Configuration Management Tool (GECO)

The goal of the Configuration Management Tool is twofold: firstly, to assist the System Engineering Group to control and maintain the configuration items of a system, both in the development phase and in the operation and maintenance phase; secondly, to make this information available to the other groups in the organisation.

Developing a proper System Engineering Plan is a distinct advantage for leading a project to success. During the implementation of such plan, the system configuration data are generated: Product Tree (PT) elements, requirements, interfaces, specification documents, procedures, reports, etc. The amount of information keeps growing in size and complexity along the project's lifetime, to an extent that it becomes virtually impossible to manage such information without the aid of specific computer-based tools.

The system information that can be stored and controlled through this tool is:

- The Product Tree elements and the parts
- Interfaces' table
- The requirements, interface requirements and the relationships between parent and child requirements.
- The requirement verification matrix
- The configuration changes
- Non-conformities
- Verification and operation anomalies
- The project documentation, i.e. specification documents (at the system and subsystem level); interface specification documents; tests, analysis and assessment documents; etc (*if the organisation that acquires this Configuration Management Tool has already a documentation database, the documentation archive can be removed from GECO and use instead the already existing document database*).

The configuration information is hierarchically distributed following the Product Tree of the system. This provides an intuitive view of the system's breakdown structure, and thus allows the user to access, with a few mouse clicks, to a Product Tree element, its requirements, interfaces, associated documents, etc.

Each Product Tree element shall have a code that identifies it uniquely. Using a consistent, manageable coding convention is a paramount, as this code shall be the base for assigning codes to the rest of the configuration items: documents, requirements, interfaces, etc. The user gives the PT element code, and then the Configuration Management Tool shall generate automatically the codes of the remaining configuration items; the user can either accept or modify such codes, but the tool shall check the codes are not duplicated or inconsistent.

The Configuration Management Tool provides the following functionalities:

- Data input forms: the tool provides forms for adding or modifying the data associated to each configuration item. Once a PT element is selected, any of the forms described below can be opened. The form provides access to all the records associated to the element, along with the ability to search or filter information based on the fields contained in the specific form.

  - PT Elements form: where the definition of the Elements of the PT can be introduced and be modified, the related documents, etc.

  - Parts form: where the definition of the Parts can be introduced and modified, the related documents, etc.

  - Configuration Changes form: it allows the user to start new configuration changes and to add information to the changes that already are in course (conducted actions, changes of status, affected documents, etc). The process associated to the changes of configuration may range from very simple (when the change considered does not affect other elements of the system) to rather complex (when other elements or different work groups are involved). In any case, the application helps to coordinate this process by sending the necessary notifications (by e-mail) to the users affected by the change, as the configuration change goes through its lifecycle (approved, rejected or finalized), i.e. it guides the user through the lifecycle defined for a configuration change.

  - Non-conformities form: this form allows the user to start a new non-conformity, as well as to add new bits of information to the already existing non-conformities. Similarly to the configuration changes, the tool sends notifications to the users affected by the non-conformity as it goes through its lifecycle (approved, rejected or fixed), i.e. it guides the user through the lifecycle defined for a non-conformity.

  - Requirements form: this form allows the user to enter new requirements, or to modify the already existing requirements, associated to a certain PT element. A major functionality of this form is the ability to track down this requirement to other requirements or to documents, what is crucial for identifying what a configuration change or a non-conformity actually involves. This utility is used for assessing the impact of the proposed change in terms of scope, schedule and price, and it is one of the major goals of the Configuration Management Tool.

  - Interfaces form: this form allows the user to define and to modify the interfaces between the PT elements, thus showing which elements are related to one another.

  - Verification matrix form: this form allows the user to enter and to modify the results of the verification tests.

  - Anomalies form: this form allows the user to start new anomalies or to add information to the already existing ones. Similarly to the configuration changes and non-conformities, the tool shall send notifications to the users in charge of the anomaly.

  - Documents form: this form allows the user to enter or to modify the documents associated to the project by connecting them with PT elements. They may be requirement specification documents, analyses, reports, procedures, etc. It is essential that the Configuration Management Tool contains the project documents, or at least it can link them from another database, as the requirements are usually traced to documents (analysis, reports, etc) that contain the rationale for the requirement, and therefore they help understand the consequences of a configuration change.

