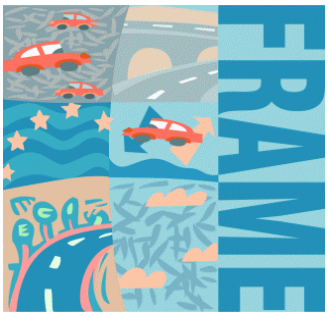
European ITS Framework Architecture

FRAME Selection Tool
User Handbook

Version 1

April 2004



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Abstract: This document provides guidance on the use of the FRAME Selection Tool. The Tool enables users to select some or all of the European ITS Framework Architecture from which to create their own ITS Architecture. Selection is made from a Microsoft® Access® Database version of the Framework Architecture that can be downloaded from the FRAME Project Web Site.

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Table of Contents

1 Introduction

The FRAME Selection Tool, which is one part of the FRAME Navigation Tool (See Section 1.1), has been designed to facilitate the creation of sub-sets of the European ITS Framework Architecture. Users of this Tool are expected to be ITS Architecture Developers who want to base the plan of their new ITS systems on the European ITS Framework Architecture. Whilst this User Manual describe the use of the Selection Tool, it does assume that the user of the tool understands the basic process of creating an ITS Architecture sub-set. A description of this can be found in the Functional Architecture Main Document (D3.1, Sections 2.6, 3 and 4), in the Physical Architecture Main Document (D3.2, Section 2.2, and in particular Sections 4 and 5), and, last but not least, in the European ITS Framework Architecture Overview Document (D3.6, Section 5).

Since the Selection Tool will only produce a proper sub-set of the European ITS Framework Architecture some users may wish to modify it to fit national-specific needs (see Section 4). For this reason a top-level description of the Selection Tool can be found in Appendix A.

1.1 The FRAME Navigation Tool

The objective of the Navigation Tool is to provide users of the Framework Architecture with two principal features (see Figure 1):

- The ability to ***browse*** through the European ITS Framework Architecture, following related elements and being provided with their definitions.
- The ability to ***select*** a sub-set of the European ITS Functional Viewpoint that satisfies a sub-set of the European ITS User Needs, and then to create a corresponding Physical Viewpoint of that sub-set.

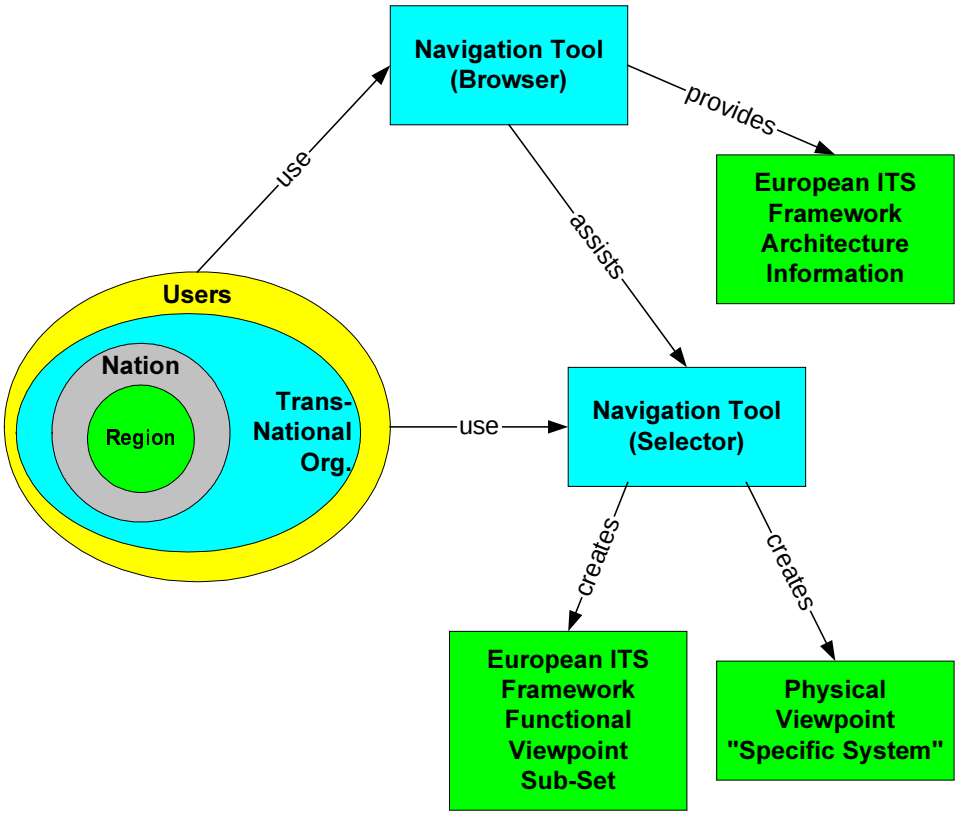


Figure 1

Since the FRAME-S Project uses the MEGA Process Tool for updating and maintaining the European ITS Framework Architecture, providing access for "browsing" has been easily achieved by exporting an HTML version of the European ITS Framework Architecture for viewing with a proprietary browser such as MS Internet Explorer, or Netscape Navigator.

