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Projet :



# Aide à la Conception de Transports Interopérables en France : ACTIF

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Titre : **MEGA and FRAME comparison**

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Business  
Services



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## Diffusion

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## Validation du document

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## Historique des versions

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0.1	Creation	Christophe CARRY	20/05/10
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## Documents de référence

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# 1. Introduction

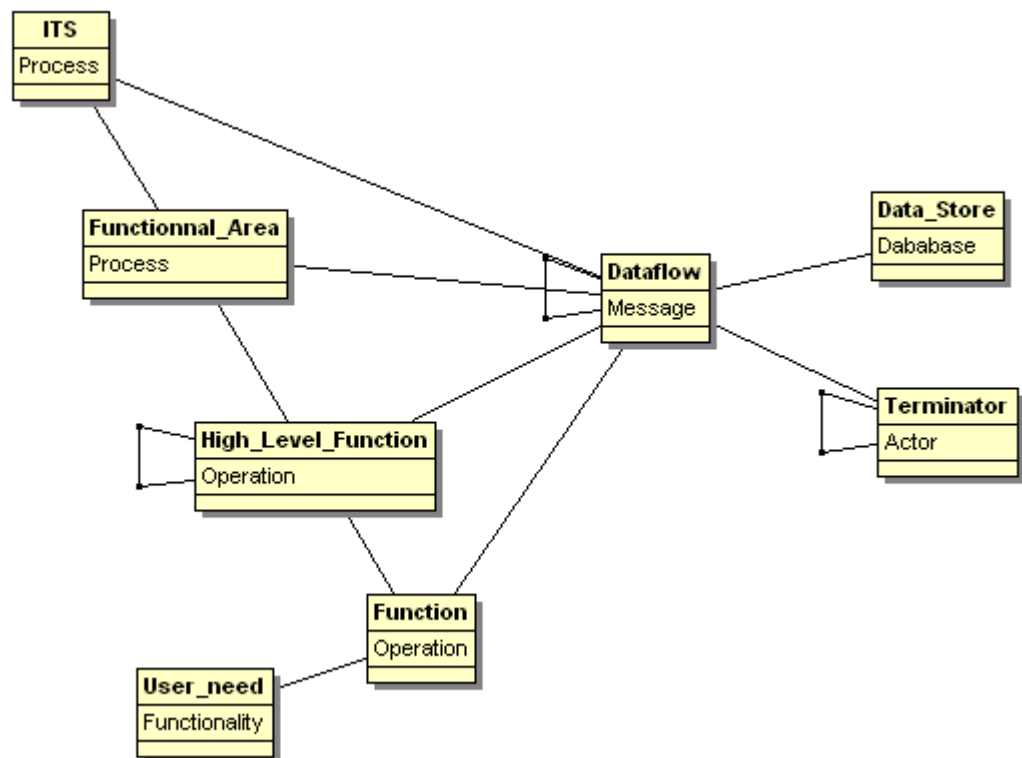
The aim of this document is to provide a comparison between the ACTIF and FRAME models.

## 2. Meta-model comparison

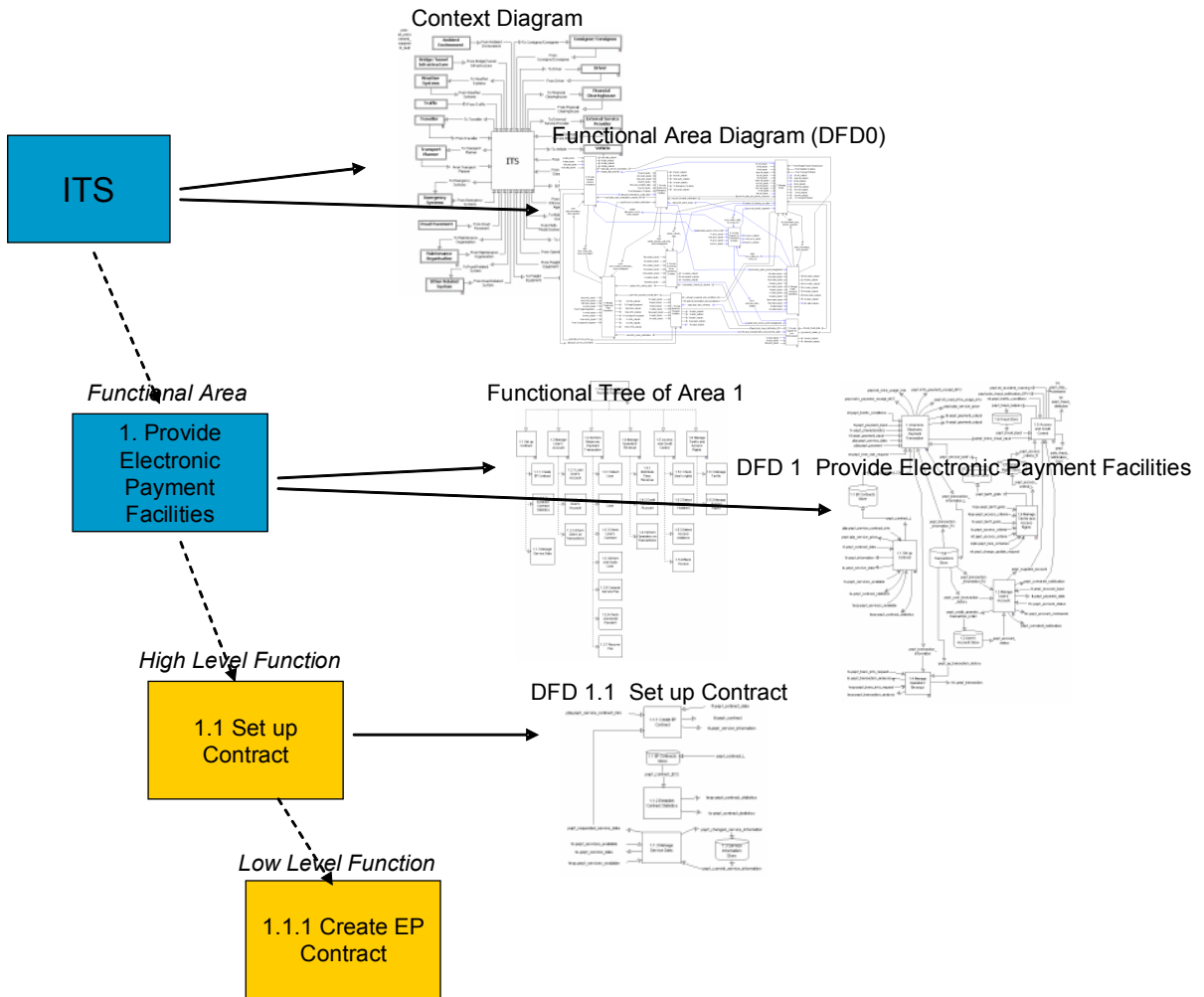
### 2.1. FRAME

FRAME is modelled with MEGA version 2005 SP4 patch 5.4 (707 – 2230).  
The MEGA metamodel has not been changed in FRAME metamodel.