- Data views: the tool allows the user to visualise as a table all the relevant information stored for a PT element. Once a PT element is selected on the screen, the following views are available:

  - Product Tree elements view
  - Parts view
  - Configuration change view
  - Non-conformities view
  - Requirements view
  - Interfaces view
  - Verification matrix view
  - Anomalies view
  - Documents view

- Utilities: the Configuration Management Tool provides a set of built-in utilities that are described below:

  - Search of child requirements: the tool shall display the requirements that are affected by a change in a higher level requirement. To do so, the parent-child (traceability) relationships that were introduced in the Requirement Form are considered.

  - Search of parent requirements: the tool shall display the requirements that are affected by a change in a lower level requirement.

  - Automatically insert the requirements in the verification matrix: all the technical requirement of one subsystem can be automatically introduced in the verification matrix when the user decides that such subsystem is ready for being verified.

  - Automatic generation of the requirements document: the tool gathers the requirements of the selected PT element and then generates the document section where the requirements are specified; such section can be imported into the definitive formal specification document. The format of the generated document section is XML.

- ❖ Permissions: The permissions implementation in both the “basic” and the “standard customisation” is quite simple and includes two types of permissions: the “administrator”, with all the privileges and able to change everything and the “user”, for people who only need to consult the contents. In both cases, the permission does not distinguish among the different projects. For those customers who need to work with different teams in different unconnected projects and have the GECO basic or the GECO basic customisation, an easy solution is to install the application several times using different databases. For a more complex permission structure a specific customisation is needed and will be quoted separately.

The Configuration Management Tool contains a database and a graphical user interface adapted to each customer’s needs. The application uses a popular database, whereas the user interface is developed in Java, what makes it platform independent, i.e. it runs on UNIX, Linux and MS-Windows operating systems.

Customisation of the Configuration Management Tool

GECO is designed according to widely accepted Software Engineering standards and best practices. For this reason, it can be used without modifications by very different companies or organisations. This status is the Basic GECO application. In addition, several steps of customisation can be implemented.

Standard Customisation Package:

A second step allows a better fitting to the customer needs. This option has been quoted separately as *Standard Customisation Package* and it is recommended for those customers who already have some established standards for codes, documentation, etc. but do not need a very complex application. The standard customisation package includes:

- ⇒ The coding convention for documents, according to the user’s guide
- ⇒ The coding conventions for requirements, according to the user’s guide
- ⇒ The coding conventions for configuration changes, according to the user’s guide
- ⇒ The coding conventions for non-conformance, according to the user’s guide
- ⇒ The coding convention for anomalies, according to the user’s guide
- ⇒ The static notifications texts sent by the Tool.
- ⇒ Customisation of the following Forms’ fields values:
  - o Anomaly Form: Severity and Criticality
  - o Configuration Change Form: Classification and Priority
  - o Documentation Form: Privacity, Reference Line and Type
  - o Non-conformity Form: Priority
  - o Requirements Form: Reference Line

<u>Specific Customisation:</u>

Nevertheless, the structure of the Tool is flexible enough to allow an organisation customise the information that it needs to maintain and the degree of automatic interaction that the Tool provides. Therefore each customer can choose the changes and the application can be customized according to specific needs. In this case, a specific quotation will be given in a case-by-case basis according to the customer’s requirements and the engineering effort needed to accomplish that.

Some examples of items to be customised:

- ⇒ The properties of a PT element.
- ⇒ The properties of a requirement.
- ⇒ The properties of an interface.
- ⇒ The properties of a configuration change.
- ⇒ The properties of a non-conformity.
- ⇒ The properties of the verification matrix.
- ⇒ The properties of an anomaly.
- ⇒ The properties of a document.
- ⇒ Remove the document forms (although keeping the document view) so that the documents can be managed by an independent tool, but still can be traced from the Configuration Management Tool.
- ⇒ The permissions list and implementation according to the privilege structure agreed with the customer. A particular quotation will be given according to the complexity of the permission schema.