



Deliverable Report

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Abstract **This document presents the framework and the pattern of the Harness Geographic Plan at T0 +26.**

Keyword List WP4, architecture, coherence

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1 Design of source code

1.1 Presentation of the Architecture

The architecture analysis begins with the inventory of objects and the description of their function.

Then, objects are organized in an architecture in order to manage Harness Geographic Plan Man Machine Interface. It is divided into two parts:

- 1) A framework that is the heart of the architecture of the Harness Geographic Plan. It can be reused in order to realize other types of diagram
- 2) a special unit that specializes this framework for Harness Geographic Plan by adding notions of wires, cables, bundles and different types of equipments.

1.2 Remarks about This Architecture

- 1) Objects are managed thanks to “Fly Weight” pattern: they are not copied, only pointers designate them. It allows to save memory and to accelerate execution.
- 3) We can find some double reference on some objects. It can be much more complicated to maintain but it provides direct access to them and it improves execution time.

1.3 Framework

It is the heart of the architecture of the Harness Geographic Plan. It can be reused in order to realize other types of diagram. Unit Framework contains all objects that are necessary to build a diagram: Objects, Edges and Connection points. It contains all global functions that allow managing a diagram:

- To create a diagram
- To destroy a diagram
- To copy a diagram
- To clear a diagram
- To store a diagram
- To add an object
- To remove an object
- To select an object
- To link objects

2 To suppress link between objects

A diagram has some characteristics and contains equipments, links, nodes and edges.

Each equipment has some nodes and each edge has exactly two nodes. Equipments and edges are connected thanks to nodes.

A reference is a node that sends to another that is on a different folio. A reference can have a direction: either GoTo or ComeFrom.

A compound equipment is an equipment that can contain other equipments or compound equipments.

2.1 Specialized Unit

It specializes this framework in Harness Geographic Plan by adding specific notions of Harness Geographic Plan:

- Wires
- Bundles
- Cables
- Equipments

Moreover, some objects of framework unit are specialized.

- Cables and bundles are special links that can contain other links.
- A connection point is specially adapted in order to connect equipment to wires, cables or bundles.

Diagram and Edges are specialized in order to sue to the Harness Geographic Plan.

An equipment can be specialized in area, connector, or different electric equipments.

A link can be specialized in wire or cable or bundle.

2.2 Undo/Redo management

Each action of the user changes data in harness: it creates a new state of the harness. In order to be able to go back to previous states, the user can press undo button. The reverse action is provided by redo button.

Actually, only state of some objects changes and not state of all objects of the diagram. That's why, to implement those functionalities, each object of the harness manages its own list of its previous states.

Each state is joined to a step number. The step number is global for all objects and it is incremented when user executes a new action.

2.2.1 STATE

The class diagram on Figure 1 shows how states are managed by objects.

