User-Centered reverse engineering: Genesis-D project

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The paper goal

The main goal is to introduce an experience of reengineering (in web perspective) of a legacy application on the environment monitoring.

- This experience has been performed into the industrial research project called "Genesis-D" (Global Environmental Network System of Information for Sustainable Development) sponsored by Edinform SpA.

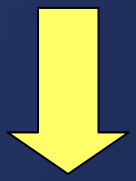
Introduction

A good software must not have only a good functionality cover but it also must have good usability features.

It is more and more frequent the requests of reengineering of existing products that have a good coverage of the application domain but are completely unsuitable to the modern interaction paradigms.

The methodological approach

In order to improve the web application (WA) quality, the designer must not only manage the information and navigation aspect but, also all the multi-user and multi-device requirements combined with the customization needs



It is necessary to use new methodological design approach.

The methodological approach

Many design solutions have been proposed evolving the well know methodology in order introduce complex contents and to manage the requirements of user-accessibility.

The WAE (Web Application Extension) of Jim Conallen approach introduces an UML profile that adding new stereotypes to represent the Web page and primitives

The reengineering phase

The methodologies (and WAE) are helpful both when the designer is planning an application ex-novo and when he/she is making an application reengineering

In reengineering phase the designer would take in care more the semantics of the user experience and less the object-oriented paradigm

The reengineering phase

If WAE was applied directly to reengineering an application the result would be only the same application translated in the web domain but with the same politics of interaction of the first one getting a "porting" and not a reengineering in the user-centred point of view.

We introduce a reengineering experience in which different design techniques, both traditional and user-centred, are combined.

The application domain

The application domain is characterized by a considerable number

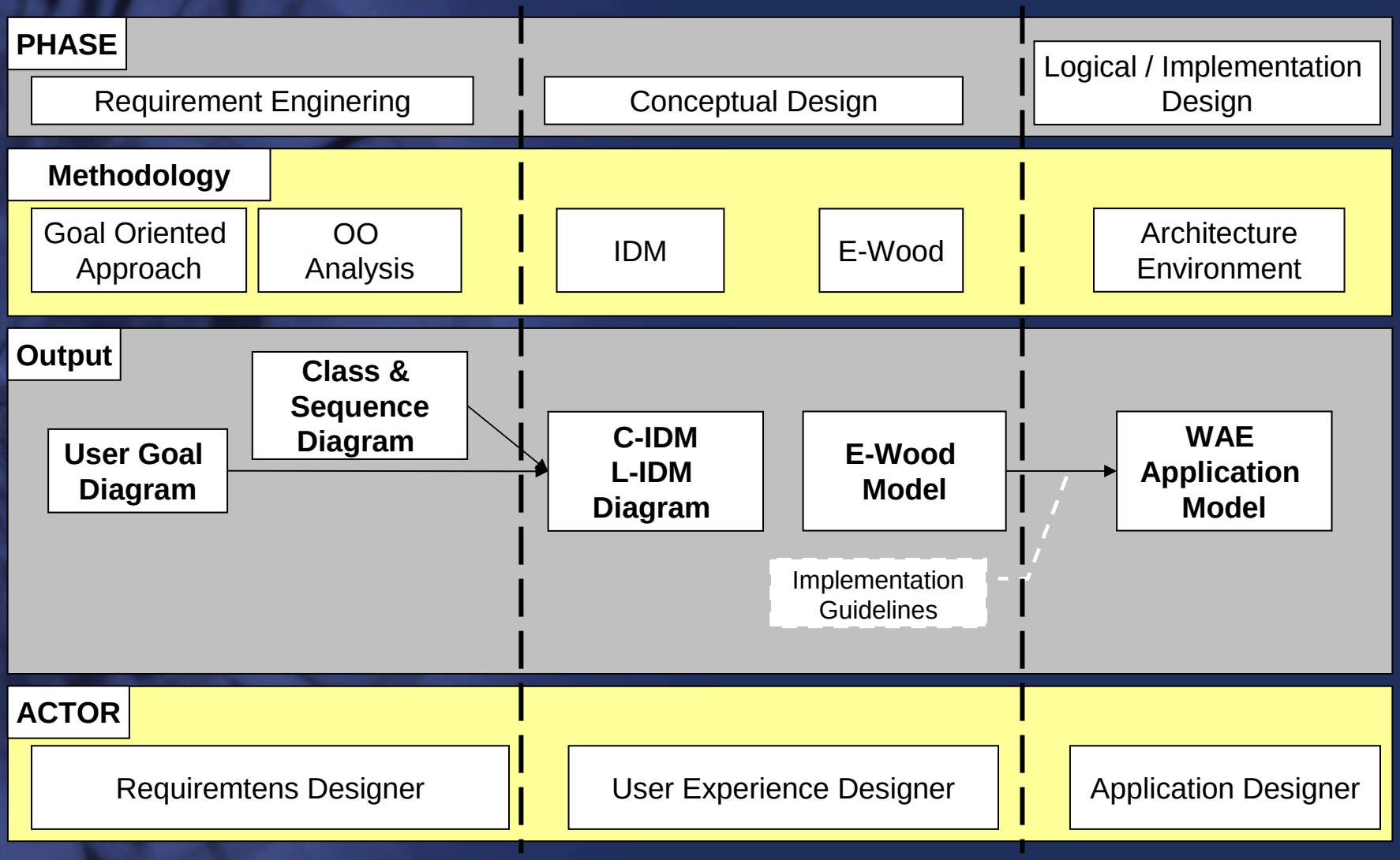
- of actors (public administrations, authorities, etc)
- of administrative documents (norms and national laws, regional, etc.)
- of studies (international standard, studies of sector, models, etc.).

