]	http://cfconventions.org/Data/cf-conventions/cf-conventions-1.6/build/cf-conventions.pdf	netCDF Climate and Forecast (CF) Metadata Conventions: Version 1.6, 5 December 2011
[ECSS-TTPU]	ECSS-E-ST-70-41A	Space Engineering Ground Systems and Operations – Telemetry and Telecommand Packet Utilisation, 30 January 2003
[EXPRC]	EUM/MTG/TEN/17/905140	Determining the Expected Repeat Cycle for MTG Products
[FCIL1FS]	EUM/MTG/SPE/10/0447	MTG FCI Level 0 & 1 Format Specification
[FCIL2FS]	EUM/MTG/SPE/10/0448	MTG LI Level 2 Format Specification
[GFSVSM]	EUM/MTG/TEN/14/782832	Generic Format Variable Source Matrix
[GSICS]	https://gsics.nesdis.noaa.gov/wiki/Development/FilenameConvention	GSICS file naming convention
[GSICS-NC]	https://gsics.nesdis.noaa.gov/wiki/bin/view/Development/NetcdfConvention	GSICS NetCDF Convention
[IDPF-I::MME_DATAC ICD]	EUM/MTG/ICD/11/0386	MTG GS IDPF-I::MME Data Centre ICD
[IDPF-I::MME_MONITOR ICD]	EUM/MTG/ICD/12/0774	MTG GS IDPF-I::MME Monitoring ICD
[IERS]	http://hpiers.obspm.fr/eoppc/bul/bulb/explanatory.html	Eplanatory Supplement to IERS Bulletins A and B
[IRSL1FS]	EUM/MTG/SPE/10/0449	MTG UVN Level 0 & 1 Format Specification
[IQT-MME-ICD]	EUM/MTG/ICD/11/0159	MTG IQT - MME Interface Control Document
[IRSL2FS]	EUM/MTG/SPE/10/0450	MTG IRS Level 2 Format Specification
[LIL1FS]	EUM/MTG/SPE/10/0448	MTG LI Level 0 & 1 Format Specification

Acronym	Reference Number	Title
[LIL2FS]	EUM/MTG/SPE/10/0452	MTG FCI Level 2 Format Specification
[LST-DAY2]	EUM/MTG/SPE/13/689906	MTG generation dissemination and archiving evolution for Day 2
[LSTL1-I]	EUM/MTG/SPE/13/689899	MTG generation dissemination and archiving baseline – L0/L1 MTG-I
[LSTL1-S]	EUM/MTG/SPE/13/689901	MTG generation dissemination and archiving baseline – L0/L1 MTG-S
[LSTL2-I]	EUM/MTG/SPE/13/689912	MTG generation dissemination and archiving baseline – L2 MTG-I
[LSTL2-S]	EUM/MTG/SPE/13/689902	MTG generation dissemination and archiving baseline – L2 MTG-S
[LST-SAF]	EUM/MTG/SPE/13/689905	MTG generation dissemination and archiving baseline – SAF
[MOF::MME _DIS ICD]	0796EUM/MTG/ICD/11/0796	MTG GS MOF ::MME Dissemination ICD
[MOF-IDPFI ICD]	EUM/MTG/ICD/11/0309	MTG Ground Segment: MOF – IDPF-I Interface Control Document
[MOF-IDPFS ICD]	EUM/MTG/ICD/13/726398	MTG Ground Segment: MOF – IDPF-S Interface Control Document
[MPDDA]	EUM/MTG/TEN/11/0466	MTG Product & Dataset Dissemination & Archiving status
[MTG-I-DH- ICD]	MTG-OHB-PF-ICD-0025	PF MTG-I Data Handling ICD
[MTGPUS]	MTG-TAF-SA-IS-0176	MTG PUS Customisation Specification
[MTG-S-DH- ICD]	MTG-OBH-PF-ICD-0026	MTG-OBH-PF-ICD-0026
[NCUG]	http://www.unidata.ucar.edu/software/netcdf/docs/netcdf.pdf	The netCDF Users' Guide, netCDF version 4.1.3, 10 June 2011
[NSSDC- NMC]	http://nssdc.gsfc.nasa.gov/nmc/	National Space Science Data Center – Master Catalogue
[PRDI]	MTG Processing Runtime Data for IDPF-I [PRDI]	EUM/MTG/SPE/15/761553
[PRDS]	MTG Processing Runtime Data for IDPF-S [PRDS]	EUM/MTG/SPE/14/765561
[PRODREG]	UM/MTG/TEN/14/780644	MTG Product File Register
[S4HQ]	EUM/MTG/SPE/12/0767	Copernicus Sentinel-4 Product Distribution Baseline at EUMETSAT
[SGICD-I]	MTG-TAF-SA-IS-0051	MTG Satellite-to-Ground Interface Control Document (for MTG-I)

Acronym	Reference Number	Title
[SGICD-S]	MTG-OHB-SAS-ICD-0001	Space to Ground ICD for MTG-S
[THREDDS]	http://www.unidata.ucar.edu/software/thredds/current/tds/	THREDDS Data Server (TDS) webpage
[UDUNITS]	http://www.unidata.ucar.edu/software/udunits/udunits-2/udunits2.html	UDUNITS 2.1.24 Manual, 2011
[UVNL1FS]	EUM/MTG/SPE/10/0453	MTG UVN Level 0 & 1 Format Specification
[UVNL2FS]	EUM/MTG/SPE/10/0454	MTG IRS Level 2 Format Specification
[WMO-306]	http://library.wmo.int/pmb_ged/wmo_306_en-v1-2_2012.pdf	WMO Manual on Codes, Common Table C. 2011 Edition.
[WMO-386]	http://www.wmo.int/pages/prog/www/ois/Operational_Information/Publications/WMO_386/WMO_386_Vol_I_2009_en.pdf	WMO Manual on the Global Telecommunication System – Volume I. 2009 Edition.

Table 1-4 Reference documents.

1.8 Assumptions

1.8.1 Diagnostic Mode Data

A high-rate diagnostic mode may exist on at least one of the instruments. When the instrument is in this mode, instrument source packets are sent at a much higher rate than in normal mode (requiring that the other instrument on the platform is inactive). When it exists, this diagnostic mode data should not be included in the Level 0 Instrument Source Packet dataset but should instead be extracted to a L0 dataset specific to this data.

1.8.2 SIP Naming Convention

It is not currently foreseen in the MTG programme to have a group of data objects within a SIP that are: multiple non-WMO named data objects; mixed WMO-named data objects; a mixture of WMO and non-WMO named objects. If this assumption proves false, the naming conventions for SIPs will need to be extended.

1.9 Open Issues

None currently identified.

2 MTG DATASET AND PRODUCT FORMATS

2.1 Overview

Level 0 datasets are copies of the original data and make no bit-level alterations whatsoever to the instrument or spacecraft data delivered from the consolidator, the downlinked instrument and other packets needed for reprocessing.

Nearly all MTG Level 1 datasets and most MTG Level 2 products (excluding quick-look components) are formatted as netCDF-4 and use HDF-5 as the storage layer.

At Level 2, MTG products are also formatted using a number of different additional encodings, including GRIB-2, HDF-5, BUFR and CAP, and may in future include JPG, PNG and other formats. A Level 1, an IRS BUFR product will also be provided for distribution via the WMO GTS network.

Datasets and products may be encapsulated in an MTG-SIP format for submission to the Archive.

The size and content of Level 0 and Level 1 datasets and Level 2 products may differ depending on the intended destination.

The structure of such datasets/products, however, independent of size, shall conform to the requirements in this document and the applicable dataset or product format specification document.

2.2 Data Preservation

All products encoded as netCDF-4 can be interpreted at the bit level using the HDF 5 File Format Specification. Therefore, in order to ensure long-term data preservation, all that is needed to be available is the HDF 5 File Format Specification, this generic format specification, and the relevant format specification for the dataset or product.

For variables that are stored in the form in which they have been delivered (e.g., packets from the spacecraft at Level 0), the instrument interface document and the space to ground interface document would need to be stored additionally.

The links to the relevant documentation can be provided in the attributes of the root group.

3 GENERIC SPECIFICATIONS

3.1 Introduction

This section defines conventions that are applicable to all MTG Level 0 and Level 1 datasets and Level 2 products, no matter what underlying format they use.

3.2 *Generalised time format*

Standard generalised time or generalised time is UTC-based. It is a string of 15 characters terminating in an ASCII 'Z' (indicating Zulu or UTC time).

The format is

(YYYY) (MM) (DD) (HH) (MM) (SS) Z

where:

YYYY:	[0-9]{4,4}	range:	0000 to 9999
MM:	[0-9]{2,2}	range:	01 to 12
DD:	[0-9]{2,2}	range:	01 to 31
HH:	[0-2][0-9]	range:	00 to 23
MM:	[0-5][0-9]	range:	00 to 59
SS:	[0-5][0-9]	range:	00 to 59 (60 for leap second)

For example, 21:19:27 on July 27th 2011 would be encoded as

20110727211927Z

NOTE: An SS (seconds) value of 60 is used to indicate an added leap second.

3.3 Abbreviated Generalised Time Format

Abbreviated generalised time format is identical to generalised time format (see above), except that the trailing time zone indicator (ASCII 'Z' (indicating Zulu or UTC time) is omitted.

3.4 Naming Conventions

3.4.1 *WMO Naming Convention for Datasets and Products*

The L0 and L1 dataset and L2 product name will be WMO-compatible, following the WMO file naming convention [WMO-386] (cf Attachment II-15 p25 2009 edition) and as specified in [NAMING].

The filename will consist of the dataset (or product) name with a file_type (referred to as “type” in [NAMING]) and a compression field:

(dataset_name) \ . ' (file_type) (compression)

Where:

dataset_name is composed of the following fields, separated by underscore symbols, “_”:

(pflag) \ _ ' (productidentifier) \ _ ' (oflag) \ _ ' (originator) \ _ '
 (yyyyMMddhhmmss) \ _ ' (freeformat)

productidentifier is composed of the following fields, separated by commas:

(locationindicator) \ , ' (datadesignator) \ , ' (freedescription)

freedescription is composed of the following fields with plus symbol or dash symbol separators:

(spacecraftid) \ + ' (data_source) \ - ' (processing_level) \ - ' (type) \ - ' (subtype)
 \ - ' (coverage) \ - ' (subsetting) \ - ' (component1) \ - ' (component2) \ - '
 (component3) \ - ' (purpose) \ - ' (format)

freeformat is composed of the following fields, separated by underscore symbols, “_”:

(facility_or_tool) \ _ ' (environment) \ _ ' (start_time) \ _ ' (end_time) \ _ '
 (processing_mode) \ _ ' (special_compression) \ _ ' (disposition_mode) \ _ '
 (repeat_cycle_in_day) \ _ ' (count_in_repeat_cycle)

The order of the fields is mandatory.

NOTE: *If there is no relevant value within the freeformat section, the field is left out. This can lead to the allowable repetition of separator characters such as commas or underscores.*

The following table shows the fully expanded set of name fields in the correct order, with contents described. Following the main table, subsequent subsections describes the allowed values for the selected fields in greater detail.

Dataset/product Name Field	Description	Size in Characters
pflag	“W”	1
locationindicator	“XX-EUMETSAT-Darmstadt” <i>Note: This field may contain other values should products be generated in other locations.</i>	21

Dataset/product Name Field	Description	Size in Characters
datadesignator	The type of data with respect to the categories and subcategories defined in [[WMO-386], for which a list is provided in 3.4.3	7
spacecraftid	Spacecraft indicator	4
data_source	Instrument, platform or SAF	Variable (maximum 3 chars)
processing_level	Processing Level	1 or 2
type	Identifies the type of data	Variable (maximum 7 chars)
subtype	Identifies a sub-type for the type.	Variable (maximum 7 chars)
coverage	Coverage of the full repeat cycle or group accumulation interval	2
subsetting	Identification of the type of subsetting performed	Variable (maximum 5 chars)
component1	Identifies a first level component of the product	Variable (maximum 5 chars)
component2	Identifies a second level component of the product	Variable (maximum 5 chars)
component3	Identifies a third level component of the product	Variable (maximum 5 chars)
purpose	The intended purpose of the dataset. This normally refers to the intended final recipient.	Variable (maximum 3 chars)
format	The intended encoding format of the dataset. NOTE: This flag is required as file_type is not sufficient. WMO convention assigns BUFR, GRIB and GRIB2 formats the same file_type of ".bin".	Variable (maximum 5 chars)
oflag	"C"	1
originator	"EUMT"	4
yyyyMMddhhmmss	Is the UTC time of the processing, defined as the time of the creation of the dataset/product by the processor, formatted in Abbreviated Generalised Time format as specified above)	14
facility_or_tool	Facility or tool producing the dataset	Variable (maximum 5 chars)

Dataset/product Name Field	Description	Size in Characters
environment	Ground Segment Environment producing the dataset	Variable (maximum 3 chars)
start_time	UTC Time of start of Sensing Data formatted in Abbreviated Generalised Time format (see above). For L0 datasets, this will be the start time of the first source packet included in the L0 dataset.	14
end_time	UTC Time of end of Sensing Data formatted in Abbreviated Generalised Time format (see above). For L0 datasets, this will be the end time of the last source packet included in the L0 dataset.	14
processing_mode	Identification of the mode of processing	1
special_compression	This field provides identification of a special compression technique that has been applied to one or more variables in the dataset. Special compression does not include the standard netCDF data compression or “deflation” using in-built zlib support which is transparent to the user.	Variable (maximum 5 chars)
disposition_mode	Shows disposition of the dataset from the perspective of an end-user’s needs.	1
repeat_cycle_in_day	4-digit number (right-justified, zero-filled) indicating the expected current repeat cycle or group accumulation interval in the day for this particular dataset. For details on how to determine the expected repeat cycle see [EXPRC]. The counter starts at 0001 for the first repeat cycle at or after midnight (based on the time_position value – see Appendix E.2.1.3) and resets for the next repeat cycle at or after the following midnight. Datasets/products that have no repeat cycle or group accumulation interval (e.g. certain DPP files) should use a fixed value of 0000 to indicate the field is not applicable.	4

Dataset/product Name Field	Description	Size in Characters
count_in_repeat_cycle	4-digit number (right-justified, zero-filled) indicating the expected count value of the dataset chunk in the repeat cycle or group accumulation interval based on the scan pattern or equivalent information. The counter will have discontinuities when chunks are not produced. The counter starts from 1 and resets when the repeat_cycle_in_day value changes. The counter increments for each chunk in a repeat cycle or accumulation interval (whether header, body or trailer). A value of 0 is used for datasets for which the counter is not applicable (e.g. datasets which are not chunk-able).	4
file_type	Indicator of the encoding format of the data, according to WMO conventions.	Variable (maximum 5 chars)
compression	Indicator of compression applied to the dataset as a whole according to WMO conventions (as opposed to the internal compression of variable indicated by the “special_compression” name field). NOTE: The WMO conventions define a period separator `.` As part of the compression value string e.g. “.zip”	Variable (maximum 5 chars)

Table 3-1 Expanded dataset/product name fields.

3.4.2 Further Details for Specific Name Fields

3.4.2.1 Datadesignator

The following data designators shall be used in MTG datasets/products:

WMO code figure	WMO name	Data designators	Used for
003	Vertical soundings (satellite)	“SND+SAT”	IRS and UVN instruments
101	Image data (satellite)	“IMG+SAT”	FCI and LI instruments

Table 3-2 Data designators for use in MTG datasets/products

The data designator table above is subject to extension throughout the life of the MTG Programme.

3.4.2.2 SpacecraftID

Value	Meaning
MTI1	MTG-I 1
MTI2	MTG-I 2
MTI3	MTG-I 3
MTI4	MTG-I 4
MTS1	MTG-S 1
MTS2	MTG-S 2

Table 3-3 Table of settings for name field “spacecraftID”

3.4.2.3 Data_source

Value	Description
Instrument Sources	
FCI	Flexible Combined Imager
LI	Lightning Imager
UVN	Ultraviolet, Visible and Near-Infrared Sounder
IRS	Infrared Sounder
SAF Sources	
OSI	SAF on Ocean and Sea Ice
H	SAF on Hydrology
LSA	SAF on Land Surface Analysis
AC	SAF on Atmospheric Composition
Platform Sources	
SAT	Satellite

Table 3-4 Table of settings for name field “data_source”

3.4.2.4 Processing_level

Value	Description
0	Level 0
1	Level 1 (non-specific)
1A	Level 1A
1B	Level 1B
1C	Level 1C
2	Level 2

Table 3-5 Table of settings for name field “processing_level”

3.4.2.5 Type

Value	Description	Used By	Note
AEAP	Aerosol asymmetry parameter	FCI-2	Day 2
AECL	Aerosol and cloud parameters synergy (UVN, IRS, FCI)	UVN-2	Day 2
AEOD	Aerosol optical depth - Total column	FCI-2	Day 2
AER	Aerosol vertical profile of the extinction coefficient and column parameters	UVN-2	Obsolete
AERI	Aerosol refractive index	FCI-2	Day 2
AESA	Aerosol single scattering albedo	FCI-2	Day 2
AESD	Aerosol size distribution	FCI-2	Day 2
AF	LI Accumulated flashes	LI-2	
AFA	LI Accumulated flash Area	LI-2	
AFR	LI Accumulated flash radiance	LI-2	
AHP	Atmospheric Humidity profile :	IRS-2	
ALBEDO	Surface Albedo	LSA-2	
ALH	Aerosol Layer Height	UVN-2	
AMV	Atmospheric Motion Vectors	FCI-2 IRS-2	Day 1 Day 2
AOP	Atmospheric Ozone Profile:	IRS-2	
ASR	All Sky Radiances (Clear Sky Radiances)	FCI-2	
ASVC	Posterior Atmospheric State Vertical Correlation	IRS-2	

ATM	Atmospheric composition	IRS-2	Day 2
ATP	Atmospheric Temperature profile:	IRS-2	
AUI	UV Aerosol Absorbing Index	UVN-2	
BCK	LI Background Image Data	LI-1	
CAL	Calibration Data	LI-1 UVN-1 IRS-1	
CAS	Cloud Analysis Support data	UVN-2	Day 2
CHOCHO	CHOCHO (glyoxal) total column	UVN-2	Obsolete
CIS	Cloud Imager Support data	UVN-2	Obsolete
CLD	Cloud optical thickness, fraction, altitude	UVN-2	
CLM	Clear/ Cloud Flag/ Dust Flag	FCI-2	
CLOUD	Cloud optical thickness, fraction, altitude	UVN-2	Obsolete
CMS	Cloud Mask data	UVN-2	Day 2
CO	CO Total Column	IRS-2	Day 2
COTR	Tropospheric Ozone Complement	UVN-2	Obsolete
CP	Cloud Product	IRS-2	Day 2
CRM	Clear Sky Reflectance Map	FCI-2	
CT	FCI Cloud analysis- Cloud Type – Cloud Phase – Cloud height layer	FCI-2	
CTTH	FCI Cloud Analysis – Cloud top temperature and height, pressure and effective cloud amount	FCI-2	

DIA	Level 0 data from instrument diagnostic mode	General	
DLID	Downward Longwave Irradiance combined with the Solar Surface Irradiance – Daily	OSI-2	
DLIH	Downward Longwave Irradiance combined with the Solar Surface Irradiance – hourly	OSI-2	
DPP	Data Processing Parameters (warm start data).	General	
DSID	Downward Short wave Irradiance combined with the Solar Surface Irradiance – Daily	OSI-2	
DSIH	Downward Short wave Irradiance combined with the Solar Surface Irradiance – hourly	OSI-2	
FCS	Cloud algorithm support data regridded to the spatial sampling of S4 L1b Earth radiance	UVN-2	
FDY	Formaldehyde	UVN-2	
FIR	Fire Detection	FCI-2	
GII	Global Instability Indices	FCI-2	
GLY	Glyoxal	UVN-2	
GSR	Gapless Surface Reflectance Daily Map	UVN-2	
GSRDM	Gapless Surface Reflectance	UVN-2	Obsolete
H40	Precipitation rate at ground by GEO/IR supported by LEO/MW and MTG Flexible Combined Imager	H-2	

H41	Precipitation rate at ground by LEO/MW supported by GEO/IR (with flag for phase) and MTG Flexible Combined Imager	H-2	
H42	Accumulated precipitation at ground by blended MW+IR and MTG Flexible Combined Imager	H-2	
H43	Snow detection and coverage	H-2	
H50	Rainfall intensity from MTG Lightning Imager	H-2	
HCHO	HCHO (formaldehyde) total column	UVN-2	Obsolete
HKTM	Housekeeping telemetry	SAT- 0	
INST	Instrument Source Packets	General-0	
IRRAD	Irradiance	UVN-1	
LE	Lightning events	LI-1	
LEF	Lightning events (filtered)	LI-2	
LFL	Lightning flashes	LI-2	
LGR	Lightning groups	LI-2	
LST	Land Surface Temperature	LSA-2	
MCAL	FCI Moon Calibration Data	FCI-1	
META	Metadata	IRS-2	
NO2	Nitrogen Dioxide	UVN-2	
O3	Ozone		

OCA	Cloud drop effective radius – Cloud top, Cloud optical depth, Cloud sub-pixel fraction, Cloud top phase, Cloud top pressure and temperature	FCI-2	
OLR	Outgoing LW irradiance at TOA	FCI-2	
OTO	Total Ozone Column	UVN-2	Obsolete
OTR	Tropospheric Ozone	UVN-2	Obsolete
OZO	Ozone (2 layers)	IRS-2	Day 2
OZOTCT	Ozone total column, tropospheric subcolumn	UVN-2	Obsolete
OZOVP	Ozone vertical profile	UVN-2	Day 2
PAD	Processing Analysis Data (Data sent to MME_MON for monitoring and analysis purposes)	General	
PC	Reduced subset of Principal Components	IRS-1	
PCTD	Principal Component Training Data + EOF functions	IRS-1	
PFAUX	Platform Auxiliary Data	SAT- 0	
RAD	FCI L1B Radiances	FCI-1	
REDU	Reports and Dumps	SAT- 0	
RGB	Three-Channel (Red, Green, Blue) image	FCI-AFR	
RI	Data for supporting reprocessing	UVN-2	
RRAD	FCI rectified radiance	FCI-1	
SCAL	FCI Sun Calibration Data	FCI-1	
SDWE	IRS-non nominal mode L0 data (Stare and Dwell data)	IRS-0	Obsolete
SE	Surface Emissivity	FCI-2	Day 2
SO2	Sulphur Dioxide	UVN-2	

SPS	Scaled Project State	IRS-2	
SR	Surface Reflectance	UVN-2	
SRAD	Sounding Radiance	UVN-1	
SRDM	Surface Reflectance Daily Map	UVN-2	Obsolete
SRF	IRS-Spectral Response Function information	IRS-1	
SSP	Surface State Product	IRS-2	
SSS	Spectral Sounding Samples	IRS-1	
SST	Sea Surface Temperature	OSI-2	
STAR	Star data	UVN-1	
TOZ	Ozone – Total column	FCI-2	
UAI	UV Aerosol Index	UVN-2	Obsolete
VOL	Volcanic Ash	FCI-2	

Table 3-6 Table of settings for name field “type”

NOTE: Additional type values may be defined in specific format specification documents.

3.4.2.6 Subtype

Value	Description
MWIR	IRS L0 MWIR data
LWIR	IRS L0 LWIR data
FDHSI	FCI L1C FDHSI data
HRFI	FCI L1C HRFI data
No value	No value present in filename implies not relevant
	Other values may be specified at the specific format specification level. In particular for DPP and PAD files.

Table 3-7 Table of currently identified settings for name field “subtype”

NOTE: Additional subtype values may be defined in specific format specification documents.

3.4.2.7 Coverage

The coverage field indicates the coverage for the complete repeat cycle (or equivalent) product. A data chunk or data segment from a product will inherit the coverage value from the parent product.

Value	Description
FD	Full disc
Qx	'Q' means a quarter of disc (LAC zone) in which case x ::= '1' '2' '3' '4' where 1 is southernmost quarter of the earth
Ty	'T' means a third of disc in which case y ::= '1' '2' '3' where 1 is southernmost third of the earth
Hz	'H' means an half disc in which case z ::= '1' '2' where 1 is southernmost half of the earth
Zw	'Z' means any other well defined coverage in which case w ::= [0-9] [A-Z] and the meaning of the value is provided via a precise definition within the dataset/product. Some reserved codes are specified in this table. Other special coverage cases that are not included will be defined at the level of the specific format specification documents.
ZS	FCI sun calibration
ZM	FCI moon calibration
ZU	UVN nominal illuminated area coverage
ZI	IRS non-nominal mode coverage
ZD	Diagnostic Mode coverage (instrument-specific) [Obsolete. Diagnostic mode datasets have not applicable (xx) coverage].
ZC	SAF area central coverage. This corresponds to the standard SAF central area which is nominally 60°E – 60°W, 60°N – 60°S but may extend beyond this region.
ZE	SAF area Europe coverage. This corresponds to the standard SAF area for Europe which is nominally 25°W to 45°E, 25°N to 75°N.
AF	African area coverage for African RGB products
xx	Coverage information is not relevant to this dataset

Table 3-8 Table of settings for name field “coverage”

3.4.2.8 Subsetting

A subsetting dataset will normally have the same format as the original dataset but with certain groups omitted. This subsetting is achieved by a generic functionality which is unaware of the type of data associated with a group, and therefore the “subsetting” field will take the value of “GROUP”.

However, when a specialised subsetting functionality is used (such as the group subsetting of the FCI-1C-RRAD dataset for dissemination) then a specific value may be assigned to indicate a specific group subsetting.

Special subsetting should result in a dataset that has the same format as the original dataset but with the dimensions of certain arrays resized and possibly with the contents of certain variables recalculated. This requires specifically tailored tools that understand the dataset and is not expected to be possible via a generic functionality.

Value	Meaning
No value	Dataset/product has not been subsetting
Group Subsetting	
GROUP	Dataset/Product has been group subsetting e.g. one or more groups has been dropped from the dataset (see Section 6.4.6.4).
Special Subsetting	
MULTI	More than one type of subsetting has been applied. The complete list of subsetting applied is obtainable from the dataset/product.
GEO	Dataset/product has been geographically subsetting. This type of subsetting will usually be the result of a product-specific subsetting tool.
TIME	Dataset/product has been temporally subsetting. This type of subsetting will usually be the result of a product-specific subsetting tool.
CHAN	Dataset/product has been channel subsetting. This type of subsetting will usually be the result of a product-specific subsetting tool.
BAND	Dataset/product has been band subsetting. This type of subsetting will usually be the result of a product-specific subsetting tool.

Table 3-9 Table of currently identified settings for name field “subsetting”

3.4.2.9 Component1

Value	Description
CHK	Data Chunk or Data Segment
QCK	Quick-Look
No value	No value present in filename implies not relevant

Table 3-10 Table of currently identified settings for name field “component1”

NOTE: Additional component1 values may be defined in specific format specification documents.