#### 2.1.1. Meta-model



## 2.1.2. Object structuration and associated diagrams



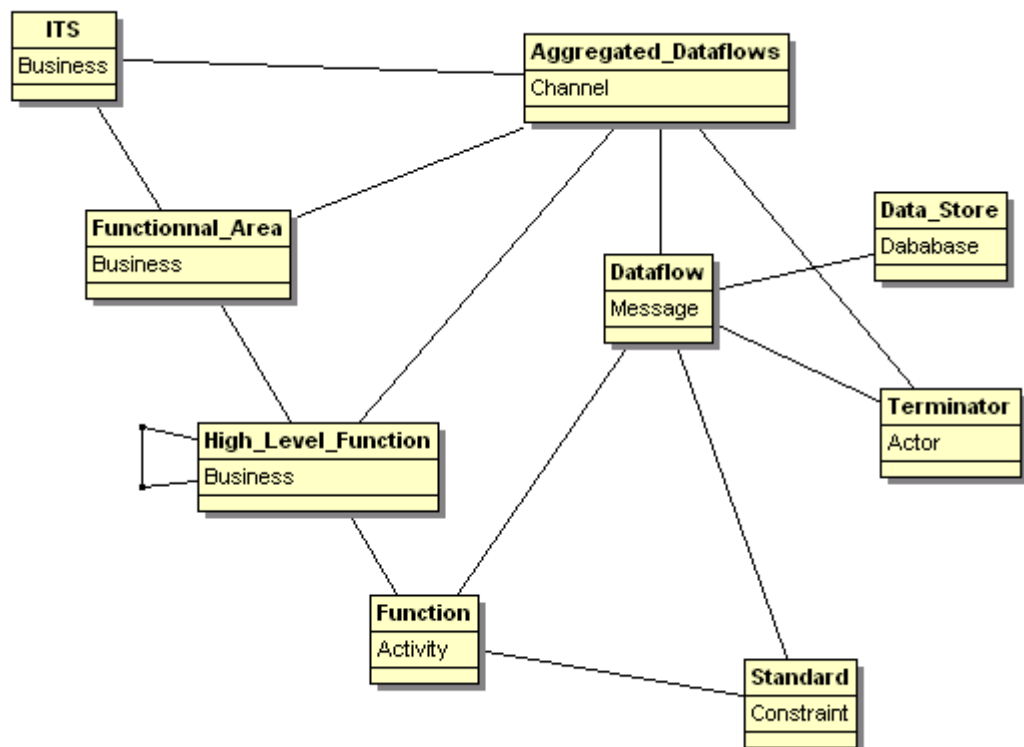
## 2.2. ACTIF

ACTIF is modelled with MEGA version 2009 SP2 patch 2.0 (722 – 2629).

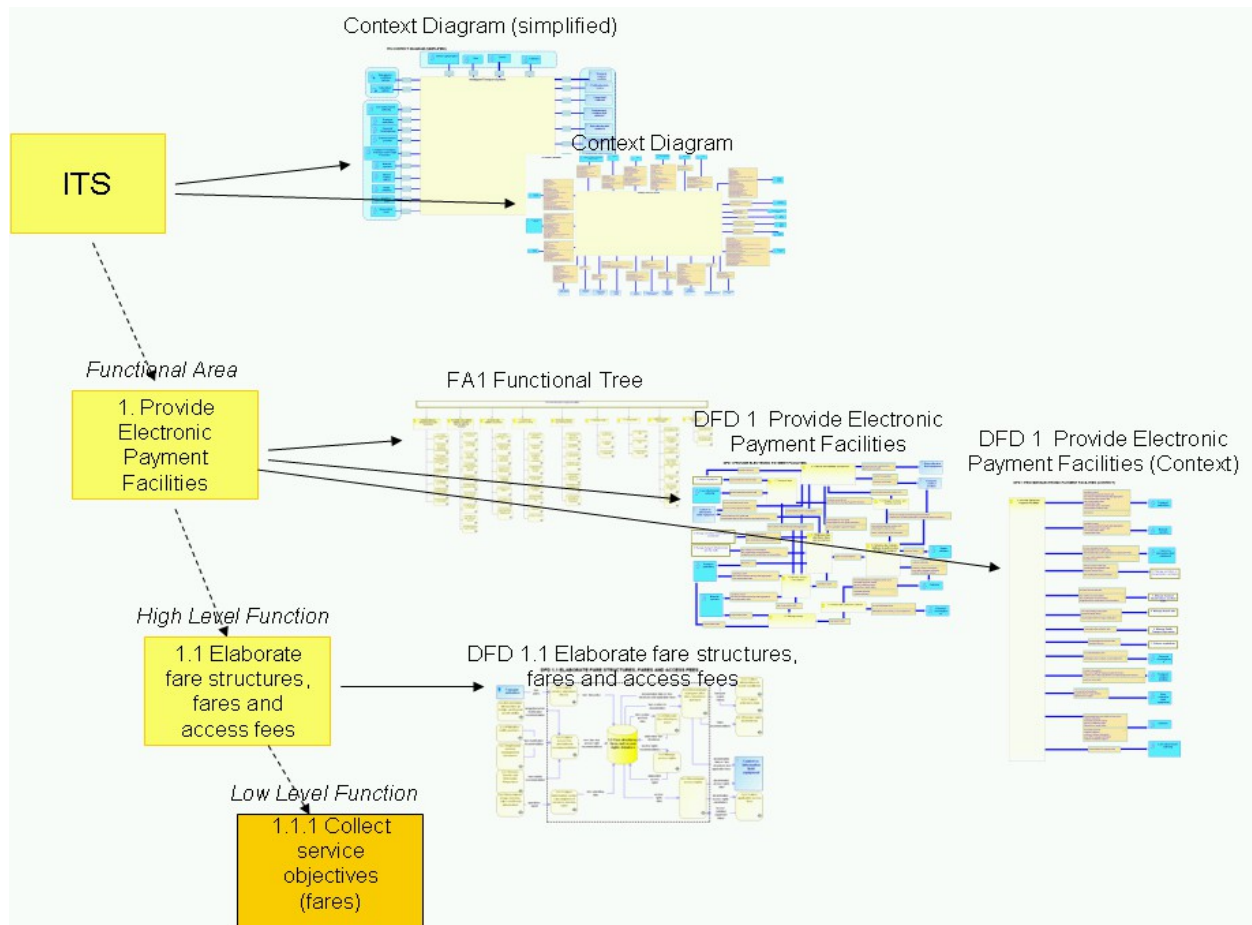
The MEGA metamodel has been customized for the needs of ACTIF. Main changes are :

