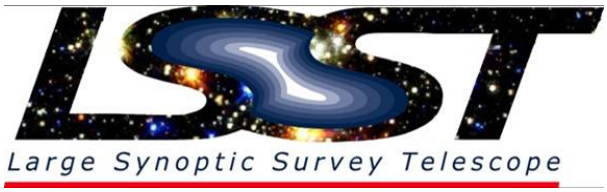

DM Software Development Plan

prepared by: theAuthor
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Abstract

This is a template for a Gaia DPAC Software Development Plan for DM. It outlines the development approach, management structure, work breakdown, configuration control etc. for the development of the DMsoftware.

Document History

Issue	Revision	Date	Author	Comment
D	1	yyyy-mm-dd	myInitials	First draft

Contents

1 Introduction

1.1 Scope

This document covers all development in DM.

1.2 Applicable Documents

WOM-017	Project Implementation Plan for Gaia DPAC
RD-010	Gaia DPAC Project Development Plan
WOM-001	Work Breakdown Structures for Gaia DPAC
TL-001	DPAC Product Assurance Plan
WOM-012	DPAC Software Configuration Management Plan
MP-011	Document Reference Codes for Gaia
RD-008	DPAC Risk Management Plan
TLO-001	ECSS Tailoring
RG-004	DPAC System Validation and Test Plan

1.3 References

[RD-010], Drimmel, R., Els, S., O'Mullane, W., et al., 2014, *DPAC Project Development Plan*, GAIA-CD-PL-INAF-RD-010, URL http://www.rssd.esa.int/cs/livelink/open/2786669

[RG-004], Guerra, R., leaders CU leaders, D., 2013, *DPAC System Validation and Test Plan*, GAIA-C1-SP-ESAC-RG-004, URL http://www.rssd.esa.int/cs/livelink/open/2898933

[UL-019], Lammers, U., Lindegren, L., 2010, *AGIS Software Requirements Specification*, GAIA-C3-SP-ESAC-UL-019, URL http://www.rssd.esa.int/cs/livelink/open/2695063

[TL-001], Levoir, T., Damery, J., Hoar, J., et al., 2012, *DPAC Product Assurance Plan*, GAIA-C1-PL-CNES-TL-001, URL http://www.rssd.esa.int/cs/livelink/open/2439085

[TLO-001], Lock, T., 2007, *Software Engineering Standards (ECSS-E-40B) - Tailored for Gaia Science Ground Segment*, GAIA-C1-TN-ESAC-TLO-001, URL http://www.rssd.esa.int/cs/livelink/open/2786522

[RD-008], Mercier, E., Drimmel, R., Lock, T., 2009, *DPAC Risk Management Plan*, GAIA-CD-PL-DPAC-RD-008, URL http://www.rssd.esa.int/cs/livelink/open/2785681

[WOM-001], O'Mullane, W., Lammers, U., 2007, *Work breakdown structures for DPAC*, GAIA-C1-TN-ESAC-WOM-001, URL http://www.rssd.esa.int/cs/livelink/open/497865

[WOM-011], O'Mullane, W., Hoar, J., Levoir, T., et al., 2011, *Software Engineering Guidelines for DPAC*, GAIA-C1-UG-ESAC-WOM-011, URL http://www.rssd.esa.int/cs/livelink/open/2760364

[WOM-017], O'Mullane, W., Drimmel, R., Mignard, F., et al., 2013, *Project Implementation Plan (PIP)*, GAIA-CD-PL-ESAC-WOM-017, URL http://www.rssd.esa.int/cs/livelink/open/2812481

[WOM-012], O'Mullane, W., Nguyen, A.T., Hoar, J., et al., 2016, *DPAC Configuration Management Plan*, GAIA-C1-PL-ESAC-WOM-012, URL http://www.rssd.esa.int/cs/livelink/open/2760363

[MP-011], Perryman, M., 2012, *Document reference codes for Gaia*, GAIA-CG-PL-ESA-MP-011, URL http://www.rssd.esa.int/cs/livelink/open/497672

1.4 Acronyms

The following table has been generated from the on-line Gaia acronym list:

Acronym	Description
AGIS	Astrometric Global Iterative Solution
AO	Announcement of Opportunity
AS	Adjacent Sample
ATP	Automatic Test Procedure
AUT	AUTomated
CCB	Configuration Control Board
CDR	Critical Design Review
CIL	Critical Items List
CM	Calibration Model

