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**ACTIF – A tool for conceptualizing concrete answers in the  
challenge for sustainable mobility in public transportation  
Last evolutions on ACTIF – the Framework Architecture for  
ITS in France for making it closer to user expectations**

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**ABSTRACT**

The sustainable mobility has become a leitmotiv for the national and European transportation policy. Preferring the name “Ministry for Ecology, Energy, Sustainable Development and the Sea” than “Ministry for Transport or Public-works”, the French government shows the will of taking into account this dimension in its policy and its actions. ACTIF - the French Framework Architecture for ITS – is one of its actions for promoting the interoperability of transport systems.

For making ACTIF an efficient Assistance for Conceptualizing Interoperable Transport Systems, the ACTIF-team, reinforced by private and public partners is working on important improvements on the model and on its tool OSCAR. The first challenge was to propose useful outputs answering better to the user expectations: diagrams and documents for project managers, description of organisation and functional chains, interfaces between systems and

sub-systems, details concerning data-flows and applicable standards, and functional specifications.

This led important improvements in:

- ACTIF methodological guidelines, clearer, and closer to the project managers questions;
- ACTIF-model, with ad-jonction of new transport services;
- ACTIF tools, with the last version of OSCAR, the selection tool which is now perfectly bilingual
- And applications made on concrete projects, eventually out of the French borders (For example, open platform for exchanging information in Shanghai – VIAJEO, EC project of the 7<sup>th</sup> Framework Program for Research and Development

With these enrichments, the wish of ACTIF-team is to contribute to produce interoperable IT systems, following clear and shared Frameworks and generalizing the use of standards.

## **KEYWORDS**

Framework architecture, interoperability, intermodality, comodality, sustainable mobility

## **SUSTAINABLE MOBILITY: TOOLING A CHALLENGE**

### **A CHALLENGE FOR PUBLIC AUTHORITIES**

The sustainable mobility has become a leitmotiv for the national and European transportation policy. Preferring the name “Ministry for Ecology, Energy, Sustainable Development and the Sea” than “Ministry for Transport or Public-works”, the government shows the will of taking into account this dimension in its policy. The fundamental issue of this concept is to allow the development of goods and people transports in respect of the Environmental aspects (Air safety, Energy consumption reduction...), and of safety, security, suitable services for users. Very often (in a lot of minds), “Sustainable Mobility” is associated with “Intelligent Transport Systems” (ITS) which should be the tools for more effective, efficient, secure, and sure services, in particular, in order to help the modal report from individual transport means on road to more ecologically well-adapted means: ships, riverboats, trains... and for the individual users, public transport.

Actually, ITS which are the new information, communication and technological systems applied on transportation world, can bring more information to services operators (infrastructures managers or transport operators) for a better managing of their activities. They can allow to offer users a better service, more reliable, more efficient, with more information. For example, in the Public Transport area, the ITS are applied in the implementation of Operation Assistance and Traveller Information Systems. But in a lot of cases, ITS doesn't bring by themselves this “sustainable mobility”. Why? Because, for the greater part, ITS solutions are implemented within the scope of one operator, one specific activity, one service, when the global service involves more numerous stakeholders.

The sustainable mobility passes through two main concepts: first, the co-modality id est the research of complementarity between the different modes of transport in order to propose the best answer for the global transport demand (and not necessary for each one); second, the interoperability, id est the ability for two or more stakeholders, at least to exchange information, furthermore to collaborate, and even better to share common tools. In public transport area, these concepts are used for example in the ticketing approach, with common payment or validating systems. It also means that before the implementation of the system, some agreements between stakeholders are to be discussed specially in order to deal with the way to share receipts, according the fare structures, the services consumption, the calculation of compensation data...

However, interoperability is not achieved easily. By nature the complexity lies in the involvement of several actors who may each have their own profession-based logic, with often conflicting requirements and objectives. It is not at the ITS technical level we solve it... Actually, it is more often at this level we discover un-interoperability problems. Worse, the fact that technical systems doesn't interoperate can sometimes becomes the pretext for braking co-operation initiatives between structures and organisations, and then co-modality.

