CENTRE NATIONAL D'ÉTUDES SPATIALES

GAIA

Quality Assurance Activity

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Quality Assurance WP

- GWP-T-x03-00000 Quality assurance and conf. management for CUx
- GWP-T-x03-10100 Quality assurance
- GWP-T-x03-10100 Write Soft. Quality Assurance Plan
- GWP-T-x03-10200 Document reviewing
- GWP-T-x03-10300 Software reviewing
- GWP-T-x03-10400 Quality Assurance Control

To obtain a satisfactory software quality level for application software

- Reliable
- Easy to maintain
- With Performance and load capacity

By giving common rules and recommendations

Essential for a project

- **Where the final system will integrate components from**
  - Hundreds of developers from a large number of institutes
- **Where corrective and enhancements maintenance will cover the period 2012-19**

QA CNES activities

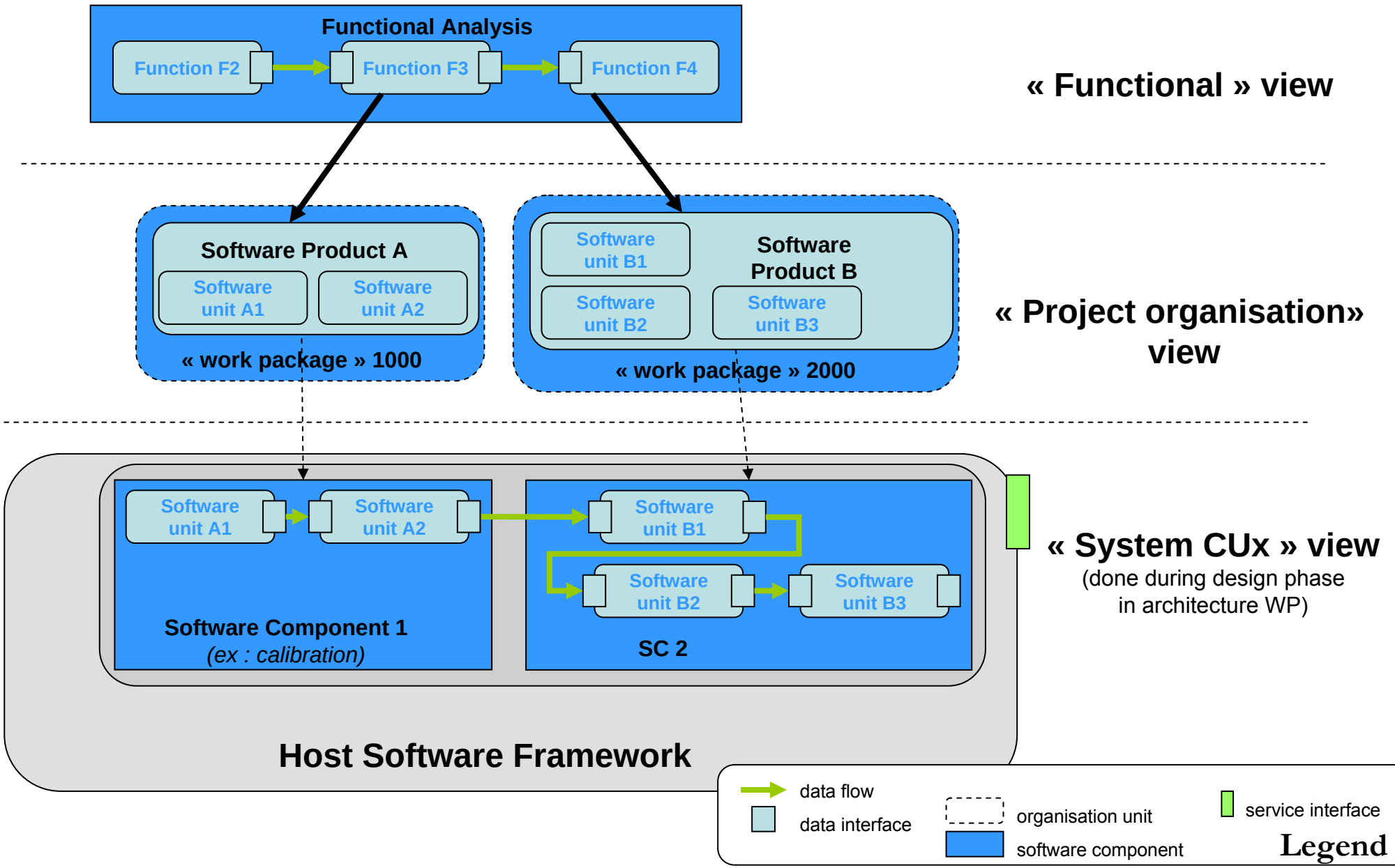
- **Leading CU1 QA WP**
  - **Provide a generic Product Assurance Plan (PAP) for CUx**
    - To be validated by CU1
    - To be agreed by DACE
  - **Tools for Quality Assurance (GWP-T-103-11000)**
    - **Control, validation and testing tools**
- **Leading QA activities for CU4, CU6, CU8**
  - **QA Support to DU**
    - To specialize PAP for CUx purpose
    - For Document reviewing
    - For Software reviewing
    - For Quality Assurance Control
  - **Engineering Support to DU**
    - QA Tools
    - Other Tools (from GWP-T-110-00000 Coordination common software resources)
      - Environment, development, ….