3.4.2.10 Component2

Value	Description
BODY	Body data chunk
TRAIL	Trailer data chunk
HEAD	Header data chunk
IMAGE	Quick-look image
No value	No value present in filename implies not relevant
	Other values may be specified at the specific format specification level.

Table 3-11 Table of currently identified settings for name field “component2”

NOTE: Additional component2 values may be defined in specific format specification documents.

3.4.2.11 Component3

Value	Description
No value	No value present in filename implies not relevant
	Other values may be specified at the specific format specification level. These will normally be an indicator of the data selected to construct a particular quick-look.

Table 3-12 Table of currently identified settings for name field “component3”

NOTE: Additional component3 values may be defined in specific format specification documents.

3.4.2.12 Purpose

Value	Description
No value	No value present in filename implies not relevant
DIS	Dissemination
L2P	Level 2 Processing
ARC	Archive

MON	Monitoring. In general, all files may be sent to MME_MON. Files marked MON are only sent to MME_MON e.g. PAD files.
-----	---

Table 3-13 Table of settings for name field “purpose”

3.4.2.13 Format

Value	Description
NC3	netCDF-3 classic model
NC4	netCDF-4 classic model
NC4E	netCDF-4 enhanced model
GRIB2	GRIB2
GRIB	GRIB
BUFR	BUFR
CAP	CAP
JPG	Jpeg image
PNG	PNG image
XML	XML
HDF5	HDF-5
TXT	ASCII Text file
PKT	CCSDS Telemetry Packets
FBIN	Fixed Binary index file for L0
ATF	Annotated Transfer Frames

Table 3-14 Table of currently identified settings for name field “format”

3.4.2.14 Facility_or_tool

NOTE: IQT and PDG datasets may not follow the WMO naming convention. However, values are given for these tools as they may be required to set the root attributes of netCDF datasets and products (see Section 3.4.5)

Value	Meaning
GTT	Generic Test Tool
IDPFI	IDPF-I – L0/L1 Instrument Data Processing Facility for MTG-I
IDPFS	IDPF-S – L0/L1 Instrument Data Processing Facility for MTG-S
IQTI	Instrument Quality Tool for MTG-I
IQTS	Instrument Quality Tool for MTG-S
IQTS4	Instrument Quality Tool for UVN Sentinel 4
L2PF	Level 2 Data Processing Facility
PDGI	Payload Data Generator for MTG-I
PDGS	Payload Data Generator for MTG-S

SAF	Satellite Application Facility
UVSIM	UVN Simulator

Table 3-15 Table of settings for name field “facility_or_tool”

3.4.2.15 Environment

Value	Meaning
OPE	Operational environment
VAL	Validation environment
IV	Integration and Verification environment
DEV	Development environment
REP	Reprocessing environment

Table 3-16 Table of settings for name field “environment”

NOTE: For product output from the IQT that follows the WMO-Naming convention defined in this document, the environment field in the output product name should be copied from the environment field in the input product name. For example, Level 1 products produced by the IQT from Level 0 data provided by the OPE IDPF shall have the environment field set to OPE whereas the same product produced by the IQT from Level 0 data provided by the VAL IDPF shall have the environment field set to VAL.

3.4.2.16 Processing_mode

The ‘mode’ of processing is related to its degree of temporal currency, as follows:

Value	Meaning
N	Nominal (Real-Time or Near-Real-Time) processing
F	Fast processing (running faster than real time on data collected earlier)
R	Reprocessing (running faster than real time on a large amount – which is likely to be several years - of data collected earlier)
V	Validation (Not used by MTG programme).
B	Backlog processing (Not used by MTG programme).

Table 3-17 Table of settings for name field “processing_mode”

3.4.2.17 Special_compression

NOTE: Standard compression supported natively and transparently by a data format will not be indicated. For example, zip compression of individual variables is supported by the netCDF-4 libraries and if used to reduce the size of a variable, it will not be indicated in the special_compression field.

Value	Meaning
No value	No special compression
MULTI	More than one type of internal compression has been applied. The complete list of compressions applied is obtainable from the dataset/product.
JLS	JPEG-LS. Lossless JPEG compression has been applied internally.
Others	Other necessary values may also be specified in the relevant specific format specification document.

Table 3-18 Table of currently identified settings for name field “special_compression”

3.4.2.18 Disposition_mode

The ‘mode’ of disposition is related to the suitability of use of the data by end-user. This “suitability of use” also indicates the intended recipients of the data.

Value	Meaning
T	Testing Data produced from a system with one or more components undergoing testing. Not disseminated to end users.
C	Commissioning Data produced from a system with one or more components undergoing commissioning. Disseminated to end users involved with commissioning activities.
O	O = Operational Data produced from a system where all components have been pronounced operational. Disseminated to all end users.
X	X = Not applicable Status of system is not relevant. This might be the case for pre-launch TVAC data or test data. Not disseminated to end users.

Table 3-19 Table of settings for name field “disposition_mode”

3.4.2.19 File_type

[WMO-386] specifies a list of file_type values (under the name “type”) for the subset of WMO-identified datasets that are allowed on the GTS/RMDCN distribution networks. The MTG naming convention covers a wider range of dataset types and so the WMO list has been extended to cover these. The table below lists only those file_type values that are expected to be used in the MTG programme and whether they are defined in the WMO convention or whether they are an MTG-programme extension.

NOTE: The file_type name field should evolve with the evolution of [WMO-386].

Value	Description	Source
jpg	JPEG file	[WMO-386]
png	PNG file	[WMO-386]
txt	ASCII text file	[WMO-386]
bin	A file containing data encoded in a WMO binary code form such as GRIB or BUFR. Or a file containing binary data such as L0 datasets.	[WMO-386] MTG extension
nc	NetCDF file	[WMO-386]
xml	XML file	MTG extension
tar	TAR file	MTG extension

Table 3-20 Table of settings for name field “file_type”

3.4.2.20 Compression

Allowed values for the field “compression” are specified in [WMO-306]

3.4.3 Format Template Specifiers and Modifiers

Normally, a standard format template is specified for a given MTG dataset or product which can then be modified to fit requirements. For instance, a standard template for an FCI-1C-RRAD body data chunk is defined, but this can be modified by changing the duration of the chunk (to accommodate different-sized chunks and segments), or by removing certain groups to provide channel sub-setting for dissemination, etc.

The following table shows the fields that define the standard format template and the fields that may modify this template to fit the requirements of the final product.

Field	Usage	Usage
data_source	Format template specifiers	All fields together define a specific product format template.
type		
subtype		
component1		
component2		
format		
start_time and end_time	Format template modifiers	Defines the duration of a given dataset e.g. allows different-sized data chunks for processing and dissemination purposes (segments). Effectively varies the size of specific arrays in the format template.

Field	Usage	Usage
coverage		May vary the size of specific arrays in the format template.
subsetting		In general, allows selected groups to be omitted from the format template. In specific cases, also varies the size of specific arrays within the template format.
special_compression	Warning	Indicates that certain contents are compressed using a special compression algorithm requiring a given decompressor be available. This does not modify the format structure and should be invisible to end users who have the decompressor installed.

Table 3-21 Format template specifiers and modifiers

3.4.4 Identifiers

Identifiers are used to link Interface Control Document (ICD) to Format Specification (FS) documents. A particular Application Data Unit (ADU) is identified in an ICD with a unique ADU ID. The ADU will have a format specification indicated by the Format ID which can be found in the relevant format specification document and is used to indicate the specific format used for that ADU.

NOTE: For legibility, where the dataset name field has no value, this is represented in the identifier as a lower case “x”. An exception is made for the case of the trailing “subsetting” field in the product ID. When this field has no value, the underscore and field itself are dropped completely. This is indicated by parentheses and italics in the table below.

Identifier	Usage	Component Fields	Example
Product Family	Identifies a convenient high-level relationship between a group of datasets.	<DATA_SOURCE>- <PROCESSING_LEVEL>-<TYPE>	FCI-1C-RRAD
Product ID	Indicates a particular member of the product family	<DATA_SOURCE>- <PROCESSING_LEVEL>-<TYPE>- <SUBTYPE>-<COVERAGE>(- <SUBSETTING>)	FCI-1C-RRAD-FDHSI-FD
Format ID	Identifies the format description applicable to a particular type of ADU	<DATA_SOURCE>- <PROCESSING_LEVEL>-<TYPE>- <SUBTYPE>-<COMPONENT1>- <COMPONENT2>-<FORMAT>	FCI-1C-RRAD-FDHSI-CHK-BODY-NC4E

Identifier	Usage	Component Fields	Example
ADU ID	Creates a unique identifier for each ADU	<DATA_SOURCE>- <PROCESSING_LEVEL>-<TYPE>- <SUBTYPE>-<COVERAGE>- <SUBSETTING>-<COMPONENT1>- <COMPONENT2>- <COMPONENT3>-<PURPOSE>- <FORMAT>	FCI-1C-RRAD-FDHSI-FD-x- CHK-BODY-x-L2P-NC4E

Table 3-22 Table of Identifiers between ICDs and FSs. Italicised fields in parentheses are suppressed when they have no value.

3.4.5 Dataset Name Fields and Root Attributes

NetCDF datasets and products that follow the specifications in the GFS will share a set of common global attributes at the root level. Many of these attributes are copies of the information in the dataset name and the attribute will have the same name as the dataset name field. This is detailed in Appendix E.

3.4.6 WMO Convention Dataset Filename Breakdown and Example

	FILE NAME																												
	DATASET NAME																												
	pflag	-	productidentifier																										
			locationindicator	,	datasignator	,	freedescription																						
							spacecraft	+	data_source	-	processing_level	-	type	-	subtype	-	coverage	-	subsetting	-	component1	-	component2	-	component3	-	purpose	-	format
		W	-	XX-EUMETSAT-Darmstadt	,	IMG+SAT	,	MT11	+	FCI	-	1C	-	RRAD	-	FDHSI	-	FD	-		-	CHK	-	BODY	-		-	L2P	-
Product ID									1		2		3		4		5		6										
Format ID									1		2		3		4						5		6						7
ADU ID									1		2		3		4		5		6		7		8		9		10		11

																							.	fil e_ ty pe	co mpr essi on	
–	ofl ag	–	origi nator	–	yyyyMMdd hhmmss	–	freefor mat																			
							facility_ or_tool	–	enviro nment	–	start_tim e	–	end_tim e	–	processin g_mode	–	special_co mpression	–	dispositio n_mode	–	repeat_cyc le_in_day	–	count_i n_repe at_cycl e			
–	C	–	EUM T	–	201801011 21212	–	IDPFI	–	OPE	–	2018010 1103000	–	2018010 1103020	–	N	–		–	C	–	0034	–	0002	.	nc	.zip

Table 3-23 Breakdown of dataset/product name components with an example name. Yellow, green and orange cells indicate where the components of the Product ID, Format ID and ADU ID occur in the filename. Numbers in these cells indicate order the fields appear in the relevant ID.

NOTE: The table is split into two sections in order to fit on the page.

3.4.7 Non-WMO Naming Convention for Datasets

The files transferred between MTG GS Facilities which don't have to comply with the WMO convention will have a filename according to the following bespoke convention in [NAMING]:

`<filename> ::= <source facility> “_” <source environment> “_” <product name> “_” <free description> “_” <yyyyMMddhhmmss> “_” <free format> <format>`

where:

`<source facility>` is the facility creating the file

`<source environment>` is the environment where the file was created in the source facility

`<product name>` identifies the “product” contained in the file, e.g. FD data

`<free description>` typically contains information on the satellite and the instrument (if applicable) the data in the file is related to.

`<yyyyMMddhhmmss>` is the UTC date and time of file creation by the source facility

`<free format>` is extra information to be included in the filename depending on the product e.g. validity time range of FD data files.

`<format>` is the file extension (referred to as `<type>` in [NAMING])

Values for the above fields are specified as required in the relevant sections of this document or the relevant reference documents.

3.4.8 Naming Convention for External Datasets

Files that are not produced in the MTG Ground Segment but are sourced externally may follow their own file naming conventions that will be described as required within this or other format specification documents.

4 ENCAPSULATION FORMATS

4.1 Encapsulation

In the MTG system, encapsulation involves grouping one or more data objects within a tar file. The data objects may be retrieved unchanged and with their original filenames.

There are three encapsulation formats associated with the Open Archival Information System (OAIS) [CCSDS-OAIS].

- **Submission Information Package (SIP)** - the information sent from the producer to the archive
- **Archive Information Package (AIP)** - the information stored by the archive
- **Dissemination Information Package (DIP)** - the information sent to a user when requested

Data submitted to the MME_DAC will utilise MTG-SIP encapsulation. The same encapsulation may be used for data sent to MME_MON.

4.2 MTG-SIP Encapsulation

An MTG-SIP is a tar file containing:

- Manifest file
- One or more Data Objects

The manifest file is an XML file that contains information about the contents such as metadata required by the archive catalogue, discovery and quality metadata about the included datasets, links to associated files, etc. The manifest file will have generic data archive metadata, as well as programme-specific MTG metadata and instrument/level-specific metadata. It is always identified with the filename “mtg_manifest.xml” so that it may be easily recognised by the recipient of the MTG-SIP. Details of the manifest file are given in Appendix B..

The MTG-SIP filename follows the generic SIP naming convention as defined in section 4.3.

4.3 Sip Naming Convention

4.3.1 Single Data Object

If the SIP contains a single data object, then the SIP filename should be the data object filename with the file_type suffix replaced by “.tar”. This applies for all naming conventions.

4.3.2 Multiple Data Objects

If the SIP contains a group of WMO-named datasets which are all components of the same dataset e.g. the header, trailer and data chunks of a L1 dataset, then the SIP filename should follow the template of the dataset names but:

- the START_TIME and END_TIME fields should be set to the earliest start time and latest end time of the set of component datasets
- the CREATION_TIME should be set to the time of the creation of the SIP
- any non-time fields where the components have differing values should be replaced with the value 'x'. In the example, the COMPONENT field would be set to a lower-case 'x'. In the case of a set of quick-looks in a single SIP, the SUBSETTING and COMPRESSION fields may also need to be set to lower-case 'x'.
- The count_in_repeat_cycle field should be set to 0000 for a SIP containing more than one chunk
- the file_type suffix should be set to ".tar"

It is not currently foreseen in the MTG programme to have other configurations of data objects within an MTG-SIP (e.g. no multiple non-WMO named data objects, nor mixed WMO-named data objects, nor a mixture of WMO and non-WMO named objects). If this assumption proves false, the naming conventions for SIPs will need to be extended.

4.4 AIP Encapsulation

The AIP is internal to the data archive and is not described here.

4.5 DIP Encapsulation

The DIP format and naming convention are expected to follow a similar format to the SIP described in [ELTA-SIP].

The DIP Encapsulation is described in [IDPF-I::MME_DAC ICD].

It is expected that after removal of any encapsulation and absent of any user-required subsetting selections, the user will be presented with the same data objects originally submitted to the archive within the [ELTA-SIP] encapsulation.

5 GENERIC LEVEL 0 DATASETS

5.1 ICD Reference Table

The following product families are covered by this Section:

Product Family	Product ID	Additional Reference	Format ID
SAT-0-HKTM	SAT-0-HKTM-x-xx		SAT-0-HKTM-x-CBK-BODY-PKT
SAT-0-REDU	SAT-0-REDU-x-xx		SAT-0-REDU-x-CBK-BODY-PKT
SAT-0-PFAUX	SAT-0-PFAUX-x-xx		SAT-0-PFAUX-x-CBK-BODY-PKT
LI-0-INST	LI-0-INST-x-FD	[LIL1FS] for packet structure references	LI-0-INST-x-CBK-BODY-PKT
LI-0-DIA	LI-0-DIA-x-xx		LI-0-DIA-x-CBK-BODY-PKT
FCI-0-INST	FCI-0-INST-x-FD	[FCIL1FS] for packet structure references	FCI-0-INST-x-CBK-BODY-PKT
	FCI-0-INST-x-Qn	[FCIL1FS] for packet structure references	
	FCI-0-INST-x-Tn	[FCIL1FS] for packet structure references	
	FCI-0-INST-x-Hn	[FCIL1FS] for packet structure references	
FCI-0-DIA	FCI-0-DIA-x-xx		FCI-0-DIA-x-CBK-BODY-PKT
UVN-0-INST	UVN-0-INST-x-ZU	[UVNL1FS] for packet structure references	UVN-0-INST-x-CBK-BODY-PKT
UVN-0-DIA	UVN-0-DIA-x-xx		UVN-0-DIA-x-CBK-BODY-PKT
IRS-0-INST	IRS-0-INST-LWIR-Qn	[IRSL1FS] for packet structure references	IRS-0-INST-LWIR-CBK-BODY-PKT
	IRS-0-INST-MWIR-Qn	[IRSL1FS] for packet structure references	IRS-0-INST-MWIR-CBK-BODY-PKT
IRS-0-DIA	IRS-0-DIA-LWIR-Qn		IRS-0-DIA-LWIR-CBK-BODY-PKT
	IRS-0-DIA-MWIR-Qn		IRS-0-DIA-MWIR-CBK-BODY-PKT

Table 5-1 Level 0 Dataset Product ID Reference Table. Additional references indicate documents with further details.

5.2 Level 0 Datasets

A Level 0 dataset is a chronological sequential concatenation of telemetered source packets from a single virtual channel.

Incomplete source packets and source packets that fail the CRC error check are not passed to Level 1 processing and are not included in Level 0 datasets.

The allocation of source packets to each virtual channel is given in Table 5-2. Level 0 datasets are not possible for virtual channel VC6 (unused) or required for virtual channel

VC7 (idle). These Level 0 datasets are also referred to as source packet datasets in this document.

Virtual Channel	TM Band	SMU TM Packets	
		MTG-I	MTG-S
VC0	S and Ka band	• Essential HK telemetry TM(3,25), • Normal Diagnostic TM(3,26), • Event reports TM(5,x), • TC acceptance and execution reports TM(1,x) • Time reports TM(9,2)	
VC1	S and Ka band	• High-Rate Diagnostic TM • Dump reports (i.e. all SMU TM that is not included in VC0 and VC2).	
VC2	Ka band	• SMU INR auxiliary reports	
VC3	Ka band	LI mission and auxiliary data	UVN mission and auxiliary data
VC4	Ka band	FCI mission and auxiliary data	IRS LWIR mission and auxiliary data
VC5	Ka band	DCP mission and auxiliary data	IRS MWIR mission and auxiliary data
VC6	None	Unused	
VC7	Ka band	Idle frame	

Table 5-2 Allocation of source packets to virtual channels

The source packets are kept in their original format to minimise risk of degradation resulting in Level 0 files that are simply a concatenation of source packets in their original binary representation. The packets are not encapsulated within a netCDF or other format. This means the file presented to the Level 0 processor is binarily identical to the equivalent virtual channel packet stream.

To aid reprocessing and cataloguing of the raw source packet file a similary named binary file (except with then “format” name field set to “FBIN” instead of “PKT”) is also included in any L0 SIP that is sent to MME-DAC and MME-MON. This FBIN file contains packet offset indexes and metadata used by the IDPF.

The virtual channels will result in Level 0 datasets with the following product IDs.

Virtual Channel	Product IDs	
	MTG-I	MTG-S
VC0	SAT-0-HKTM-x-xx	SAT-0-HKTM-x-xx
VC1	SAT-0-REDU-x-xx	SAT-0-REDU-x-xx

VC2	SAT-0-PFAUX-x-xx	SAT-0-PFAUX-x-xx
VC3	LI-0-INST-x-FD LI-0-DIA-x-xx	UVN-0-INST-x-ZU UVN-0-DIA-x-xx
VC4	FCI-0-INST-x-FD FCI-0-INST-x-Qn FCI-0-INST-x-Tn FCI-0-INST-x-Hn FCI-0-DIA-x-xx	IRS-0-INST-LWIR-Qn IRS-0-DIA-LWIR-Qn
VC5	-	IRS-0-INST-MWIR-Qn IRS-0-DIA-MWIR-Q

Table 5-3 Allocation of product IDs to virtual channels

5.3 Naming Convention

The L0 dataset will follow the WMO compliant naming convention described in Section 3.4 with the following specific settings:

5.3.1 Start_time and end_time

The value of the start_time and end_time fields in the dataset name reflect respectively the earliest and latest packet OBT (correlated to UTC) of the contained source packets.

5.4 Level 0+ Datasets

Earlier editions of this document described a physical L0+ dataset to be sent to MME_DAC which contained not only the instrument L0 dataset(s) but also all other L0 datasets and any auxiliary data files required to process the instrument L0 dataset at level 1.

This has been replaced by the concept of a virtual L0+ dataset, whereby the instrument L0 dataset and any other necessary L0 datasets and auxiliary files are associated within the archive (a virtual L0+ dataset) and thus may be retrieved as a set. This is achieved by the use of grouping tags and dataset association within the manifest file of the instrument L0 dataset.

5.4.1 Auxiliary Datasets for L0 Processing

5.4.1.1 MOF Datasets

The following datastreams are identified from MOF to IDPF and may be required to create a given virtual L0+ dataset.

Datastream Name	Description	Format	Frequency	Number of associations to Instrument L0 dataset
iOrbitParametersOPM	The datastream consists of an OPM file in accordance with CCSDS-502 [CCSDS-ODM] including the spacecraft orbital position and velocity and date and time range of validity together with the manoeuvre information: DeltaV, start and end time of manoeuvre. The reference frame for the orbit is the True of Date Frame.. The file contains pre-manoevure data.	XML	Once per day	1
iOrbitParametersOEM	The datastream consists of an OEM file in accordance with CCSDS-502 [CCSDS-ODM] which includes the spacecraft orbital position and velocity at multiple epochs contained within a specified time range. The file contains a determined orbit.	XML	Once per day	1
iProcessedRange	The datastream consists of a processed range measurements file in accordance with CCSDS-503 [CCSDS-TPM] including: - the two way range corrected from troposphere, ionosphere, tidal, ground station delay as from on ground station calibration, on-board transponder calibration; - date and time range of validity.	XML	Minimum 3 hours during sequential S-Band ranging using 2 TTC ground stations with periodic station swap. A higher frequency in other scenarios.	1
iCelestialBodiesEphemeris	The datastream consists of an OEM file in accordance with CCSDS-502 [CCSDS-ODM] including: - celestial bodies (sun, moon, stars) ephemeris; - date and time range of validity.	XML	The file in each instance of this datastream will be transferred regularly with a nominal frequency of once per day, although this value shall remain configurable.	1 file per Sun, Moon or Star

Datastream Name	Description	Format	Frequency	Number of associations to Instrument L0 dataset
iGeometricEvents	The datastream consists of a file with the following predicted geometric events related to a single satellite: • Earth and Moon eclipse (umbra and penumbra) • Equator crossing times (ascending node time, descending node time) • Apogee / Perigee times • Ground stations AOS/LOS times (acquisition, relocation and disposal phases) • Co-linearity between ground-station and two satellites (collocated satellites) • GS-Satellite-Sun co-linearity • Sun/Moon enter and exit of sensors FoV • Sensors (e.g. earth sensor) interference • Sensors (e.g. earth sensor) FoV penetration (collocated satellite in Sensor FoV)	XML	Configurable but nominally once per day.	1
iOBT/UTC	The datastream consists of a file containing OBT/UTC time correlation coefficients for any satellite.	XML	The file in each instance of this datastream will be transferred asynchronously, the maximum frequency of the transfer being the frequency of reception of the time packet from the satellite by the MOF	1
iInstrSchedule	This datastream describes the instrument schedule information.	XML	1 file per satellite and instrument to be transferred intermittently, nominally once a week.	1

Table 5-4 Datastreams from MOF to IDPF

The data stream files will be named according to the MTG convention for non-WMO compliant names:

<source facility> “_” <source environment> “_” <product name> “_” <free description> “_”
 <yyyyMMddhhmmss> “_” <free format> <type>

The free_description and free_format fields may be defined differently for each type of MOF file. The breakdown of the naming convention for each MOF file is given in Table 5-6.

5.4.1.2 External Feedback Calibration Dataset

The External Feedback Calibration Dataset consists of one file per satellite and instrument and is expected once or twice per day from the MME Monitoring facility via the iCalFeedback_for_IDPF-I datastream [IDPF-I::MME_MON ICD] or iCalFeedback_for_IDPF-S datastream [IDPF-S::MME_MON ICD]

The file will be named according to the WMO conventions but will not follow the MTG tailoring of the conventions described in this document. Instead, it will be named according to the conventions described in [GSICS].