CN	Change Notice
CNES	Centre National d'Etudes Spatiales (France)
COTS	Commercial-Off-The-Shelf
CPU	Central Processing Unit
CRB	Change Review Board
CRR	Command Request Response
CSV	Comma-Separated Value (database output format, e.g., for MS Excel)
CU	Coordination Unit (in DPAC)
DB	DataBase
DDP	Delivered Duty Paid
DOC	Department of Commerce (USA)
DPAC	Data Processing and Analysis Consortium
DPC	Data Processing Centre
DPCE	Data Processing Centre ESAC
DPCG	Data Processing Centre (ObsGE/ISDC) Geneva
DU	Development Unit (in DPAC)
ECSS	European Cooperation for Space Standardisation
ESA	European Space Agency
ESAC	European Space Astronomy Centre (VilSpa)
FL	First Look
FLOP	FLoating-point OPeration
FTE	Full-Time Equivalent
GAIA	Global Astrometric Interferometer for Astrophysics (obsolete; now spelled as Gaia)
GWP	Gaia Work Package
HW	Hardware (also denoted H/W)
ICD	Interface Control Document
ID	Identifier (Identification)
IDT	Initial Data Treatment (Image Dissector Tube in Hipparcos scope)
ISO	International Organisation for Standardisation (Geneva, Switzerland)
IT	Information Technology
JD	Julian Date
JDK	Java Development Kit
LaTeX	(Leslie) Lamport TeX (document markup language and document preparation system)
MAN	MANual
MDB	Main DataBase
OF	Object Feature (source packet)
OSG	Operations Steering Group
PA	Product Assurance
PAP	Product Assurance Plan

PDR	Preliminary Design Review
PO	Partial Observation (of object in AF)
PPN	Parametrised Post-Newtonian (formalism in General Relativity)
PR	Progress Report
QA	Quality Assurance
RAM	Random Access Memory
SADT	Structured (System) Analysis and Design Technique
SCI	Schedule-Critical Item
SCMP	Software Configuration Management Plan
SDD	Software Design Document
SDP	Supplementary Data Pattern
SGS	Science Ground Segment
SOC	System On a Chip
SP	SPecification
SPR	Software Problem Report
SRR	System Requirements Review
SRS	Software Requirements Specification
SSS	System Software Specification
STP	Software Test Plan
STR	Software Test Report
STS	Software Testing Specification
SUM	Software User Manual
SVN	SubVersioN
SVTP	Software Verification Test Plan
SW	Software
TN	Technical Note
TRB	Test Review Board
TRR	Test Readiness Review
UML	Unified Modeling Language
URL	Uniform Resource Locator
VV	Verification and Validation
WBS	Work Breakdown Structure
WP	Work Package

2 DM role and structure

2.1 Role of DM

2.2 Organisation and members

The key functions of DM are the following:

Position	Name	Description
DM Leader	(Insert Name here)	RD-010 (Section A.2.1)
DM Technical Manager	(Insert Name here)	RD-010 (Section A.2.2)
Configuration Manager	(Insert Name here)	WOM-012 (Section 3.1)
Quality Assurance Leader	(Insert Name here)	TL-001 (Section 4)
Risk Manager	(Insert Name here)	RD-008 (Section 5)
Test Manager	(Insert Name here)	RG-004 (Test Personnel sections)

This may include an organigram as in Figure 1.

The current number of active members in the CU is around XX though it might fluctuate slightly in time. For a full list of members use the Gaia People finder and select the Group DM. Here is a convenient link to the list (one must be logged in to the Gaia portal first) `http://www.rssd.esa.int//SYS/include/people_search_open.php?project=GAIA&action=Retrieve&group_select=gaiaperson.DM`

2.3 Product Breakdown Structure

In the section the products of DM are outlined. In general for Gaia a product is related to a top level work package, and may be include SW systems, data and documentation. All top-level SW systems which will have an SRS should be listed (minimum detail), and the Science Products to be produced by the CU should be included A version of the CU1 product tree is included as an example in Figure 2.

2.4 Work Breakdown Structure and effort required

In this section you should list the work packages and sub packages with the the person responsible for each. The effort required per year for each workpackage is listed in Table **??**.