Within this context, the role of central government is to assist transport authorities and their partners in the development of more efficient services that take into account the logics of the various different actors. In addition to participation in standardization work, proposals for regulatory frameworks, the dissemination of doctrines and direct assistance to project owners, the scientific network of the French Ministry of Ecology has also begun to promote operational frameworks that can act as design-aid tools, enabling the development of efficient transport systems.

## **ACTIF: A TOOL FOR PROMOTING SUSTAINABLE MOBILITY**

ACTIF, which stands for «assistance in the design of interoperable transport systems in France», forms part of this policy. The project, which was launched in 2000 by the Ministry of Transport and co-funded by the European Commission, provides transport system project managers with an operational « tool-kit » enabling the design of interoperable solutions. The purpose of this paper is to show what is ACTIF, how we can use it and what it brings out, in particular, in the public transport activities area.

For making ACTIF a true Assistance for Conceptualizing Interoperable Transport Systems, the ACTIF-team, reinforced by private and public partners is working on important improvements on the model and on its tool OSCAR. The first challenge was to propose useful outputs answering better to the user expectations: diagrams and documents for project managers and designers, description of organisation and functional chains, interfaces between systems and sub-systems, details concerning data-flows and applicable standards, and functional specifications.

This led to important improvements in:

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- ACTIF tools, with the last version of OSCAR, the selection tool which is now perfectly bilingual
- And applications made on concrete projects (5), eventually out of the French borders (For example, open platform for exchanging information in Shanghai – VIAJEO, EC project of the 7<sup>th</sup> Framework Program for Research and Development)

This paper shows these improvements.

## **ACTIF'S METHOD : TO DESIGN AND BUILD PROJECTS OF INTEROPERABLE SYSTEMS**

A design-assistance « kit » naturally requires a set of documents describing the method used, the different elements of the kit and their use. In ACTIF, the basic element made available to designers, independent of the model and the tool, is a handbook outlining a method for designing transport systems in an interoperable manner (4). Developed in 2003, this methodology is based on project management practices that specifically take into account several actors, systems and projects. The six phases listed are in fact similar to those used within the scope of any typical project management.

In the kick-off step, requirements are identified. In particular this phase must enable the different scopes to be determined (functional, geographical, institutional...) along with the likely actors and their relative roles. All of the actors must express their needs with regards to the identified project. The iteration of these needs must be kept concise so as to avoid broadening the project's scope excessively.

The second and the third steps consist, respectively, in analysing the present situation and defining the functional and physical architectures. Choices must be made so as to clearly allocate functions and responsibilities between organizations and information subsystems. The fourth and fifth steps are more operational as they involve developing an implementation plan (based on several scenarios) and applying it.

The sixth and final step is essential: as in urban planning, it involves checking that the different elements of the overall project come together in a way that is conform with the initial plan and if necessary adjusting the « urban planning rules » to deal with changes in the project environment (regulatory, technical, functional changes...). This supposes defining and maintaining ad-hoc project steering groups throughout the system's life cycle.

On the basis of this reflection, a proposal arose for a «tool-kit» enabling the method to be applied on concrete projects. At the most basic level, it was a matter of identifying the main needs of project designers. Experience rapidly showed that their needs develop long before technical solutions can be envisaged: they lie at the limit between functional aspects and organization and profession-related logics. In fact interoperability issues arise at the interfaces between organizations and are translated by the identification of necessary data-flows between data acquisition and dissemination functions located at specific levels of profession-related processes. This leads to difficulties in establishing a common vocabulary which is

necessary for the comprehension of processes and the dissemination of information understandable by all actors.

# **ACTIF'S MODEL: A PROFESSIONAL REPOSITORY IN ORDER TO SHARE KNOWLEDGE**

## **A SIMPLIFIED REPRESENTATION OF THE REALITY**

The need for understanding between organizations and actors shows the importance for a clear vision of the internal logics of each profession and of the interfaces where information may be exchanged. That is the aim of a model, which is, by definition, a representation of the reality simplified to the necessary and sufficient elements for explaining and forecasting a behaviour in a particular context. But, it is particularly difficult to conceptualize a model in the aim of others use it. The different "Framework Architectures for ITS" over the world, like FRAME (The European Framework Architecture), ARKTRANS (Norway), US-Architecture and know this difficulty. A model must be easy to understand and to use.