In accord with Edinform Spa, it was established to perform the reverse engineering of the application SIRA (Environmental Regional Information System).

SIRA

- SIRA supports the environment management and control activities in a regional context.
- Use the SINAnet (Cognitive National System and of the Environmental Controls) standard
- SIRA splits the environmental subject in the thematic area: Waters, Wastes, Soil, Preservation of the nature..
- Its reality is the Environmental Reality composed by environmental facts and phenomena

The reverse engineering process



Requirement engineering

This phase is divided in two parts:

- The first one uses the "user centred" approach focused on the stakeholders and on their goals. The analysis is made using the methodology AWARE. The output of the analysis is a vision user-centred of the application requirements and will be the base for following process phases
- The second one aims to represent the application domain knowledge. Use an object-oriented technique to perform the application reverse engineering. Its output is the complete diagrams (class diagram and sequence diagram)

Conceptual design

It is the first phase of the reengineering and it is performed using WA design methodologies based on user centred approach.

Two methodologies are applied:

- Interactive Dialogue Model (IDM) to describe the interactive and navigational essential aspects focusing on the dynamics of dialogue end-user / application
- Edinform Web Object-oriented Design (E-Wood) that, refining the IDM analysis, uses the object-oriented techniques integrated with the necessary semantics for the web applications. E-Wood inherits the notation from UML

Implementation design

It is called also "logical design" and it allows adding the implementation details directly connected with the system and the selected architecture.

The phase output is intended to the developer and provides the implementation model in the system views.

It describes through WAE the pages and the software components that the developer must implement using a specific implementation technology such as Micorsoft .Net, J2EE model 1, J2EE model 2 etc.

The guidelines

Explain the transition from the conceptual modelling E-Wood to the implementation design

Provide several advantages to create the final product; in fact, applied in a systematic way after having established the architecture type to use, they allow to conform the implementation of specific E-Wood structures and accordingly to get an uniformity in the code