5.4.2 Auxiliary Datasets from IDPF Processing

5.4.2.1 MOF Datasets

The following datastreams are identified from IDPF to MOF

Datastream Name	Description	Format	Frequency
iRefinedOrbitParameters	The datastream consists of an OEM file in accordance with CCSDS-502 ([CCSDS-ODM]) which includes the spacecraft orbital position and velocity at multiple epochs contained within a specified time range.	XML	Once per day

Table 5-5 Datastreams from IDPF to MOF

5.4.3 Naming Conventions for Auxiliary Datasets

	<source facility>	–	<source environment>	–	<product name>	–	<free description>	–	<yyyyMMddhhmmss>	–	free format	<type>	Example Name
iOrbitParametersOPM							<spacecraft>				<UTC epoch of state vector>		
Examples	MOF	–	OPE	–	OPM	–	MTI1	–	yyyyMMddhhmmss	–	yyyyMMddhhmmss	.xml	MOF_OPE_OPM_MTI1_yyy yMMddhhmmss_yyyyMMd dhmmss.xml
iOBT/UTC							<spacecraft>				<UTC validity start time of the coefficients in the file >		
Examples	MOF	–	OPE	–	OBTUTC	–	MTI1	–	yyyyMMddhhmmss	–	yyyyMMddhhmmss	.xml	MOF_OPE_OBTUTC_MTI1_ yyyyMMddhhmmss_yyyyM Mddhhmmss.xml
iOrbitParametersOEM							<spacecraft>				<UTC start time of time span covered by ephemeris data in file>_ <UTC end time of time span covered by ephemeris data in file>		
Examples	MOF	–	OPE	–	OEM	–	MTI1	–	yyyyMMddhhmmss	–	yyyyMMddhhmmss_ yyyyMMddhhmmss	.xml	MOF_OPE_OEM_MTI1_yyy yMMddhhmmss_yyyyMMd dhmmss_yyyyMMddhmm mss.xml
iCelestialBodiesEphemeris							<celestial body>				<UTC start time of time span covered by ephemeris data in file>_ <UTC end time of time span covered by ephemeris data in file>		
Examples	MOF	–	OPE	–	OEM	–	SUN	–	yyyyMMddhhmmss	–	yyyyMMddhhmmss_ yyyyMMddhhmmss	.xml	MOF_OPE_OEM_SUN_yyy yMMddhhmmss_yyyyMMd dhmmss_yyyyMMddhmm ss.xml
iRefinedOrbitParameters							<spacecraft>				<UTC start time of time span covered by ephemeris data in file>_ <UTC end time of time span covered by ephemeris data in file>_ <UTC epoch of state vector>		

	<source facility>	–	<source environment>	–	<product name>	–	<free description>	–	<yyyyMMddhhmmss>	–	free format	<type>	Example Name
Examples	IDPF-I	–	OPE	–	OEM	–	MTI1	–	yyyyMMddhhmmss	–	yyyyMMddhhmmss_ yyyyMMddhhmmss_ yyyyMMddhhmmss	.xml	IDPF- I_OPE_OEM_MTI1_yyyyM Mddhhmmss_yyyyMMddh hmmss_yyyyMMddhhmms s.xml
iProcessedRange							<spacecraft>				<UTC start time of time span covered by tracking data in file>_ <UTC end time of time span covered by tracking data in file>		
Examples	MOF	–	OPE	–	TDM	–	MTI1	–	yyyyMMddhhmmss	–	yyyyMMddhhmmss_ yyyyMMddhhmmss	.xml	MOF_OPE_TDM_MTI1_yyy yMMddhhmmss_yyyyMMd dhmmss_yyyyMMddh mss.xml
iGeometricEvents							<spacecraft>				<UTC start time of time span covered by events in file>_ <UTC end time of time span covered by events in file>		
Examples	–	–	OPE	–	GEOEV	–	MTI1	–	yyyyMMddhhmmss	–	yyyyMMddhhmmss_ yyyyMMddhhmmss	.xml	MOF_OPE_GEOEV_MTI1_y yyyMMddhhmmss_yyyyM Mddhhmmss_yyyyMMddh hmmss.xml
iInstrSchedule							<spacecraft> + <instrument>				<UTC start time of time span covered by schedule data in file>_ <UTC end time of time span covered by schedule data in file>		
Examples	MOF	–	OPE	–	INSSCH	–	MTI1+FCI	–	yyyyMMddhhmmss	–	yyyyMMddhhmmss_ yyyyMMddhhmmss	.xml	MOF_OPE_INSSCH_MTI1+F CI_yyyyMMddhhmmss_yyy yMMddhhmmss_yyyyMMd dhmmss.xml

Table 5-6 Auxiliary File Naming Convention – Example values are shown for illustrative purposes only.

6 NETCDF-4 FORMAT CONVENTIONS

6.1 Guiding Principles

Most Level 1 and Level 2 MTG datasets/products are formatted as netCDF-4 and use HDF-5 as the storage layer.

As noted in [NCUG], netCDF-4 provides an abstraction – the Data Model – that

“...supports a view of data as a collection of self-describing, portable objects that can be accessed through a simple interface. Array values may be accessed directly, without knowing details of how the data are stored. Auxiliary information about the data, such as what units are used, may be stored with the data. Generic utilities and application programs can access netCDF datasets and transform, combine, analyze, or display specified fields of the data.”

Specifications constraining aspects of the Data Models common to all MTG netCDF-4-datasets/products follow in the sections below.

This document does not address the physical file structure of the HDF-5 storage layer underlying the netCDF-4 data model.

NetCDF-4-formatted MTG datasets/products should where practicable conform to the [CF] convention extended where appropriate to satellite data, and should where practicable conform to at least the “Highly Recommended” aspects of the [ACDD].

6.2 The NetCDF-4 Data Model

The netCDF-4 Data Model [NCUG] supports dimensions, variables, and attributes. In addition, it supports named groups of dimensions, variables, and attributes, as well as user-defined types. Groups can be nested hierarchically. The netCDF-4 dataset/product itself constitutes the ‘root’ group.

Dimensions are used to define array variables that are used to store the bulk of the data in a netCDF-4 dataset/product. Dimensions declared at the level of a particular group are visible within all the groups nested in it.

Variables have a name, a ‘shape’ – a rank defined by their dimensions –, and a data type. They can be composed of one of several different predefined or user defined data types. Predefined types include – but are not limited to – byte, int, short, unsigned 64-bit int, string, etc. User-defined types include arrays of variable-length arrays, opaque Binary Large Objects (BLObs) of bytes, or compound types (analogous to C structs). (No matter where a type is defined in a netCDF-4 file, its definition is visible throughout it.)

Attributes store information about variables. Every attribute has an associated variable or group. (Global attributes are considered attached to the root group.) Every attribute has a name, a value, a data type, and a length. Attributes are dynamic and weakly typed: they can be declared with one value, data type, and length, and then have these changed later.

Groups are used to organise large amounts of data. Groups also define namespaces; this means that within a group, all the variables, types, and sub-groups must have unique names. In addition, groups define the scope of a dimension: as noted above, a dimension declared in one group is visible within all the sub-groups below it.

The data in a netCDF-4-formatted MTG dataset/product are arranged in nested groups, as set out in the following sections.

6.3 NetCDF-4 Conventions and Best Practises

The MTG netCDF-4 datasets/products should where practicable follow the conventions specified in the global attributes Conventions and Metadata_conventions fields.

In general, the Conventions will be a specified version of “The Climate and Forecast (CF) Metadata Conventions” [CF] and the Metadata_conventions will be “The NetCDF Attribute Convention for Dataset Discovery” [ACDD].

6.3.1 Naming Conventions for Variables, Groups, Dimensions and Attributes

The convention for the standard names used in [CF] is:

Standard names consist of lower-letters, digits and underscores, and begin with a letter. Upper case is not used.

This convention is also widely used as a netCDF naming convention for non-standard names, and should be adopted for the MTG netCDF-4 datasets/products.

6.3.2 Atomic Data Types

The following netCDF-4 data types are available in the netCDF data model:

netCDF-4 Data Type	Description
NC_BYTE	signed 1 byte integer
NC_UBYTE	unsigned 1 byte integer
NC_CHAR	ISO/ASCII character
NC_STRING	string
NC_SHORT	signed 2 byte integer
NC_USHORT	unsigned 2 byte integer
NC_INT	signed 4 byte integer
NC_UINT	unsigned 4 byte integer
NC_INT64	signed 8 byte integer
NC_UINT64	unsigned 8 byte integer

netCDF-4 Data Type	Description
NC_FLOAT	single precision floating point number
NC_DOUBLE	double precision floating point number

Table 6-1 List of netCDF-4 atomic data types

The netCDF libraries are responsible for translating the netCDF-4 data model types (also called external types) into the native types of the target machine.

6.3.3 User-Defined Data Types

The following netCDF-4 data types are available in the netCDF data model:

netCDF-4 Data Type	Description
NC_ENUM	An array of (integer, string) pairs. The stored integer may be interpreted as the corresponding string value.
NC_VLEN	Variable length array of a given atomic or user-defined data type. The integer may be one of NC_BYTE, NC_UBYTE, NC_SHORT, NC_USHORT, NC_INT, NC_UINT, NC_INT64, NC_UINT64
NC_OPAQUE	A collection objects of a known size. Nothing is known to netCDF about the contents of these blobs of data, except their size in bytes, and the name of the type.
NC_COMPOUND	A user-defined collection of one or more atomic or user-defined types (similar to a C structure).

Table 6-2 List of netCDF-4 user-defined data types

6.3.3.1 Common User-Defined Compound Data Types

The netCDF-4 enhanced data model allows the definition of user-defined compound data types.

Currently, there are no compound data types that are common to all datasets/products.

6.3.3.2 Notation Convention

There is no standard convention for naming user type definitions in CDL or nCML description code. However, CDL code at least prohibits using the same name for the definition or a user type and the instance of a variable. Examples of code on the netCDF homepage use a postfix of underscore and lower case t for such definitions e.g.:

```
byte enum cloud_type_t {Clear = 0, Cumulonimbus = 1, Stratus = 2, Missing = 127} ;  
  
cloud_type_t cloud_type ;
```

Where `cloud_type_t` is the name of the user_defined type and `cloud_type` is the name of the variable instance.

6.3.4 Time in an MTG NetCDF-4 Dataset/Product

Time may be encoded as either

- A character string
- A real data type
- An integer data type.

Unless otherwise specified, or required to meet operational needs, time *should* be encoded as a real data type (see section 6.3.4.2)

6.3.4.1 Time as a Character String Data Type

When time is encoded as a character string in a netCDF-4 product it shall be encoded in an NC_STRING data type in Abbreviated Generalised Time format (Section 3.3).

Note: This allows for a precision of one second.

6.3.4.2 Time as an Real Data Type

Rationale

Encoding time as a character string allows only limited precision and is not memory-efficient.

When time is encoded as a real or integer data type in an MTG netCDF-4 dataset/product, it should be encoded as a numeric value or an array of numeric values with associated attributes that specify the units and reference epoch and, optionally, the precision at which the data is stored.

The CDL examples in this section use normal font to indicate that an attribute is specified in the [CF] conventions. **Bold font** indicates that an attribute is non-CF i.e. not specified in the [CF] conventions and *italic font* indicates that an attribute is optional. ***Bold-italic font*** indicates an attribute is both non-[CF] and optional.

Specification of time encoding using real data type

When time is encoded as a real data type an MTG netCDF-4 dataset/product, it shall be by default the UTC time encoded as an NC_DOUBLE data type following the CF conventions for a time coordinate. The units attribute will have a default value of “seconds since 2000-1-1 00:00:00.0” unless a different unit or epoch time are required for reasons of enhanced precision or precision over a longer time period.

NOTE: The conventions in [CF] are not particularly well-defined for time variables (as is attested to by the number of lengthy discussions on this subject on the related mailing group). In line with current prevailing opinion on how best to interpret the conventions, the time system for the value encoded is by default UTC time which includes leap seconds.

This default encoding is shown in the CDL example below:

```
dimensions:  
    time = 100;  
  
variables:  
    double time (time);  
        time:standard_name = "time";  
        time:long_name = "Time of observation"  
        time:units = "seconds since 2000-01-01 00:00:00.0";
```

This example shows an array of 100 times, stored in an array of NC_DOUBLE data types. The times are stored as seconds since an epoch of midnight on January 1st 2000

In addition, non-[CF] attributes can be attached to the variable.

precision

The precision attribute is specified as a numerical value in the same units given in the units attribute. The precision attribute is optional and only required if knowledge of the precision is important.

Example:

```
time:units = "seconds since 2000-01-01 00:00:00.0";  
time:precision = "0.001";
```

would specify a precision of 0.001 seconds or 1 millisecond.

time_standard

By default, the time coordinate contains encoded UTC times. If there is a need to encode times in a different time standard or to state that the time is UTC, then the time_standard attribute may be used:

Example:

```
time:units = "seconds since 2000-01-01 00:00:00.0";  
time:time_standard = "UT1";
```

would specify that the encoded times are UT1 times.

Codes for the time_standard attribute are:

UTC	Coordinated Universal Time is an atomic time scale designed to approximate Universal Time. UTC differs from TAI by an integral number of seconds and is kept to within 0.9 seconds of UT1 by the introduction of leap seconds.
UT1	Universal Time (UT) is mean solar time at 0° longitude. It is irregular due to variations in the Earth's rotation.
TAI	International Atomic Time is the primary international time standard from which other time standards are calculated.

dut1

DUT1 is the time correction between UTC and UT1 ($DUT1 = UT1 - UTC$). The optional attribute `dut1` contains the value of DUT1 expressed in the same units given in the units attribute.

Example:

```
time:units = "seconds since 2000-01-01 00:00:00.0";  
time:time_standard = "UT1";  
time:dut1 = "0.02";
```

Where `dut1` contains the `dut1` value in seconds that allows the encoded UT1 times to be converted to UTC.

The DUT value is available from the auxiliary dataset `iExtdata_for_flightdynamics` (see Appendix C.10) and will not change during the processing of a repeat cycle or group accumulation interval, so a single value in the attribute suffices.

Note: When expressed as a `NC_DOUBLE` with an epoch reference of "seconds since 2000-1-1 00:00:00.0", the time variable can be expressed with 15 significant figures which provide a precision of 1 microsecond until approximately the year 2030.

If greater precision is required or the same precision is required beyond this period, then a different epoch shall be used.

For instance, expressing the epoch as the start of the year in which the time event occurs would allow 10^{-7} seconds accuracy. Expressing the epoch as the start of the day in which the event occurs would allow 10^{-10} seconds accuracy, and so on.

Example (in CDL notation) of time encoding with a non-standard epoch (only relevant attributes shown for clarity):

dimensions:

```
time = 100;
```

variables:

```
double time (time);
```

```
time:standard_name = "time";
```

```
time:long_name="UTC time"  
time:units = "seconds since 2022-01-01 00:00:00.0";  
time:precision = "100 nanoseconds";
```

This example shows an array of 100 times, stored in an array of NC_DOUBLE data types. The times are stored as seconds since an epoch of midnight on January 1st 2022 (the year in which the times occur). The data stored has a precision of 100 nanoseconds. This higher precision has been accommodated by the changed epoch time.

6.3.4.3 Time as an integer data type

Rationale:

Time may be stored more compactly, if required for operational reasons, as an integer data type.

Specification of time encoding using integer data type

When time is encoded as an integer data type it shall be by encoding as an integer data type with units compatible with udunits where possible, an epoch time attribute, a scale_factor attribute, and an optional precision attribute.

Note: Different epoch times and units may be specified in order to help reduce the data size.

Example (in CDL notation) of compact time encoding (only relevant attributes shown for clarity):

```
dimensions:  
    time = 100;  
  
variables:  
    ushort time (time);  
        time:standard_name = "time";  
        time:long_name="UTC time"  
        time:units = "milliseconds since 2022-10-12 12:00:00.0";  
        time:scale_factor = 1000;  
        time:precision = "0.005";
```

This example shows an array of 100 times, stored in an array of NC_USHORT data types (16-bit unsigned integers). The times are stored as milliseconds since an epoch of midday on October 10th 2022 (possibly the start time of a repeat cycle for instance). The data has a scale factor of 1000 which means the data can be stored to microsecond precision, although the actual precision of the data is given as 5 microseconds.

An integer time coordinate variable may have the same attributes as those defined for a real time coordinate variable.

6.3.5 Geolocation

6.3.5.1 Latitude and Longitude Variables

In line with the [CF] conventions, both latitude and longitude will have explicitly declared units attributes of “degrees_north” and “degrees_east” respectively.

For MTG, latitude measurements will be stored using a range of -90 to +90 degrees and longitude measurements will be stored using a range of -180 to +180 degrees.

In line with [CONV] latitude and longitude will nominally be in geodetic coordinates.

Latitude and longitude values in an MTG netCDF file will be usually be stored as an NC_FLOAT which can encode values to an accuracy of 1/100 of a second (around 1 m at the equator).

If there is a need to store the data in a compressed format then a scaled NC_SHORT may be used although this will result in a lesser precision of 0.0055 degrees or 600 m at the equator if the full 360 degree longitude range is used. However, by restricting the range to 180 degrees (i.e. just the visible disk), then a precision of 0.0027 degrees or 300 m at the equator is possible.

6.3.5.2 Grid Mapping

If the data is on a fixed geolocation grid, then the products may make use of the grid mapping functionality provided by the CF Conventions [CF]. For MTG, the geostationary projection should be used as in the example below:

Example:

```
int mtg_geos_projection;  
    mtg_geos_projection:long_name=" MTG geostationary projection";  
    mtg_geos_projection:long_name="geostationary";  
    mtg_geos_projection:perspective_point_height= "42164000"; //m – WGS84 configured  
value  
    mtg_geos_projection: semi_major_axis= "6378169.0" ; //m– WGS84 configured value  
  
    mtg_geos_projection: semi_minor_axis= "6356583.8" ; //m – WGS84 configured value  
  
    mtg_geos_projection: inverse_flattening = "298.2572221; // WGS84 configured value  
  
    mtg_geos_projection: latitude_of_projection_origin ="0"; // configured value  
    mtg_geos_projection: longitude_of_projection_origin="0"; // configured value
```

```
mtg_geos_projection: sweep_angle_axis= "y"; // configured value
```

NOTE: Values are provided for illustration only. Implementation values should be obtained from the relevant format specification document.

The "perspective_point_height" is the distance to the surface of the ellipsoid. Adding the earth major axis gives the distance from the centre of the earth.

The "sweep_angle_axis" attribute indicates which axis the instrument sweeps. The value "y" corresponds to the spin-stabilized Meteosat satellites and should be the value for the three axes stabilised MTG platform.

This grid mapping functionality relies on the associated x and y coordinate variables for the geolocated data. The scale factor and offset of the coordinate are dependent upon the required grid mapping SSD and are chosen to encode the column and row positions into azimuth and elevation radian values.

Example:

dimensions:

```
y = 5568;  
x = 5568;
```

variables:

```
short x(x); // x coordinate variable for reference grid  
    x:long_name = "x coordinate mtg_geos_projection for each data  
point";  
    x:standard_name = "projection_x_coordinate"  
    x:units = "radians";  
    x:axis = "X";  
    x:valid_range = 0, 5567; // configured value  
    x:scale_factor = 5.58955533337e-5; // configured value  
    x:add_offset = -0.155613220481; // configured value  
  
short y(y); // y coordinate variable for reference grid  
    y:long_name = "y coordinate in mtg_geos_projection for each data  
point";  
    y:standard_name = "projection_y_coordinate"  
    y:units = "radians";  
    y:axis = "Y";  
    y:valid_range = 0, 5567; // configured value  
    y:scale_factor = 5.58955533337e-5; // configured value  
    y:add_offset = -0.155613220481; // configured value
```

The valid range restricts the extent of the grid.

The values for scale_factor and add_offset are for the 0.5 km, 1km and 2 km SSD reference grids are given in Table 6-3.

SSD Value	Columns	Rows	add_offset value	scale_factor value
0.5 km	22272	22272	-8.91474041	0.000800533
1 km	11136	11136	-8.914740409	0.001601067
2 km	5568	5568	-8.914740401	0.003202134

Table 6-3 Grid Mapping values for coordinate encoding

The x and y coordinate variables can then be associated with any variable to be geolocated on the grid, e.g.:

```
ushort effective_radiance(x,y);
    effective_radiance:long_name = "Effective radiance";
    effective_radiance:standard_name= "effective_radiance_in_wavenumber"
    effective_radiance:units = "mW.m-2.sr-1.(cm-1)-1";
    effective_radiance:_FillValue = NC_FILL_SHORT;
    effective_radiance:valid_range = 0, 4095;
    effective_radiance:valid_cold_range = 0, 4095;
    effective_radiance:scale_factor = runtime_value;
    effective_radiance:add_offset = runtime_value;
    effective_radiance:coordinates = "x y";
    effective_radiance:grid_mapping = "mtg_geos_projection";
```

It should be noted that although CF-aware netCDF tools can use the grid_mapping and x,y coordinate variables geolocation of the relevant variable, this can also be achieved by reading the attribute information and applying it to the inverse projection equations given in Section 5.6 of [CONV] with the exception that the [CONV] equations assume a grid starting at (1,1) the offset values have been adjusted for a grid starting at (0,0) in line with the CF implementation.

6.4 The Overall Structure and Sections of an MTG netCDF-4 Dataset/Product

The term *netCDF components* is used for brevity and describes a set that includes netCDF attributes, dimensions, data types and variables. It does not include groups.

6.4.1 NetCDF Products with Groups

An MTG netCDF-4 dataset/product can contain a number of groups. Groups are used to contain certain related classes of data to provide a logical structure to a dataset/product.

This document defines a number of generic groups which are classified as *root*, *extensible* or *fixed*. Instrument and level specific format specifications may add a further set of groups which are designated as *specific*.

The table below describes these group types and sets out a colour coding that is used in the dataset/product group overview figures to identify the group types.

6.4.2 NetCDF Products without Groups (Flat Products)

If the use of groups does not bring any benefit to the product structure, then a simple flat product containing only netCDF components may be defined.

The flat product must also contain those netCDF components defined for the generic root group and the corresponding processing level root group. This ensures compliancy with conventions and that the necessary metadata and other information is available.

In addition, if a flat netCDF product is required to contain the same data as a product with groups, then the same netCDF components from the relevant group definition should be utilised in both cases e.g. if the flat product contains celestial state information, then the netCDF components to contain this information should be a copy of those found in the appendix defining the “celestial” group.

Group Type	Colour Coding	Mandatory	Extensible	Format Specification	Description
root	<u>root</u>	Yes	Yes	GFS and FS	The root group is a special case. It contains a number of netCDF components which must be present in every dataset/product. A given dataset/product format may add new netCDF components, but may not omit any that are defined in the generic root group. This document defines which groups may be present in the root level specific to a certain processing level. An instrument/level specific format specification may choose not to use all these defined groups, but it may not add additional groups at root level.
fixed	<u>fixed</u>	No (But if the data assigned to this group is included in a dataset/product then this group should be used).	No	GFS	Fixed groups contain a specific class of information and have a fixed format. No additional groups or netCDF components may be added to a fixed group and no defined netCDF components may be omitted. If a format specification includes the class of information specified by a fixed group, in a dataset/product, it should include the generic fixed group and not define its own specific group.
extensible	extensible	No (But if the class of data assigned to this group is included in a dataset/product then this group should be used).	Yes	GFS and FS	An extensible group may contain netCDF components and groups. The generic and instrument specific format specification documents will define which of these groups to include in a particular dataset/product and which to omit. This document does not mandate the contents of an extensible group, just the category of data it should contain. A format specification document will define the netCDF components and/or further groups that are in a variable group.
specific	specific	No	Not Applicable	FS	A specific group is defined at the instrument and/or processing level by the instrument specific format specification documents. Although they must conform to the conventions specified in this document, their contents (netCDF components and /or further groups) are determined by the particular format specification document.

Table 6-4 Description of group types and their colour coding in dataset overview diagrams. Mandatory column indicates if a group must be present in a dataset/product. Extensible column indicates if a format specification may extend the generic specification by adding netCDF components or groups. Format Specification column indicates which documents define the specification of the group (GFS =Generic Format Specification. FS = Format Specification for a specific instrument and processing level).

6.4.3 Root

The root level of an MTG dataset/product contains sets of global attributes, dimensions, variables, and user-defined types. The global attributes, which conform as far as is practicable to the netCDF-4 Attribute Convention for Dataset Discovery [ACDD], provide information identifying the instrument(s), dataset/product type, processing level, instrument model(s), and spacecraft.

In addition, the root may contain groups that separate the data into conceptual blocks and these groups may contain further groups. The possible groups at L1 and L2 root level are:

- ***data*** - containing measured values or geophysical parameter information, and associated quality information, calibration parameters and other related information.
- ***state*** - containing information about the state of the satellite (e.g. attitude, orbit, OBT to UTC correlation, etc.), instrument (e.g. instrument mode and operations, etc.) and processor configuration, as well as celestial state information (e.g. sun, moon and stellar ephemerides, celestial events, etc.).

Figure 6-1 is an illustration of an archetypal Level 1 MTG product, showing the root level group, the three allowed groups within root, and then examples of possible groups within these groups. Although groups can theoretically be nested to any depth, for usability and practicality purposes, format definitions should, where possible, limit the nesting to a maximum of 4 levels.

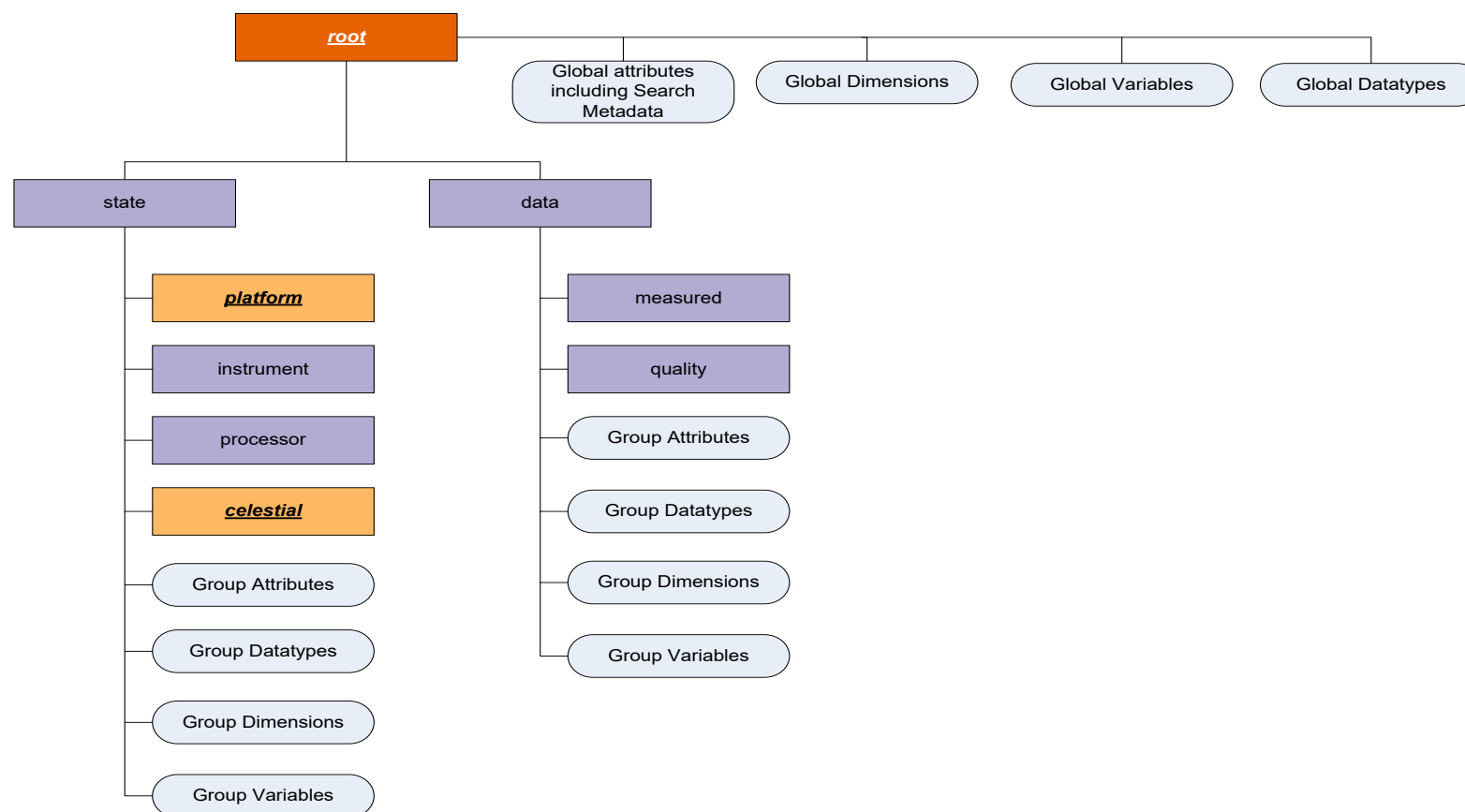


Figure 6-1 Example showing structure and groups of an archetypal MTG Level 1 netCDF-4 dataset. Groups are shown as square boxes. Variables, dimensions, attributes, and data types (netCDF components) are shown as rounded lozenges. Any group can contain attributes, dimensions, variables and data types but these have been omitted here below level 2 for clarity. Not all groups are mandatory and shown groups may not be present in all datasets/products.