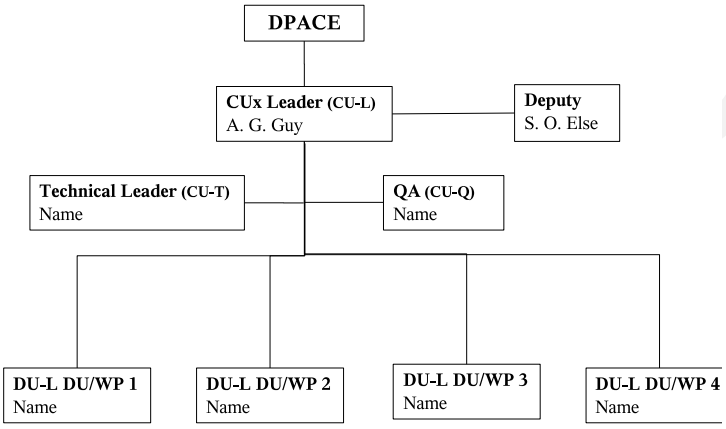

FIGURE 1: Example generic organigram for a CU

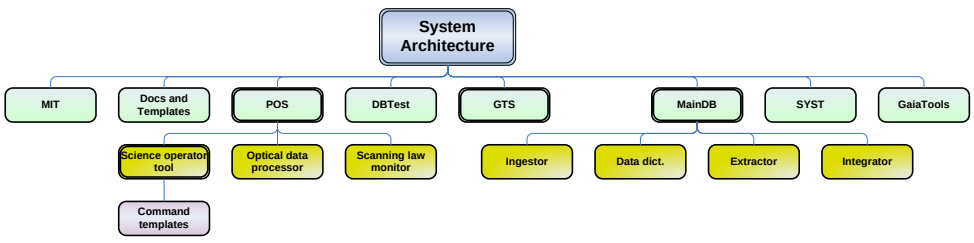

FIGURE 2: Example Product tree a version of CU1 product tree

If all WPS are in a directory called WPS the script GWPsummary.pl from the CU1/docs/common/scripts directory will generate a table such as the one bellow which may be included.

Full details of all work packages are provided in Appendix B.

WP Number	Description	Manager
GWP-M-x01-00000	Management and scientific coordination of CUx	CU-L

The effortReq directory from the AO response is now in CU1/docs/common/effrotReq the script for making the effort tables and sumaries from these files is now in CU1/docs/common/scripts/effortTex.pl. You may use this script to generate a table such as the one included bellow from CU1. To generate the table for your CU or DPC you must set the environment variable DOCCOMMON to point to CU1/docs/common. Preferably include DOCCOMON/scirpts in your path. Then run the script passing your CUx as an argument i.e. for cu1

```
effortTex.pl CU1
```

3 Software management approach

The management approach is heavily driven by the cyclical approach outlined in WOM-001 and defined in RD-010.

3.1 Master schedule

The global planning of the CU for the period 2006-2011. General description of each cycle linking to the milestones listed in Section 3.2.1. Please also take note of the cycles as listed with their reviews in WOM-001.

This should be high level and short giving an overview of important dates for the CU.

This document should be updated near the end of each cycle to refine planning for the next cycle and reassess risks etc.

3.2 Milestones

Here list top-level milestones for the CU, including the final ”end-to-end tests” of the CU data processing system. If there are only DU milestones then one subsection for each DU to list the DU milestones for each cycle.

3.2.1 Milestones for DUx

A simple and short bullet list of clear objectives for each cycle. This can be removed if all milestones are listed under the CU heading i.e. then this list appears only once

- Cycle 1
  - Goal 1
- Cycle 2
  - Goal 1
- Cycle 3
  - Goal 1
- Cycle 4
  - Goal 1

- Cycle 5
  - Goal 1
- Cycle 6
  - Goal 1
- Cycle 7
  - Goal 1
- Cycle 8
  - Goal 1
- Cycle 9
  - Goal 1
- Cycle 10
  - Goal 1

3.3 Planning

All cycles should be identified here, with formal DPAC reviews included. Detail in the approaching cycle is in a later section.

The CU development plan should include top-level CU milestones to be achieved (from previous section), tasks that need to be done to reach these milestones, and critical deliveries from other CUs or ESA (when these need to be received).

If the CU has no DUs all planning may be in this section otherwise a subsection such as Section 3.3.1 should be added for each DU.

3.3.1 Planning for DUx

Here a gantt chart type planning is suggested linking this to the WBS and tasks. This section is optional (see text above) and may be repeated for each DU.

3.3.2 Deliverables

This section should list the deliveries that the CU must make to other CUs or ESA (*not ESAC as DPC*)

- Critical delivery 1 (to CUx)
- Critical delivery 2 (to CUy)

3.4 Assumptions, dependencies and constraints on DM

3.4.1 Assumptions

The assumptions on which the plan is based.