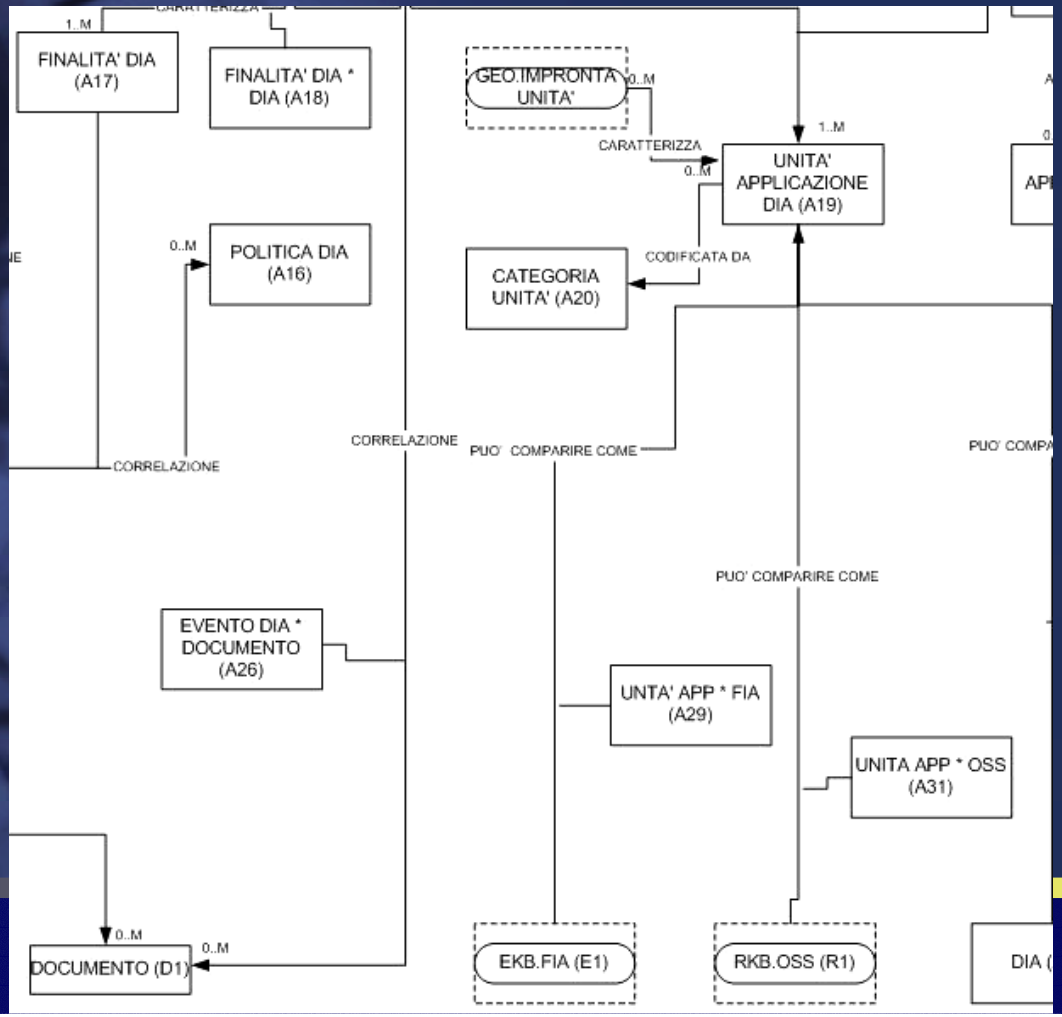
the guidelines limit the freedom of the developer to translate the methodology objects in code.

SIRA: Aware

- Studying the competences of these corporate bodies, it is possible to identify not detailed professional figures but their the roles:
  - *Government role*
  - *Coordination role*
  - *Operational role*