6.4.4 State

The state data are in turn divided into four groups particular to celestial events (*celestial_events*), the satellite state (*satellite*), the instrument state (*instrument*), and the processing system state (*processor*).

Celestial events information includes information on, e.g., moon in field of view, eclipse, and sun-glint.

Satellite state information includes information sufficient to reconstruct the position and attitude of the spacecraft throughout the time during which the sensing data in the dataset/product were acquired, including:

- Orbit characteristics (e.g., semi-major axis, eccentricity, inclination, argument of perigee, right ascension, mean anomaly)
- Spacecraft state vector at start of sensing
- Spacecraft attitude (whether as deviations from a law, or as a time series)
- Subsatellite latitude and longitude at start and end of sensing

Instrument information includes flags and information indicative of the instrument status during the sensing period. (Sensing time information includes sensing start and end times, milliseconds of data present, and milliseconds of data missing.)

Instrument information is deduced by the processor from the satellite housekeeping telemetry and the instrument data. Information in the instrument group generally contains more detailed, non-generic information at the dataset/product level, such as quality indicators, processing indicators, and statistics about measurements. Since it is generally specific to a particular instrument and processing level it is described in the relevant format document.

Processor information covers details of the dataset/product's generation that are not present as global attributes, such as ground station(s) start and end receive time.

6.4.5 Data

The data are dividend into a number of groups appropriate to the processing level and associated values.

At Level 1, it might contain the group *measured* holding calibrated spectral radiances, calibration values, and geolocation values and *quality* group holding associated quality data such as estimates of the radiometric and geometric accuracy of the calibration or geolocation

At level 2, it might contain a *derived* group holding retrieved specific humidity and again a *quality* group holding associated quality data.

If data are compressed by a method other than those inherent to the netCDF-4 libraries, or those that can be signalled by a terminator of the WMO file name then the science data shall have an associated string attribute encoding a pointer to the information needed for decompression can be found. This pointer may be an html address or other indicator.

6.4.6 Attributes

Attributes may be attached to groups or variables to provide additional information. As well as common attributes conforming to the applicable conventions, such as `long_name`, `units`, `valid_min`, `valid_max`, `valid_range`, `_FillValue`, etc. as defined in [NCUG], additional attributes may be assigned.

6.4.6.1 Data Interpretation

The `data_interpretation` attribute contains a string encoding a location reference where further information is provided in order for the user to utilise the data in a variable. This could be information about compression or subsetting of the variable or reference data that it may not be efficient to distribute with the dataset/product and instructions on how to use that data. For example, the data may be a restricted subset of principal components that has been used to compress the variable.

The location reference may be a hyperlink to a website or a Digital Object Identifier or some equivalent mechanism.

Attribute Name	Type	Allowable Values
<code>data_interpretation</code>	NC_STRING	Valid location reference to requisite information for reconstructing dataset.

Table 6-5 Data Interpretation types

6.4.6.2 Missing Data

The `_FillValue` attribute specifies the value used to pre-fill space allocated to a variable. In accordance with the D Conventions, this value also represents undefined or missing data. The `_FillValue` is appropriate for this purpose because it is defined to be outside the valid range.

For MTG, the `_FillValue` attribute should normally be set to the appropriate default netCDF fill value for the variable type as defined in the `netcdf.h` include file and shown in the table below. If necessary, the default value may be over-ridden by the individual format specification on a case-by-case basis.

Variable Type	Numerical Value	Macro Name
---------------	-----------------	------------

byte	-127	NC_FILL_BYTE
char	0	NC_FILL_CHAR
short	-32767	NC_FILL_SHORT
int	-2147483647	NC_FILL_INT
float	9.9692099683868690e+36 (near $15 * 2^{119}$)	NC_FILL_FLOAT
double	9.9692099683868690e+36 (near $15 * 2^{119}$)	NC_FILL_DOUBLE
ubyte	255	NC_FILL_UBYTE
ushort	65535	NC_FILL_USHORT
uint	4294967295	NC_FILL_UINT
int64	-9223372036854775806	NC_FILL_INT64
uint64	18446744073709551614	NC_FILL_UINT64

Table 6-6 Default `_FillValue` attribute values by variable type

An enumerated variable must always be set to a specific state so a suitable code value for each eventuality should be defined.

For a bitflag variable, the `_FillValue` should not follow the above table, but should be a value of zero i.e. all bits unset, unless specified differently at the specific format specification.

The `missing_value` attribute is a deprecated attribute and in general, should not be specified in MTG format specifications. It is a scalar or a vector containing values that indicate missing data. These values should be outside the valid range. Unlike the `_FillValue`, the `missing_value` is not treated in any special way by the netCDF libraries or conforming generic applications and An exception is made for the rare case that a vector set of missing values are required for a variable. In this case, the reason for and meaning of the additional `missing_value` values should also be documented.

6.4.6.3 Subsetting

If a dataset/product is a subset of another dataset/product, then the amount of science data is reduced.

6.4.6.4 Subsettable Groups

The MTG dataset/product format can be support a generic subsetting of groups that can be tailored to support channel and band subsetting using a single, generic functionality.

If a group can be removed from a dataset, but that dataset is still an integral entity, i.e. the dataset contains everything required to utilize the remaining data, then that group may be marked using the group-level global attribute:

```
:subsettable = "yes";
```

Groups that are not subsettable will have no corresponding attribute.

An example of usage may be for an instrument where the data is broken into groups corresponding to a number of spectral channels. If these channel groups have specified formats that make them independent of each other, then it is possible to offer the user the choice to select which of the groups are included in the delivered product.

In conjunction with the subtable attribute at group level, there is a corresponding set of root level global attributes which contains the group names of all groups that can be subsetted, the names of the subtable groups present in the dataset.

```
:subtable_groups = "";
:subtable_groups_present = "";
```

Root Attribute	Meaning	Usage
:subtable_groups	Vector attribute with names of all groups that have global attribute :subtable = "yes"	Vector of group names created with dataset and corresponding to format specification.
:subtable_groups_present	Vector attribute with names of all groups that have global attribute :subtable = "yes" that are in the dataset	In general, contents will be identical to :subtable_groups. However, if subsetting has occurred after retrieval from the archive, then the contents will be a subset of the full list.

Table 6-7 Details of subtable_groups and subtable_groups_present attributes

6.4.6.5 Optional Groups

Optional groups are similar to subtable groups, but these are groups that may not be present in the original product. This may be the case when a group template is used for a number of instances, but not every instance requires the optional child group to be present. As for subtable groups, an optional group may be left out from a dataset, but that dataset is still an integral entity. Optional groups are indicated with the group attribute (although if an optional group is not present, this is only seen at the format specification level):

```
:optional = "yes";
```

Groups that are not optional will have no corresponding attribute.

7 GENERIC LEVEL 1 DATASET NETCDF-4 FORMAT

7.1 ICD Reference Table

This section is applicable to all Level 1 products in netCDF format.

Details of specific L1 products are given in [FCIL1FS], [UVNL1FS], [LIL1FS] and [IRSL1FS].

7.2 Overview

IRS, LI and UVN L1b datasets and FCI L1c datasets are formatted in netCDF-4. The relevant ICD may specify that they are passed to other environments either as a stream of data chunks or as [MTG-SIP] - encapsulated data objects.

7.3 L1 Dataset Components

A dataset or product may be divided into data chunks, which are sized to meet timeliness requirements and processing criteria for ground segment processing, or data segments which are sized to meet dissemination. In terms of format specification, data segments can be regarded as synonymous with data chunks.

Each of these data chunks is a may be identified as one of three components of the dataset or product:.

- **Body.** There can be one or more body data chunks per repeat cycle or group accumulation interval. They contain the L1 data and share a common format.
- **Header.** There can be none or one header data chunks per per repeat cycle or group accumulation interval. It is created at the start of processing and contains bulk information that is common to all the data chunks. The header allows bandwidth to be saved by reducing redundant information, but may also lead to a reduction in robustness due to data chunk dependency on the header. The header has its own format and its use is optional i.e. not all L1 datasets require a header.
- **Trailer.** There is one trailer data chunk per per repeat cycle or group accumulation interval. The trailer is created at the end of a repeat cycle or group accumulation interval, after the last L1 data chunk and may contain information, quality and conformance flags that can only be calculated at the repeat cycle or group accumulation interval. It always contains the list of preceding header and body chunks that have been produced for this repeat cycle dataset. The trailer has its own format and its use is compulsory for all datasets that are or could be chunked.

7.4 Body Data Chunk Format

MTG Level 1 datasets extracted by instrument, at full instrument pixel resolution, with Earth-location and calibration information.

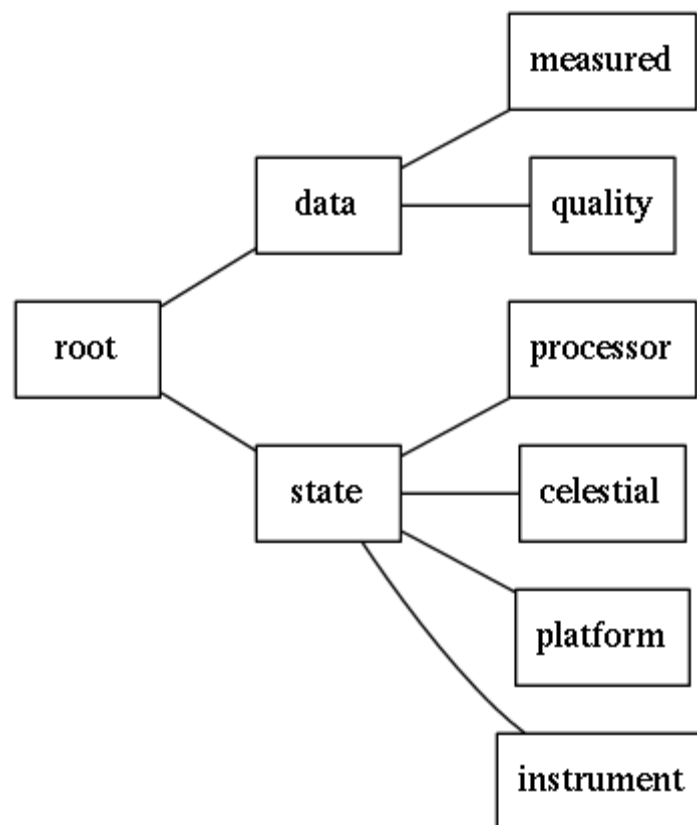


Figure 7-1 Overview of an archetypal MTG L1 body data chunk showing some of the possible groups that might be included in the dataset.

Figure 6-1 shows a typical MTG Level 1 body data chunk. Not all shown groups need to be in any specific Level 1 dataset, but if they are included, they should match the group definitions given in Appendix B.

Group Name	Description
root	Root level search metadata and global data.
data	Science data
measured	Measured data from the instrument e.g. radiances
quality	Quality information for the measured data.
state	Satellite, instrument and celestial events data
platform	Satellite related state information such as manoeuvre information
instrument	Instrument related state information
processor	Processor related state information

celestial	State information for celestial bodies such as eclipse information
-----------	--

Table 7-1 Overview of possible groups in L1 dataset.

The format and contents of each group are detailed in Appendix F.

7.5 Header Chunk Format

The header chunk is a netCDF-4 file. The format should follow the group structure for the data chunk (as shown in Figure 6-1) with details specified at the format specification level as the contents are instrument and level specific.

7.6 Trailer Chunk Format

The trailer chunk is a netCDF-4 file. The format should follow the group structure for the data chunk (as shown in Figure 6-1) with details specified at the format specification level as the contents are instrument and level specific.

7.7 Chunk Naming Convention

Data chunks are named per the standard WMO naming convention. Trailer and Header chunks follow the same naming convention as data chunks with the following settings for `start_time` and `end_time` dataset name fields:

Chunk Type	start_time	end_time
Header	Takes the value of <code>start_time</code> of earliest data chunk in the same repeat cycle or group accumulation interval.	Set to <code>start_time</code> .
Trailer	Takes the value of <code>start_time</code> of earliest data chunk in the same repeat cycle or group accumulation interval.	Takes the value of the <code>end_time</code> of latest data chunk in the same repeat cycle or group accumulation interval.

Table 7-2 Setting of `start_time` and `end_time` for header and trailer chunks

8 GENERIC LEVEL 2 PRODUCT NETCDF-4 FORMAT

8.1 ICD Reference Table

This section is applicable to all Level 2 products in netCDF format except the S4/UVN L2 products.

Details of specific L2 products are given in, [FCIL2FS], LIL2FS] and [IRSL2FS].

8.2 Overview

MTG Level 2 products contain derived geophysical values at instrument pixel resolution. Not all MTG Level 2 products are in netCDF format. Other formats are covered elsewhere in this document.

8.3 Chunks

As with L1 datasets, Level 2 products may also consist of a header chunk, a trailer chunk and one or more data chunks. As with L1 datasets, the data chunk may span the full repeat cycle or group accumulation interval and correspond to the full L2 product.

8.4 Data Chunk Format

Figure 8-1 shows a typical MTG Level 2 data chunk for a grouped structure. Not all shown groups need to be in any specific Level 2 data chunk, but if they are included, they should match the group definitions given in Appendix C.

Group Name	Description
root	Root level search metadata and global data.
data	Science data
derived	Derived geophysical parameters e.g. cloud information, wind vectors, temperature profiles, etc.
quality	Quality information for the measured data.
state	Satellite, instrument and celestial events data
platform	Satellite related state information such as manoeuvre information
instrument	Instrument related state information
processor	Processor related state information
celestial	State information for celestial bodies such as eclipse information

Table 8-1 Overview of possible groups in L2 datasets.

The format and contents of each group are detailed in Appendix D.

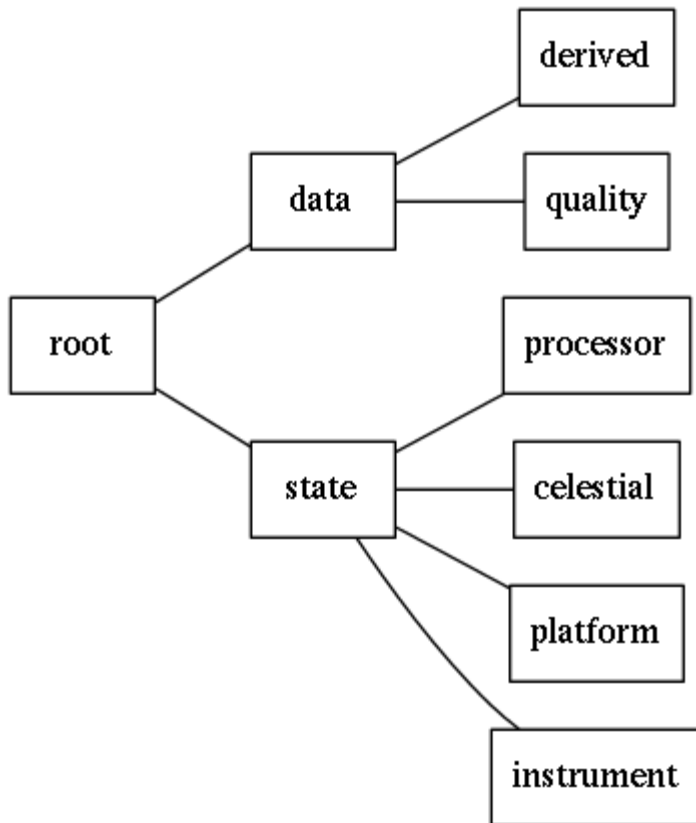


Figure 8-1 Overview of an archetypal MTG L2 body data chunk showing some of the possible groups that might be included in the dataset.

8.5 Header Chunk Format

The header chunk is a netCDF-4 file. The format should follow the group structure for the data chunk (as shown in Figure 6-1) with details specified at the format specification level as the contents are instrument and level specific.

8.6 Trailer Chunk Format

The trailer chunk is a netCDF-4 file. The format should follow the group structure for the data chunk (as shown in Figure 6-1) with details specified at the format specification level as the contents are instrument and level specific.

8.7 Chunk Naming Convention

Data chunks are named per the standard WMO naming convention. Trailer and Header chunks follow the same naming convention as data chunks with settings for start and stop times obeying the same rules for Level 1 chunks, as given in Table 7-2.

9 GENERIC DATA PROCESSING PARAMETER (DPP) FILE NETCDF-4 FORMAT

9.1 ICD Reference Table

This section is applicable to all DPP files in netCDF format.

Details of specific DPP files are given in [FCIL1FS], [UVNL1FS], [LIL1FS], [IRSL1FS], [FCIL2FS], [UVNL2FS], [LIL2FS] and [IRSL2FS].

9.2 Overview

The Data Processing Parameters (DPP) file for an IDPF contains the detailed radiometric and geometric processing model parameters and other parameters needed to perform a warm start of that IDPF.

Different DPP parameters may be generated for different functionality and at different update rates, so it may be more efficient to produce a number of independent DPP files, and this is reflected in the DPP naming convention.

9.3 Naming

DPP files will follow the WMO naming convention. Most name fields will have the same definitions and settings as the instrument data being processed. However, certain fields will have DPP-specific definitions and settings that are detailed in the following Table:

Name Field	Specific DPP Setting
type	"DPP"
component	The values for this field will be determined in the relevant format specification document. As each component name indicates a unique dataset, this field can be used to create a set of DPP files with unique contents and differing periodicities and generation cycles.
coverage	This will generally be set to "xx" to indicate no specific coverage. However, this default may be overridden by a specific format specification if required.
start_time	The start and end time fields will normally reflect the start and end times of the data that has been used to produce the DPP file in question. There may be some latitude in the definition that should be resolved at the specific format specification level. For instance, the start time of a dataset that derives from a running average could be

	set to the start time at which the running average commenced, or the start time of the new data being added to the running average calculation.
end_time	See “start_time” above

9.4 netCDF Format

Currently no generic netCDF structures (groups, user types, etc.) have been identified for DPPFs.

The contents of the DPPFs for specific instruments and processing levels will be determined with the help of the relevant IDPF contractor.

10 OTHER FORMAT CONVENTIONS

10.1 BUFR and GRIB

Products in BUFR or GRIB format shall conform firstly to the standards and conventions in [WMO-386] and [WMO-306] and secondly to any applicable provisions relevant to them in this document.

10.2 CAP

Products in the Common Alerting Protocol (CAP) format shall conform firstly to the standards and conventions in [CAP] and secondly to any applicable provisions relevant to them in this document.

10.3 Other Formats

Products in formats other than those already specified in this document shall conform firstly to the relevant standards and conventions and secondly to any applicable provisions relevant to them in this document.

11 GENERIC MTG/SENTINEL LEVEL 2 PRODUCT NETCDF-4 FORMAT

11.1 ICD Reference Table

This section is applicable to S4/UVN Level 2 products in netCDF format.

Details of specific S4/UVN L2 products are given in [UVNL2FS].

11.2 Overview

S4/UVN L2 products contain derived geophysical values at instrument pixel resolution.

11.3 Chunks

S4/UVN Level 2 products may consist of a header chunk, a trailer chunk and one or more data chunks. The data chunk may span the full repeat cycle or group accumulation interval and correspond to the full L2 product.

11.4 Product Format

Figure 11-1 shows a typical MTG/Sentinel Level 2 data chunk for a grouped structure. Which is an amalgam of Sentinel and MTG group layouts. The exact layout per product is defined in the specific format specification document.

Group Name	Description
root	Root level search metadata and global data.
product	Science data
data	Derived geophysical parameters e.g. cloud information, wind vectors, temperature profiles, etc.
quality	Quality information for the measured data.
other...	Other groups defined in the specific format specification as necessary
state	Satellite, instrument and celestial events data.
platform	Satellite related state information such as manoeuvre information
instrument	Instrument related state information
processor	Processor related state information
celestial	State information for celestial bodies such as eclipse information
metadata	Metadata information for the product (in addition to the global metadata at root level)
esa metadata	ESA standard metadata information
iso metadata	ISO standard metadata information
other...	Other metadata groups defined in the specific format specification as necessary

Table 11-1 Overview of typical groups in S4/UVN L2 datasets.

The format and contents of each group are detailed in Appendix D.

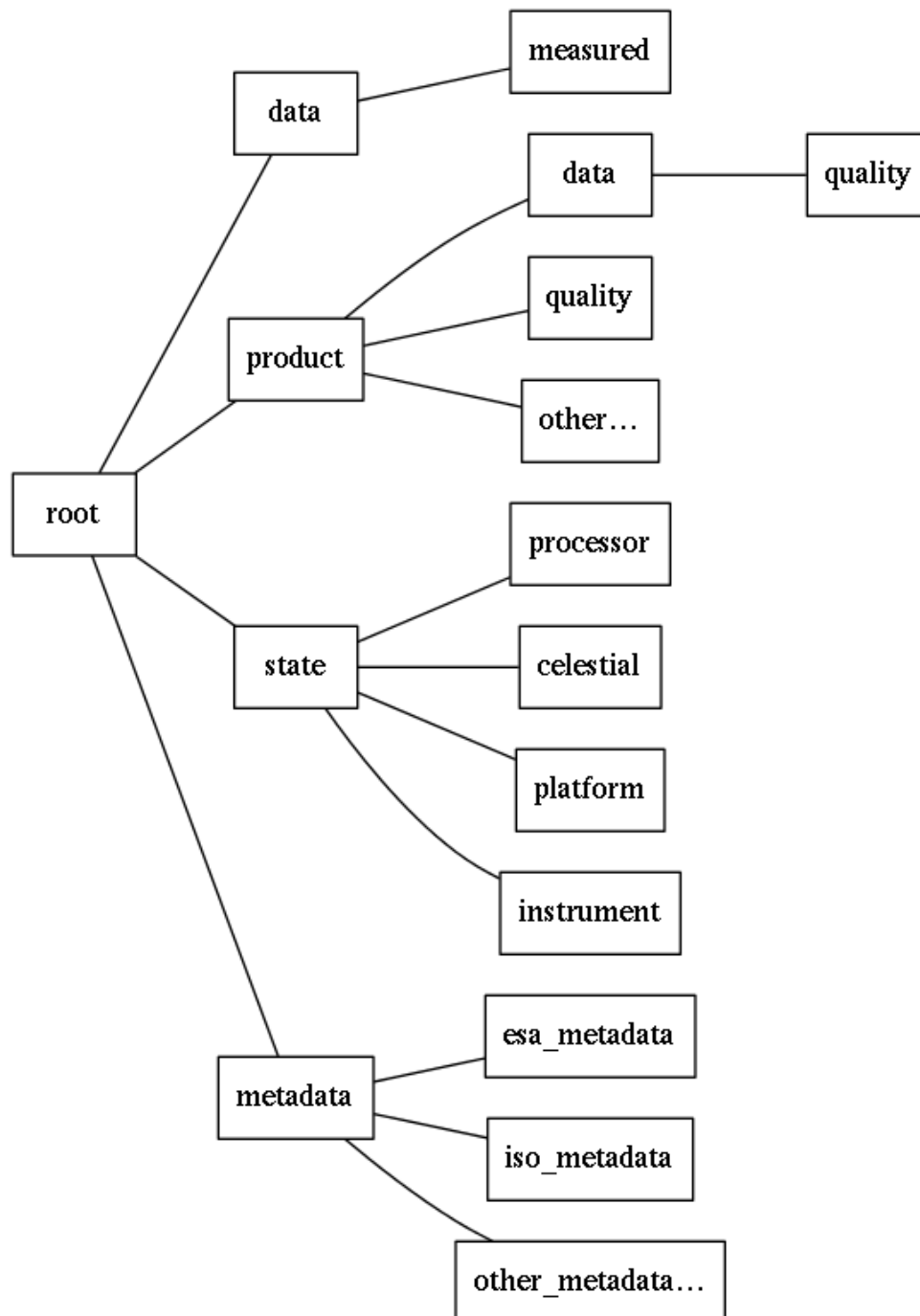


Figure 11-1 Overview of an archetypal MTG/Sentinel L2 product showing some of the possible groups that might be included in the product.

11.5 Header Chunk Format

The header chunk is a netCDF-4 file. The format should follow the group structure for the data chunk (as shown in Figure 8-1 with details specified at the format specification level as the contents are instrument and level specific.

11.6 Trailer Chunk Format

The trailer chunk is a netCDF-4 file. The format should follow the group structure for the data chunk (as shown in Figure 11-1) with details specified at the format specification level as the contents are instrument and level specific.

11.7 Chunk Naming Convention

Data chunks are named per the standard WMO naming convention. Trailer and Header chunks follow the same naming convention as data chunks with settings for start and stop times obeying the same rules for Level 1 chunks, as given in Table 7-2.

APPENDIX A CCSDS SOURCE PACKET FORMAT

A.1 Space Packet

The following description of the CCSDS source packet format is based on [CCSDS-SPS].

A Space Packet (as shown below) encompasses a mandatory, 6-octet Packet Header (TM_PH) contiguously followed by a mandatory Packet Data Field (TM_PDF) with a variable size of 1 to 65536 octets.

The total size of a Space Packet is therefore at least 7 and at most 65542 octets.

Note: the total size of a given MTG space packet will depend on the size of the Source Data (TM_SDF) field specified for that particular packet.

Packet Header (TM_PH)							Packet Data Field (TM_PDF) (Variable)		
Version Number (TM_VER)	Packet ID (TM_PID)			Packet Sequence Control (TM_PSC)		Packet Length (TM_PLEN)	Data Field Header (TM_DFH)	Source Data (TM_SDF)	Packet Error Control (TM_PEC)
	Type (TM_CAT)	Data Field Header Flag (TM_DFHF)	Application Process ID (TM_APID)	Grouping Flags (TM_GRPFL)	Source Sequence Count (TM_SEQCNT)				
3 bits	1 bit	1 bit	11 bits	2 bit	14 bits				
16 bits				16 bits		16 bits	96 bits	Variable	16 bits
48 bits							Variable		

Figure A-2 Telemetry Packet Fields

Field ID	Field ID	Field ID	Content Description
TM_PH	TM_VER		Set to 0
	TM_PID	TM_CAT	Set to 0 (TM Packet)
		TM_DFHF	Set to 0 for spacecraft time source packet Set to 1 for other TM packets
		TM_APID	ID that uniquely identifies the on-board application process that is the source of this packet.
	TM_PSC	TM_GRPFL	Set to 11 _b for stand-alone TM packets
		TM_SEQCNT	The Source Sequence Counter corresponds to the order of release of Telemetry Packets by a source and enables the destination (e.g. the ground system) to detect missing packets. A separate TM_SEQCNT is maintained by each APID and is incremented by 1 whenever it releases a Telemetry Packet.