- New object « Standard » to allow the association of standards (eg: DATEX, etc.), as well as recommendations or best practices to ACTIF low-level objects (functions and dataflows). Nevertheless, while still present in the ACTIF database, this object is no longer used in ACTIF v5. Instead, the MEGA Object « Functionality » is now used.
- Extension of the use of Channels to handle dataflow exchanges between Functional Areas, High level Functions, and Terminators. In MEGA one can only use channels between processes and actors.
- New attribute for the « Business Function » object (ie: functional areas and high level functions). This attribute is no longer used since the version 4 of ACTIF. This attribute is :
  - « ACTIF Traçabilité »
- New attributes for the « Functional Activity » object (ie: low level functions). These attributes are no longer used since the version 4 of ACTIF. These attributes are :
  - « ACTIF Traçabilité »
  - « Functional specifications »

### 2.2.1. Meta-model



## 2.2.2. Object structuration and associated diagrams



## 2.3. Main differences

Type	ACTIF	FRAME
Terminators	- Flat structure	- Lattice-like structure (a terminator may contain other terminators, and a terminator can have the same ancestor in 2 different « paths » (See [F-3])). Hierarchical maximum deep is 2 levels)
Functionnal Area	- modelled with the « Business Function » object	- modelled with the « Process » object
Dataflows	- Flat structure	- Tree-like structure (a dataflow may contain other dataflows)
Functions	- Function characteristics include the item « Functional specifications ». This attribute is no longer used since the	- Function characteristics include the item « Functional requirements » which aims to describe how the function



	version 4 of ACTIF. - Function characteristics include the item « Traçabilité ACTIF ». This attribute is no longer used since the version 4 of ACTIF.	works.

Miscellaneous information :

In the FRAME model, the great number of dataflows is due to the fact that MEGA Channel objects are not used. This means that flows are hierarchically structured according to the hierarchical objects they are linked to. For example :

Message name	Source	Destination
From Driver	Driver	ITS
fd-mffo_inputs	Driver	8. Manage Freight and Fleet Operations
fd.fvd-input_management_data	Freight Vehicle Driver	8.2 Manage Commercial Fleet 8.2.2 Manage Fleet Operations
fd.fvd-payment_receipt	Freight Vehicle Driver	8.2.2.2 Control and Monitor Fleet Operations 8.2.2.2.3 Process on-board Payments
fd.fvd-statutory_information	Freight Vehicle Driver	8.2.2.3 Manage Fleet ressources 8.2.2.3.3 Manage Driver Employment
fd.fvd.driver_trip_input	Freight Vehicle Driver	8.3 Manage vehicle/driver/cargo/equipment
fd-mpto_inputs	Driver	4. Manage Public Transport Operations
...		

This way of doing was the only one possible until the introduction of Channels in the version 6 of MEGA. Using channels save a great load for maintaining the consistency between all these dataflows (in fact it has just been introduced for that purpose), in terms of hierarchical links, comments, etc.

By the way we can see in the example above that some dataflows (eg: fd.fvd-input\_management\_data) are linked to functions of 2 different levels from the same hierarchy. That should not be, and illustrates the difficulty to maintain consistency with that approach.

Finally this is quite confusing for a user, as in the web site one can see, for a given object, all the dataflows, whatever level it is (see [F-4]).

In ACTIF the use of channels makes it possible to create only the low-level dataflows, that is, the dataflows between the low-level objects (like functions), letting MEGA automatically deduce dataflows at higher levels (High Level Functions and Functional Areas).

## 3. Object Comparison

### 3.1. Object numbers comparison

Type	ACTIF	FRAME
User Needs	<i>none</i>	606 ?
Terminators	27	87 level 1 : 21 lowest level : 77
Business Functions	69 1 top level (ITS) 9 level 1 (FA) 59 level 2 & 3 (High level functions)	
Processes	1 (thematic views)	10 (ITS + 9 FA)
Data Store	58	50
Operation	<i>none</i>	
Logical flows	794	2542 level 1 : 2085 Lowest level : 1085
Standards	39	<i>none</i>
Diagrams	97 2 main diagrams (ITS) 15 Functional Trees 70 DFD 10 Thematic views	97 2 main diagrams (ITS) 9 organigrams 16 Functional Trees 70 DFD

## 3.2. Functional comparison

### 3.2.1. User Needs

No user needs are defined in the ACTIF model.

### 3.2.2. Terminators

The matrix below aims to point the correspondances between ACTIF and FRAME terminators.

Note the color code used on ACTIF Terminators :

- gray : the ACTIF Terminator has no corresponding object in FRAME ;
- yellow : the ACTIF Terminator can be fully modelled by FRAME objects (either terminators and/or functions)
- salmon : the ACTIF Terminator is partially covered by FRAME objects. See note for details.

As a general rule it should be noted that in FRAME, field equipments are not explicitly mentioned. Instead, there are terminators that represent the environment itself (that is : road, weather conditions, etc.), and these terminators send data flows directly to functions that *evaluate* these flows.

So these functions include both the equipment functions and other processing functions, making it difficult to separate devices when modelling a real system.

To avoid this it has been decided in ACTIF to model field equipments as terminators.