TERMINOLOGY

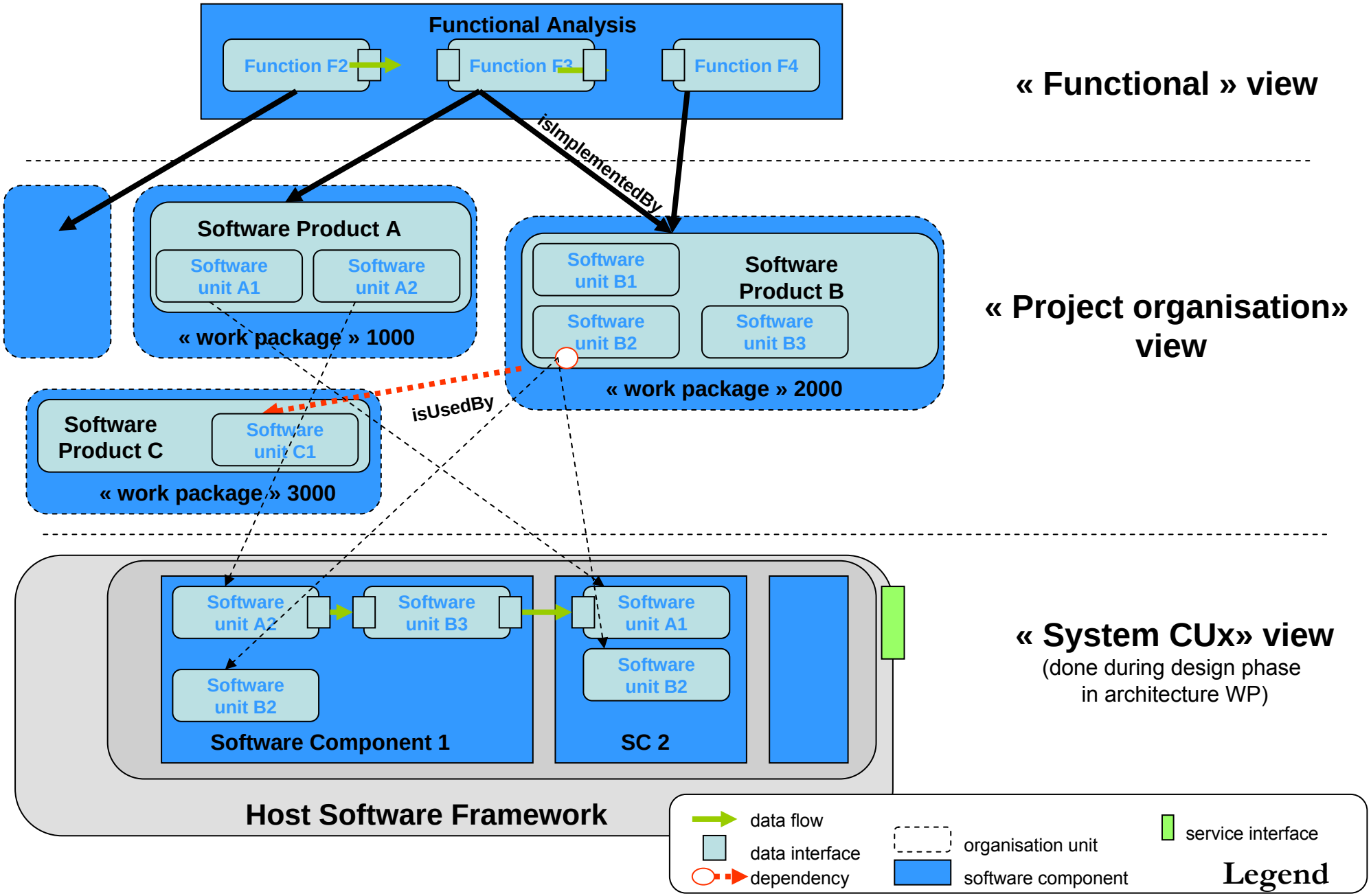
Through Next figures :