			TM_SEQCNT only re-initialises when it wraps around from $2^{14}-1$ to zero.
	TM_PLEN		The packet length is an unsigned integer, C where: $C = (\text{Number of octets in Packet Data Field}) - 1$ (The actual length of the TM packet is 6 bytes longer due to the packet header).
TM_PDF	TM_DFH		The Data Field Header is mandatory, at least one octet in length and consists of at least one of the following two fields, positioned contiguously, in the following sequence: a) Packet Secondary Header (variable length); b) User Data Field (variable length).
	TM_SDF		The telemetry source data is detailed in the individual Level 0 format specifications.
	TM_PEC		Error detection code of type Cyclic Redundancy Code (CRC) specified in Annex A of [ECSS-TTPU] to verify packet integrity.

Figure A-3 Details of the contents of the Telemetry Packet fields

A.2 Application Process Identifier (APID)

In support of a routing and multiplexing of telemetry data streams according to priority, which is based on the concept of Virtual Channels, APIDs will be associated with certain TM/TC-packet types.

The Application Process ID (APID) is structured into two fields [MTGPUS]:

- **Packet ID (PID):** The 7 most significant bits of each APID form a base address, which identifies in general terms the user or process generating the TM packet (or which the TC packet is addressed to) in a unique way.
- **Packet Category (PCAT):** The 4 least significant bits within the APID form a field used to identify different categories of TM packets. This allows the identification of a certain service type of a packet without the need to decode the Data Field Header of a packet. This helps support functionality such as the routing of different types of data via different Virtual Channels

APID Range	Assigned to	
	MTG-I	MTG-S
000h	Standard Spacecraft Time Packet	

001h – 200h	Platform (including RMU and instruments' discrete telemetries).	Platform (including RMU and instruments' discrete telemetries).
201h – 300h	FCI	Spare
301h – 400h	Spare	IRS
401h – 500h	LI	Spare
501h – 600h	Spare	UVN
601h – 700h	Data Collection System and Geostationary Search and Rescue	Spare
701h – 770h	Spare	Spare
771h – 7FEh	EGSE	EGSE
7FFh	Idle TM Packet	

Figure A-4 Details of the assigned APID ranges

The details of the APID values will be given in the relevant L0/L1 Format Specification documents.

A.3 SAT-0-PFAUX

The specific format of the packets in the SAT-0-PFAUX Level 0 dataset are defined in [MTG-I-DH-ICD] and [MTG-S-DH-ICD].

A.4 SAT-0-HKTM

The specific format of the packets in the SAT-0-HKTM Level 0 dataset are defined in [MTG-I-DH-ICD] and [MTG-S-DH-ICD].

A.5 SAT-0-REDU

The specific format of the packets in the SAT-0-REDU Level 0 dataset are defined in [MTG-I-DH-ICD] and [MTG-S-DH-ICD].

A.6 Instrument Source Packets

The formats of the instrument source packets will be described in the instrument specific format specification.

APPENDIX B MTG-SIP MANIFEST FILE FORMAT

B.1 General Contents of the Manifest File

The manifest file is an XML file that describes the information contained in an MTG-SIP. In order to avoid ambiguities, the manifest file name is fixed and must always be: **mtg_manifest.xml**. There will be only one manifest file per MTG-SIP.

B.2 MTG Manifest Contents

The metadata in the manifest file has a strong connection to the generic root-level metadata in the NetCDF datasets and products.

The MME archive product linkage operates at the level of an AIP, and therefore the Manifest supports the linkage by including a unique MTG-SIP Identifier.

Element Name	Description	Possible Values and Source
sipIdentifier	Unique identifier for this MTG-SIP, which must be determinable before its contained product(s) are complete. In the Archive this is used as the AIP for non-amalgamated products.	For NON-WMO files, the MTG-SIP filename is the root file name + .tar. The filename is known as soon as the file existence is known. Therefore, the filename can be used as the Unique MTG-SIP Identifier. For WMO files, we may not always know the MTG-SIP filename when it needs to be cross-referenced (either the data hasn't been written as a file, or the archive may be amalgamating chunks to a new AIP) so the identifier may only contain known fields. For WMO files the <sipIdentifier> shall be the following: <platform>_<data_source>_ <processing_level>_<type>_ <subtype>_<component1>_YYYY_DDD_ <repeat_cycle_in_day>_ <count in repeat cycle> <release version>
catalogueMappingId	Defines the mapping specification to be used in the MME.	String Type A statically configured string. Blank by default.

The information in the manifest file is grouped into sections, each containing relevant information for a specific aspect to be accounted for about the dataset to be archived in the MTG-SIP, namely:

Section Name	Description & Use
dataSection	The data section contains information about each data object contained in the MTG-SIP along with its format, size, etc. Thus, there shall be as many dataObject entries in a manifest file as data objects are contained in the MTG-SIP.
amalgamationSection	An optional “amalgamation” section that shows the relationship between the data objects e.g. linking together chunks that belong to the same repeat cycle. Note: This section contains information relevant to the amalgamation of chunks into a single AIP within the Archive.
metadataSection	The remaining sections in the manifest file contain relevant metadata about the data objects in the MTG-SIP, grouped into different subject-specific sections as per the type of information that they contain. The complete list of metadata sections considered is presented in B.2.3, whereas the different subsections B.2.3.x provide the details for a given subject-specific metadata section each.

B.2.1.1 Data Section(s)

As previously explained, there will be as many dataObject entries as there are data objects contained in the MTG-SIP. For each of these data objects, the information about the object that they represent is provided in the table below:

Element Name	Description	Possible Values and Source
fileType	Describes the type of file that is stored in the MTG-SIP	Data, Browse, Thumbnail Quicklook. Data = Used for datasets, products, auxiliary data.
format	Describes the format of the file.	Used as appropriate for the fileType Can include values of <format> as defined in 3.4.2.13. e.g: Binary, Native, PNG, JPEG, BUFR, NetCDF, HDF5, TXT, XML.
size	Size of the file in bytes	Integer Type
fileName	Data object filename	It is expected that data objects will reside in the MTG-SIP root directory.
checksum	Contains the checksum of the file. The algorithm used (md5 for instance) will be set as an attribute of the element.	String Type md5 is suggested OPTIONAL for MTG products with strict timeliness requirements.

B.2.1.2 Amalgamation Section

A single data product may be submitted as a set of sub-products (e.g. chunks) that together make up the complete data product. The Amalgamation section provides information to the Archive to identify the individual sub-products (part delivery of products) and supports the archival of the corresponding product as a single AIP. The Amalgamation section is only present for data objects that need to be amalgamated within the MME_DAC (e.g. L0 chunked data).

For products which are amalgamated within the MME_DAC, only metadata values from the last sub-product (chunk) are retained in the Archive.

Element Name	Description	Type, possible Values and Source
amalgamationId	Identifier for all chunk members that make up the complete amalgamated product.	Any Type The identifier contains the version to allow uniqueness across reprocessing sessions. The string has the format: <platform>_<datasource>_ <processing_level>_<type>_ <subtype>_YYYY_DDD_ <repeat cycle in day> <release version>
aipIdentifier	The AIP Identifier to be used for the resultant AIP in the archive (instead of the collection of <sipIdentifier> from each chunk)	Will be the same as the <sipIdentifier> for all the chunks in a repeat cycle, but with the count_in_repeat_cycle set to 0000 rather than an actual chunk number. i.e.: <platform>_<data_source>_ <processing_level>_ <type>_<subtype>_<component1>_ YYYY_DDD_<repeat cycle in day>_ 0000 <release version>
memberCounter	Counter to identify an item that is a sub-product (e.g. chunk) of a whole product.	Integer (greater than zero) For NetCDF files, corresponds to the root <processed_count_in_repeat_cycle> attribute Note: The counter refers to the MTG-SIP belonging to the product
finalFlag	A flag to identify the last member of the Group	Boolean true: Indicates that the MTG-SIP is the member of the group with the largest memberCounter value for the corresponding amalgamationId. false: The item is not the last member of the product. Note: For a chunked product, will be set 'true' for the MTG-SIP that contains the trailer chunk, or the last body chunk when there is no trailer (i.e. for L0), otherwise set to FALSE.

B.2.1.3 Metadata Section

Following the data section(s) and amalgamation section, a series of metadata sections are included, each containing information about a specific subject. The table below provides the names of the different metadata section(s) considered in the MTG manifest file along with the description of the type of information that they contain:

Section Name	Description & Use
extraInformation	Contains programme, instrument and processing level specific information.

B.2.1.1 ExtraInformation Metadata

The extraInformation area contains product-specific metadata information for MTG datasets/products

Section Name	Description	Type, Possible Values and Source
common	Section containing metadata common to all dataset and quick-look products. The section is not applicable to Auxiliary files, or DDP files which are not specific to a repeat cycle.	Refer to the detailed description in B.2.3.1.1
level0	Section containing specific metadata that is applicable only for L0 dataset (chunk) products of Fixed Binary format. It contains information related to quality-related aspects of the Level 0 product, such as missing packets. The section is not applicable to Level 0 Auxiliary files and quick-look products.	Refer to the detailed description in B.2.3.1.2
level1	Section containing MTG-specific metadata that is applicable only for L1 products	Refer to the detailed description in B.2.3.1.3
level2	Section containing MTG-specific metadata that is applicable only for L2 products	Refer to the detailed description in B.2.3.1.4

B.2.1.1.1 Common Metadata Section

Common metadata that is applicable to all dataset and quick-look products:

Element Name	Description	Type, Possible Values and Source
groupIdentifier	Identifier for all chunk members that make up the complete product group. I.e. a grouping of datasets that allows chunks, DPP files (when related to the repeat cycle) and quick-looks to be grouped together.	Any Type As per the <group_tag> in the NetCDF generic root group description in E1.3, including the release version number. The identifier contains the version to allow uniqueness across reprocessing sessions. The string has the format: <platform>_<datasource>_ <processing_level>_<type>_ <subtype>_YYYY_DDD_ <repeat cycle in day> <release version>

Element Name	Description	Type, Possible Values and Source
nominalLongitude	Nominal sub-satellite longitude location of the satellite	Float type Operator configured value in manifest template.
rectificationLatitude	Configured value. Current rectification latitude for the FCI grid	Float type Operator configured value in manifest template.
serviceIndicator	Service indicator value	String type FDC, RSS, ISS, (others TBD) Operator configured value in manifest template.
locationIndicator	Location Indicator value	String type Nominal, IODC, Transit, (others TBD) Operator configured value in manifest template.

B.2.1.1.2 Level0 Specific Metadata Section

Specific metadata that is applicable only for L0 dataset (chunk) products of Fixed Binary format.

Note: For products which are amalgamated within the MME_DAC, only metadata values from the last chunk are retained in the Archive.

Element Name	Description	Type, Possible Values and Source
processorName	Name of the (algorithm) Processing Element used to generate the product	String Type Free text which uniquely identifies the (algorithm) processing element (APE). e.g. "L0-FCI-APE"
processorVersion	Version of the (algorithm) Processing Element used to generate the product	String Type Expected to correspond to the release version of the (algorithm) processing element (APE). e.g. "1.2.0"
repeatCycleInDay	Identifier of the expected current repeat cycle or group accumulation interval in the day for this particular dataset.	Four digits integer padded with zeros As per <repeat_cycle_in_day> in Table 3-1 of section 3.4.1
countInRepeatCycle	The expected count value of the dataset chunk in the repeat cycle or group accumulation interval based on the scan pattern or equivalent information. The counter will have discontinuities when chunks are not produced.	Four digits integer padded with zeros As per <count_in_repeat_cycle> in Table 3-1 of section 3.4.1

Element Name	Description	Type, Possible Values and Source
processedCountInRepeatCycle	Cumulative count of the dataset chunk in the repeat cycle or group accumulation interval.	Integer Type Resets when the repeatCycleInDay value changes. The counter increments for each created chunk in a repeat cycle or accumulation interval. It does not increment when a chunk is not created due to missing parent data.
numberSourcePackets	The total number of (CCSDS) source packets contained in the dataset If this is an amalgamated product it shall be the cumulative running total within the repeat cycle, and re-set to zero at the start of the next repeat cycle.	Integer Type Computed during L0 processing
sourceApids	Comma separated list of the APIDs in the dataset If this is an amalgamated product it shall be the cumulative list within the repeat cycle, and re-set to a blank list at the start of the next repeat cycle.	String Type (comma separated) The possible APID values are contained in the [MTGPUS]. Leave blank if no source packets
gapApids	Comma separated list of the APIDs for which missing packets were identified If this is an amalgamated product it shall be the cumulative list within the repeat cycle, and re-set to a blank list at the start of the next repeat cycle.	String Type (comma separated) The possible APID values are contained in the [MTGPUS]. Gaps are based on APID and SSC. A gap can only be identified once a packet of a given APID is received. Therefore, the gap may have spanned the prior dataset/(s). Leave blank if no gaps identified.
gapCount	Total number of gaps of source packets identified in the Level 0 dataset If this is an amalgamated product it shall be the cumulative running total within the repeat cycle, and re-set to zero at the start of the next repeat cycle.	Integer Type Gaps are based on APID and SSC. A gap can only be identified once a packet of a given APID is received. Therefore, the gap may have spanned the prior dataset/(s).

Element Name	Description	Type, Possible Values and Source
missingSourcePackets	The total number of missing source packets calculated from the identified gaps If this is an amalgamated product it shall be the cumulative running total within the repeat cycle, and re-set to zero at the start of the next repeat cycle.	Integer Type The missing source packets may include gaps spanning the prior dataset/(s).
linkedWith	The unique MTG-SIP (or AIP) Identifier of a linked Auxiliary file or dataset. There is an instance of the linkedWith element (multiplicity = 0*) for each associated auxiliary dataset and/or file, and there can be multiple associated auxiliary datasets or files of the same type.	String Type Must cross-reference the <sidIdentifier> field for the auxiliary datasets and files, or the <aipIdentifier> for a reference to an amalgamated product. The links are used to point to auxiliary files (xml), and non-instrument datasets (e.g. L0-HKTM). Note that association of Quicklook images is through the <groupIdentifier>.

B.2.1.1.3 Level 1 Specific Metadata Section

There is no Level 1 MTG-specific metadata defined for the MTG-SIP Manifest file for NetCDF products. This section will be expanded if metadata needs to be exposed for non-NetCDF products (i.e. BUFR).

Specific Level 1 instrument and/or processing level related information will be extracted from the product's filename and root attributes and then translated into the [ELTA-SIP] (EOPMetadata) file within the MME_DAC prior to archiving. Hence, the [ELTA-SIP] (EOPMetadata) file is N/A to the format description in this document.

Level 2 Specific Metadata Section

There is currently no Level 2 Specific metadata defined for the MTG-SIP Manifest file. This section will be expanded if metadata needs to be exposed. Similarly, to include specific metadata related to non-NetCDF products (e.g. BUFR, GRIB and CAP), the schema could be extended by the addition of optional metadata sections for these products.

B.3 MTG-SIP Manifest Schema

The MTG-SIP schema is represented as per the following figure:

```

<?xml version="1.0" ?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" >
  <!--
  *****
  * Source File : MTG_SIP_manifest.xsd (MTG Submission Information Package)
  * Creation   : 11/10/2017
  * Environment : XML Schema 2.0
  * Abstract: This is the XML Schema for the mtg_manifest.xml file
  *****
  -->

  <xs:simpleType name="Format">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Binary"/>
      <xs:enumeration value="CAP"/>
      <xs:enumeration value="Native"/>
      <xs:enumeration value="PNG"/>
      <xs:enumeration value="JPEG"/>
      <xs:enumeration value="BUFR"/>
      <xs:enumeration value="TIFF"/>
      <xs:enumeration value="HDF5"/>
      <xs:enumeration value="GRIB"/>
      <xs:enumeration value="NetCDF"/>
      <xs:enumeration value="GRIB2"/>
      <xs:enumeration value="OpenMTP"/>
      <xs:enumeration value="RECT2LP"/>
      <xs:enumeration value="MCIDAS"/>
      <xs:enumeration value="TXT"/>
      <xs:enumeration value="XML"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="Checksum">
    <xs:simpleContent>
      <xs:extension base="xs:string">
        <xs:attribute name="algorithm" type="xs:string" use="required"/>
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>

  <xs:simpleType name="FileType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Data"/>
      <xs:enumeration value="Browse"/>
      <xs:enumeration value="Geolocation"/>
      <xs:enumeration value="Quicklook"/>
      <xs:enumeration value="Thumbnail"/>
      <xs:enumeration value="Album"/>
      <xs:enumeration value="Other"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="DataObject">
    <xs:sequence>
      <xs:element name="fileType" type="FileType"/>
      <xs:element name="format" type="Format"/>
      <xs:element name="size" type="xs:nonNegativeInteger"/>
      <xs:element name="fileName" type="xs:string"/>
      <xs:element name="checksum" type="Checksum" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="DataSection">
    <xs:sequence>
      <xs:element name="dataObject" type="DataObject" minOccurs="1" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

```

```

<xs:complexType name="AmalgamationSection">
  <xs:sequence>
    <xs:element name="amalgamationId" type="xs:anyType"/>
    <xs:element name="aipIdentifier" type="xs:anyType"/>
    <xs:element name="memberCounter" type="xs:nonNegativeInteger"/>
    <xs:element name="finalFlag" type="xs:boolean"/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="Common">
  <xs:sequence>
    <xs:element name="groupIdentifier" type="xs:anyType"/>
    <xs:element name="nominalLongitude" type="xs:float"/>
    <xs:element name="rectificationLatitude" type="xs:float"/>
    <xs:element name="serviceIndicator" type="xs:string"/>
    <xs:element name="locationIndicator" type="xs:string"/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="Level0">
  <xs:sequence>
    <xs:element name="processorName" type="xs:string"/>
    <xs:element name="processorVersion" type="xs:string"/>
    <xs:element name="repeatCycleInDay" type="xs:nonNegativeInteger"/>
    <xs:element name="countInRepeatCycle" type="xs:nonNegativeInteger"/>
    <xs:element name="processedCountInRepeatCycle" type="xs:nonNegativeInteger"/>
    <xs:element name="numberSourcePackets" type="xs:nonNegativeInteger"/>
    <xs:element name="sourceApid" type="xs:string"/>
    <xs:element name="gapApid" type="xs:string"/>
    <xs:element name="gapCount" type="xs:nonNegativeInteger"/>
    <xs:element name="missingSourcePackets" type="xs:nonNegativeInteger"/>
    <xs:element name="linkedWith" type="xs:anyType" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="ExtraInformation">
  <xs:sequence>
    <xs:element name="common" type="Common" minOccurs="1" maxOccurs="1"/>
    <xs:element name="level0" type="Level0" minOccurs="0" maxOccurs="1"/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="MetadataSection">
  <xs:sequence>
    <xs:element name="extraInformation" type="ExtraInformation"/>
  </xs:sequence>
</xs:complexType>

<xs:element name="informationPackage">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="sipIdentifier" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="catalogueMappingId" type="xs:string" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="dataSection" type="DataSection"/>
      <xs:element name="amalgamationSection" type="AmalgamationSection" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="metadataSection" type="MetadataSection" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
</xs:schema>

```

Figure B-5 MTG-SIP Manifest Schema

APPENDIX C DICTIONARY OF LEVEL 0 AUXILIARY DATASETS

NOTE: Most information in this Appendix is “cut and paste” directly from the relevant ICD.

C.1 iOrbitParametersOPM

For details see also [CCSDS-NDM].

OPM Header (“ndmHeader” type in XML schema)

Keyword	Comments
CCSDS_OPM_VERS	Format version in the form of ‘x.y’, where ‘y’ is incremented for corrections and minor changes, and ‘x’ is incremented for major changes. Set to “2.0”
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
CREATION_DATE	UTC time in CCSDS ASCII Time Code A without decimal fractions of second and without the corresponding decimal point (YYYY-MM-DDThh:mm:ss[Z]). “Z” time code terminator shall be optional and both MOF and IDPF-I facilities shall be able to deal with it and without it.
ORIGINATOR	The value for this keyword shall be “MOF” by default. In case of inconsistency between the received value and the expected value, a warning shall be raised to the user.

A. OPM Body (“opmBody” type in XML schema)

Keyword	Details
segment	Please refer to [CCSDS-NDM]

B. OPM Metadata (“opmMetadata” type in XML schema)

Keyword	Details
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
OBJECT_NAME	Recommendation for the use of the spacecraft designator published at [NSSDC-NMC]] shall be followed. However, the value for this keyword shall remain configurable, especially for covering the case where the object is not listed in the bulletin.

	In case of inconsistency between the received value and the expected value, the message shall not be processed.
OBJECT_ID	Recommendation for the use of the spacecraft designator published at [NSSDC-NMC] shall be followed. However, the value for this keyword shall remain, especially for covering the case where the object is not listed in the bulletin. In case of inconsistency between the received value and the expected value, the message shall not be processed.
CENTER_NAME	The value for this keyword shall be “EARTH”.
REF_FRAME	The default value for this keyword shall be “TOD”. However, the value shall be configurable for the MOF allowing selection of the following frames: GCRF, EME2000, ITRF2008, TDR, TEME and TOD.
REF_FRAME_EPOCH	This keyword shall not be included.
TIME_SYSTEM	The value for this keyword shall be “UTC”.

C. OPM Data (“opmData” type in XML schema)

Keyword	Details
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
STATE VECTOR COMPONENTS IN THE SPECIFIED COORDINATE SYSTEM (“stateVectorType” in XML schema)	
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
EPOCH	UTC time in CCSDS ASCII Time Code A with 3 decimal fractions of second (YYYY-MM-DDThh:mm:ss.sss[Z]). “Z” time code terminator shall be optional
X	Position and velocity components in “km” and “km/s”. The “units” attribute shall be specified.
Y	
Z	
X DOT	
Y DOT	
Z DOT	
OSCULATING KEPLERIAN ELEMENTS IN THE SPECIFIED REFERENCE FRAME (“KeplerianElementsType” in XML schema)	
COMMENT	These keywords shall not be specified.
SEMI MAJOR AXIS	
ECCENTRICITY	
INCLINATION	
RA OF ASC NODE	
ARG OF PERICENTER	

TRUE_ANOMALY	or	
MEAN_ANOMALY		
GM		
SPACECRAFT PARAMETERS ("spacecraftParametersType" in XML schema)		
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.	
MASS	Spacecraft total mass in "kg". The "units" attribute shall be specified.	
SOLAR_RAD_AREA	Spacecraft solar radiation pressure area in "m**2". The "units" attribute shall be specified.	
SOLAR_RAD_COEFF	Spacecraft solar radiation pressure coefficient (unitless). As a default it is derived from the IERS cannonball model.	
DRAG_AREA	Spacecraft drag area in "m**2". The "units" attribute shall be specified. The value for this keyword shall be set to zero.	
DRAG_COEFF	Spacecraft drag coefficient (unitless). The value for this keyword shall be set to zero.	
POSITION/VELOCITY COVARIANCE MATRIX ("covarianceMatrixType" type in XML schema)		
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.	
EPOCH	This keyword shall be specified in case it is different from EPOCH keyword of state vector. In case the epoch associated to the covariance matrix is the same as the state vector, this keyword shall be omitted (not simply empty) and, in this case, state vector epoch assumed. Comment given for EPOCH attribute of stateVectorType applies to this keyword too.	
COV_REF_FRAME	The default value for this keyword shall be "TOD". However, the value shall be configurable for the MOF allowing selection of the following frames: GCRF, EME2000, ITRF2008, TDR, TEME, TOD, RTN.	
CX_X		Covariance matrix in "km**2", "km**2/s" and "km**2/s**2". The "units" attribute shall be specified.
CY_X		
CY_Y		
CZ_X		
CZ_Y		
CZ_Z		
CX_DOT_X		
CX_DOT_Y		
CX_DOT_Z		
CX_DOT_X_DOT		
CY_DOT_X		
CY_DOT_Y		

CY DOT Z	
CY DOT X DOT	
CY DOT Y DOT	
CZ DOT X	
CZ DOT Y	
CZ DOT Z	
CZ DOT X DOT	
CZ DOT Y DOT	
CZ DOT Z DOT	
MANOEUVRE PARAMETERS* ("maneuverParametersType" type in XML schema)	
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default..
MAN_EPOCH_IGNITION	UTC time in CCSDS ASCII Time Code A with 3 decimal fractions of second (YYYY-MM-DDThh:mm:ss.sss[Z]). "Z" time code terminator shall be optional
MAN_DURATION	Manoeuvre duration in "s" with millisecond resolution. The "units" attribute shall be specified.
MAN_DELTA_MASS	Spacecraft mass change during the manoeuvre in "kg" with a resolution of 3 decimal places. The "units" attribute shall be specified.
MAN_REF_FRAME	The value shall be configurable for the MOF allowing selection of the following frames: GCRF, EME2000, ITRF2008, TDR, TEME, TOD and RTN. For IDPF, the expected reference frame is TOD.
MAN_DV_1	Components of the velocity increment in "km/s". The "units" attribute shall be specified.
MAN_DV_2	
MAN_DV_3	
USER DEFINED PARAMETERS ("userDefinedType" in XML schema)	
USER_DEFINED_x	These keywords shall not be used.

**The section MANOEUVRE PARAMETERS shall be specified in the OPM data message only in case of a scheduled manoeuvre.*

C.2 iOrbitParametersOEM

For details see also [CCSDS-NDM].

A. OEM Header ("ndmHeader" type in XML schema)

Keyword	Comments
CCSDS_OEM_VERS	Format version in the form of 'x.y', where 'y' is incremented for corrections and minor changes, and 'x' is incremented for major changes.

	Set to "2.0"
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
CREATION_DATE	UTC time in CCSDS ASCII Time Code A without decimal fractions of second and without the corresponding decimal point (YYYY-MM-DDThh:mm:ss[Z]). "Z" time code terminator shall be optional
ORIGINATOR	The value for this keyword shall be "MOF" by default. Although this value shall remain configurable. In case of inconsistency between the received value and the expected value, a warning shall be raised to the user.

B. OEM Body ("oemBody" type in XML schema)

Keyword	Details
segment	Only 1 occurrence of this type shall be used.