The facility for selecting part(s) of the Framework Architecture (from which specific Functional or Physical viewpoints can be created) has to be provided in a way that does not impose high costs on the users, and that enables modifications to the resulting viewpoints (or system) to be made using any tool, not only MEGA Process. After consultations with the representatives from the user community involved in FRAME-NET, it was felt that the best way to do this was to create an "open" export file, which would be both a well-documented vehicle for the widest possible use of the European ITS Framework Architecture, and the database to be used by the Selection Tool.

The choice of MS Access tables for the "open" export file of the European ITS Framework Architecture (created from the MEGA Repository) is motivated by the fact that most potential users are likely to have Microsoft® Access already. ITS Architecture developers with Mega Process can always use the Mega Process Repository (see Figure 2).

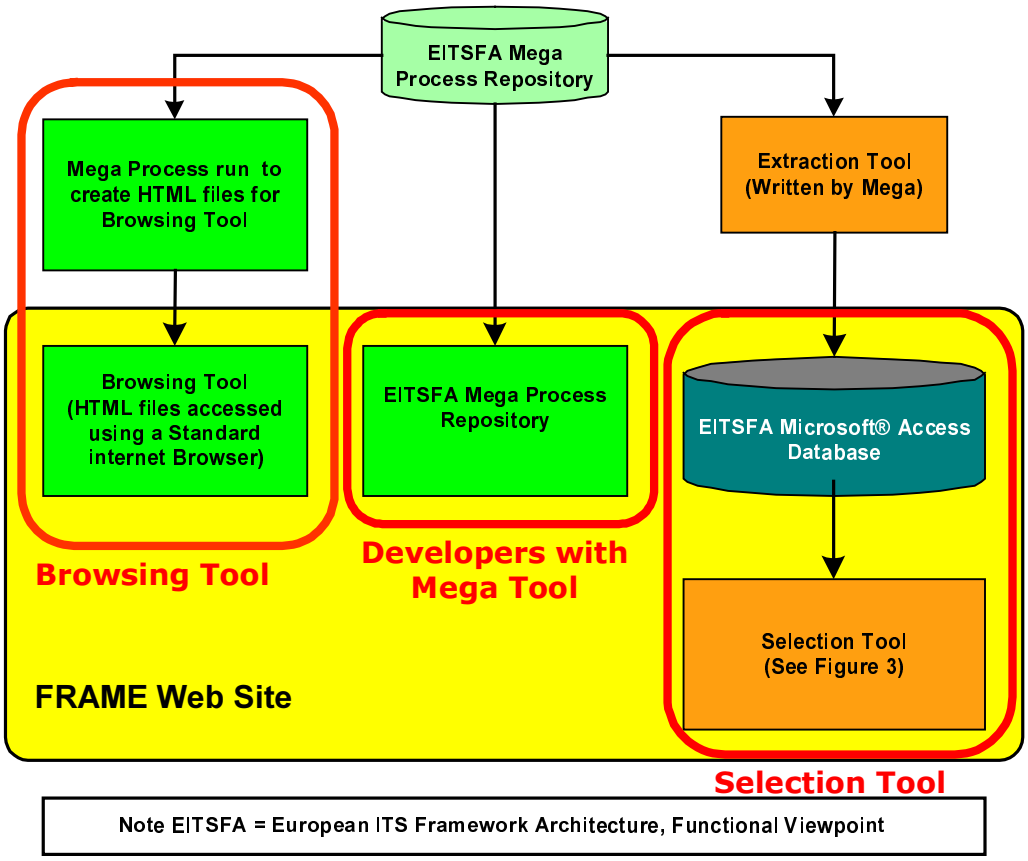


Figure 2

The Browsing and Selection Tools are therefore separate entities that use different files, although they are representations of the same source. The remainder of this document is focused on the Selection Tool, explaining what it can be used for, how it was designed, how to run it, etc.

2 Overview of the Selection Process

2.1 Background

The European ITS Framework Architecture is a large product, made up of a number of different documents, including a set of User Needs that define the services to be provided, and the Functional, Physical and Communication Viewpoints that show how these services can be provided. It also contains other supporting documentation, such as the Deployment Approach, the Cost Benefit Analysis, and the Risk Analysis.