FRAME / ACTIF		Archives User	Atmospheric conditions systems	Automatic enforcement field equipment	Camera field equipment	Carrier	Consignor/Consignee, Principal and Freight	Control or information field equipment	Customer	Data collection field equipment	Driver/captain/pilot	Environmental conditions field equipment	External service provider	Financial Clearinghouse	Intermodal transport unit	Intervention team	Law enforcement authority	Network operator	Positioning data source	Public vehicle and embarked equipments	Shared vehicle offerer	Status validator	Subscribed system	Transport authorities	Transport contract medium	User	Vehicle and staff depot	Vehicle equipment
Ambient Environment				X							X																	
Bridge/Tunnel Infrastructure				X					X		X																	
Consignor/Consignee							X																					
Freight Shipper							X																					
Principal							X																					
Driver										X																		
Emergency Vehicle Driver										X																		
Freight Vehicle Driver										X																		
Hazardous Freight Vehicle Driver										X																		
On-Demand Service Driver										X																		
Private Driver										X																		
Public Transport Driver										X																		
Emergency Systems	1															X												
External Service Provider												X																
Bookable Service Provider												X																
Broadcaster												X																
Driver and Vehicle Information Provider												X																
Freight Storage Renting Agency												X																
General Information Provider												X																
Geographic Information Provider												X																
Multi-Modal Travel Information Provider												X																
Planned Event Organiser												X																
Traffic and Travel Information Provider												X																
Vehicle Renting Agency												X																
Financial Clearinghouse													X															
Freight Equipment	2													X														
Law Enforcement Agency																X												
Location Data Source																		X										
Maintenance Organisation	11																											
Public Transport Maintenance Organisation	11																										X	
Road Maintenance Organisation	11																											
Multi-Modal System	12																											
Multi-Modal Crossing	12																											
Multi-Modal Management System	12																											
Other Mode Freight System	12																											
Operator	3																											
Emergency Operator	3																											
Fleet Operator	3																											
Freight Operator	3																											
On-Demand Service Operator	3																											
Parking Operator	3																											
Public Transport Operator	3																											
Road Maintenance Operator	3																											
Road Network Operator	3																											
Toll Operator	3																											
Traveller Information Operator	3																											
Other Related System																												
Emergency Management System	4															X												
Environmental Traffic Management System	5																											
Incident Traffic Management System	6																											
Inter-urban Traffic Management System	7																											
Public Transport Management System	8																											
Public Transport Stop							X																					
Traffic Signal Controller							X																					
Traffic Simulation System	9																											
Urban Traffic Management System	10																											
Road Pavement			X						X																			
Traffic			X						X																			
Transport Planner	21																											
Traveller																											X	
Car-Pooler																				X							X	
Cyclist																											X	
On-Demand Service Passenger																											X	
Pedestrian																											X	
Pre-Trip Traveller																											X	
Public Transport Passenger																											X	
Static Traveller																											X	
Vehicle Driver										X																	X	
Vehicle	22																											
Emergency Vehicle	22																											
Freight Vehicle	22																											
Hazardous Freight Vehicle	22																											
Human Machine Interface	22																											
Other Vehicle	22																											
On-Demand Service Vehicle	22																											
Private Vehicle	22																											
Public Transport Vehicle	22																				X							
Vehicle Systems																											X	
Weather Systems		X																										

- 1 Emergency systems are modelled in ACTIF by the FA2 and associated reflexive dataflows, and by the "Intervention Team" terminator.
- 2 Freight Equipments can be modelled in ACTIF through the FA5, but not in a explicit way : there is no explicit mention of them in the FA description. Anyway, in FRAME this Terminator does not send or receive dataflow.
- 3 In FRAME operators are human entities that interact with the system. In ACTIF this Terminator and its interactions are part of the functions themselves.
- 4 Emergency Management systems are modelled in ACTIF by the FA2 and associated reflexive dataflows, and by the "Intervention Team" terminator.
- 5 Environmental Traffic Management systems are modelled in ACTIF by the FA3 and associated reflexive dataflows
- 6 Incident Management systems are modelled in ACTIF by the FA2 and associated reflexive dataflows
- 7 Inter-Urban Traffic Management systems are modelled in ACTIF by the FA3 and associated reflexive dataflows
- 8 Public Transport Management systems are modelled in ACTIF by the FA4 and associated reflexive dataflows
- 9 Covered by the function "3.3.7 Produce traffic advisories" ?
- 10 Urban Traffic Management systems are modelled in ACTIF by the FA3 and associated reflexive dataflows
- 11 Road Maintenance is covered by FA 3.5 in ACTIF. Maintenance on Public Transport vehicles is managed in the 4.3 function "Manage Human and Physical Resources". Note that some light maintenance on Public transport vehicle is managed in the "Vehicle and staff depot" Terminator.
- 12 As ACTIF aims to be multi-modal, non-road systems are modelled in ACTIF the very same way as road systems are. That means that these FRAME terminators are modelled in ACTIF using corresponding FA (mainly 3 or 4).
- 13 ACTIF "Automatic enforcement field equipment" are modelled in FRAME in function "7.1 Detect Fraud".
- 14 In FRAME no distinction is made between the Traveller and the Client (ie between the one who uses a service and the one who pays it).
- 15 ACTIF "Archives User" terminator has no correspondance in FRAME as this terminator is linked with the FA9 which is specific to ACTIF model. Same remark for the "Subscribed system" terminator.
- 16 ACTIF "Carrier" terminator has no correspondent terminator in FRAME. This terminator can be modelled in FRAME with the 8.3 aggregated function. It seems that this terminator can also be modelled in ACTIF using functions of FA8 rather than a terminator. To be removed ?
- 17 ACTIF "Network Operator", as mentionned in the associated description, can also be modelled through functions of FA 3, 4, 6. To be removed ?
- 18 ACTIF "Status validator" terminator has no correspondent terminator in FRAME. The concept of a third-party validatidating the status of a traveller (eg a University for a student status) is not modelled in FRAME.
- 19 ACTIF "Transport Authorities" terminator has no correspondent terminator in FRAME. This concept is not modelled in FRAME.
- 20 ACTIF "Transport contract medium" terminator has no correspondent terminator in FRAME. This concept is not modelled in FRAME.
- 21 FRAME "Transport Planner" terminator can be modelled in ACTIF with FA6.
- 22 Vehicles can be modelled in ACTIF using the FA5 functions, or the "Driver" terminator.