The ACTIF model could seem similar to the FRAME one. The same modelling hardware tool (MEGA international) has been used, with the same meta-objects, skeleton and legends for diagram. But, the application of ACTIF model on real application cases led the technical team to introduce some consistent differences in order to make it more readable, understandable, useful, and usable. A big work has been also made with MEGA-tool (Now the version 2009) for checking the consistence of the model and the coherence of each object with the modelling rules. In fact, since 2004, the modelling rules are significantly different and introduce different ways for applying it in particular in the ACTIF selection tool OSCAR.

## **ACTIF-V5 CONTENT**

Firstly, the ACTIF model doesn't use the concept of "User needs". The project managers, owners and designers doesn't express their needs according a "standardized way" but more significantly speak about the functionalities and service levels they aim.

Secondly, the professions of transport represented by a functional sub-area (see below) are grouped in nine functional areas:

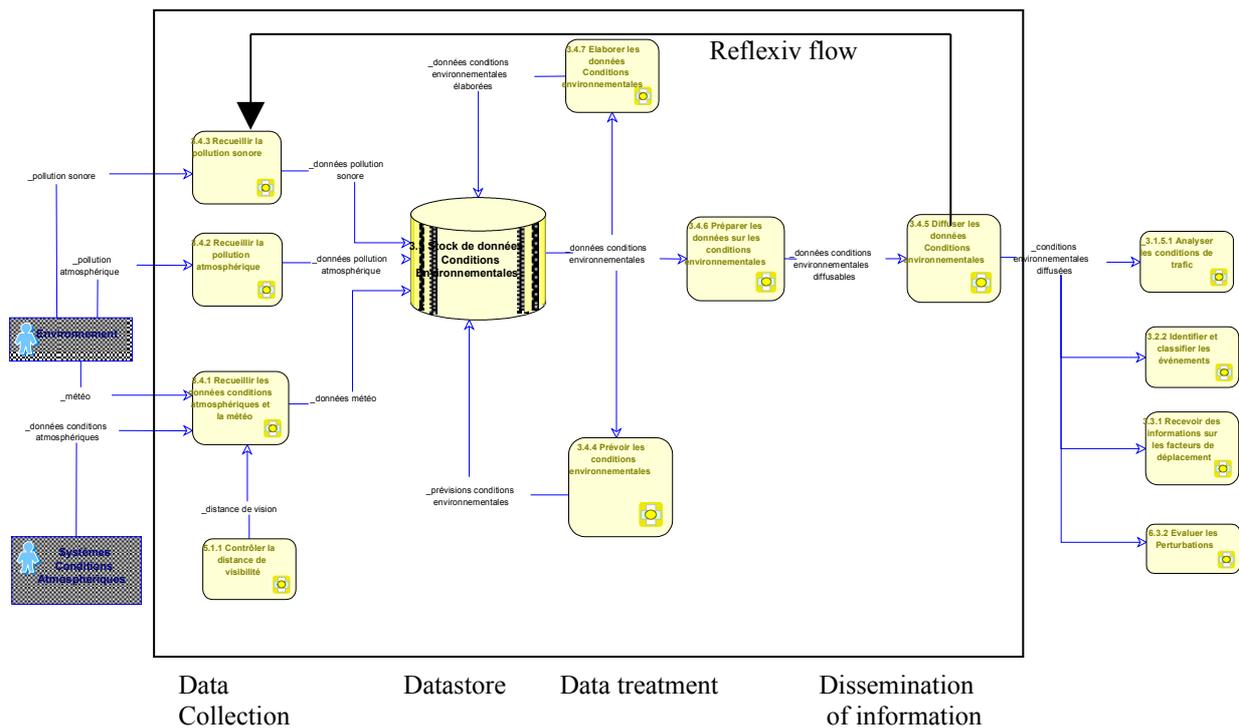
- provide electronic payment systems,
- manage safety and emergency services;
- manage transport infrastructures and their traffic;
- manage public transport operations;
- provide advanced driver assistance systems;
- manage and inform on transportation coordination;
- enforce regulations;
- manage freight and fleet operations;
- manage shared data.