In fact, the Functional Viewpoint is itself a large document many hundreds of pages long: it covers the areas of Traveller Journey Assistance; Traffic Management; Public Transport Operations; Freight and Fleet Operations; Advanced Driver Assistance Systems; Safety and Emergency Facilities; Support for Law Enforcement; and Electronic Payment. Each area is composed of many Functions, Data Flows and Data Stores (both the Functions and the Data Flows have an hierarchical structure). The interaction between the Functional Viewpoint and the world outside is described through Terminators and Actors.

Therefore to go from User Needs to the Physical Viewpoint (see Figure 3) of a particular application you first have to carry out a number of steps to determine the sub-set Functional Viewpoint:

- Identify the User Needs that define the service(s) to be provided.
- Select Functions from the Trace Table, which provide a cross reference from User Needs to the Functions that help to satisfy them.
- Identify their Functional Areas or Sub-Functional group (DFD).
- Confirm that the selected Functions are reasonable.
- Confirm that those Functions “nearby” but not selected, should be omitted.
- Select the Data Flows needed by the selected Functions.
- Select the Data Stores needed by the selected Data Flows.
- Select the additional Data Flows needed by the selected Data Stores.
- Identify the Terminators associated with all these Data Flows.

At this stage some of the Data Flows that are required by the selected Functions may not have a source or a target, and some Functions and/or Data Stores many not have any associated Data Flows at all. It is therefore necessary to identify these inconsistencies and errors in the resulting sub-set Functional Viewpoint, and to correct them.

To create a description of how the sub-set Functional Viewpoint can be deployed as a Physical Viewpoint:

- Allocate Functions and Data Stores to Physical locations (Sub-Systems), and sometimes to Modules within the Sub-Systems.
- Define the Physical Data Flows that need to pass between the Sub-systems, Modules and the outside world (represented by Terminators and Actors).