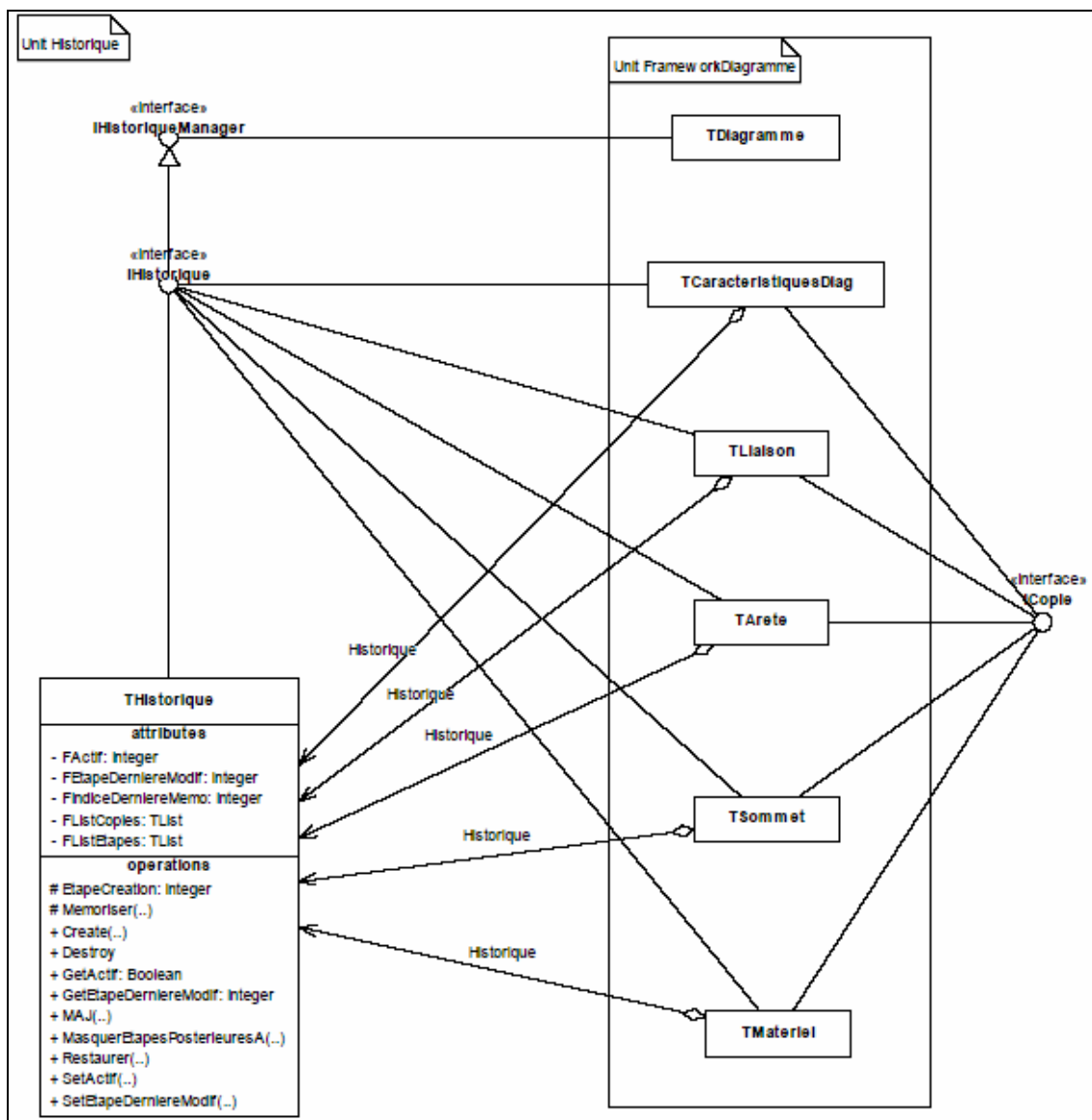


Figure 1 Class diagram of undo/redo management

2.2.2 STEP

Step number already exists in CAD program in which Harness Geographic Plan is integrated.

As a consequence, to implement undo/redo function for Harness Geographic Plan Man Machine Interface implies to manage coordination between those two programs.

2.3 Programming Language

Programming language is Delphi 2005. It is an Object Oriented Language edited by Borland. We use it in order to develop Windows application. This language is based on Pascal Object.

2.4 Source Code Management

Source code is divided in two units: one for the framework and the other for its specialization.

2.5 Release Management

This architecture will change. We have to ensure compatibility between its different releases.

That's why a release number is added to each object for this implementation. It has to be correctly managed, particularly for file storage.

2.6 File Storage

As we use an Object Oriented Language, storage functions are overridden by sub-classes: the storage function of an object executes the storage function of its upper-class before storing its own data. It allows ensuring that if the storage function of an object changes, there won't be any bad effect on other objects that depend on it.

3 Specifications for Zenon's work

3.1 Arrangement of graphic objects on a sheet

This task aims to correctly place each graphic object and their links on a sheet thanks to a description of objects and links given in a file. Place of each object depends on obstruction of graphic objects, groups by area and route of links. The whole makes a drawing.

3.2 Routing algorithm

The goal of this task is to determine the route of a link when the user manually moves a graphic object.

4 Inspector of Algo'Tech Informatique

In CAD software, a window already exists and provides the same functions for elements of an electric schema: it is called Inspector.

5 Merging the two windows

As these two windows provide the same functionalities, we decided to merge them: the window of the harness Man Machine Interface is inserted into the inspector of Algo'Tech informatique.