It is one more than within the FRAME model. The ninth functional area answers at two different requests. The first one is the repository management which is essential to allow the consistency, coherence and comparison between data. For example, implementing a multimodal information system in a conurbation area need first to upload comparable data. It means to propose common referentials, like map (with transport infrastructure, bus lines, bus stop codification, addresses...). timetable, travel time calculation. The second one is the reuse

of data in a sharing approach: it allows archive data, in order to produce assessment , or observatory at a regional level (see for example the ACTIF application on Data management system in Franche-Comté Region or on open platform – VIAJEO project). This aspect has been introduced in the French law, which imposes to public authorities the implementation of multimodal information systems and transportation observatories.

Thirdly, ACTIF-model follows an “a-modal” description of the different objects (functions, data-flows, data-stores, terminators...). The first versions of the ACTIF model come directly from KAREN (and then, afterwards, FRAME), which describes transport professions linked with road activities. For example, the “traffic management” functional area is clearly orientated on road management, the “provide advanced driver assistance systems” one concerns essentially cars and trucks. The application of ACTIF on sea-, water- or railways projects allows to verify that the different professional logics was very similar and that the analogy permit to propose common modelling rules

This allows two different things: bringing projects concerning both railways and road closer (for example, traveller information masterplan in the Ile-de-France- (5)); ask the question of the possible application or transposition of some specific standards on other modes (Automatic identification systems for Maritim on waterways transport, use of standardized messages between road managers to coordinators).



This contributes to the fourth improvement: applying more regularly the modelling rules defined for the ACTIF-version 4 for representing the logics of similar professions, by the way illustrated below. Each profession (or functional sub-area) can be seen as a functional chain of functions collecting data, treating and disseminating information, and turning around a data-store which stores a set of specific data and of specific algorithms for a specific results

(output). It highlights the potential interfaces between professions and actors by identifying the source of entry data and those targeted to receive the processed data. The adjunction of reflexive flows allow the possibility to implement (with the ACTIF selection tool – called OSCAR) data exchanges between to structure (or sub-systems) making the same activities.

This improvement also concerned the “electronic payment” and “public transport” functional areas, whose descriptions are now very close from TRANSMODEL: in particular, the data-stores for ticketing systems are exactly those described in TRANSMODEL. The description is now enough independent from technical levels that we can wonder if keeping the word “electronic” in the first one is necessary...

## **FURTHER IMPROVEMENTS: ACTIF V6**

This aspect allows the sixth and seven improvements which will be progressively implemented during the next months. The sixth is to extend the ACTIF model to the different services and professions of transport. In 2007, this extension concerned some professions, like the hub management, the reserved use of transport infrastructure (like sea motorways), the warehouse management... the aim of ACTIF team is to cover all the professions of transport and in particular the new services like car-sharing, shared vehicle, transport on demand, station and traveller exchange pool management...

The seventh is to make the ACTIF model closer to the existing standards (9) in order to give a way for using it. This challenge is not obvious, because it needs to come closer to the logics used for standardization works... and often, these logics depends on the profession and work items... It is why, we need previously that the model be applied in different projects for making that the transport expert wonder how the model could be more appropriated.