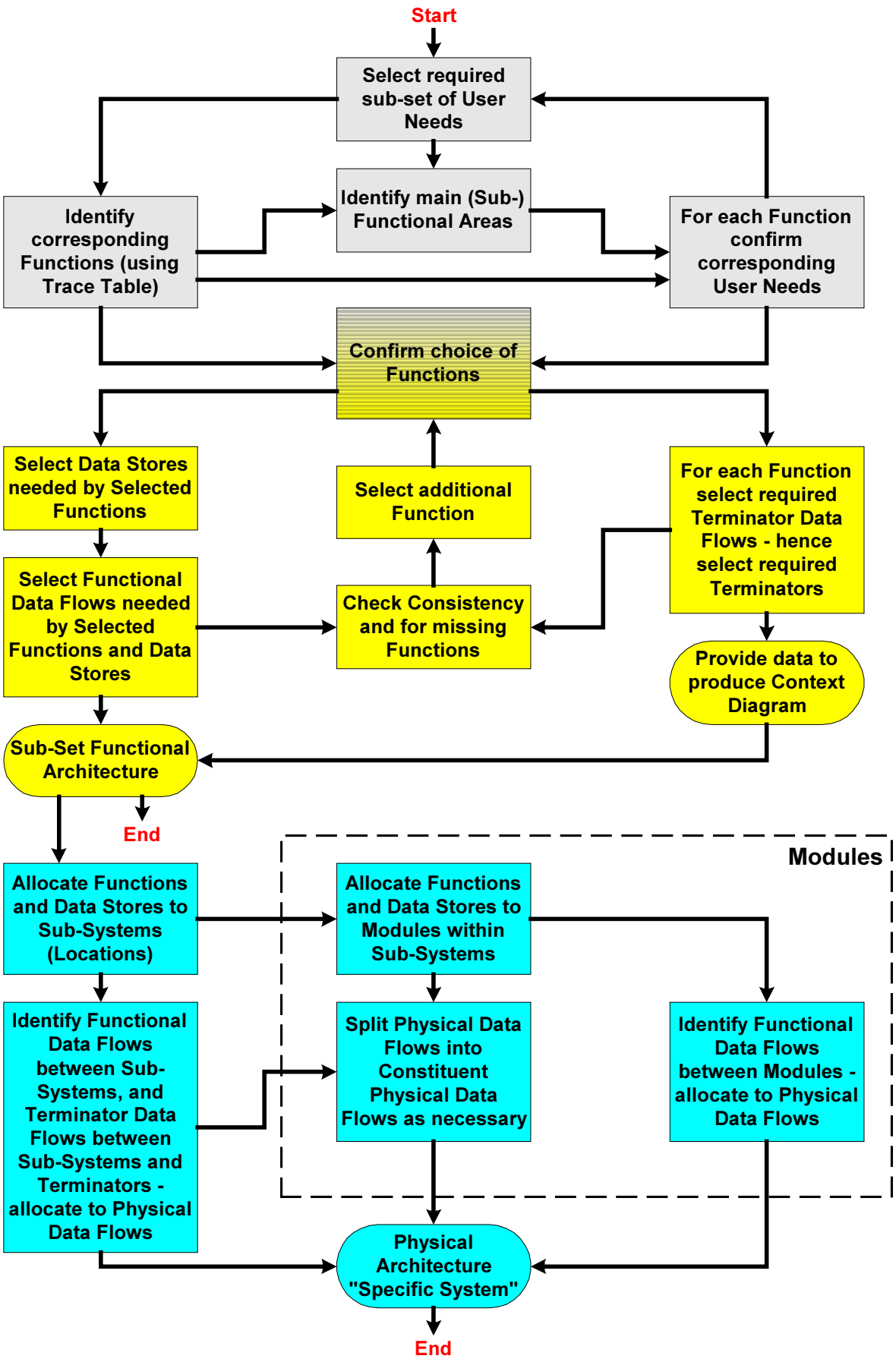

Start
Select required sub-set of User Needs
Identify main (Sub-) Functional Areas
Identify corresponding Functions (using Trace Table)
For each Function confirm corresponding User Needs
Confirm choice of Functions
Select Data Stores needed by Selected Functions
Select additional Function
For each Function select required Terminator Data Flows - hence select required Terminators
Select Functional Data Flows needed by Selected Functions and Data Stores
Check Consistency and for missing Functions
Provide data to produce Context Diagram
Sub-Set Functional Architecture
End
Modules
Allocate Functions and Data Stores to Sub-Systems (Locations)
Allocate Functions and Data Stores to Modules within Sub-Systems
Identify Functional Data Flows between Sub-Systems, and Terminator Data Flows between Sub-Systems and Terminators - allocate to Physical Data Flows
Split Physical Data Flows into Constituent Physical Data Flows as necessary
Identify Functional Data Flows between Modules - allocate to Physical Data Flows
Physical Architecture "Specific System"
End

Figure 3

2.2 Advantages and facilities provided by the FRAME Selection Tool

The activities needed to create an Architecture sub-set, starting from a sub-set of the User Needs, are quite demanding and time-consuming, especially if you can only rely on paper documentation. The task is made a little easier using the FRAME Browsing Tool, which provides hyper-linked access to the components of the European ITS Functional Viewpoint via an Internet Browser. But the situation is completely different if you have the ability to exploit the support of an automatic assistant, e.g. the FRAME Selection Tool.

However the Selection Tool does not do all the work for you: the design choices are always left to the ITS engineer, but he or she is released from most of the routine activities such as: finding the description of a specific Function, Data Flow, Data Store, Terminator or Actor to decide whether it has to be included or not; determining which Data Flows are associated with a specific set of Functions; etc. Thus the Selection tool will assist in the creation of a logically consistent Architecture sub-set, but not a semantically consistent one.

Once the Selection Tool has been used to select a sub-set Functional Viewpoint, it is expected that some users of the Navigation Tool may wish to add additional elements (e.g. User Needs, Functions, Data Flows, etc.) in order to create a full National, Regional or Service Architecture. The provision of these facilities is outside the scope of the FRAME Projects, but other mechanisms are available for achieving the same results, e.g.:

- To modify (i.e. add features to) the Selection Tool produced by the FRAME-S Project (the "source code" is in the public domain; see Section 4 for further details).
- To modify the exported Database and/or report(s) describing the sub-set Functional and/or Physical Viewpoints created by the Selection Tool (see Section A.1).
- To import the Database created by the Selection Tool (see Section A.1) into another suitable tool.

The current version of the Selection Tool does not provide the user with an automatic facility for drawing the diagrams. Even though this feature would clearly be very useful, for budgetary reasons it has had to be left for a future enhancement after the current FRAME projects have finished.

3 Using the Selection Tool

This section describes the User Interface and hence of the use of the Selection Tool by going through an example. Appendix B contains a printout of the complete Functional Viewpoint produced by the Selection Tool of this example.

3.1 Initialisation of the Functional Viewpoint

When the Selection Tool is started it is first necessary to choose a Viewpoint with which to work. All work begins with the Functional Viewpoint, and when that is complete and consistent, it may be used as the basis for one or more Physical Viewpoints. Once a Functional Viewpoint has been used to create a Physical Viewpoint it is no longer possible to change that Functional Viewpoint.