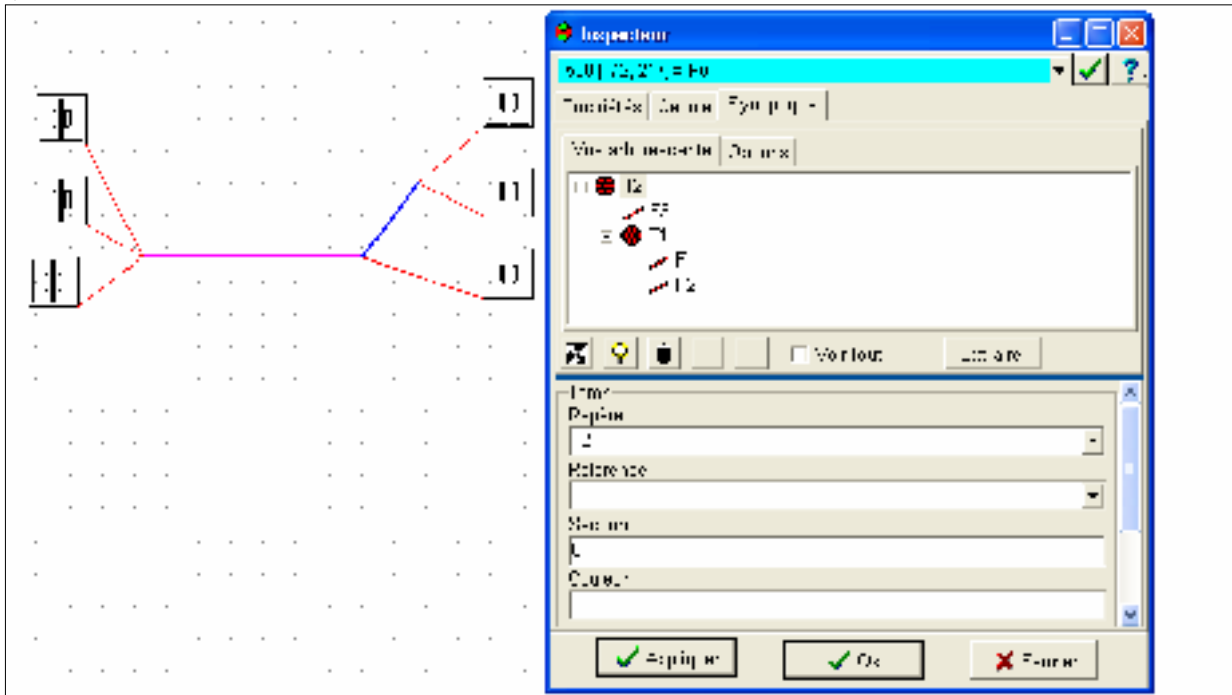


Figure 2 Merge of Harness Man Machine Interface and Inspector

6 Integration of the Man Machine Interface of the harness to the CAD software of Algo'Tech

The use of more than one folio to represent a harness has been studied in the report WR-FRESH- WP4-ALGO-T5 and it has been implemented during the next period (month 15, 16 and 17). Nevertheless, this period revealed that some improvements were necessary to the coherence between folios.

6.1 Undo/Redo

Modifications on "undo-redo": instead of apply it to a single folio, it is applied to all the folios of the document.

Until today, the function undo/redo of the CAD software was effective on only one folio: an action canceled on a folio did not have any impact on other folios.

Since the harness can be drawn on several pages, it is important to be able to apply undo/redo on several folios at the same time.

6.2 Suppression

The use of more than one folio for a harness implies also a change on the operation "suppression" : the software has to ensure coherence between folios.

More over, when a link goes from a folio to an other, connexion between folio are represented thanks to graphic objects called "go to". If the link is suppressed those objects has to be suppressed too.

Coherence is now ensured on folio for the operation of suppression.

7 Coherence link between the wiring diagram and the harness

A new functionality has been developed to prevent errors about the creation of the harness.

When the user draws the harness, he may already have the electrical diagram of this harness. In this case, some data are common to those two documents.

Our new functionality consists in maintaining link from the electrical diagram to the harness. Moreover, this link is permanent: the user can decide to firstly design a part of the electrical diagram, secondly to draw the corresponding harness, thirdly to finish the electrical diagram and fourthly to finish the harness drawing.

The big advantage of this link is to save time during design and maintenance operations and to prevent errors due to double type in.

8 Semi-automatic generation of the harness thanks to the wiring list

Wiring list

The wiring list is a file that contains, for each wire, its two equipments connected and other specific data of wires and equipments. This is an Excel file automatically created by exporting an electrical schema drawn in Elec'View

Semi-Automatic creation of equipments and areas

By reading the wiring list, the software suggests name of equipments that are listed in the wiring list. The user just has to create equipments: specific data of each equipment is already type in.

Semi-automatic choice of place for an equipment

The best way to use semi-automatic creation of equipments and areas is to begin with creation of areas. Then, the user can create equipments in each area: thanks to the wiring list, only equipments of this area are suggested to the user.

Manual creation of ways thanks to bundles

The user creates and places bundles between areas and equipments to its liking. He can connect bundles with other bundles in order to obtain a way made of bundles between two equipments or areas.

Automatic creation of links

Once areas, equipments and bundles are created, the user just has to press a key to automatically connect all equipments thanks to wires of the wiring list: wires are automatically create and connected.

Automatic search and use of possible ways for each link

Moreover, if there are ways made of bundles between equipments, the software automatically suggests the best way for each wire: as a result, wires go throw bundles automatically, at their creation.

9 Error management system

All automatic functions can cause errors. A special error management has been created in order to rescue each error. It allows to prevent lost of data and to maintain coherence between data and their graphic representation.

10 XML Export 1.1

WP3 provides PIVOT language and explains how to organize data for export into XML files.

In order to export data of the harness into XML files, an export function has been added to each object which composes the harness. When the harness has to be exported, it calls this function for each object.

While exporting a wire, if this wire is inside a bundle then a part of the wire's geometry is the same as cable's geometry.

11 XML Export 1.2

The new release of PIVOT language has been provided by WP3. Pivot has been improved and it suits to the harness structure.

Export function of the Harness has been modified in order to be able to save data of the harness into a file that respects pivot-1.2.dtd. It has been tested and validated.

12 To merge work of Zenon

Zenon is working on an algorithm which allows to automatically place objects of the harness of a folio while creating the harness.

This arrangement algorithms needs some input data: two lists. One is a set of nodes and the other is a set of edges. Nodes represents objects of the harness and edges represents wires, cables and route that link objects. Functions have been added to the harness in order

- to collect those data and to transmit it to the algorithm,
- to take results produced by the algorithm into account.