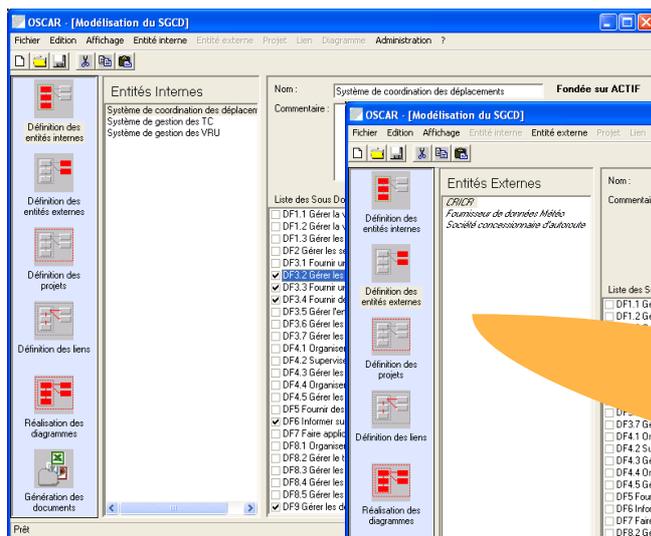
# OSCAR: A TOOL FOR CONCEPTUALIZING INTEROPERABLE SYSTEMS

## THE INTERESTS OF A SELECTION TOOL

The modelling tool MEGA allows the checking of the model consistency. It also allows the production of a Web-site which get accessible this organized knowledge. Each object is represented in clear diagrams and linked with an html-page, which presents its description and the links with other objects (functions, data-flows, and related standards). But a model presents each objects once. It doesn't allow by itself the conceptualization of transport system project, overall when it implies different structures sharing the same activities and responsibilities.

It is why the ACTIF team realized a “simplified tool for conceptualizing Architecture” – OSCAR. The OSCAR tool can be downloaded free of charge from the project website: [http://www.its-actif.org/fr/index\\_outil.asp](http://www.its-actif.org/fr/index_outil.asp)

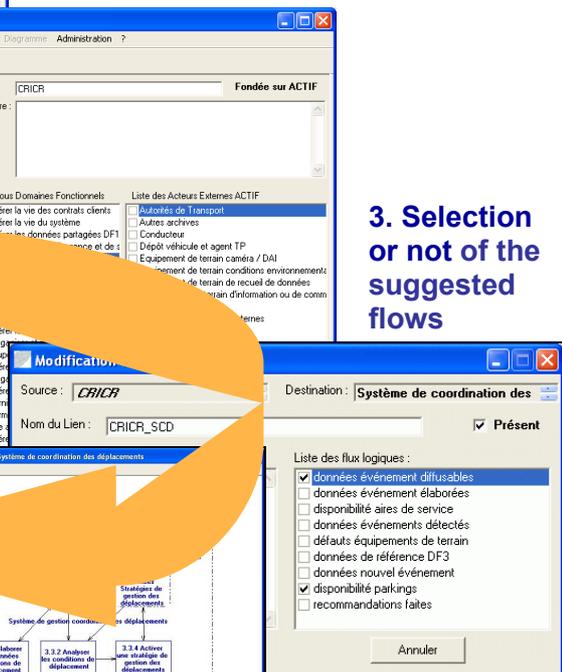
### 1. Definition of the System



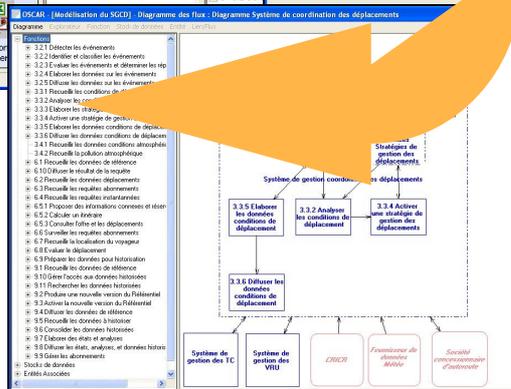
### 2. Definition of the components in interface with the

### 3. Selection or not of the suggested flows

### 5. Documentation Generation



### Diagram creation



# SOME OUTPUTS

The OSCAR tool was created to enable the requirements of different organizations to be taken into account. In principle, this involves identifying the different sub-systems that participate in the functioning of the overall project, defining the functional scope of each one and highlighting the terminators with whom they interact. By identifying them in relation to objects within the model, the OSCAR tool enables the identification of the links that exist between the different sub-systems and terminators, and the interfaces which must be created.

The use of OSCAR allows with simple diagrams to explain the public authority issues, the analysis of the today services (with lacks and redundancies), and, thanks the ability to propose different scenarios, to define a common target system, which describes the role of each partners (sub-systems) and a clear distribution of responsibilities. For example the diagrams below show the interfaces between the different subsystems involved for tracking a truck with hazardous goods in a case of accident.