- **function :**
  - **part of a logical model used to decompose the functionalities expected to be performed by a system. This logical model is an implementation-independent model of software items used to analyze and document software requirements.**
- **Scientific algorithm:**
  - **mathematical, formal or graphical description of a scientific processing. This description will be an input for the software implementation.**
- **interface:**
  - **depending the need, the following interface terminology must be used:**
    - Data interface : data exchange between Software products
    - Service interface : description of means that are set between systems to provide exchange of data.
    - Dependency : API call or link between different software products or units.
- **system/subsystem:**
  - ***set of interdependent* hardware and software elements *constituted to achieve a given objective by performing a specified function.* System is composed of subsystems.**
    - *For GAIA, the term System is implicitely related to the overall GAIA data processing system (overall system)*
    - *The subsets of the overall system that are installed and operated in the various Data Processing Center (IDT, First look, AGIS, Photometry, Object processing…) are subsystems: : a GAIA subsystem will be the result of the integration of Software products and/or Software Units within an host infrastructure in the Data Processing Center*
    - *The term system may be used more widely with the condition to be precede by its name : i. e the GIBIS System*
- **software component : part of a software system**
  - **NOTE 1 Software component is used as a general term**
  - **NOTE 2 Components can be assembled and decomposed to form new components. In the production activities, components are implemented as modules, tasks or programs, any of which can be configuration items.**
- **software product :**
  - **set of computer programs, procedures, documentation and their associated data. A software product is the result of a unit of work (DU, WP, …) for which an organization is set (responsible, developers, …). The software product life cycle and management is defined through a common set of rules.**
- **software unit/module :**
  - **program or library that is part of a software product and which could not be divided. In particular, software interfaces shall be identified and described at this level.**

ideal case


Functional Analysis
Function F2
Function F3
Function F4
« Functional » view
Software Product A
Software unit A1
Software unit A2
« work package » 1000
Software unit B1
Software Product B
Software unit B2
Software unit B3
« work package » 2000
« Project organisation» view
Software unit A1
Software unit A2
Software Component 1
(ex : calibration)
Software unit B1
Software unit B2
Software unit B3
SC 2
« System CUx » view
(done during design phase in architecture WP)
Host Software Framework
data flow
data interface
organisation unit
software component
service interface
Legend

Reality ?