C. OEM Metadata ("oemMetadata" type in XML schema)

Keyword	Details
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
OBJECT_NAME	Recommendation for the use of the spacecraft designator published at [NSSDC-NMC] shall be followed. However, the value for this keyword shall remain configurable, especially for covering the case where the object is not listed in the bulletin. In case of inconsistency between the received value and the expected value, the message shall not be processed.
OBJECT_ID	Recommendation for the use of the spacecraft designator published at [NSSDC-NMC] shall be followed. However, the value for this keyword shall remain configurable, especially for covering the case where the object is not listed in the bulletin. In case of inconsistency between the received value and the expected value, the message shall not be processed.
CENTER_NAME	The value for this keyword shall be "EARTH".
REF_FRAME	The default value for this keyword shall be "TOD". However, the value shall be configurable for the MOF allowing selection of the following frames: GCRF, EME2000, ITRF2008, TDR, TEME and TOD.
REF_FRAME_EPOCH	This keyword shall not be included.
TIME_SYSTEM	The value for this keyword shall be "UTC".
START_TIME	UTC time in CCSDS ASCII Time Code A with 3 decimal fractions of second (YYYY-MM-DDThh:mm:ss.sss[Z]). "Z" time code terminator shall be optional.
USEABLE_START_TIME	

USEABLE_STOP_TIME	USEABLE_START_TIME and USEABLE_STOP_TIME shall be specified.
STOP_TIME	
INTERPOLATION	Interpolation method shall be “LAGRANGE” and interpolation degree “7”. The time step used in the OEM Data section shall be constant and configurable. By default, the time step shall be 1800 seconds.
INTERPOLATION_DEGREE	

D. OEM Data (“oemData” type in XML schema)

Keyword	Details
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
STATE VECTOR COMPONENTS (“stateVectorAccType” type in XML schema)	
EPOCH	UTC time in CCSDS ASCII Time Code A with 3 decimal fractions of second (YYYY-MM-DDThh:mm:ss.sss[Z]). “Z” time code terminator shall be optional
X	Position and velocity components in “km” and “km/s”. The “units” attribute shall be specified.
Y	
Z	
X DOT	
Y DOT	
Z DOT	
X DDOT	These keywords shall not be specified.
Y DDOT	
Z DDOT	
COVARIAMCE MATRIX COMPONENTS (“covarianceMatrixType” type in XML schema)	
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
EPOCH	This keyword shall be specified in case it is different from EPOCH keyword of state vector. In case the epoch associated to the covariance matrix is the same as the state vector, this keyword shall be omitted (not simply empty) and, in this case, epoch of corresponding state vector assumed.
COV_REF_FRAME	The default value for this keyword shall be “TOD”. However, the value shall be configurable for the MOF allowing selection of the following frames: GCRF, EME2000, ITRF2008, TDR, TEME, TOD, RTN.
CX X	Covariance matrix in “km**2”, “km**2/s” and “km**2/s**2”. The “units” attribute shall be specified.
CY X	
CY Y	

CZ X	
CZ Y	
CZ Z	
CX DOT X	
CX DOT Y	
CX DOT Z	
CX DOT X DOT	
CY DOT X	
CY DOT Y	
CY DOT Z	
CY DOT X DOT	
CY DOT Y DOT	
CZ DOT X	
CZ DOT Y	
CZ DOT Z	
CZ DOT X DOT	
CZ DOT Y DOT	
CZ DOT Z DOT	

C.3 iProcessedRange

For details see also [CCSDS-NDM].

A. TDM Header (“ndmHeader” type in XML schema)

Keyword	Comments
CCSDS_TDM_VERS	Format version in the form of ‘x.y’, where ‘y’ is incremented for corrections and minor changes, and ‘x’ is incremented for major changes. Set to “1.0” Note: This is an attribute, and not a keyword in the XML format.
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
CREATION_DATE	UTC time in CCSDS ASCII Time Code A without decimal fractions of second and without the corresponding decimal point (YYYY-MM-DDThh:mm:ss[Z]). “Z” time code terminator shall be optional
ORIGINATOR	The value for this keyword shall be “MOF” by default. Although this value shall remain configurable In case of inconsistency between the received value and the expected value, a warning shall be raised to the user.

B. TDM Body (“tdmBody” type in XML schema)

Keyword	Details
segment	One segment shall be used for the single tracking session with a single tracking station.

C. TDM Metadata (“tdmMetadata” type in XML schema)

Keyword	Details
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
TIME_SYSTEM	The value for this keyword shall be “UTC”.
START_TIME	UTC time in CCSDS ASCII Time Code A with 3 decimal fractions of second (YYYY-MM-DDThh:mm:ss.sss[Z]). “Z” time code terminator shall be optional
STOP_TIME	
PARTICIPANT_1	This keyword represents the ground antenna and its value shall be nominally “TTC1A1” or “TTC2A1”. If the ranging was executed from TTC3-5 instead of TTC1 or TTC2, then its value shall be “TTC3A1” or “TTC4A1” or “TTC5A1”. However, the value for this keyword shall remain configurable for the MOF and the IDPF-I. In case of inconsistency between the received value and the expected value, the message shall not be processed.
PARTICIPANT_2	This keyword represents the satellite and its value shall be the spacecraft designator published at [NSSDC-NMC]. However, the value for this keyword shall remain configurable, especially for covering the case where the spacecraft is not listed in the bulletin. In case of inconsistency between the received value and the expected value, the message shall not be processed.
PARTICIPANT_3	These keywords shall not be specified.
PARTICIPANT_4	
PARTICIPANT_5	
MODE	The value for this keyword shall be “SEQUENTIAL”.
PATH	The value for this keyword shall be “1,2,1”.
TRANSMIT_BAND	This keyword shall not be specified.
RECEIVE_BAND	This keyword shall not be specified.
TURNAROUND_NUMERATOR	This keyword shall not be specified.
TURNAROUND_DENOMINATOR	This keyword shall not be specified.

TIMETAG_REF	The value for this keyword shall be either “TRANSMIT” or “RECEIVE”.
INTEGRATION_INTERVAL	This keyword represents the time interval used for the computation of each normal point. This field can be used for Doppler data or for the creation of normal points.
INTEGRATION_REF	The value for this keyword shall be either “START”, “MIDDLE” or “END”.
FREQ_OFFSET	This keyword shall not be specified.
RANGE_MODE	The value for this keyword shall be either “COHERENT” or “CONSTANT”. It shall be the same value contained in the RANGE_MODE field of the TDM received from TTCF.
RANGE_MODULUS	The value for this keyword shall be “0.0”.
RANGE_UNITS	The value for this keyword shall be “km”.
ANGLE_TYPE	The value for this keyword shall be “AZEL” (azimuth and elevation in local horizon).
REFERENCE_FRAME	This keyword shall not be specified.
TRANSMIT_DELAY_1	These keywords shall not be specified.
TRANSMIT_DELAY_2	
TRANSMIT_DELAY_3	
TRANSMIT_DELAY_4	
TRANSMIT_DELAY_5	
RECEIVE_DELAY_1	These keywords shall not be specified.
RECEIVE_DELAY_2	
RECEIVE_DELAY_3	
RECEIVE_DELAY_4	
RECEIVE_DELAY_5	
DATA_QUALITY	The value for this keyword shall be either “RAW”, “VALIDATED” or “DEGRADED”, meaning the following: “RAW” shall mean that no quality check has performed by the MOF; “VALIDATED” shall mean that the 1-sigma value associated to the residuals of the ranging data included in the TDM is smaller than a pre-defined threshold. “DEGRADED” shall mean that the 1-sigma value associated to the residuals of the ranging data included in the TDM is equal to or greater than a pre-defined threshold.
CORRECTION_ANGLE_1	The value for this keyword shall be the correction applied by the MOF.
CORRECTION_ANGLE_2	
CORRECTION_DOPPLER	These keywords shall not be specified.
CORRECTION_RANGE	The value for this keyword shall be the correction applied by the MOF.
CORRECTION_RECEIVE	These keywords shall not be specified.

CORRECTION TRANSMIT	
CORRECTIONS APPLIED	The value for this keyword shall be “YES”.

D. TDM Data (“tdmData” type in XML schema)

Note: as per TDM standard, this section contains one or more Tracking Data Records (TDR), each containing the information listed in the table below.

Keyword	Details
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
EPOCH	UTC time in CCSDS ASCII Time Code A with 3 decimal fractions of second (YYYY-MM-DDThh:mm:ss.sss[Z]). “Z” time code terminator shall be optional
RANGE	This keyword represents the post-processed and corrected two-way range from the ground station to the satellite in km as specified with RANGE_UNITS keyword.
ANGLE_1	These keywords represent the azimuth and elevation from the ground station, their types “AZEL”, and their units degrees. These values will be provided for each RANGE measurement.
ANGLE_2	

No other keywords than those listed in the table above shall be specified for the TDM Data section.

C.4 iCelestialBodiesEphemeris

For details see also [CCSDS-NDM].

A. OEM Header (“ndmHeader” type in XML schema)

Keyword	Comments
CCSDS_OEM_VERS	Format version in the form of ‘x.y’, where ‘y’ is incremented for corrections and minor changes, and ‘x’ is incremented for major changes. Set to “2.0”
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.

CREATION_DATE	UTC time in CCSDS ASCII Time Code A without decimal fractions of second and without the corresponding decimal point (YYYY-MM-DDThh:mm:ss[Z]). “Z” time code terminator shall be optional
ORIGINATOR	The value for this keyword shall be “MOF” by default. Although this value shall remain configurable. In case of inconsistency between the received value and the expected value, a warning shall be raised to the user.

B. OEM Body (“oemBody” type in XML schema)

Keyword	Details
segment	Only 1 occurrence of this type shall be used.

C. OEM Metadata (“oemMetadata” type in XML schema)

Keyword	Details
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
OBJECT_NAME	The value for this keyword shall be, by default, either “SUN”, “MOON” for the celestial bodies and a pre-defined name for stars. In any case, the value for this keyword shall remain configurable, especially for covering the stars names. In case of inconsistency between the received value and the expected value, the message shall not be processed.
OBJECT_ID	The value for this keyword shall be, by default, identical to that one of “OBJECT_NAME” keyword. However, the value for this keyword shall remain configurable In case of inconsistency between the received value and the expected value, the message shall not be processed.
CENTER_NAME	The value for this keyword shall be “EARTH” when interface used for Sun and Moon, and the satellite name [TBC] when used for stars. The default satellite names shall be “MTG-S1”, “MTG-S2”. (iCelestialBodiesEphemeris files are not required for IDPF-I). However, the value for the satellite names shall remain configurable In case of inconsistency between the received value and the expected value, the message shall not be processed.
REF_FRAME	The value for this keyword shall be “TOD”. However, the value for this keyword shall be configurable for the MOF allowing selection of the following frames: GCRF, EME2000, ITRF2008, TDR, TEME, TOD and RTN.

REF FRAME EPOCH	This keyword shall not be included.
TIME SYSTEM	The value for this keyword shall be “UTC”.
START TIME	UTC time in CCSDS ASCII Time Code A with 3 decimal fractions of second (YYYY-MM-DDThh:mm:ss.sss[Z]). “Z” time code terminator shall be optional USEABLE_START_TIME and USEABLE_STOP_TIME shall be specified.
USEABLE_START_TIME	
USEABLE_STOP_TIME	
STOP_TIME	
INTERPOLATION	Interpolation method shall be “LAGRANGE” and interpolation degree “7”.
INTERPOLATION_DEGREE	The time step used in the OEM Data section shall be constant and configurable. By default, the time step shall be 1800 seconds.

D. OEM Data (“oemData” type in XML schema)

Keyword	Details
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.
STATE VECTOR COMPONENTS (“stateVectorAccType” type in XML schema)	
EPOCH	UTC time in CCSDS ASCII Time Code A with 3 decimal fractions of second (YYYY-MM-DDThh:mm:ss.sss[Z]). “Z” time code terminator shall be optional
X	When referring to Sun and Moon: These keywords represent the position of the Sun and Moon in km, in the frame defined with “REF_FRAME” keyword and centred at the object defined with “CENTER_NAME” keyword. The “units” attribute shall be specified. The positions of the celestial objects, Sun and Moon, shall be taken from the JPL planetary ephemerides (DE405).
Y	When referring to stars: These keywords represent the unit vector pointing to the star defined with “OBJECT_NAME” and “OBJECT_ID” keywords, in the frame defined with “REF_FRAME” keyword and from the object defined with “CENTER_NAME” keyword. The stars position (normally given as right ascension and declination in a given inertial frame) and motion (normally given as proper

Z	motion and radial velocity) shall be taken from a dedicated star catalog accessible by the MOF. The MOF shall take into account for the apparent positions of the stars, with respect to the satellite, the following corrections: Parallax due to the motion of the Earth around the Sun. Aberration due to the motion of the Earth around the Sun and the satellite around the Earth. N.B.: Gravitational light deflection (mainly caused by the proximity of the Sun to the star light path) is assumed either negligible and/or avoidable by using stars not close to the star light path.
X DOT	These keywords shall be set to “0.0” km/s. The “units” attribute shall be specified.
Y DOT	
Z DOT	
X DDOT	These keywords shall not be specified.
Y DDOT	
Z DDOT	
COVARIAMCE MATRIX COMPONENTS (“covarianceMatrixType” type in XML schema)	
COMMENT	These keywords shall not be specified, i.e. “covarianceMatrixType” type shall not be specified.
EPOCH	
COV REF FRAME	
CX X	
CY X	
CY Y	
CZ X	
CZ Y	
CZ Z	
CX DOT X	
CX DOT Y	
CX DOT Z	
CX DOT X DOT	
CY DOT X	
CY DOT Y	
CY DOT Z	
CY DOT X DOT	
CY DOT Y DOT	
CZ DOT X	
CZ DOT Y	
CZ DOT Z	
CZ DOT X DOT	
CZ DOT Y DOT	
CZ DOT Z DOT	

C.5 iGeometricEvents

For details see also [CCSDS-NDM].

A. EVM Header (“headerType” complex type in XML schema)

Table C-2: EVM Header Detailed Description.

Keyword		Obligatory
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.	N
CREATION_DATE	UTC time in CCSDS ASCII Time Code A without decimal fractions of second and without the corresponding decimal point (YYYY-MM-DDThh:mm:ss[Z]). “Z” time code terminator shall be optional	Y
ORIGINATOR	The value for this keyword shall be “MOF” by default. Although this value shall remain configurable. In case of inconsistency between the received value and the expected value, a warning shall be raised to the user.	Y

B. EVM Body (“bodyType” complex type in XML schema)

Table C-3: EVM Body Detailed Description.

Keyword		Obligatory
segment	Only 1 occurrence of this type shall be used.	Y

C. EVM Metadata (“metadataType” complex type in XML schema)

Table C-4: EVM Metadata Detailed Description.

Keyword		Obligatory
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default. The IDPF shall provide the user with the possibility to access this information, although automatic processing may not be implemented.	N
OBJECT_NAME	Recommendation for the use of the spacecraft designator published in the SPACEWARN Bulletin shall be followed [NSSDC-NMC]. However, the value for this keyword shall remain configurable for the Mission Operations	Y

Keyword		Obligatory
	Facility, especially for covering the case where the object is not listed in the bulletin. In case of inconsistency between the received value and the expected value, the message shall not be processed.	
OBJECT_ID	Recommendation for the use of the spacecraft designator published in the SPACEWARN Bulletin shall be followed [NSSDC-NMC]. However, the value for this keyword shall remain configurable for the Mission Operations Facility, especially for covering the case where the object is not listed in the bulletin. In case of inconsistency between the received value and the expected value, the message shall not be processed.	Y
CENTER_NAME	The value for this keyword shall be "EARTH".	Y
REF_FRAME	The value for this keyword shall be configurable for the MOF allowing selection of the following frames: GCRF, EME2000, ITRF2008, TDR, TEME and TOD. The default value for this keyword shall be "TOD".	Y
REF_FRAME_EPOCH	This keyword shall not be included.	N
TIME_SYSTEM	The value for this keyword shall be "UTC".	Y
START_TIME	Start of the event coverage interval. UTC time in CCSDS ASCII Time Code A with 3 decimal fractions of second (YYYY-MM-DDThh:mm:ss.sss[Z]).	Y
STOP_TIME	End of the event coverage interval. UTC time in CCSDS ASCII Time Code A with 3 decimal fractions of second (YYYY-MM-DDThh:mm:ss.sss[Z]).	Y

D. EVM Data ("dataType" type in XML schema)

Table C-5: EVM Data Detailed Description.

Keyword		Obligatory
COMMENT	The MOF shall provide the user with the possibility to specify comments. However, this keyword shall not be present by default.	N
EVENT (“eventType” complex type in XML schema)		
TYPE	Event type	Y

Keyword		Obligatory
	Event type <pre> <xsd:simpleType name="eventIdentifierType"> <xsd:restriction base="xsd:string"> <xsd:enumeration value="AscendingNode"/> <xsd:enumeration value="DescendingNode"/> <xsd:enumeration value="Perigee"/> <xsd:enumeration value="Apogee"/> <xsd:enumeration value="DayNightXing"/> <xsd:enumeration value="EarthUmbra"/> <xsd:enumeration value="MoonUmbra"/> <xsd:enumeration value="EarthPenumbra"/> <xsd:enumeration value="MoonPenumbra"/> <xsd:enumeration value="MeteorShading"/> <xsd:enumeration value="LatitudeXing"/> <xsd:enumeration value="LongitudeXing"/> <xsd:enumeration value="ZoneXing"/> <xsd:enumeration value="Manoeuvre"/> <xsd:enumeration value="ZenithAngle"/> <xsd:enumeration value="LocalTime"/> <xsd:enumeration value="SunSatEarthColin"/> <xsd:enumeration value="Keyhole"/> <xsd:enumeration value="Switchover"/> <xsd:enumeration value="SunSatStatColin"/> <xsd:enumeration value="StationAOSLOS"/> <xsd:enumeration value="StationMask"/> <xsd:enumeration value="SensorAOSLOS"/> <xsd:enumeration value="ZoneXingSwath"/> <xsd:enumeration value="XpderAOSLOS"/> <xsd:enumeration value="SatStatSatColin"/> <xsd:enumeration value="Dawn"/> <xsd:enumeration value="Dusk"/> </xsd:restriction> </pre>	

Keyword		Obligatory
EPOCH	UTC time in CCSDS ASCII Time Code A with 3 decimal fractions of second (YYYY-MM-DDThh:mm:ss.sss[Z]). “Z” time code terminator shall be optional	Y
DURATION	Event duration in seconds Included in time span events only.	N
UNIQUE_ID	Unique identifier of the event (integer)	Y
parameterList	List of parameters with further information on the event.	N
PARAMETERS (derived types in XML schema depending on event TYPE)		
parameter_type	parameter_value <xsd:complexType name="paramListType"> <xsd:sequence> <xsd:element name="latitude" type="ndm:angleType" minOccurs="0"/> <xsd:element name="longitude" type="ndm:angleType" minOccurs="0"/> <xsd:element name="upperLongitude" type="ndm:angleType" minOccurs="0"/> <xsd:element name="lowerLongitude" type="ndm:angleType" minOccurs="0"/> <xsd:element name="upperLatitude" type="ndm:angleType" minOccurs="0"/> <xsd:element name="lowerLatitude" type="ndm:angleType" minOccurs="0"/> <xsd:element name="station" type="xsd:string" minOccurs="0"/> <xsd:element name="colinearityAngle" type="ndm:angleType" minOccurs="0"/> <xsd:element name="azimuthRate" type="ndm:angleRateType" minOccurs="0"/> <xsd:element name="elevationAngle" type="ndm:angleType" minOccurs="0"/> <xsd:element name="sensorId" type="xsd:string" minOccurs="0"/> <xsd:element name="xpderId" type="xsd:string" minOccurs="0"/> <xsd:element name="target" type="xsd:string" minOccurs="0"/> </xsd:sequence> <xsd:attribute name="count" type="xsd:integer" use="optional"/> </xsd:complexType>	

C.6 iOBT/UTC

The file structure is specified in the MTG IQT - MME Interface Control Document [IQT-MME-ICD].

C.7 iInstrSchedule

Its implementation as an XML document will have following structure:

```
<inssch>
  <header>
    ...
  </header>
  <body>
    ...
  </body>
</inssch>
```

Table C-6: Header Description.

Keyword	Details
Source	Identifies the source sub-system of the schedule, including environment, software and database version used in the generation
Destination	Identifies the external system to process the schedule, including which environment
Summary	Overview of the schedule content, including product name, domain (satellite and instrument), time range and creation date

Table C-7: Header Detailed Definition.

Keyword	Data Format	MTG Specific Values	Notes
Source.SubSystem	xs:string	MPS	The value will always be “MPS”
Source.Environment	xs:enumeration	OPE/VAL/I&V/B SCC-OPE	
Source.SoftwareVersion	xs:string		
Source.DatabaseVersion	xs:string		
Destination.System	xs:enumeration	IDPF-I	For this schedule the value will always be “IDPF-I”
Destination.Environment	xs:enumeration	OPE/VAL/I&V/A NY/ALL	“ANY” means that any environment is expected to process it, while

Keyword	Data Format	MTG Specific Values	Notes
			“ALL” means all environments may process it.
Summary.ProductName	xs:enumeration	INSSCH	For this schedule the value will always be “INSSCH”
Summary.CreationDate	ndm:epochType ¹		
Summary.TimeSpan.StartTime	ndm:epochType		
Summary.TimeSpan.EndTime	ndm:epochType		

Table C-8: Body Definition.

Keyword	Details
Schedule.ScheduleId	A human readable ID for the schedule for the lifetime of the system
Schedule.AncestorScheduleId	A human readable ID for the previous schedule that this schedule fully or partially replaces, or follows
Schedule.Domain	E.g. satellite, satellite payload/unit, station, or ground segment element ID
Schedule.Tasks.Task	Scheduled items to be executed. The same Task may appear in ancestor and dependent schedules

Table C-9: Body Detailed Description.

Keyword	Data Format	MTG Specific Values	Notes
Schedule.ScheduleId	xs:string		A human readable ID for the schedule for the lifetime of the system
Schedule.AncestorScheduleId	xs:string		A human readable ID for the previous schedule that this schedule fully or partially replaces, or follows
Schedule.Domain.Spacecraft.SpacecraftName	xs:pattern	MTI[1-4]	For this schedule the value will always be MTI1, MTI2, MTI3 or MTI4

¹ epochType is defined further down.

Keyword	Data Format	MTG Specific Values	Notes
Schedule.Domain.Spacecraft.Instrument	xs:enumeration	FCI, LI	For this schedule the value will always be: FCI or LI
Schedule.Tasks.Task2.TaskId3	UUID (RFC 4122)		UUID of this task. Uniquely identifies this task in all schedules for the lifetime of the mission
Schedule.Tasks.Task.TaskName	xs:string		The defined name of this type of task in the MPS database
Schedule.Tasks.Task.StartTime	ndm:epochType		The planned start time of this task
Schedule.Tasks.Task.EndTime	ndm:epochType		The planned end time of this task
Schedule.Tasks.Task.EarliestStartTime	ndm:epochType		Execution may start as early as this time without affecting the plan.
Schedule.Tasks.Task.LatestEndTime	ndm:epochType		Execution may end as late as this time without affecting the plan.
Schedule.Tasks.Task.Arguments.Argument.ArgName	xs:string		
Schedule.Tasks.Task.Arguments.Argument.ArgValue	xs:string		
Schedule.Tasks.Task.Arguments.Argument.ArgType	xs:enumeration	<xsd:simpleType name="schedule ArgTypeType"> <xsd:restriction base="xsd:string"> </xsd:restriction> <xsd:enumeration value="boolean"/> <xsd:enumeration value="unsigned"/> <xsd:enumeration value="signed"/> </xsd:simpleType>	

² A task may have zero to unlimited number of arguments.

³ TaskId has to be implemented as an attribute, rather than as an element, in XML. See Figure 4-1. The rationale is that it can facilitate visualization/traverse the tree without opening all elements.

Keyword	Data Format	MTG Specific Values	Notes
		<xsd:enumeration value="real" /> <xsd:enumeration value="bits" /> <xsd:enumeration value="octet" /> <xsd:enumeration value="ascii" /> <xsd:enumeration value="absoluteTime" /> <xsd:enumeration value="relativeTime" /> <xsd:enumeration value="deduced" /> <xsd:enumeration value="synthetic" /> </xsd:restriction> </xsd:simpleType>	

C.8 iCalFeedback_for_IDPF-I

The External Feedback Calibration Dataset consists of one file per satellite and instrument. The files will be in netCDF and formatted according to the conventions given in [GSICS-NC].

C.9 iCalFeedback_for_IDPF-S

The External Feedback Calibration Dataset consists of one file per satellite and instrument. The files will be in netCDF and formatted according to the conventions given in [GSICS-NC].

C.10 iExtdata_for_flightdynamics

C.10.1.1 Description

This will be the IERS Bulletin A file. IERS Bulletin A provides current information on the Earth's orientation in the IERS Reference System. This includes Universal Time, coordinates of the terrestrial pole, and celestial pole offsets. Bulletin A gives an advanced solution updated weekly.

C.10.1.2 Filename

The filename will be of the form:
YYYYMMDDHHMMSS-ser7.dat

C.10.1.3 Format

Example of a typical Bulletin A file is given blow.

NOTE: an indicated section of the file has been removed in order to reduce the amount of data but maintain the format.

```
*****
*
*               I E R S   B U L L E T I N   -   A
*
*       Rapid Service/Prediction of Earth Orientation
*
*****
29 January 2015                               Vol. XXVIII No. 005

-----
GENERAL INFORMATION:
  To receive this information electronically, contact:
    ser7@maia.usno.navy.mil or use
    <http://maia.usno.navy.mil/docrequest.html>
  MJD = Julian Date - 2 400 000.5 days
  UT2-UT1 = 0.022 sin(2*pi*T) - 0.012 cos(2*pi*T)
            - 0.006 sin(4*pi*T) + 0.007 cos(4*pi*T)
            where pi = 3.14159265... and T is the date in Besselian years.
  TT = TAI + 32.184 seconds
  DUT1= (UT1-UTC) transmitted with time signals
        = -0.5 seconds beginning 25 Dec 2014 at 0000 UTC
  Beginning 1 July 2012:
    TAI-UTC = 35.000 000 seconds
*****
```

```

*
* Please note that daily and Bulletin A EOP data can be obtained from *
* the primary Earth Orientation (EO) servers at: *
* http://maia.usno.navy.mil ftp://maia.usno.navy.mil *
* and from the backup EO server at: *
* http://toshi.nofs.navy.mil ftp://toshi.nofs.navy.mil *
*
* A positive leap second WILL be introduced in UTC on 30 June 2015. *
*
* Distribution statement A. Approved for public release: *
* distribution unlimited. *
*
*****

```

The contributed observations used in the preparation of this Bulletin are available at <<http://www.usno.navy.mil/USNO/earth-orientation/eo-info/general/input-data>>. The contributed analysis results are based on data from Very Long Baseline Interferometry (VLBI), Satellite Laser Ranging (SLR), the Global Positioning System (GPS) satellites, Lunar Laser Ranging (LLR), and meteorological predictions of variations in Atmospheric Angular Momentum (AAM).