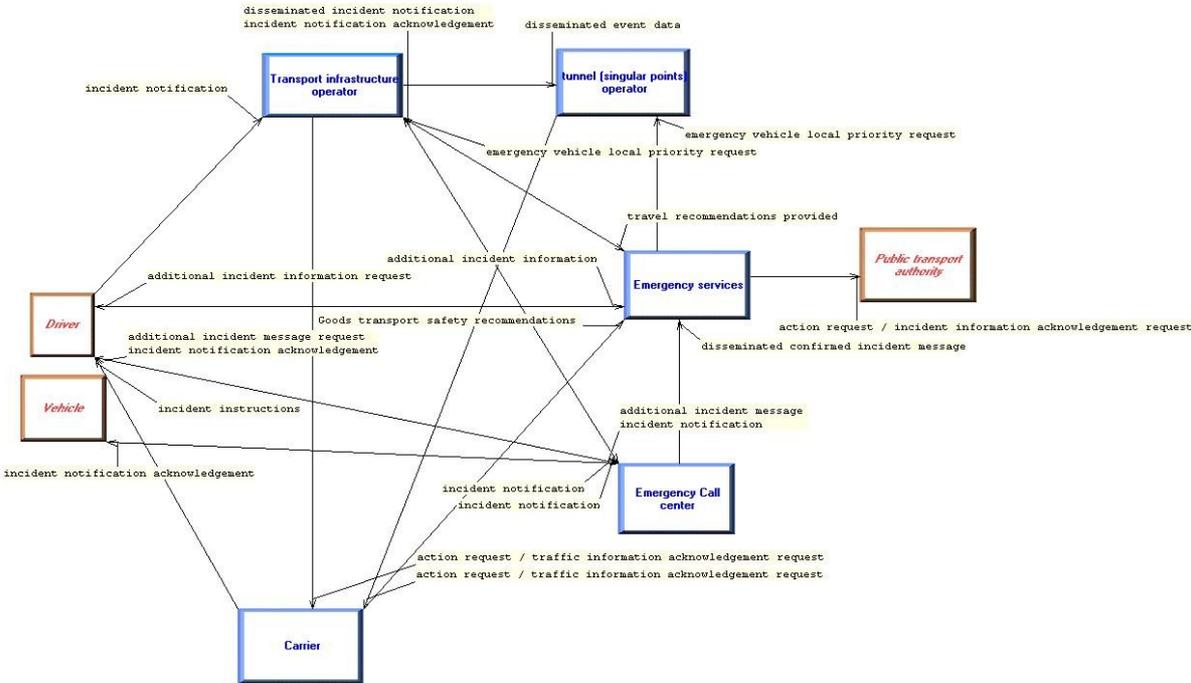
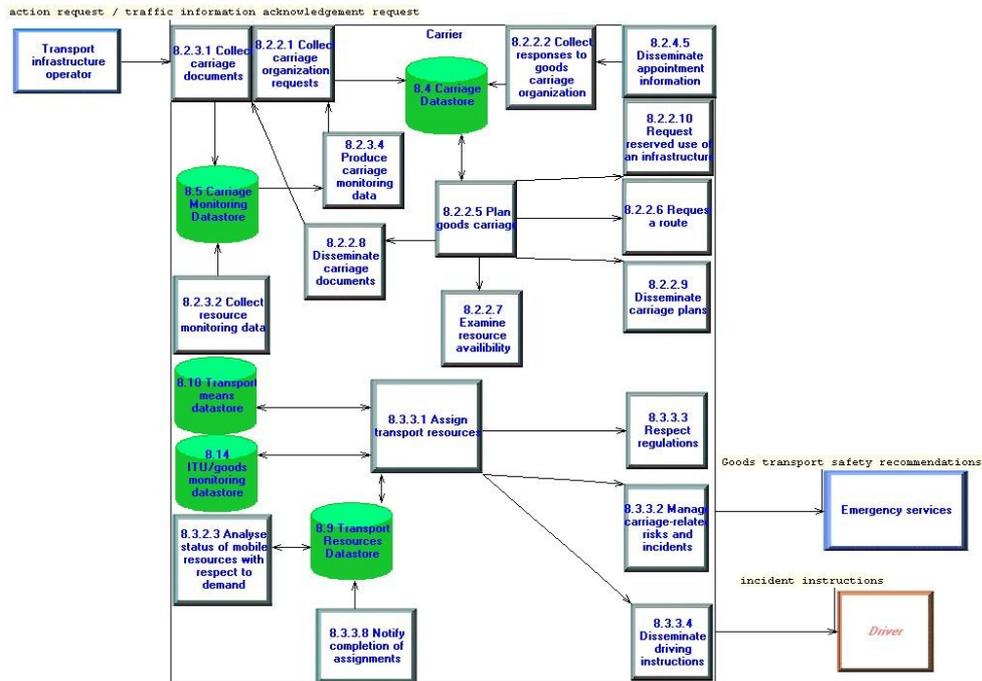