### 3.2.3.1. FA1

1. Provide Electronic Payment Facilities							
ACTIF / FRAME							
1. Provide Electronic Payment Facilities							
		1.1 Set up Contract	1.2 Manage User's Account	1.3 Perform Electronic Payment Transaction	1.4 Manage Operators' Revenue	1.5 Access and Credit Control	1.6 Manage Tariffs and Access Rights
1.1 Elaborate fare structures, fares and access fees							X
1.2 Vendre des contrats, attribuer et mettre à jour des titres de transport	X						X 8
1.3 Check and validate access fees			X		X		3
1.4 Monitor the customer's contract		X					7
1.5 Manage contracts and travel documents	X						9
1.6 Manage receipt				X			
1.7 Analyze fraud					X		5
1.8 Monitor service consumption				X			4
1.9 Manage FA1 shared data							2
			6			1	

#### Notes

- 1 There are 2 "Manage Access rights" functions in ACTIF : 1.2.2 and 1.1.5. Are they redundant ?
- 2 In FRAME, shared data and reference data are handled by individual functions.
- 3 ACTIF includes a "Manage command installation" function.
- 4 ACTIF includes a function that reveals fraud which has not been directly identified in the field (1.8.5).
- 5 ACTIF includes specific processing a posteriori to detect frauds by cross-checking.
- 6 Detecting and Identifying User is done in ACTIF through the "Transport contract medium" Terminator.
- 7 ACTIF includes "Issue refunds" (1.4.9) and "Disseminate loyalty offer" (1.4.5) functions.
- 8 ACTIF adds the concept of "Transport contract medium" with functions that can create, update and reproduct such a medium, as well as function that invalidate a transport contract.
- 9 ACTIF aggregated function 1.5 is partially covered by FRAME function "1.1.2 Establish Contract Statistics".

3.2.3.2. FA2

2. Provide Safety and Emergency Facilities																
ACTIF / FRAME																
2. Manage Safety and Emergency Services																
		2.1 Manage Emergencies														
		2.1.1 Acquire Mayday Call on Roadside	2.1.2 Manage Emergency Intervention			2.1.2.1 Identify and Classify Emergencies		2.1.2.2 Manage Incident and Emergency Information		2.1.2.3 Plan Emergency Intervention		2.1.2.4 Process Emergency Progress Reports	2.1.4 Provide Emergency Control to the Operator	2.1.5 Provide Access and Maintain Data for Emergencies	2.1.6 Manage Emergency Vehicle	2.2 Manage Stolen Vehicle Notification
2.1 Process incident notifications																1
2.1.1 Collect event notifications		X		X												2
2.1.2 Qualify incident notifications				X												
2.1.4 Re-route incident notifications				X												
2.1.5 Process Incident Notifications				X												
2.1.6 Disseminate incident notifications data				X												
2.2 Manage emergencies																
2.2.1 Analyse event and emergency data								X								
2.2.2 Activate / Deactivate an incident management strategy								X								
2.2.3 Implement emergency management measures								X								
2.2.4 Develop incident management strategies													X			
2.2.5 Assess the efficiency of emergency management strategies										X						
2.2.6 Manage emergency interventions								X						X		
2.2.7 Disseminate strategy data for ongoing emergency situation management								X	X							
2.2.8 Mobilise incident partners								X	X							
2.3 Manage FA2 shared data													X			7
								3					6		4	5

1 In ACTIF, 2 levels are considered (incident notifications / emergencies) which are managed by 2 different sets of functions (2.1.x and 2.1.y). In FRAME, these 2 levels are handled in one unique function (2.1.2.1) which transforms a incident notification into an emergency by means of increasing a confidence parameter.

2 ACTIF incident collection is not limited to mayday call on the roadside as FRAME is.

3 In ACTIF, managing access to database data is considered done inside the database itself. This has been done to avoid adding one additional function for each database. Computing statistical data is done in FA9.

4 The concept of "green wave" is not explicitly modelled in ACTIF.

5 In ACTIF, stolen vehicle notification is received by the 2.1.1 function.

6 In ACTIF, Operators are considered embedded in the functions themselves

7 In FRAME, shared data and reference data are handled by individual functions.



### 3.2.3.3. FA3

3. Manage traffic													
ACTIF / FRAME													
3. Manage transport infrastructures and their traffic													
		3.1 Provide Traffic Control	3.1.1 Provide Urban Traffic Management	3.1.2 Provide Inter-urban Traffic Management	3.1.3 Provide Traffic Management for Bridges and Tunnels	3.1.4 Provide Management of Car Parks	3.1.5 Provide Management of Service Areas	3.1.6 Provide Network Modelling and Traffic Simulation	3.2 Manage Incidents	3.3 Manage Demand	3.4 Provide Environmental Information	3.5 Manage Road Maintenance	
3.1 Produce traffic data			X	X		X	X	X					1
3.2 Manage Events									X				
3.3 Regulate traffic			X	X		X	X						
3.4 Provide Environmental Information											X		
3.5 Manage upkeep and maintenance of transport infrastructures												X	7
3.6 Manage a network's particular structures and atypical points					X								3
3.7 Manage FA3 shared data							X						6
						2	2			4	5		

In ACTIF functions are grouped by their processing type or associated objective (ie: produce, regulate traffic, etc.). In FRAME they are grouped by the nature of the data processed (eg: urban, inter-urban, car park, service area, etc.).

1 ACTIF provides explicit reference to video input data and automatic anomaly detection from this data.

Management of car parks and service areas are more detailed in FRAME, which, for example, provides 2 functions to calculate car park occupancy. In ACTIF this data is received by a car park Operator which is modelled as an Terminator. Note that collecting car payment is done in FA1 in ACTIF.

3 ACTIF broadened the scope of specific points like tunnels or bridges to any particular structure or atypical point on the network. However the low-level functions 3.6.x only refers to bridges and tunnels.