Functional Analysis
Function F2
Function F3
Function F4
isImplementedBy
« Functional » view
Software Product A
Software unit A1
Software unit A2
« work package » 1000
Software unit B1
Software Product B
Software unit B2
Software unit B3
« work package » 2000
« Project organisation» view
isUsedBy
Software Product C
Software unit C1
« work package » 3000
Software unit A2
Software unit B3
Software unit A1
Software unit B2
Software unit B2
Software Component 1
SC 2
« System CUx» view
(done during design phase in architecture WP)
Host Software Framework
data flow
data interface
dependency
organisation unit
software component
service interface
Legend

PAP & Engineering Dispositions document

- **Comes from**
  - **“Simplified Quality Assurance provisions for software development”**
    - Part of ECSS-E-80
- **Addresses CUx for Scientific development (DU/WP)**
- **Contents**
  - **QA provisions**
    - For instance about the development cycle
      - What has to be provided during specification, design, …
  - **Engineering dispositions**
    - For instance :
      - Tests shall be automated with JUNIT.
      - Developers shall have separated environment for development and for execution

      When needed, those dispositions are given with example to be used directly
  - **Coding standards are in separated documents**
    - Java coding standard and Guideline document
    - …?

PAP & Engineering Dispositions document

- **Important point**
  - **The development cycle is iterative**
    - Each iteration provides more functionalities to the CUx System
      - May reveal issues quicker
    - Each CU, through the development plan :
      - Will have to determine the number of iteration and their
        Objectives,
        Activities planned,
        Completion criteria.
      - In concordance with the overall GAIA system planning

Programming Language

- **questionnaire**
  - **main objective**
    - Define and dimension the JAVA support actions
    - Determine if an additional language is needed
  - **41 replies**
  - **Main observations :**
    - Good availability of developers until the end of mission
    - Strong determination to reuse existing libraries or SW already developed in laboratories
    - Most developers have no experience in cooperative development

Language

- **The language skills are extremely varied:**
  - Fortran (77, 90, 95), C, C++, JAVA, R, MatCad, MIDAS, Basic, Visual Basic, Pascal, Labview, IDL, Perl, TCL, Yorick, Mathlab, AWK, Python, Bash, …)
  - **Opinion on JAVA:**
    - Of those who do not know Java (41 – 6 = 35 people), 25 have a positive or very positive opinion on the transition to JAVA and are prepared to learn this language.
- **Main objections on Java choice**
  - Need to translate codes previously developed and validated through years of use.
    - We cannot expect to obtain the same level of validation for codes transcribed into Java.
  - Java computation performance is insufficient
    - (it appears, on the basis of the ESAC evaluation, that this objection is no longer relevant)
  - We under-estimate the training time required
  - Greater development time will be required due to lack of experience
  - Transcription into JAVA should be handled at CU or DPC level.
  - **Note: those familiar with JAVA and other languages see no special difficulties in implementing in Java for GAIA.**

Language

- **Java is the programming language recommended by the consortium and recommended by CNES for CUs 4, 6 and 8.**
  - **for both developed reused laboratory :**
    - reused codes must be transcribed into JAVA, otherwise an existing Java library offering equivalent features will be used.
  - **Actions required (CU1 and DPC from 2006) :**
    - JAVA training,
    - support for the translation of existing codes into JAVA,
    - support for setting up development environments,
- **authorization to use Fortran on a case by case basis :**
  - **With the following conditions:**
    - need to operate in a standalone environment
      - no interaction between different languages in the same executable (no calls to Fortran functions from Java or vice versa)
    - comply with the Fortran ISO standard (no use of features specific to a particular compiler)
    - Compliance with the coding standards,
  - **With the following disadvantages:**
    - Less support and tools
    - Data access may turn out to be much slower since less flexible than with JAVA

Environment & Workshop

- **Wiki version of PAP document will be available**
  - **Ensure to use an up to date Version**
  - **Allow an easy “copy and paste” use**

- **Developer Toolkit**
  - **A developer Toolkit will be provide**
    - This Toolkit has to be defined in CU1 framework
    - Include
      - Environment tools (language, library, ..)
      - Development tools (IDE, …)

- **Quality, Java, Tools Workshop**
  - **Exact contents will be defined in march**
  - **The idea is**
    - To give “à la carte” course
    - To get to a common way to work

Planning

- Mid 2006
  - PAP validated
- October 2006
  - Specialized PAP for CUx ready

- Workshop QA, Tools, Java
  - March 2006 : schedule defined
  - June 2006 : Number 1
  - October/November 2006 : Number 2

- Developer Toolkit
  - Ready : mi 2006

- Support Web Site :
  - October 2006