SIRA: OO Analisys

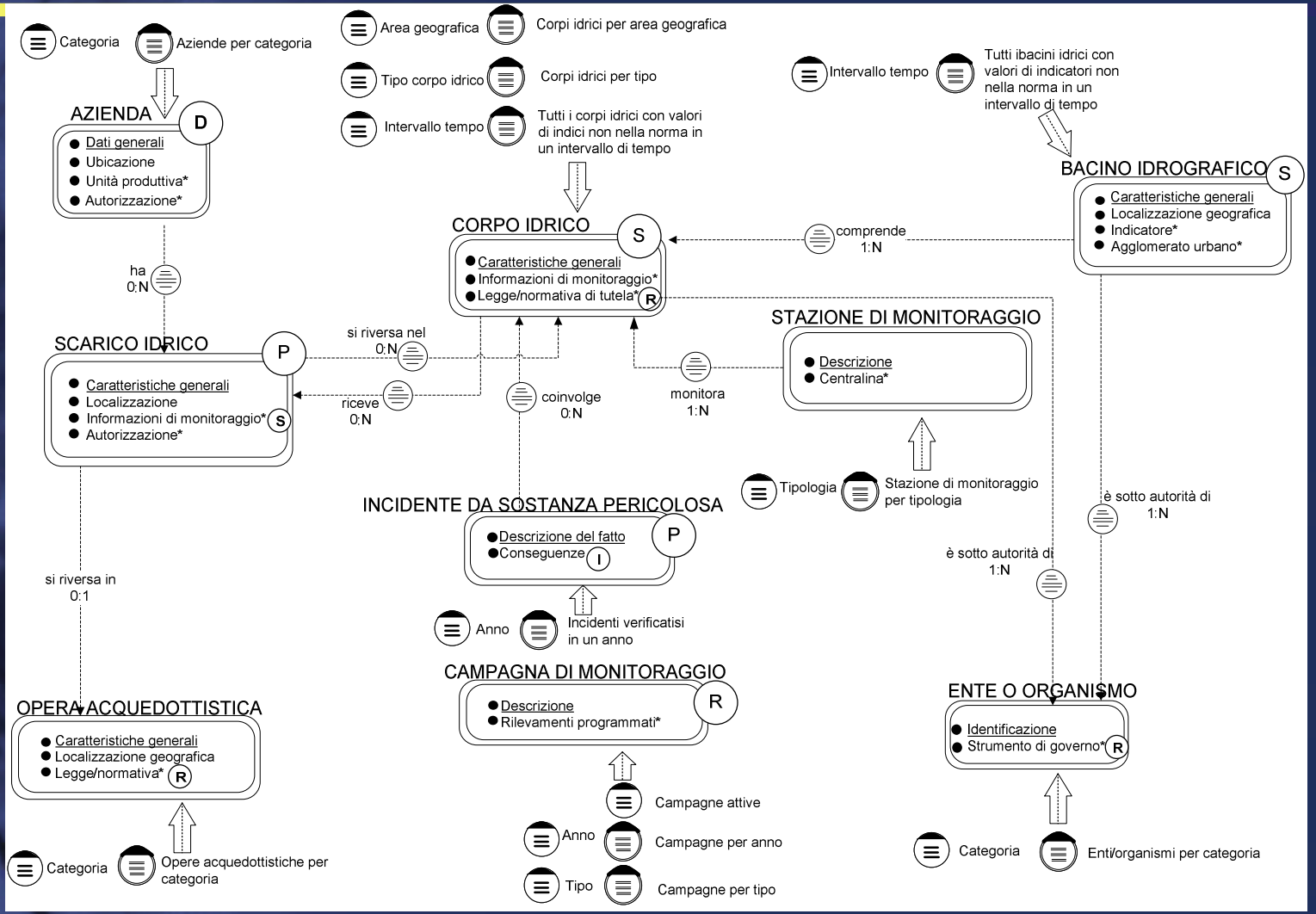
- The analysis OO identified about 190 classes with the relative methods and objects



SIRA: IDM

- The identified objects are tightly bind to the information and cannot directly be used in a user-centric application
- Thus, using the goal analysis and the detailed information (attributes and methods) derived from the OO analysis, the methodology IDM is applied.
- The conceptual model of the new system has been realized
- Keeping in mind therefore the thematic environmental and the typologies of stakeholders, have been realized for each end-user five IDM views, one for each thematic.