4 In ACTIF, Demand management is handled in the FA6.

5 In ACTIF , actions to be taken in response to specific environmental conditions are managed in FA6.

6 In FRAME, shared data and reference data are handled by individual functions.

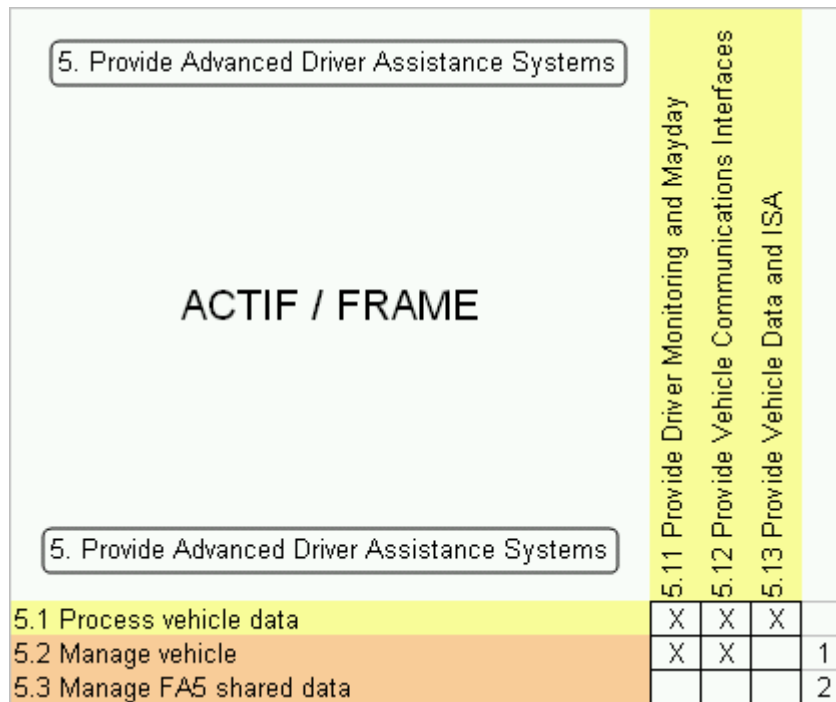
In ACTIF, functions not only asset the needs for maintenance but also launch and follow-up worksites. In 7 FRAME the needs are determined by the Operator and disseminated to the Road maintenance operator Terminator.

### 3.2.3.4. FA4

4. Manage Public Transport Operations		ACTIF / FRAME						
4. Manage Public Transport Operations		4.1 Monitor PT fleet	4.2 Plan PT Service	4.3 Provide PT Management	4.4 Control PT Fleet	4.5 Provide PT Fare Facilities	4.6 Provide Facilities for Vehicle Sharing	4.7 Provide On-demand Services
4.1 Organize and plan public transport services		X						2
4.2 Monitor, control and inform travellers.		X			X			
4.3 Manage human and physical resources			X					5
4.4 Organize shared services						X	X	
4.5 Manage FA4 shared data								7
		3	1		4	6		

- 1 PT fares are handled in ACTIF the same way as other ones, that is in FA1.
- 2 In ACTIF, function 4.1 includes equipments configuration.
- 3 In FRAME predicting vehicle timings is dedicated to one function.
- 4 In FRAME, controlling PT fleet is more detailed than in ACTIF (use of additional vehicles, optimizing PT fleet, etc.)
- 5 In ACTIF, maintenance functions are more detailed than in FRAME (ACTIF includes : plan maintenance, rolling stock maintenance, monitor maintenance interventions, etc.)
- 6 Fare management is handled in ACTIF through the FA1 (true in that case ?).
- 7 In FRAME, shared data and reference data are handled by individual functions.

### 3.2.3.5. FA5



FA5 structure is very different from ACTIF to FRAME. In ACTIF, 2 "levels" are considered : on the first level raw data is collected from sensors and processed to provide basic information to the driver, in-vehicle equipment, or external equipments. The second level is in charge of triggering elaborated strategies to deal with more complex situations (eg: mayday call, vehicle theft, etc.). In FRAME, functions are a mixed between hardware function (communication interface), low-level service (vehicle data), and high-level service (driver monitoring and mayday).

- 1 ACTIF introduces the use of high-level strategies to deal with specific situations.
- 2 In FRAME, shared data and reference data are handled by individual functions.

3.2.3.6. FA6

6. Provide Traveller Journey Assistance		ACTIF / FRAME					
6. Manage and inform on transportation coordination		6.1 Define Traveller's GTP	6.3 Support Trip	6.4 Evaluate Trip	6.5 Prepare Trip Plan	6.6 Provide Traveller Information	
6.1 Produce travel data					X		
6.2 Manage travel coordination							1
6.3 Produce Travel Information			X	X			
6.4 Distribute travel information		X	X		X	X	
6.5 Manage FA6 shared data							2
		3					

- 1 Managing travel coordination is limited in FRAME to coordination between road network operators (FA3).
- 2 In FRAME, shared data and reference data are handled by individual functions.
- 3 FRAME takes into account the traveller's general trip preferences. These are not explicitly mentioned in ACTIF (function 6.4.1 ?).

3.2.3.7. FA7

7. Provide Support for Law Enforcement						
ACTIF / FRAME						
7. Enforce regulations						
		7.1 Detect Fraud	7.2 Identify Violator	7.3 Process Fraud Notifications	7.5 Manage Rules and Users' Registration	7.6 Store Violations Data
7.1 Manage regulations					X	1
7.2 Record offences		X		X		2
7.3 Establish offences			X	X		X
7.4 Manage FA7 shared data						3

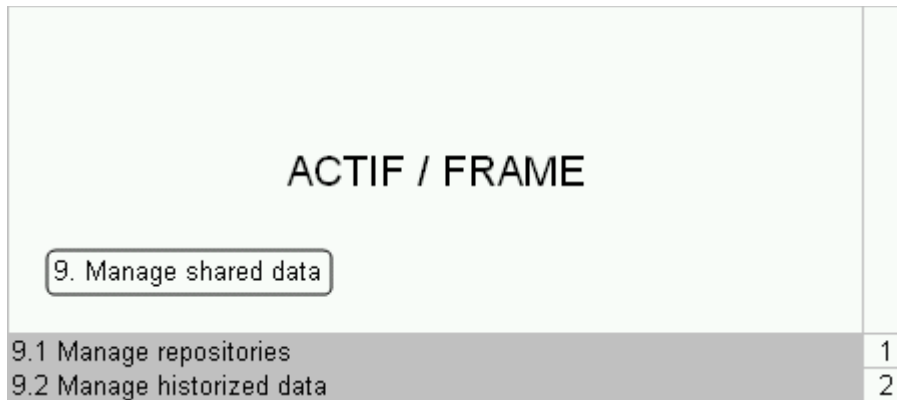
1 ACTIF includes the management of in-field installations.

2 ACTIF includes notification of maintenance/repair requirements.

3 In FRAME, shared data and reference data are handled by individual functions.



### 3.2.3.9. ACTIF FA9



- 1 In FRAME, there is no centralized function which handles repositories management.
- 2 In FRAME, there is no centralized function which handles data historization.