3.4.2 Dependencies and constraints with respect to other CUs

This section should list the critical deliverables (data, SW, etc.) that the CU must receive from other CUs, i.e. those items needed to stay on its development schedule.

- Critical delivery 1 (from CUx)
- Critical delivery 2 (from CUy)

3.4.3 Other dependencies and constraints

This section should list the critical deliveries that the CU must receive from outside DPAC, especially from ESA.

- Critical delivery 1 (from ESA)
- Critical delivery 2 (from ESA)

3.5 Risk Management

Risk management is carried out in accordance with the DPAC risk management plan RD-008.

3.5.1 Identification of Risks

Identification of technical, financial, human etc. risks at CU or DU / WP level.

DPAC-CUx--010	Hardware prices	**severity:**5	**likelihood:** B
Description: It is possible hardware prices will not continue to drop. At todays prices the CU1 hardware will cost far more than budgeted.			
Mitigation: Try to have money put in contingency for hardware.			
Actions:			

3.5.2 Actions related to risk management

The actions taken at CU, organizational, DPAC, etc. level to manage identified risks.

3.6 Monitoring mechanisms

The monitoring mechanisms for managing the work (e.g. progress report, progress meeting, action item lists).

3.7 Training plan

Identification of missing skills and training needs.

4 Software development approach

Could be a link to WOM-001.

4.1 DM software development strategy

CU development strategy elements (not covered by TL-001).

4.2 Detailed description of DM cycle Z

Review of objectives, activities, input, output, completion criteria, internal reviews, etc. of the cycle Z. The development schedule (plan) for the upcoming cycle.

One of these for each cycle more detail in the upcoming one (i.e. replace ”Z” with a cycle number).

4.3 Internal reviews and associated documentation

Description of the scope and purpose of each identified internal review, relevant deliverables and expected outputs. The role of involved parties at each internal review shall be described here. Formalities are outlined in the QA document.

5 Software Configuration Management

Detailed description of the software configuration management process, activities and procedures (including software problem report, change request management are covered in WOM-012 configuration management plan.

Practical information on implementing configuration management is contained in the Engineering Guide WOM-011.

In this section the configuration control board organisation, configuration items etc are listed for DM.

5.1 Configuration Item List and Baseline

This is a list of the configuration items for DM.

Prod. Name	WP Number	Manager	SRS
As outlined in SRS Template a name e.g AGIS	Full WP Number e.g GWP-T-320-10000	Name of manager	GAIA-C3-SP-ESAC-UL-019-1 UL-019

Note: the SRS document code includes the issue number effectively this is the configuration baseline.

5.2 Configuration Control Board

Describe the Configuration Control Board organisation and members. Guidelines for the setting up the the DMCCB are in WOM-012.

Here actual names of the members should be listed and proposed frequency of meetings.

6 DM Specific Policies

Any deviations from the product assurance plan should be listed here. Also any specific engineering techniques not covered in the engineering guide should be mentioned. Any configuration management deviating or on top of the SCMP should be listed.

This section is optional and may be dropped if the CU adheres to the PA and CM plans.

A Product assurance compliance Matrix

A table will be provided for this section when the QA plan id

B Detail Work Package Descriptions for DM

List here the detailed work package descriptions using the `gwp` environment. Typically there would be a file for each WP usually named with the WP number. The template example is included here :

Gaia DPAC WP:		GWP-T-CNNN-PPPP
Title: Work Package Title		
Provider(s): List of people doing the work		
Manager(s): Name of WP's manager		
Start: dd/mm/yyyy	**End**: dd/mm/yyyy	**Total Effort**: nnn SM
Objective: Describe here the objective of the WP - this is a free text input - all LaTeX constructs can be used (lists, verbatim, etc.)		

Tasks: Listing of all tasks this WP consists of - this is a free text text input - all LaTeX constructs can be used, e.g. 1. Task 1   (a) SubTask 1 2. Task 2 3. Task 3
Input: List here all inputs to the WP
Output: List here all outputs of the WP
Deliverables: List of WP deliverables, e.g. software or report under configuration control
Dependencies: List of all dependencies of this WP
Interfaces: List of all interfaces of this WP, i.e. links with other tasks, WPs, or CUs
Remarks: Remarks - free text

This entire section may be generated from a directory full of GWP files using GWPsummary.pl from the CU1/docs/common/scripts directory.