SIRA: IDM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Corpi idrici per area geografica
Tipo corpo idrico
Corpi idrici per tipo
Intervallo tempo
Tutti i corpi idrici con valori di indici non nella norma in un intervallo di tempo
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Tipologia
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Descrizione del fatto
Conseguenze
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CAMPAGNA DI MONITORAGGIO
Descrizione
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ENTE O ORGANISMO
Identificazione
Strumento di governo*
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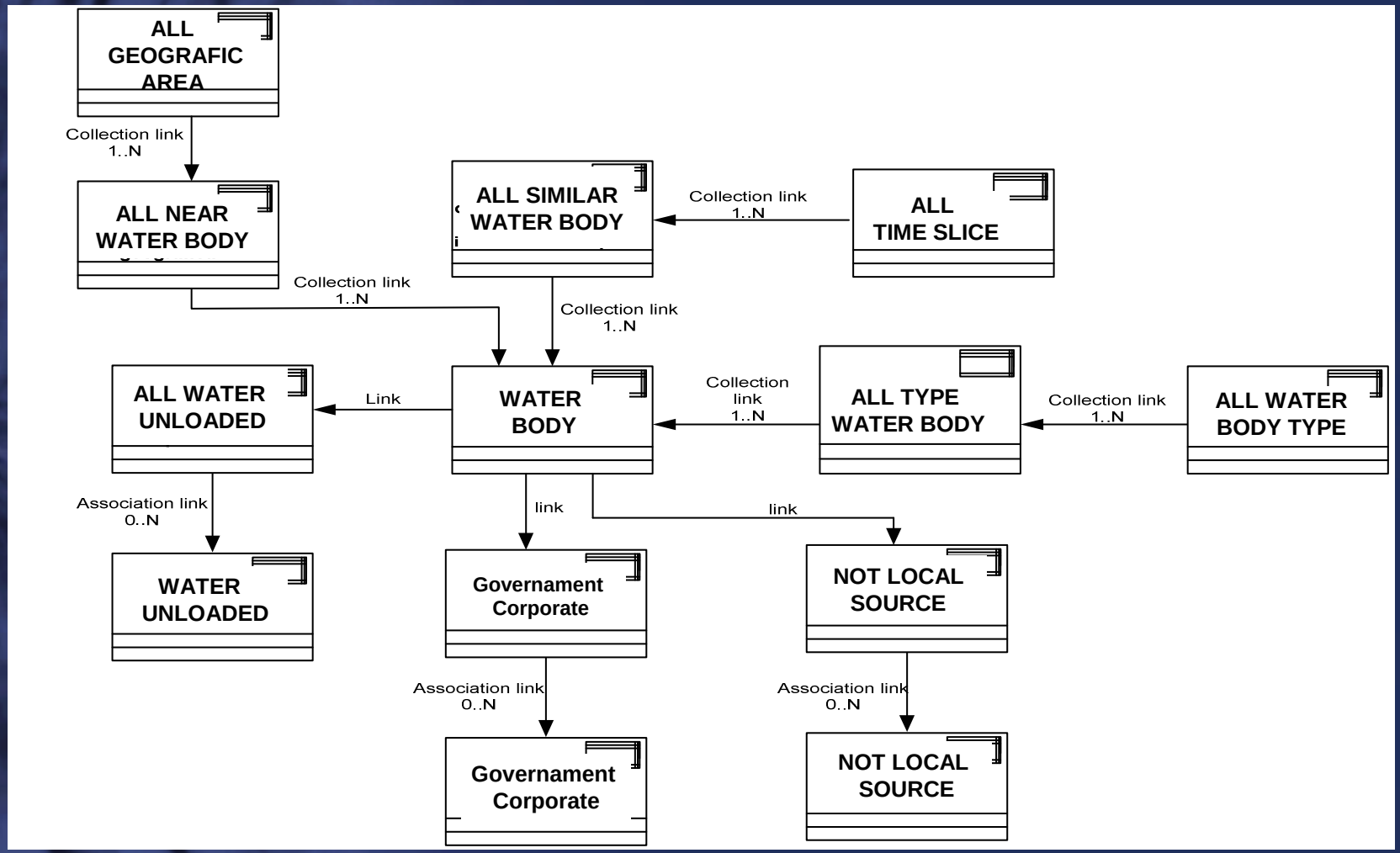
Categoria
Enti/organismi per categoria

SIRA: E-Wood

- At the end of the IDM design (in which the information is modified in terms of user experience), the E-Wood analysis is performed; thus, all the E-Wood views for specific end-user and environmental thematic are produced: Structural Navigation View, Association View, Navigation Paths View, Operations View, Page Template View, Navigational Map View.