### 3.2.3.10. FRAME FA9



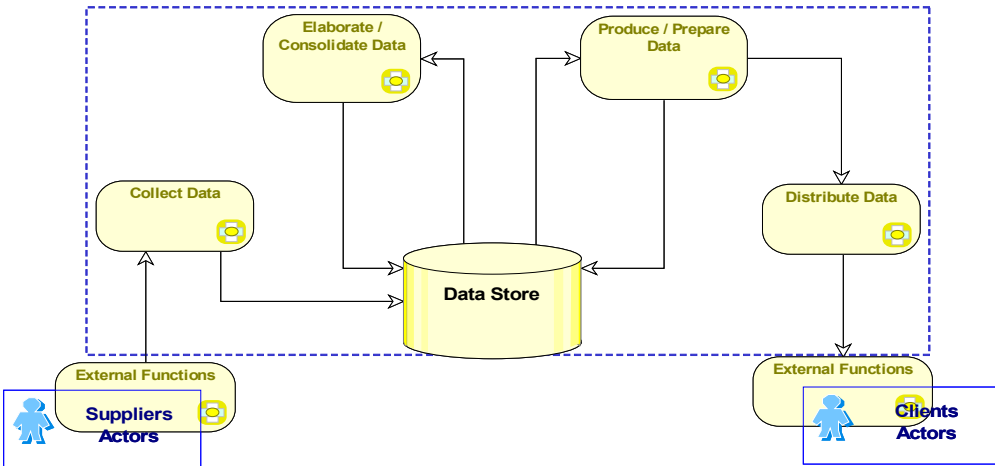
- 1 In ACTIF, there is no explicit mention of "green waves request", but such requests may be modelled via generic functions and data flows.
- 2 In ACTIF, bus lanes are not managed in a specific way.

## 4. Modelling rules Comparison

Type	ACTIF	FRAME
Ergonomic rules	There is no limitation on the size of the diagrams. So some diagrams are quite large in size and difficult to read on a screen.	Most of the FRAME Diagrams are designed not to exceed a A4 page in size.  This implies some limitations : source and recipients of dataflows are not shown (but the names of the dataflows include some information about them)
	Diagrams are to be read from left to right : source functions and terminators are on the left part of the diagram, while dataflows exiting from the high level function described are on the right part.	There is no reading sense commonly found in the diagrams.
Structure	The structure of the diagrams is based on a generic pattern (see below). This pattern is used throughout the model to improve legibility of the diagrams and help making distinction between distinct types of functions.  Another pattern have been defined to handle behaviour in mainly predictable situations : definition of strategies associated with triggering conditions, strategy activation, etc.	No commonly used structure.
Naming	Functions (both high and low level) are identified with a unique number in the form of x.y.z, where x is the number of the corresponding FA, y is the number of the high level function inside the FA, and so on.  The numbering of the data stores follow the same rule as for the functions.	Same rules as in ACTIF.  Furthermore old numbers are not be used again : if a function is permanently removed from the model, for example to be replaced by another set of functions, its number will not be re-used by a new function.
Comments	Comments and names of the dataflows should only mention the nature of the data carried on, not the way this data will be further used in the system.	Comments about dataflows often mentionned the way the data will be used, or the objective behind the sending of the data (see [F-1]).  This requires additional load to maintain consistency in the model as a change in the scope of a function may need a change in the comments



		<p>of the incoming (or outgoing) dataflows.</p> <p>Furthermore some dataflow comments don't say anything on the dataflow contents (see [F-2]).</p>
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**Illustration 1: Generic Architecture**

## 5. Other differences

### 5.1. *Accessibility*

FRAME is only available as a downloadable file on the Frame web site (size: 5.2 MBytes). It is not possible to browse the model online. Furthermore one should browse the model exclusively with Internet Explorer web browser, as the generated web site from MEGA includes an activeX component that provides the ability to zoom in and out the diagrams.

This functionality is not so interesting as it seems to be, as zooming out a diagram in order to have a general view of it rapidly decreases the ability of reading the texts inside the diagram (the names of the objects).

The ACTIF model can either be browsed inline or downloaded as a ZIP file and installed on one's computer to be browsed offline. The « browsing tool » offer no zooming abilities but can be invoked from any web browser as it is based on pure HTML code (no browser-dependant javascript code nor ActiveX component).

## 6. Selection Tool Comparison

### 6.1. FRAME Selection Tool

The process of defining a new Functional Viewpoint is as follows :

- the user selects a subset of *user needs* ;
- the tool proposes the list of the *low-level functions* linked to the previously selected *user needs* ;
- the user selects a subset of these *functions* ;
- the tool proposes the list of the *dataflows* linked to the previously selected *functions* ;
- the user selects a subset of these *dataflows* ;
- the tool proposes the list of the *data stores* linked to the previously selected *dataflows* ;
- the user selects a subset of these *data stores* ;
- the tool proposes the list of the *dataflows* linked to the previously selected *data stores* ;
- the user selects a subset of these *dataflows* ;
- the tool proposes the list of the *terminators* linked to the previously selected *dataflows* ;
- the user selects a subset of these *terminators* ;
- if any, the tool lists errors and warnings that points inconsistencies in the selected objects (data flows not related at both ends to functions, etc.)

Then the user creates a Physical Viewpoint :

- the user creates a new Physical Viewpoint, which he associates to a previously created Functional Viewpoint ;
- the user creates sub-systems which are elements of the physical viewpoint. He may also creates modules which are elements of a sub-system ;
- the user allocates functions and/or datastores to sub-systems ;

Finally the tool establishes the Communication Viewpoint which lists all the links that should exist between sub-systems and modules, according to the FRAME model, each link being composed of dataflows.

### 6.2. ACTIF Selection Tool (OSCAR)

The process of defining a new Architecture is as follows :

- the user creates sub-systems by selecting low-level functions and data stores ;
- the user creates stakeholders by selecting aggregated functions and terminators ;
- the tool proposes the list of dataflows linked between sub-systems and stakeholders ;
- the user selects a subset of these dataflows ;
- the user draws some diagrams in which he can put some or all of the objects created, in order to illustrate parts of the architecture.

### 6.3. Main differences between ACTIF and FRAME Selection Tool

ACTIF and FRAME selection tools are rather similar in their process : they both allow the user to define elements of the real world (sub-systems and modules in FRAME, sub-systems and stakeholders in ACTIF) based on the model objects, and deduce afterwards the dataflows that should be exchanged by these elements.