COMBINED EARTH ORIENTATION PARAMETERS:

			IERS Rapid Service					
		MJD	x	error	y	error	UT1-UTC	error
			"	"	"	"	s	s
15	1 23	57045	0.00621	.00009	0.29945	.00009	-0.482339	0.000026
15	1 24	57046	0.00519	.00009	0.30024	.00009	-0.483876	0.000027
15	1 25	57047	0.00402	.00009	0.30117	.00009	-0.485430	0.000025
15	1 26	57048	0.00296	.00009	0.30214	.00009	-0.486781	0.000020
15	1 27	57049	0.00243	.00009	0.30315	.00009	-0.487995	0.000019
15	1 28	57050	0.00228	.00009	0.30449	.00009	-0.489032	0.000015
15	1 29	57051	0.00223	.00009	0.30614	.00009	-0.489911	0.000055

PREDICTIONS:

The following formulas will not reproduce the predictions given below, but may be used to extend the predictions beyond the end of this table.

$$\begin{aligned}
 x &= 0.1051 - 0.0648 \cos A - 0.0545 \sin A - 0.0401 \cos C + 0.0049 \sin C \\
 y &= 0.3489 - 0.0483 \cos A + 0.0577 \sin A + 0.0049 \cos C + 0.0401 \sin C \\
 \text{UT1-UTC} &= -0.5011 - 0.00102 (\text{MJD} - 57059) - (\text{UT2-UT1})
 \end{aligned}$$

where $A = 2\pi * (\text{MJD} - 57051) / 365.25$ and $C = 2\pi * (\text{MJD} - 57051) / 435$.

$\text{TAI-UTC}(\text{MJD } 57052) = 35.0$

The accuracy may be estimated from the expressions:

$S_x, y = 0.00068 (\text{MJD} - 57051)^{0.80}$ $S_t = 0.00025 (\text{MJD} - 57051)^{0.75}$
 Estimated accuracies are: Predictions 10 d 20 d 30 d 40 d
 Polar coord's 0.004 0.007 0.010 0.013
 UT1-UTC 0.0014 0.0024 0.0032 0.0040

			MJD	x(arcsec)	y(arcsec)	UT1-UTC(sec)
2015	1 30	57052	0.0019	0.3079	-0.49078	
2015	1 31	57053	0.0015	0.3096	-0.49163	
2015	2 1	57054	0.0009	0.3113	-0.49250	
2015	2 2	57055	0.0002	0.3130	-0.49342	
2015	2 3	57056	-0.0006	0.3146	-0.49442	

[DATA REMOVED HERE]

2016	1 26	57413	0.0005	0.2506	0.14350
------	------	-------	--------	--------	---------

2016	1	27	57414	-0.0011	0.2521	0.14245
2016	1	28	57415	-0.0027	0.2536	0.14137
2016	1	29	57416	-0.0043	0.2552	0.14032

These predictions are based on all announced leap seconds.

CELESTIAL POLE OFFSET SERIES:

NEOS Celestial Pole Offset Series				
MJD	dpsi	error (msec. of arc)	deps	error
57029	-88.22	0.14	-9.23	0.05
57030	-88.08	0.14	-9.35	0.05
57031	-87.93	0.14	-9.47	0.05
57032	-87.85	0.30	-9.56	0.15
57033	-87.78	0.30	-9.61	0.15
57034	-87.68	0.30	-9.67	0.05
57035	-87.68	0.30	-9.80	0.05
57036	-87.92	0.30	-9.97	0.05

IAU2000A Celestial Pole Offset Series				
MJD	dX	error (msec. of arc)	dY	error
57029	-0.252	0.056	0.121	0.050
57030	-0.248	0.056	0.109	0.050
57031	-0.243	0.056	0.114	0.050
57032	-0.239	0.119	0.107	0.150
57033	-0.231	0.119	0.085	0.150
57034	-0.219	0.119	0.053	0.050
57035	-0.211	0.119	0.013	0.050
57036	-0.206	0.119	-0.038	0.050

The recommended software to predict celestial pole offsets can be found at
<<http://www.usno.navy.mil/USNO/earth-orientation/software/aux/ceppred.f>>
and software for the calculation of the dX and dY components with
respect to IAU2000A Nutation/Precession Theory can be found at the
<<http://maia.usno.navy.mil/conv2010/conventions.html>>
web site in Chapter 5 Section 5.5 of the IERS Conventions (2010).

APPENDIX D DICTIONARY OF EXTERNAL AUXILIARY DATASETS

NOTE: iExtdata_for_flightdynamics has been moved to Appendix C as it is a Level 0 auxiliary dataset.

APPENDIX E DICTIONARY OF GENERIC NETCDF GROUPS FOR ALL DATASETS/PRODUCTS

E.1 Common Definitions

E.1.1 Enumerated Types

Name	Type	Description	Value	String
manoeuvre_type	ubyte	Indicates type of manoeuvre		
		No manoeuvre	0	None
		North-South Station Keeping	1	NSSK
		East-West Station Keeping	2	EWSK
		Station Relocation	3	SR
		Momentum Unloading	4	MU
reference_frame_type	ubyte	Reference frame for the manoeuvre parameters		
			0	undefined
			1	GCRF
			2	EME2000
			3	ITRF2008
			4	TDR
			5	TEME
			6	TOD
			7	RTN

boolean	ubyte	boolean type - two states		
			0	false
			1	true
trilean	ubyte	trilean type - three states		
			0	false
			1	true
			2	undefined
auxiliary_dataset_status_type	ubyte	Possible states for an auxiliary dataset used in processing		
		OK	0	OK
		dataset was used but was out of its stated validity time	1	out_of_validity_time
		auxiliary dataset was not available	2	not_available
yaw_flip_type	ubyte	Possible yaw flip states of the platform		
			0	winter
			1	summer

E.1.2 Bit Masks

Name	Type	Bit	String	Description	Meaning
None defined					

E.2 Generic Root

E.2.1 Global Attribute

E.2.1.1 Dimensions

Name	Description	Type	Values	Shape
None defined				

E.2.1.2 User Types

Name	Description	Type	Values	Shape
boolean	See Enums spreadsheet There is no boolean type in netCDF. This enumerated type at root level can be used by all datasets/products. This user type definition only needs to be present when it is used within the dataset.	enum byte	See Enums table	
trilean	See Enums spreadsheet For situations where an undefined state is also required. This user type definition only needs to be present when it is used within the dataset.	enum byte	See Enums table	

E.2.1.3 Group Attributes

Name	Description	Type	Values	Shape
Conventions	Conventions that the product conforms to. This could be a future version of the CF Conventions that is applicable to netCDF4.	string	e.g. "CF-1.7"	
title	Dataset/product name	string		
summary	As defined in the relevant dataset/product format specification.	string		
keywords	As defined in the relevant dataset/product format specification.	string		
keywords vocabulary	As defined in the relevant dataset/product format specification.	string		
history	As per [CF]	string	"original generated file"	
institution	This field may be extended with other values should datasets/products be generated in other locations.	string	"EUMETSAT"	
location_indicator	As per the dataset name field "location_indicator" in dataset name	string		
data_designator	As per the dataset name field "data_designator" in dataset name	string		
platform	As per the dataset name field "spacecraft" in dataset name. Renamed in line with Attribute Convention for Dataset Discovery	string		
data_source	As per the dataset name field "data_source" in dataset name	string		
processing_level	As per the dataset name field "level" in dataset name	string		
coverage	As per the dataset name field "coverage" in dataset name	string		
type	As per the dataset name field "type" in dataset name	string		
subtype	As per the dataset name field "subtype" in dataset name	string		
component1	As per the dataset name field "component1" in dataset name	string		
component2	As per the dataset name field "component2" in dataset name	string		
component3	As per the dataset name field "component3" in dataset name	string		
product_id	The identifying product_id as used in the SIP	string		
baseline_version	Baseline version. The baseline version will reference of all other version numbers. Assumes processor version is not sufficient for this.	string		
release_version	Release version. Used to tag datasets that can be considered to have a contiguous consistency sufficient for example, for consideration as a climate set.	string		

processor_version	Processor version. Currently assumes a single processor version number suffices for the relevant IDPF or L2PP. Currently undefined if processor version also includes configuration of static auxiliary data and processor switch configuration, etc.	string		
algorithm_version	Algorithm version. Currently unclear how this would be used and it may be redundant with processor version.	string		
format_version	Format version of the dataset/product.	string		
time_coverage_start	As per the dataset name field “start_time” in dataset name. Renamed in line with Attribute Convention for Dataset Discovery	string		
time_coverage_end	As per the dataset name field “end_time” in dataset name. Renamed in line with Attribute Convention for Dataset Discovery	string		
processing_mode	As per the dataset name field “processing_mode” in dataset name	string		
special_compression	As per the dataset name field “special_compression” in dataset name	string		
subsetting	If this field is empty then no further strings follow. If this value is a single specified internal compression method as listed in the “special_compression” field in dataset name then it is followed by two strings: (1) human-readable parameters describing the exact internal compression performed (2) either a URL providing a description of the internal compression method or the words “NO URL”. If the value is “MULTI”, then this is followed by sets of triplets of strings (one per internal compression applied) A triplet consists of: (1) an internal compression code as listed in the “special_compression” field dataset name ; (2) human-readable parameters describing the exact internal compression performed; (3) either a URL providing a description of the internal compression method or the words “NO URL”.	string		

disposition_mode	As per the dataset/product name field “disposition_mode” in dataset name	string		
source	Characterisation of the type of data as per [CF].	string		
runtime_data	Space-separated string array of the SIP names of all nonproduct input datasets used in the creation of the dataset (auxiliary data, configuration file, DPP files, etc.) (Was part of <source> field)	string		
parent_data	Space-separated string array of the SIP names of all parent products/datasets used in the creation of the dataset (Was part of <source> field)	string		
linked_data	Space-separated string array of the SIP names of all datasets to be linked with this dataset in the archive (e.g. for a Level 0 dataset this would be all additional datasets required to create the virtual L0+ dataset in the archive). (Was part of <source> field)	string		
facility or tool	As per the dataset name field “facility or tool” in dataset name	string		
environment	As per the dataset name field “environment” in dataset name	string		
references	“www.eumetsat.int”	string		
comment	Unless otherwise specified in the relevant dataset/product format specification, “None.”	string		
date_created	UTC time of processing formatted in Abbreviated Generalised Time format and defined as the time of the formatting of the dataset/product by the processor. Renamed in line with Attribute Convention for Dataset Discovery	string		
group_tag	String that represents a grouping of datasets that allows chunks and quick-looks to be linked together. The string has the format: <platform> <datasource> <processing_level> <type> <subtype> YY	string		

	YY_DDD_NNNN_<release_version> where: ◇ indicates the same value as the named global metadata field in the brackets (as described in this table) YYYY = the year value of the “date-time_position” root attribute DDD = day in year value derived from the “date-time_position” root attribute, left padded with zeroes: 001 = Jan 1st, etc. NNNN = copy of the “repeat_cycle_in_day” field			
repeat_cycle_in_day	4-digit number (right-justified, zero-filled) indicating the expected current repeat cycle or group accumulation interval in the day for this particular dataset. For details on how to determine the expected repeat cycle see [EXPRC]. The counter starts at 0001 for the first repeat cycle at or after midnight (based on the time_position value) and resets for the next repeat cycle at or after the following midnight. Datasets/products that have no repeat cycle or group accumulation interval (e.g. certain DPP files) should use a fixed value of 0000 to indicate the field is not applicable.	string		
processed_count_in_repeat_cycle	Cumulative count of the dataset chunk in the repeat cycle or group accumulation interval. Resets when the repeat_cycle_in_day value changes. The counter increments for each created chunk in a repeat cycle or accumulation interval. It does not increment when a chunk is not created due to missing parent data.	string		
count_in_repeat_cycle	4-digit number (right-justified, zero-filled) indicating the expected count value of the dataset chunk in the repeat cycle or group accumulation interval based on the scan pattern or equivalent information. The counter will have discontinuities when chunks are not produced. The counter starts from 1 and resets when the repeat_cycle_in_day value changes. The counter increments for each	string		

	chunk in a repeat cycle or accumulation interval (whether header, body or trailer). A value of 0 is used for datasets for which the counter is not applicable (e.g. datasets which are not chunk-able).			
instrument_configuration_id	List of space-separated values of the “instrument configuration identifier” from the level 0 data ICU-I auxiliary data. Each unique ICID/ICID Version combination produces an entry in the list e.g. an ICID 100 that exists in the product with ICID Versions 1 and 2 will produce two “100” entries in the list.	string		
instrument_configuration_id_version	List of space-separated values of the “instrument configuration identifier version” from the level 0 data ICU-I auxiliary data. Each ICID in the instrument_configuration_id field should have a matching ICID Version entry in the same position in this list.	string		
subsettable_groups	Space separated list of paths to groups that have the subsettable="yes" group attribute.	string		
subsettable_groups_present	Space separated list of paths to groups that are present in the product. Will be the same as subsettable_groups for unsubsetted products.	string		
mtg_name	String field containing the MTG WMO-convention name for the file	string		
alternative_name	String field containing a possible alternative name for the file (e.g. Sentinel-4 naming convention)	string		
purpose	As per the dataset/product name field “purpose” in dataset name	string		
format	As per the dataset/product name field “format” in dataset name	string		
id	Can contain a DOI for reprocessed climate datasets (configuration file). Otherwise set to an empty string.	string		
naming authority	Will contain the DOI issuing authority for reprocessed climate datasets (configuration file) if id attribute is used. Otherwise set to an empty string.	string		
creator_type	Specifies type of creator with one of the following: 'person', 'group', 'institution', or 'position'.	string		
creator_institution	The institution of the creator; should uniquely identify the creator's institution.	string		

creator_name	The name of the person (or other creator type specified by the creator_type attribute) principally responsible for creating this data.	string		
creator_email	The email address of the person (or other creator type specified by the creator_type attribute) principally responsible for creating this data.	string		
creator_url	The URL of the person (or other creator type specified by the creator_type attribute) principally responsible for creating this data.	string		
license	URL to a standard or specific license, enter "Freely Distributed" or "None", or describe any restrictions to data access and distribution in free text.	string		
standard_name_vocabulary	The name and version of the controlled vocabulary from which variable standard names are taken. (Values for any standard_name attribute must come from the CF Standard Names vocabulary for the data file or product to comply with CF.) Example: 'CF Standard Name Table v27'.	string		
project	The name of the project(s) principally responsible for originating this data. Multiple projects can be separated by commas	string		
time_coverage_duration	Describes the duration of the data set.	string		
time_coverage_resolution	Describes the targeted time period between each value in the data set	string		
cdm_datatype	The data type, as derived from Unidata's Common Data Model Scientific Data types and understood by THREDDS [THREDDS]	string		
comment	Miscellaneous information about the data, not captured elsewhere. (See [CF])	string		
date_time_position	This is the start time of the repeat cycle (accumulation interval) shifted forwards or backwards to the nearest 30 seconds bin counting from 00:00:00. This removes minor variations and offsets in the actual observation start time of the repeat cycle. Repeat cycle Observations starting at 11:59:58, 12:00:00 and 12:00:05 would all have a date_time_position value with a time of 12:00:00. An observation starting at 23:59:45 would have value of 00:00:00 and be the first repeat cycle of the next day.	string		

time_position	This is the time string taken from date/time string in date_time_position.	string		
geospatial_lat_min	Geospatial_lat_min specifies the southernmost latitude covered by the dataset.	double		
geospatial_lat_max	Geospatial_lat_max specifies the northernmost latitude covered by the dataset.	double		
geospatial_lon_min	Geospatial_lon_min specifies the westernmost longitude covered by the dataset.	double		
geospatial_lon_max	Geospatial_lon_max specifies the easternmost longitude covered by the dataset.	double		

E.2.1.4 Variables

Name	Attribute	Description	Type	Values	Shape
None defined					

E.3 Generic Trailer

E.3.1 Global Attribute

E.3.1.1 Dimensions

Name	Description	Type	Values	Shape
body_chunk	Number of body chunks that were produced for the current repeat cycle or equivalent time period.		<runtime_value>	

E.3.1.2 User Types

Name	Description	Type	Values	Shape
None defined				

E.3.1.3 Group Attributes

Name	Description	Type	Values	Shape
None defined				

E.3.1.4 Variables

Name	Attribute	Description	Type	Values	Shape
available_body_chunks		Names of all the body chunk files that were produced for the current repeat cycle or equivalent time period.	String		body_chunk
	<i>long_name</i>		<i>String</i>	<i>"Names of body chunk files produced for this product"</i>	

APPENDIX F DICTIONARY OF GENERIC NETCDF GROUPS FOR GEOMETRIC DATA

Geometric data that can be included in grouped products – most commonly L1 dataets. Separated into Body chunk groups and Trailer chunk groups.

F.1.1 Global Attribute

F.1.1.1 Dimensions

Name	Description	Type	Values	Shape
index	Length of geometric metadata vectors			

F.1.1.2 User Types

Name	Description	Type	Values	Shape
None defined				

F.1.1.3 Group Attributes

Name	Description	Type	Values	Shape
None defined				

F.1.1.4 Variables

Name	Attribute	Description	Type	Values	Shape
time		UTC Time for geometric data vectors i.e. time at which the	double		index

		geometric metadata are calculated.			
	<i>title</i>		<i>string</i>	<i>"UTC Time for geometric data vectors"</i>	
	<i>long_name</i>		<i>string</i>	<i>"UTC time at which the geometric metadata are calculated."</i>	
	<i>standard name</i>		<i>string</i>	<i>"time"</i>	
	<i>units</i>		<i>string</i>	<i>"seconds since 2000-01-01 00:00:00.0"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC FILL DOUBLE</i>	
index		Coordinate variable with indices of data vectors segments extracted for chunk from the complete repeat cycle data vectors.	ushort		index
	<i>long_name</i>		<i>string</i>	<i>"Coordinate variable of indices driven from repeat cycle data vectors"</i>	
index_offset		Offset index of data vectors in this dataset. If not using the coordinate variable index, then data vector data should be extracted from array position <code>indexed_position - index_offset</code> .	ushort		

	<i>long_name</i>		string	<i>"Offset index for data vectors"</i>	
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F.1.2 state

F.1.2.1 Dimensions

Name	Description	Type	Values	Shape
None defined				

F.1.2.2 User Types

Name	Description	Type	Values	Shape
None defined				

F.1.2.3 Group Attributes

Name	Description	Type	Values	Shape
None defined				

F.1.2.4 Variables

Name	Attribute	Description	Type	Values	Shape
None defined					

F.1.3 platform

F.1.3.1 Dimensions

Name	Description	Type	Values	Shape
None defined				

F.1.3.2 User Types

Name	Description	Type	Values	Shape
manoeuvre_type	See Enums worksheet	enum ubyte	See Enums table	
reference_frame_type	See Enums worksheet	enum ubyte	See Enums table	
yaw_flip_type	yaw_flip summer = 1, winter = 0	enum ubyte	See Enums table	

F.1.3.3 Group Attributes

Name	Description	Type	Values	Shape
None defined				

F.1.3.4 Variables

Name	Attribute	Description	Type	Values	Shape
yaw_flip		Yaw flip configuration	yaw_flip_type	See Enums table	
in_manoeuvre		A manoeuvre occurs during this dataset	boolean		
	<i>title</i>		<i>string</i>	<i>"Platform manoeuvre occurs in"</i>	

				<i>this dataset when set"</i>	
recent_manoeuvre_time_window		Window of time prior to dataset start that is searched for a recent manoeuvre.	double		
	<i>title</i>		<i>string</i>	<i>"Time window to search for a manoeuvre that starts before or during this dataset"</i>	
	<i>long_name</i>		<i>string</i>	<i>"Recent manoeuvre time window"</i>	
	<i>units</i>		<i>string</i>	<i>"seconds"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC FILL DOUBLE</i>	
recent_manoeuvre_found		Boolean to indicate if a recent manoeuvre was found	boolean	true/false	
	<i>long_name</i>		<i>string</i>	<i>"Recent or current manoeuvre found"</i>	
	<i>title</i>		<i>string</i>	<i>"Recent or current manoeuvre found in the recent manoeuvre time window"</i>	

recent_manoeuvre_type		See Enums worksheet	manoeuvre_type		
	<i>long_name</i>		<i>string</i>	<i>"Type of recent manoeuvre"</i>	
recent_manoeuvre_start_time		Start time for manoeuvre	double		
	<i>long_name</i>		<i>string</i>	<i>"Start time in UTC of recent manoeuvre"</i>	
	<i>standard_name</i>		<i>string</i>	<i>"time"</i>	
	<i>units</i>		<i>string</i>	<i>"seconds since 2000-01-01 00:00:00.0"</i>	
	<i>precision</i>		<i>string</i>	<i>"1 millisecond"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC_FILL_DOUBLE</i>	
recent_manoeuvre_end_time		End time for manoeuvre	double		
	<i>long_name</i>		<i>string</i>	<i>"End time in UTC of recent manoeuvre"</i>	
	<i>standard_name</i>		<i>string</i>	<i>"time"</i>	
	<i>units</i>		<i>string</i>	<i>"seconds since 2000-01-01 00:00:00.0"</i>	
	<i>precision</i>		<i>string</i>	<i>"1 millisecond"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC_FILL_DOUBLE</i>	
recent_manoeuvre_reference_frame		Reference frame for manoeuvre parameters	reference_frame		
	<i>long_name</i>		<i>string</i>	<i>"Reference frame for manoeuvre parameters"</i>	

recent_manoeuvre_delta_vx		X component of the velocity increment	double		
	<i>long_name</i>		<i>string</i>	<i>"X component delta v for recent manoeuvre"</i>	
	<i>units</i>		<i>string</i>	<i>"m/s"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC FILL DOUBLE</i>	
recent_manoeuvre_delta_vy		Y component of the velocity increment	double		
	<i>long_name</i>		<i>string</i>	<i>"Y component delta v for recent manoeuvre"</i>	
	<i>units</i>		<i>string</i>	<i>"m/s"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC FILL DOUBLE</i>	
recent_manoeuvre_delta_vz		Z component of the velocity increment	double		
	<i>long_name</i>		<i>string</i>	<i>"Z component delta v for recent manoeuvre"</i>	
	<i>units</i>		<i>string</i>	<i>"m/s"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC FILL DOUBLE</i>	
recent_manoeuvre_spacecraft_delta_mass		Change in spacecraft mass	double		

	<i>long_name</i>		<i>string</i>	<i>"Delta spacecraft mass for recent manoeuvre"</i>	
	<i>units</i>		<i>string</i>	<i>"g"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC_FILL_DOUBLE</i>	
upcoming_manoeuvre_time_window		Window of time that is searched post dataset end for an upcoming manoeuvre.	double		
	<i>title</i>		<i>string</i>	<i>"Time window to search for a manoeuvre that starts after this dataset"</i>	
	<i>long_name</i>		<i>string</i>	<i>"Upcoming manoeuvre time window"</i>	
	<i>units</i>		<i>string</i>	<i>"seconds"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC_FILL_DOUBLE</i>	
upcoming_manoeuvre_found		Boolean to indicate if an upcoming manoeuvre was found	boolean		
	<i>long_name</i>		<i>string</i>	<i>"Upcoming manoeuvre found"</i>	
	<i>title</i>		<i>string</i>	<i>"Upcoming manoeuvre found in"</i>	

				<i>the upcoming manoeuvre time window"</i>	
upcoming_manoeuvre_type		Type of manoeuvre	manoeuvre_type		
	<i>long_name</i>		<i>string</i>	<i>"Type of upcoming manoeuvre"</i>	
upcoming_manoeuvre_start_time		Start time for manoeuvre	double		
	<i>long_name</i>		<i>string</i>	<i>"Start time in UTC of upcoming manoeuvre"</i>	
	<i>standard name</i>		<i>string</i>	<i>"time"</i>	
	<i>units</i>		<i>string</i>	<i>"seconds since 2000-01-01 00:00:00.0"</i>	
	<i>precision</i>		<i>string</i>	<i>"1 millisecond"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC FILL DOUBLE</i>	
upcoming_manoeuvre_end_time		End time for manoeuvre	double		
	<i>long_name</i>		<i>string</i>	<i>"End time in UTC of upcoming manoeuvre"</i>	
	<i>standard name</i>		<i>string</i>	<i>"time"</i>	
	<i>units</i>		<i>string</i>	<i>"seconds since 2000-01-01 00:00:00.0"</i>	
	<i>precision</i>		<i>string</i>	<i>"1 millisecond"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC FILL DOUBLE</i>	
upcoming_manoeuvre_reference_frame		See Enums worksheet	reference_frame_type		

	<i>long_name</i>		<i>string</i>	<i>"Reference frame for manoeuvre parameters"</i>	
upcoming_manoeuvre_delta_vx		X component of the velocity increment	double		
	<i>long_name</i>		<i>string</i>	<i>"X component delta v for upcoming manoeuvre"</i>	
	<i>units</i>		<i>string</i>	<i>"m/s"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC FILL DOUBLE</i>	
upcoming_manoeuvre_delta_vy		Y component of the velocity increment	double		
	<i>long_name</i>		<i>string</i>	<i>"Y component delta v for upcoming manoeuvre"</i>	
	<i>units</i>		<i>string</i>	<i>"m/s"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC FILL DOUBLE</i>	
upcoming_manoeuvre_delta_vz		Z component of the velocity increment	double		
	<i>long_name</i>		<i>string</i>	<i>"Z component delta v for upcoming manoeuvre"</i>	
	<i>units</i>		<i>string</i>	<i>"m/s"</i>	
	<i>FillValue</i>		<i>double</i>	<i>NC FILL DOUBLE</i>	

upcoming_manoeuvre_spacecraft_delta_mass		Change in spacecraft mass	double		
	<i>long_name</i>		<i>string</i>	"Delta spacecraft mass for upcoming manoeuvre"	
	<i>units</i>		<i>string</i>	"g"	
	<i>FillValue</i>		<i>double</i>	NC FILL DOUBLE	
subsattellite_latitude		Latitude of the sub-satellite point at time(index)	float		index
	<i>long_name</i>		<i>string</i>	"Sub-satellite latitude"	
	<i>units</i>		<i>string</i>	"degrees north"	
	<i>FillValue</i>		<i>float</i>	NC FILL FLOAT	
	<i>standard name</i>		<i>string</i>	"latitude"	
subsattellite_longitude		Longitude of the sub-satellite point at time(index)	float		index
	<i>long_name</i>		<i>string</i>	"Sub-satellite longitude"	
	<i>units</i>		<i>string</i>	"degrees east"	
	<i>FillValue</i>		<i>float</i>	NC FILL FLOAT	
	<i>standard name</i>		<i>string</i>	"longitude"	
platform_altitude		Platform altitude at time(index)	float		index
	<i>long_name</i>		<i>string</i>	"Platform altitude"	
	<i>units</i>		<i>string</i>	"m"	

	<i>FillValue</i>		<i>float</i>	<i>NC FILL FLOAT</i>	
orbit_phase		Orbital phase angle at time(index)	float		index
	<i>long_name</i>		<i>string</i>	<i>"Orbit phase"</i>	
	<i>units</i>		<i>string</i>	<i>"degrees"</i>	
	<i>FillValue</i>		<i>float</i>	<i>NC FILL FLOAT</i>	