SIRA: E-Wood


ALL GEOGRAFIC AREA
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ALL SIMILAR WATER BODY
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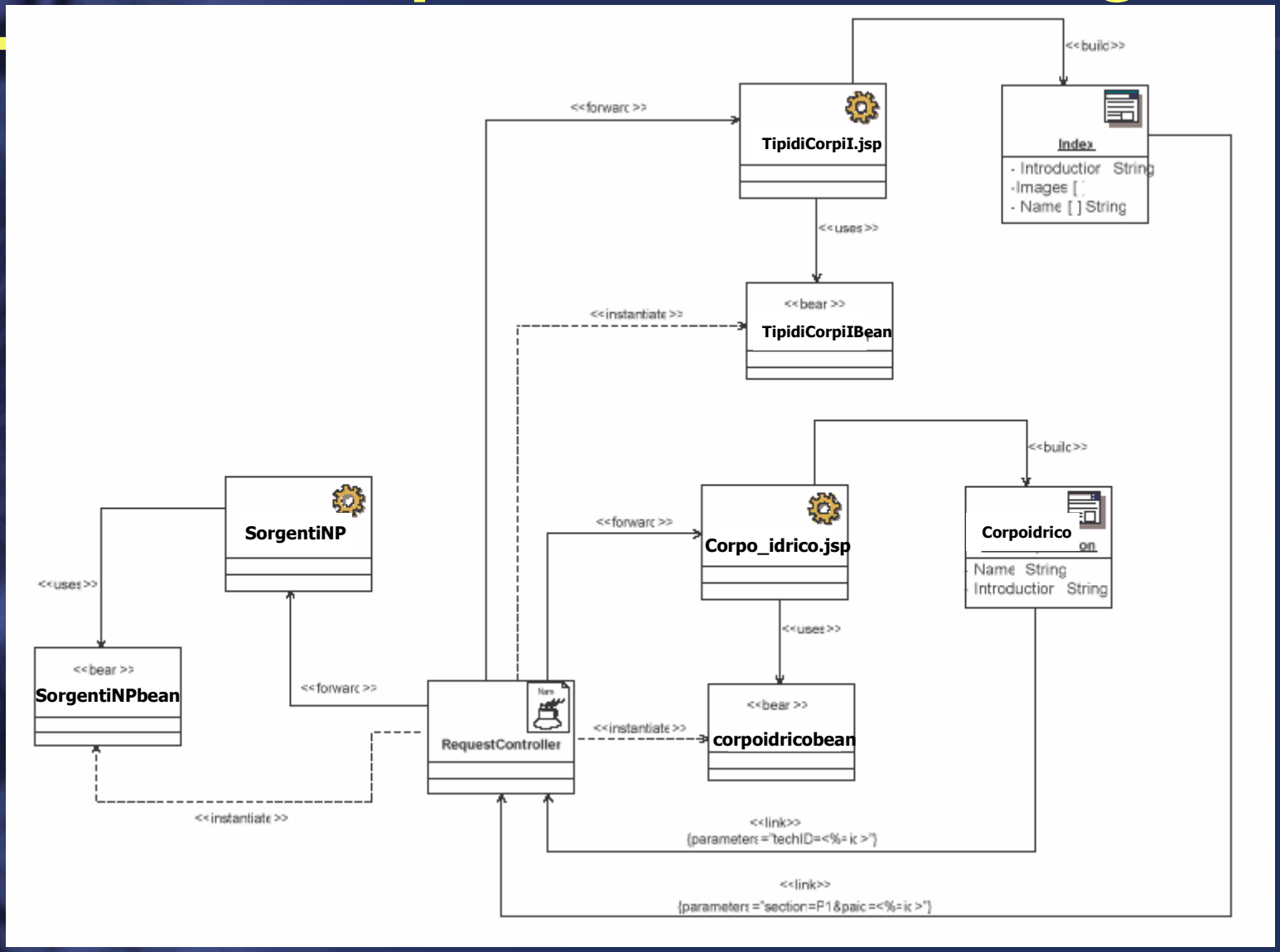
SIRA: Implementation Design

At the end of the E-Wood modelling, established the software architecture, the implementation view could be produced.

This task is not excessively complex because E-Wood uses a similar notation of implementation views and thus, it is possible to establish a mapping between the objects of the conceptual modelling and those of the "implementation view".

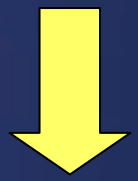
The guidelines are used

SIRA: Implementation Design



Conclusions

The growing demand of new services and the continuous interest for the web is forcing a lot of company to evolve their applications. This transition is heavy: all the application logic has to change from a system vision to user centric vision.



The information is not fundamental while the perception and the interaction that the user has with it is the design core.

Conclusion

To resolve the problem of the reengineering is not enough a methodology but it is necessary a *process* that leads the designer to understand the domain, the stakeholders and the following phase of analysis and design.

The output is good: a logical model effectiveness and uniform ready to be implemented. The effort to perform the complete design with user centred approach has required just 4 months of a designer (a very small effort for a domain very extended).

It is sure, that the presence of the guidelines for the implementation level, constitutes a great facilities for the designer and it allows to get a design more uniform and correct.