Main differences between ACTIF and FRAME selection tool are :

- Starting point : in FRAME the user begins the selection process by selecting user needs. As there are no user needs in ACTIF, the user directly selects functions and data stores.
- Selection process :
  - in FRAME the user first selects a set of functions, data stores, data flows, and terminators, that defines a consistent functional perimeter (Named Functional viewpoint). The user will then group subsets of these objects (with the exception of terminators) into physical sub-systems and modules. Each object can only be related to one sub-system. In ACTIF the user first defines physical entities (either sub-systems or stakeholders), and then assign them functions and/or data stores.
  - ACTIF distinguishes between internal sub-systems, that the user can define precisely by selecting low-level functions and/or data stores, and stakeholders that the user define by selecting aggregated functions (and the related datastores) and/or terminators. FRAME only offers selection of low-level functions and datastores.
  - In ACTIF terminators can be part of physical entities (stakeholders). In FRAME all terminators are external to the system described.
  - In ACTIF physical links between stakeholders are not to be defined by the user. In FRAME all the links are displayed.
  - In ACTIF the user can de-select dataflows inside physical links to adapt the proposed links to the system he planned to define. In FRAME the tool does not offer this functionality.
- Consistency control : both tools provide consistency checks to help build the architecture, but in a different way.
  - FRAME selection tool checks for the existence of selected objects not fully linked to the other objects (eg: terminators with no dataflow or dataflow with no source or target object). This is because in the selection process FRAME proposes all the dataflows whose source or target is a selected object, no matter if the other end of the dataflow is also linked to a selected object.
  - ACTIF selection tool works differently, because in the selection process only the dataflows linked on both ends to already selected objects are proposed to the user. So there is no need to check for consistency at that point. In fact consistency checks are only provided at the diagram drawing step, where it consists of checking duplicate or missing objects. Nevertheless it could be interesting to provide a consistency check in the selection process to guarantee that all the objects inside an entity form a continuous chain (i.e. each object – function, data store, terminator - composing an entity sends or receives a dataflow to/from at least one other object of the same entity).
- Instanciation : OSCAR allows for a rich instanciation of the ACTIF model, including reflexive dataflows, multi-instanciation (that is several distinct entities having the same low-level function), re-use of predefined objects (entity library), etc. FRAME instanciation scheme is very basic : a function can only be part of one entity in a given architecture.

- Drawing diagrams : ACTIF offers functionalities to draw the system built with the selection tool. FRAME does not offer this functionality.
- Updating existing architectures : in FRAME, once associated to a physical viewpoint, a functional viewpoint may not be modified. Instead it can be cloned, then modified and finally associated to a new Physical viewpoint. In ACTIF the user has always the possibility to go back to a previous step and modify already created objects and associations.
- Exporting and Importing : FRAME only permits to export the created architecture in CSV or MDB format, but with no possibility of importing these architectures. ACTIF offers export functionalities in three ways : as Word or Excel documents, as MDB database, or as format-specific files intended to be imported in another architecture.

## 7. Annexes

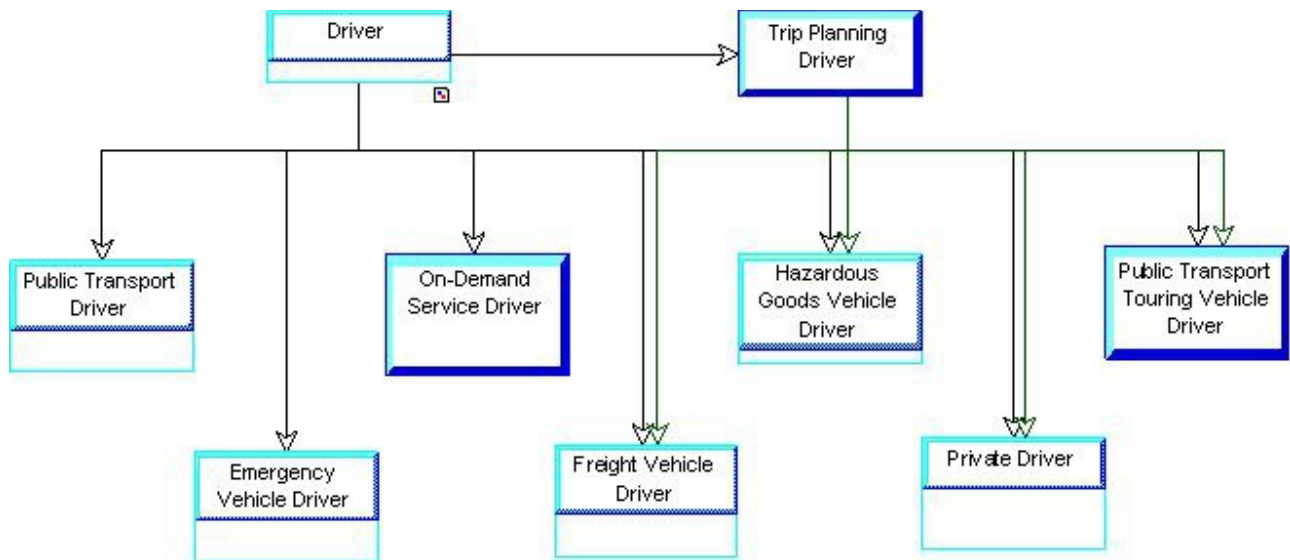
### 7.1. References to ACTIF Model

### 7.2. References to FRAME Model

[F-1] Comment on dataflow « frp\_current conditions » : It contains analogue data from which sensors within a Function can determine the current state of the pavement in terms of its temperature and moisture content. This will be used to decide whether or not de-icing treatment will be needed.

[F-2] Comment on dataflow « frp-long\_term\_wearing\_state » : It contains analogue data from which sensors within a Function can determine the need for long term maintenance of the road pavement.

[F-3] In the diagram below the Terminator « Hazardous Goods Vehicle Driver » is linked to the « Driver » Terminator with both a directlink and via the « Trip Planner Driver » Terminator.



[F-4] The following image shows the dataflows of the « 1.6 Fraud Store » data store, taken from the web site. In fact there is no 5 incoming dataflows but 4 : The pepf\_fraud\_output dataflow includes the 4 preceding ones. Same thing for the outgoing « pepf\_fraud\_input » dataflow.

### **Input dataflows**

- pepf\_black\_list\_request
- pepf\_black\_list\_update
- pepf\_fraud\_notification\_L1
- pepf\_fraud\_notification\_L2
- pepf\_fraud\_output

### **Output dataflows**

- pepf\_black\_list
- pepf\_fraud\_history
- pepf\_fraud\_input