F.1.4 celestial

F.1.4.1 Dimensions

Name	Description	Type	Values	Shape
None defined				

F.1.4.2 User Types

Name	Description	Type	Values	Shape
None defined				

F.1.4.3 Group Attributes

Name	Description	Type	Values	Shape
None defined				

F.1.4.4 Variables

Name	Attribute	Description	Type	Values	Shape
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earth_sun_distance		Distance from Earth to Sun at time(index)	float		index
	<i>long_name</i>		<i>string</i>	<i>"Distance between Earth and Sun"</i>	
	<i>units</i>		<i>string</i>	<i>"km"</i>	
	<i>FillValue</i>		<i>float</i>	<i>NC_FILL_FLOAT</i>	
sun_satellite_distance		Distance from Earth to Satellite at time(index)	float		index
	<i>long_name</i>		<i>string</i>	<i>"Distance between satellite and Sun"</i>	
	<i>units</i>		<i>string</i>	<i>"km"</i>	
	<i>FillValue</i>		<i>float</i>	<i>NC_FILL_FLOAT</i>	
sun_eclipse_by_earth		If TRUE indicates an eclipse of the sun by the earth, as viewed by the satellite	boolean		index
	<i>long_name</i>		<i>string</i>	<i>"Sun eclipsed by Earth"</i>	
	<i>title</i>		<i>string</i>	<i>"If TRUE indicates an eclipse of the Sun by the Earth, as viewed by the satellite"</i>	
sun_eclipse_by_moon		If TRUE indicates an eclipse of the sun by the moon, as viewed by the satellite	boolean		index
	<i>long_name</i>		<i>string</i>	<i>"Sun eclipsed by Moon"</i>	

	<i>title</i>		<i>string</i>	<i>"If TRUE indicates an eclipse of the Sun by the Moon as viewed by the satellite"</i>	
solar_elevation		Solar angle in instrument frame at time(index)	float		index
	<i>standard_name</i>		<i>string</i>	<i>"solar_elevation_angle"</i>	
	<i>long_name</i>		<i>string</i>	<i>"Solar elevation angle"</i>	
	<i>units</i>		<i>float</i>	<i>"degree"</i>	
	<i>FillValue</i>		<i>string</i>	<i>NC_FILL_FLOAT</i>	
solar_azimuth		Solar angle in instrument frame at time(index)	float		index
	<i>standard_name</i>		<i>string</i>	<i>"solar_azimuth_angle"</i>	
	<i>long_name</i>		<i>string</i>	<i>"Solar azimuth angle"</i>	
	<i>units</i>		<i>float</i>	<i>"degree"</i>	
	<i>FillValue</i>		<i>string</i>	<i>NC_FILL_FLOAT</i>	
subsolar_latitude		Latitude of the sub-solar point at time(index)	float		index
	<i>long_name</i>		<i>string</i>	<i>"Sub-solar latitude"</i>	
	<i>units</i>		<i>string</i>	<i>"degrees north"</i>	
	<i>FillValue</i>		<i>float</i>	<i>NC_FILL_FLOAT</i>	
	<i>standard_name</i>		<i>string</i>	<i>"latitude"</i>	
subsolar_longitude		Longitude of the sub-solar point at time(index)	float		index
	<i>long_name</i>		<i>string</i>	<i>"Sub-solar longitude"</i>	
	<i>units</i>		<i>string</i>	<i>"degrees east"</i>	
	<i>FillValue</i>		<i>float</i>	<i>NC_FILL_FLOAT</i>	

	<i>standard_name</i>		<i>string</i>	<i>"longitude"</i>	
	<i>valid_range</i>		<i>float</i>	<i><configured_value>, -90, 90</i>	

F.2 Group Geometric Trailer

F.2.1 Global Attribute

F.2.1.1 Dimensions

Name	Description	Type	Values	Shape
None defined				

F.2.1.2 User Types

Name	Description	Type	Values	Shape
None defined				

F.2.1.3 Group Attributes

Name	Description	Type	Values	Shape
None defined				

F.2.1.4 Variables

Name	Attribute	Description	Type	Values	Shape
None defined					

F.2.2 state

F.2.2.1 Dimensions

Name	Description	Type	Values	Shape
None defined				

F.2.2.2 User Types

Name	Description	Type	Values	Shape
None defined				

F.2.2.3 Group Attributes

Name	Description	Type	Values	Shape
None defined				

F.2.2.4 Variables

Name	Attribute	Description	Type	Values	Shape
None defined					

F.2.3 platform

F.2.3.1 Dimensions

Name	Description	Type	Values	Shape
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None defined

F.2.3.2 User Types

Name	Description	Type	Values	Shape
None defined				

F.2.3.3 Group Attributes

Name	Description	Type	Values	Shape
None defined				

F.2.3.4 Variables

Name	Attribute	Description	Type	Values	Shape
subsatellite_minimum_latitude		Minimum value from the subsatellite_latitude vector	float		
	<i>long_name</i>		<i>string</i>	<i>"Minimum sub-satellite latitude"</i>	
	<i>units</i>		<i>string</i>	<i>"degrees north"</i>	
	<i>FillValue</i>		<i>float</i>	<i>NC FILL FLOAT</i>	
	<i>standard name</i>		<i>string</i>	<i>"latitude"</i>	
subsatellite_minimum_longitude		Minimum value from the subsatellite_longitude vector	float		
	<i>long_name</i>		<i>string</i>	<i>"Minimum sub-satellite longitude"</i>	

	<i>units</i>		<i>string</i>	<i>"degrees east"</i>	
	<i>_FillValue</i>		<i>float</i>	<i>NC_FILL_FLOAT</i>	
	<i>standard name</i>		<i>string</i>	<i>"longitude"</i>	
subsatellite_maximum_latitude		Maximum value from the subsatellite_latitude vector	float		
	<i>long_name</i>		<i>string</i>	<i>"Maximum sub-satellite latitude"</i>	
	<i>units</i>		<i>string</i>	<i>"degrees north"</i>	
	<i>_FillValue</i>		<i>float</i>	<i>NC_FILL_FLOAT</i>	
	<i>standard name</i>		<i>string</i>	<i>"latitude"</i>	
subsatellite_maximum_longitude		Maximum value from the subsatellite_longitude vector	float		
	<i>long_name</i>		<i>string</i>	<i>"Maximum sub-satellite longitude"</i>	
	<i>units</i>		<i>string</i>	<i>"degrees east"</i>	
	<i>_FillValue</i>		<i>float</i>	<i>NC_FILL_FLOAT</i>	
	<i>standard name</i>		<i>string</i>	<i>"longitude"</i>	

APPENDIX G PROCESSOR INFORMATION IN PRODUCTS

This information is included in every product to provide an audit trail of the auxiliary files used in processing. If the product has groups, it may be included in the /state/processor group. If the product does not have groups (is flat) or does not include a state group, then it may be included in the root.

G.1 Products with Groups

G.2 Global Attribute

G.2.1.1 Dimensions

Name	Description	Type	Values	Shape
auxiliary_dataset	Number of auxiliary datasets involved in processing the dataset		<runtime_value>	

G.2.1.2 User Types

Name	Description	Type	Values	Shape
auxiliary_dataset_status_type	See Enum types	enum ubyte		

G.2.1.3 Group Attributes

Name	Description	Type	Values	Shape
None defined				

G.2.1.4 Variables

Name	Attribute	Description	Type	Values	Shape
------	-----------	-------------	------	--------	-------

auxiliary_dataset_identifier		Unique identifier for the auxiliary dataset. If available, the filename should be used. If the auxiliary file was not available, the file name template should be stated, with unknown values such as times set to the correct length of lower case x characters.	string		auxiliary_dataset
auxiliary_dataset_status		See Enum types	auxiliary_dataset_status_type		auxiliary_dataset

G.3 Flat Products

G.3.1 Global Attribute

G.3.1.1 Dimensions

Name	Description	Type	Values	Shape
auxiliary_dataset	Number of auxiliary datasets involved in processing the dataset		<runtime_value>	

G.3.1.2 User Types

Name	Description	Type	Values	Shape
auxiliary_dataset_status_type	See Enum types	enum byte		

G.3.1.3 Group Attributes

Name	Description	Type	Values	Shape
None defined				

G.3.1.4 Variables

Name	Attribute	Description	Type	Values	Shape
auxiliary_dataset_identifier		Unique identifier for the auxiliary dataset. If available, the filename should be used. If the auxiliary file was not available, the file name template should be stated, with unknown values such as times set to the correct length of lower case x characters.	string		auxiliary_dataset
	<i>long_name</i>		<i>string</i>	<i>"Auxiliary dataset identifier"</i>	

	<i>title</i>		<i>string</i>	<i>"Identifier of auxiliary dataset or type of auxiliary dataset used to produce this product"</i>	
auxiliary_dataset_status		Possible states for an auxiliary dataset 0 = OK 1 = dataset was used but was out of its stated validity time 2 = auxiliary dataset was not available	auxiliary_dataset_status_type		auxiliary_dataset
	<i>long_name</i>		<i>string</i>	<i>"Status of auxiliary dataset"</i>	

APPENDIX H COMPLIANCE WITH NETCDF ATTRIBUTE CONVENTION FOR DATASET DISCOVERY

This appendix indicates the compliance with [ACDD].

Attribute	Description from [ACDD]	GFS Compliance
Highly Recommended		
title	A short phrase or sentence describing the dataset. In many discovery systems, the title will be displayed in the results list from a search, and therefore should be human readable and reasonable to display in a list of such names. This attribute is also recommended by the NetCDF Users Guide and the CF conventions.	Present
summary	A paragraph describing the dataset, analogous to an abstract for a paper.	Present
keywords	A comma-separated list of key words and/or phrases. Keywords may be common words or phrases, terms from a controlled vocabulary (GCMD is often used), or URIs for terms from a controlled vocabulary (see also "keywords_vocabulary" attribute).	Present
Conventions	A comma-separated list of the conventions that are followed by the dataset. For files that follow this version of ACDD, include the string 'ACDD-1.3'. (This attribute is described in the NetCDF Users Guide.)	Present
Recommended		

Attribute	Description from [ACDD]	GFS Compliance
id	An identifier for the data set, provided by and unique within its naming authority. The combination of the "naming authority" and the "id" should be globally unique, but the id can be globally unique by itself also. IDs can be URLs, URNs, DOIs, meaningful text strings, a local key, or any other unique string of characters. The id should not include white space characters.	Present
naming_authority	The organization that provides the initial id (see above) for the dataset. The naming authority should be uniquely specified by this attribute. We recommend using reverse-DNS naming for the naming authority; URIs are also acceptable. Example: 'edu.ucar.unidata'.	Present
history	Provides an audit trail for modifications to the original data. This attribute is also in the NetCDF Users Guide: 'This is a character array with a line for each invocation of a program that has modified the dataset. Well-behaved generic netCDF applications should append a line containing: date, time of day, user name, program name and command arguments.' To include a more complete description you can append a reference to an ISO Lineage entity; see NOAA EDM ISO Lineage guidance.	Present
source	The method of production of the original data. If it was model-generated, source should name the model and its version. If it is observational, source should characterize it. This attribute is defined in the CF Conventions. Examples: 'temperature from CTD #1234'; 'world model v.0.1'	Present
processing_level	A textual description of the processing (or quality control) level of the data.	Present

Attribute	Description from [ACDD]	GFS Compliance
comment	Miscellaneous information about the data, not captured elsewhere. This attribute is defined in the CF Conventions.	Present
acknowledgement	A place to acknowledge various types of support for the project that produced this data.	Not Present
license	Provide the URL to a standard or specific license, enter "Freely Distributed" or "None", or describe any restrictions to data access and distribution in free text.	Present
standard_name_vocabulary	The name and version of the controlled vocabulary from which variable standard names are taken. (Values for any standard_name attribute must come from the CF Standard Names vocabulary for the data file or product to comply with CF.) Example: 'CF Standard Name Table v27'.	Present
date_created	The date on which this version of the data was created. (Modification of values implies a new version, hence this would be assigned the date of the most recent values modification.) Metadata changes are not considered when assigning the date_created. The ISO 8601:2004 extended date format is recommended, as described in the Attribute Content Guidance section.	Present
creator_name	The name of the person (or other creator type specified by the creator_type attribute) principally responsible for creating this data.	Present
creator_email	The email address of the person (or other creator type specified by the creator_type attribute) principally responsible for creating this data.	Present

Attribute	Description from [ACDD]	GFS Compliance
creator_url	The URL of the person (or other creator type specified by the creator_type attribute) principally responsible for creating this data.	Present
institution	The name of the institution principally responsible for originating this data. This attribute is recommended by the CF convention.	Present
project	The name of the project(s) principally responsible for originating this data. Multiple projects can be separated by commas, as described under Attribute Content Guidelines. Examples: 'PATMOS-X', 'Extended Continental Shelf Project'.	Present
publisher_name	The name of the person (or other entity specified by the publisher_type attribute) responsible for publishing the data file or product to users, with its current metadata and format.	Not Present
publisher_email	The email address of the person (or other entity specified by the publisher_type attribute) responsible for publishing the data file or product to users, with its current metadata and format.	Not Present
publisher_url	The URL of the person (or other entity specified by the publisher_type attribute) responsible for publishing the data file or product to users, with its current metadata and format.	Not Present

Attribute	Description from [ACDD]	GFS Compliance
geospatial_bounds	Describes the data's 2D or 3D geospatial extent in OGC's Well-Known Text (WKT) Geometry format (reference the OGC Simple Feature Access (SFA) specification). The meaning and order of values for each point's coordinates depends on the coordinate reference system (CRS). The ACDD default is 2D geometry in the EPSG:4326 coordinate reference system. The default may be overridden with geospatial_bounds_crs and geospatial_bounds_vertical_crs (see those attributes). EPSG:4326 coordinate values are latitude (decimal degrees_north) and longitude (decimal degrees_east), in that order. Longitude values in the default case are limited to the [-180, 180) range. Example: 'POLYGON ((40.26 -111.29, 41.26 -111.29, 41.26 -110.29, 40.26 -110.29, 40.26 -111.29))'.	Not Present
geospatial_bounds_crs	The coordinate reference system (CRS) of the point coordinates in the geospatial_bounds attribute. This CRS may be 2-dimensional or 3-dimensional, but together with geospatial_bounds_vertical_crs, if that attribute is supplied, must match the dimensionality, order, and meaning of point coordinate values in the geospatial_bounds attribute. If geospatial_bounds_vertical_crs is also present then this attribute must only specify a 2D CRS. EPSG CRSs are strongly recommended. If this attribute is not specified, the CRS is assumed to be EPSG:4326. Examples: 'EPSG:4979' (the 3D WGS84 CRS), 'EPSG:4047'.	Not Present

Attribute	Description from [ACDD]	GFS Compliance
geospatial_bounds_vertical_crs	The vertical coordinate reference system (CRS) for the Z axis of the point coordinates in the geospatial_bounds attribute. This attribute cannot be used if the CRS in geospatial_bounds_crs is 3-dimensional; to use this attribute, geospatial_bounds_crs must exist and specify a 2D CRS. EPSG CRSs are strongly recommended. There is no default for this attribute when not specified. Examples: 'EPSG:5829' (instantaneous height above sea level), "EPSG:5831" (instantaneous depth below sea level), or 'EPSG:5703' (NAVD88 height).	Not Present
geospatial_lat_min	Describes a simple lower latitude limit; may be part of a 2- or 3-dimensional bounding region. Geospatial_lat_min specifies the southernmost latitude covered by the dataset.	Present
geospatial_lat_max	Describes a simple upper latitude limit; may be part of a 2- or 3-dimensional bounding region. Geospatial_lat_max specifies the northernmost latitude covered by the dataset.	Present
geospatial_lon_min	Describes a simple longitude limit; may be part of a 2- or 3-dimensional bounding region. geospatial_lon_min specifies the westernmost longitude covered by the dataset. See also geospatial_lon_max.	Present

Attribute	Description from [ACDD]	GFS Compliance
geospatial_lon_max	Describes a simple longitude limit; may be part of a 2- or 3-dimensional bounding region. geospatial_lon_max specifies the easternmost longitude covered by the dataset. Cases where geospatial_lon_min is greater than geospatial_lon_max indicate the bounding box extends from geospatial_lon_max, through the longitude range discontinuity meridian (either the antimeridian for -180:180 values, or Prime Meridian for 0:360 values), to geospatial_lon_min; for example, geospatial_lon_min=170 and geospatial_lon_max=-175 incorporates 15 degrees of longitude (ranges 170 to 180 and -180 to -175).	Present
geospatial_vertical_min	Describes the numerically smaller vertical limit; may be part of a 2- or 3-dimensional bounding region. See geospatial_vertical_positive and geospatial_vertical_units.	Not Present
geospatial_vertical_max	Describes the numerically larger vertical limit; may be part of a 2- or 3-dimensional bounding region. See geospatial_vertical_positive and geospatial_vertical_units.	Not Present
geospatial_vertical_positive	One of 'up' or 'down'. If up, vertical values are interpreted as 'altitude', with negative values corresponding to below the reference datum (e.g., under water). If down, vertical values are interpreted as 'depth', positive values correspond to below the reference datum. Note that if geospatial_vertical_positive is down ('depth' orientation), the geospatial_vertical_min attribute specifies the data's vertical location furthest from the earth's center, and the geospatial_vertical_max attribute specifies the location closest to the earth's center.	Not Present
time_coverage_start	Describes the time of the first data point in the data set. Use the ISO 8601:2004 date format, preferably the extended format as recommended in the Attribute Content Guidance section.	Present

Attribute	Description from [ACDD]	GFS Compliance
time_coverage_end	Describes the time of the last data point in the data set. Use ISO 8601:2004 date format, preferably the extended format as recommended in the Attribute Content Guidance section.	Present
time_coverage_duration	Describes the duration of the data set. Use ISO 8601:2004 duration format, preferably the extended format as recommended in the Attribute Content Guidance section.	Present
time_coverage_resolution	Describes the targeted time period between each value in the data set. Use ISO 8601:2004 duration format, preferably the extended format as recommended in the Attribute Content Guidance section.	Present
Suggested		
creator_type	Specifies type of creator with one of the following: 'person', 'group', 'institution', or 'position'. If this attribute is not specified, the creator is assumed to be a person.	Present
creator_institution	The institution of the creator; should uniquely identify the creator's institution. This attribute's value should be specified even if it matches the value of publisher_institution, or if creator_type is institution.	Present
publisher_type	Specifies type of publisher with one of the following: 'person', 'group', 'institution', or 'position'. If this attribute is not specified, the publisher is assumed to be a person.	Not Present
publisher_institution	The institution that presented the data file or equivalent product to users; should uniquely identify the institution. If publisher_type is institution, this should have the same value as publisher_name.	Not Present

Attribute	Description from [ACDD]	GFS Compliance
program	The overarching program(s) of which the dataset is a part. A program consists of a set (or portfolio) of related and possibly interdependent projects that meet an overarching objective. Examples: 'GHR SST', 'NOAA CDR', 'NASA EOS', 'JPSS', 'GOES-R'.	Not Present
contributor_name	The name of any individuals, projects, or institutions that contributed to the creation of this data. May be presented as free text, or in a structured format compatible with conversion to ncML (e.g., insensitive to changes in whitespace, including end-of-line characters).	Not Present
contributor_role	The role of any individuals, projects, or institutions that contributed to the creation of this data. May be presented as free text, or in a structured format compatible with conversion to ncML (e.g., insensitive to changes in whitespace, including end-of-line characters). Multiple roles should be presented in the same order and number as the names in contributor_names.	Not Present
geospatial_lat_units	Units for the latitude axis described in "geospatial_lat_min" and "geospatial_lat_max" attributes. These are presumed to be "degree_north"; other options from udunits may be specified instead.	Not Present
geospatial_lat_resolution	Information about the targeted spacing of points in latitude. Recommend describing resolution as a number value followed by the units. Examples: '100 meters', '0.1 degree'	Not Present
geospatial_lon_units	Units for the longitude axis described in "geospatial_lon_min" and "geospatial_lon_max" attributes. These are presumed to be "degree_east"; other options from udunits may be specified instead.	Not Present

Attribute	Description from [ACDD]	GFS Compliance
geospatial_lon_resolution	Information about the targeted spacing of points in longitude. Recommend describing resolution as a number value followed by units. Examples: '100 meters', '0.1 degree'	Not Present
geospatial_vertical_units	Units for the vertical axis described in "geospatial_vertical_min" and "geospatial_vertical_max" attributes. The default is EPSG:4979 (height above the ellipsoid, in meters); other vertical coordinate reference systems may be specified. Note that the common oceanographic practice of using pressure for a vertical coordinate, while not strictly a depth, can be specified using the unit bar. Examples: 'EPSG:5829' (instantaneous height above sea level), 'EPSG:5831' (instantaneous depth below sea level).	Not Present
geospatial_vertical_resolution	Information about the targeted vertical spacing of points. Example: '25 meters'	Not Present
date_modified	The date on which the data was last modified. Note that this applies just to the data, not the metadata. The ISO 8601:2004 extended date format is recommended, as described in the Attributes Content Guidance section.	Not Present
date_issued	The date on which this data (including all modifications) was formally issued (i.e., made available to a wider audience). Note that these apply just to the data, not the metadata. The ISO 8601:2004 extended date format is recommended, as described in the Attributes Content Guidance section.	Not Present
date_metadata_modified	The date on which the metadata was last modified. The ISO 8601:2004 extended date format is recommended, as described in the Attributes Content Guidance section.	Not Present

Attribute	Description from [ACDD]	GFS Compliance
product_version	Version identifier of the data file or product as assigned by the data creator. For example, a new algorithm or methodology could result in a new product_version.	Not Present (metadata available across version fields)
keywords_vocabulary	If you are using a controlled vocabulary for the words/phrases in your "keywords" attribute, this is the unique name or identifier of the vocabulary from which keywords are taken. If more than one keyword vocabulary is used, each may be presented with a prefix and a following comma, so that keywords may optionally be prefixed with the controlled vocabulary key. Example: 'GCMD:GCMD Keywords, CF:NetCDF COARDS Climate and Forecast Standard Names'.	Present
platform	Name of the platform(s) that supported the sensor data used to create this data set or product. Platforms can be of any type, including satellite, ship, station, aircraft or other. Indicate controlled vocabulary used in platform_vocabulary.	Present
platform_vocabulary	Controlled vocabulary for the names used in the "platform" attribute.	Not Present
instrument	Name of the contributing instrument(s) or sensor(s) used to create this data set or product. Indicate controlled vocabulary used in instrument_vocabulary.	Not Present (metadata available in data_source)
instrument_vocabulary	Controlled vocabulary for the names used in the "instrument" attribute.	Not Present
cdm_data_type	The data type, as derived from Unidata's Common Data Model Scientific Data types and understood by THREDDS. (This is a THREDDS "dataType", and is different from the CF NetCDF attribute 'featureType', which indicates a Discrete Sampling Geometry file in CF.)	Not Present

Attribute	Description from [ACDD]	GFS Compliance
metadata_link	A URL that gives the location of more complete metadata. A persistent URL is recommended for this attribute.	Not Present
references	Published or web-based references that describe the data or methods used to produce it. Recommend URIs (such as a URL or DOI) for papers or other references. This attribute is defined in the CF conventions.	Present
Highly Recommended Variable Attributes		
long_name	A long descriptive name for the variable (not necessarily from a controlled vocabulary). This attribute is recommended by the NetCDF Users Guide, the COARDS convention, and the CF convention.	Usually present
standard_name	A long descriptive name for the variable taken from a controlled vocabulary of variable names. We recommend using the CF convention and the variable names from the CF standard name table. This attribute is recommended by the CF convention.	Usually present
units	The units of the variable's data values. This attribute value should be a valid udunits string. The "units" attribute is recommended by the NetCDF Users Guide, the COARDS convention, and the CF convention.	Usually present

Attribute	Description from [ACDD]	GFS Compliance
coverage_content_type	An ISO 19115-1 code to indicate the source of the data (image, thematicClassification, physicalMeasurement, auxiliaryInformation, qualityInformation, referenceInformation, modelResult, or coordinate).	Not Present

APPENDIX I DICTIONARY OF COMMON VARIABLES

I.1 Introduction

This appendix aims to bring some conformity across the MTG products by setting a common naming policy and usage for variables that are common across many of the products. This usage should be in line with the CF conventions [CF].

Values that are in underlined italics will have a value dependent upon their usage within the

I.2 Common Variables

I.2.1.1 Longitude and Latitude

When used as a coordinate variable for the main measurement values, the variables should be given the simple names “longitude” and “latitude”. If additional latitude values are required, they can be given appropriate names and long_name descriptions. _FillValues will depend on the variable type.

Valid range will depend on the subsatellite point.

Float Representation

```
<variable name="longitude" type="float">  
  <attribute name="units" value="degrees_east" />  
  <attribute name="long_name" value="Longitude of observation" />  
  <attribute name="_FillValue" value="[NC_FILL_FLOAT]" />  
  <attribute name="standard_name" value="longitude" />
```

```
<attribute name="valid_range" value= "-90 90" />
</variable>
```

```
<variable name="latitude" type="float">
  <attribute name="units" value=" degrees_north" />
  <attribute name="long_name" value=" Latitude of observation" />
  <attribute name="_FillValue" value=[NC_FILL_FLOAT] />
  <attribute name="standard_name" value=" latitude" />
  <attribute name="valid_range" value= "-90 90" />
</variable>
```

Short Representation

```
<variable name="longitude" type="short">
  <attribute name="units" value=" degrees_east" />
  <attribute name="long_name" value=" Longitude of observation" />
  <attribute name="_FillValue" value=[NC_FILL_SHORT] />
  <attribute name="standard_name" value=" longitude" />
  <attribute name="valid_range" value= "-90 90" />
  <attribute name="add_offset" value= "0.0" />
  <attribute name="scale_factor" value= "180.0" />
</variable>
```

```
<variable name="latitude" type="float">
  <attribute name="units" value=" degrees_north" />
  <attribute name="long_name" value=" Latitude of observation" />
  <attribute name="_FillValue" value=[NC_FILL_SHORT] />
  <attribute name="standard_name" value=" latitude" />
  <attribute name="valid_range" value= "-90 90" />
  <attribute name="add_offset" value= "0.0" />
```

```
<attribute name="scale_factor" value=" 180.0" />
</variable>
```

I.3 Time

```
<variable name="time" type="double">
  <attribute name="units" value="seconds since 2000-01-01 00:00:00.0" />
  <attribute name="long_name" value="Time of observation" />
  <attribute name="standard_name" value="time" />
  <attribute name="_FillValue" value=[NC_FILL_DOUBLE] />
</variable>
```