Figure 3: OSCAR output 1: organisational diagram with interfaces

The functionalities of one stakeholder (or subsystem) can be presented in functional diagrams which can be described globally or if needed in the context of one occurrence, like for example below, the functions activated by a carrier in the case of an accident without electronic monitoring functions.



**Figure 4: OSCAR output 2: functional diagram for one sub-system**

## NEW IMPROVEMENTS OF OSCAR V4

Some improvements have been brought in the last version of OSCAR available on the website:

- firstly, this tool is now bilingual: we can switch without difficulties between English and French... and perhaps for the future between other different languages;
- secondly, the functionalities have been improved for making for example diagrams more easily, or import or export projects and models more easily;
- thirdly, the outputs have been improved for making it closer to the documents expected by project manager (functional and technical specifications...);
- fourthly, the outputs can be produced directly on open office files;
- fifthly, the tool content is now fed by examples making its use more user-friendly.

## CONCLUSION

### THE IMPORTANCE OF A WELL-UNDERSTANDING FOR A SUSTAINABLE MOBILITY

A tool-kit like ACTIF is important to propose a shared knowledge and methods for helping stakeholders to find common solutions for co-operation. But it is not sufficient by itself. The implementation of transport systems is complex: it requests the clear will of each stakeholders participating at the designing steps but also their interests in its implementation and maintaining. This means the need for agreement concerning the data property, the interest safeguard of each ones, and financial counterparts... But, at the first stage, the stakeholders have to sit down around the same table in aim to understand each others.

The different ACTIF applications, in Toulon area, in Montpellier - multi-modal transportation co-ordination (7)-, in Franche-Comté Region - shared data management (7), in Alsace region (multi-modal information system) have shown that constitutes the first and main contribution of ACTIF. The follow-on activities is to continue the promotion of such a tool by experience sharing and capitalization.

For promoting ACTIF, the ACTIF team manages the website [www.its-actif.org](http://www.its-actif.org) where: the ACTIF application study reports are available, the ACTIF model can be browsed and OSCAR-tool can be downloaded for free. Training courses are regularly proposed (3 per year).

The capitalization concerns firstly the ongoing enrichment of ACTIF model with new services and professions. It means that a network of experts use ACTIF for themselves in order to make connection between their professions and the knowledge and method proposed by ACTIF model. We can hope that these experts translate the objects contented by their professional standards in ACTIF concepts. That is the next challenge of ACTIF-team.

New versions of ACTIF model and tool will be proposed in order to update the standards (9) and to introduce new professions (3), and to get them more useful. This capitalization is also planned at European level, with for example the participation to FRAME forum for exchanging information about the different Framework Architectures for ITS, and a contribution to E-FRAME project, which proposes extension of FRAME (1) on cooperative systems. In VIAJEO project, the challenge is also to conceive open platforms for exchanging data between several partners in order to manage globally the traffic and the public transport in real time (5). The results of this kind of application is not only the enrichments of ACTIF and FRAME which will be used for conceiving this platforms, but more subsequently, the description of a method applicable universally, for designing this kind of open platform for other cities over the world, in aim of sustainable mobility.

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