It is possible to stop using the Selection Tool at any point and to "continue previous work" or to "edit previous work". The former automatically continues from the point reached in the process at the end of the last session.

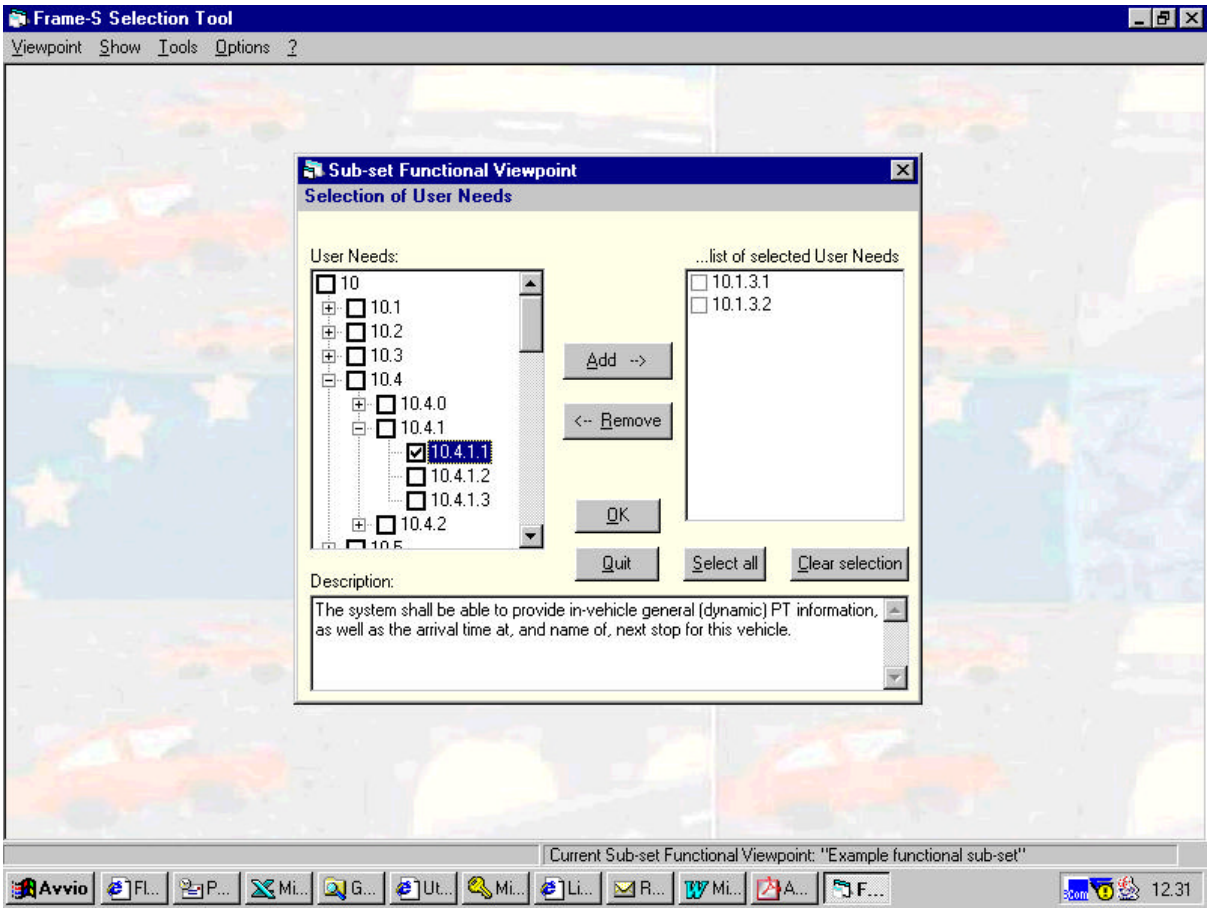
3.2 Selection of the User Needs

Screen 1

The User Needs provide a description of the applications and services supported by the European ITS Framework Architecture, and creation of the Functional Viewpoint sub-set begins by selecting those User Needs that define the service(s) to be provided. The User Needs are structured into four levels as follows:

- Group (2 – 10) – High level group of services
- Service (e.g. 6.1) – Medium level classification of service(s)
- Topic (e.g. 6.1.1) – (Part of) an application or service
- User Need (e.g. 6.1.1.1) – The individual User Needs themselves

Whilst sets of User Needs can be selected by Topic, Service or Group, care should be taken to ensure that all the resulting User Needs thus selected are indeed required.



Screen 1 – Selection of the User Needs

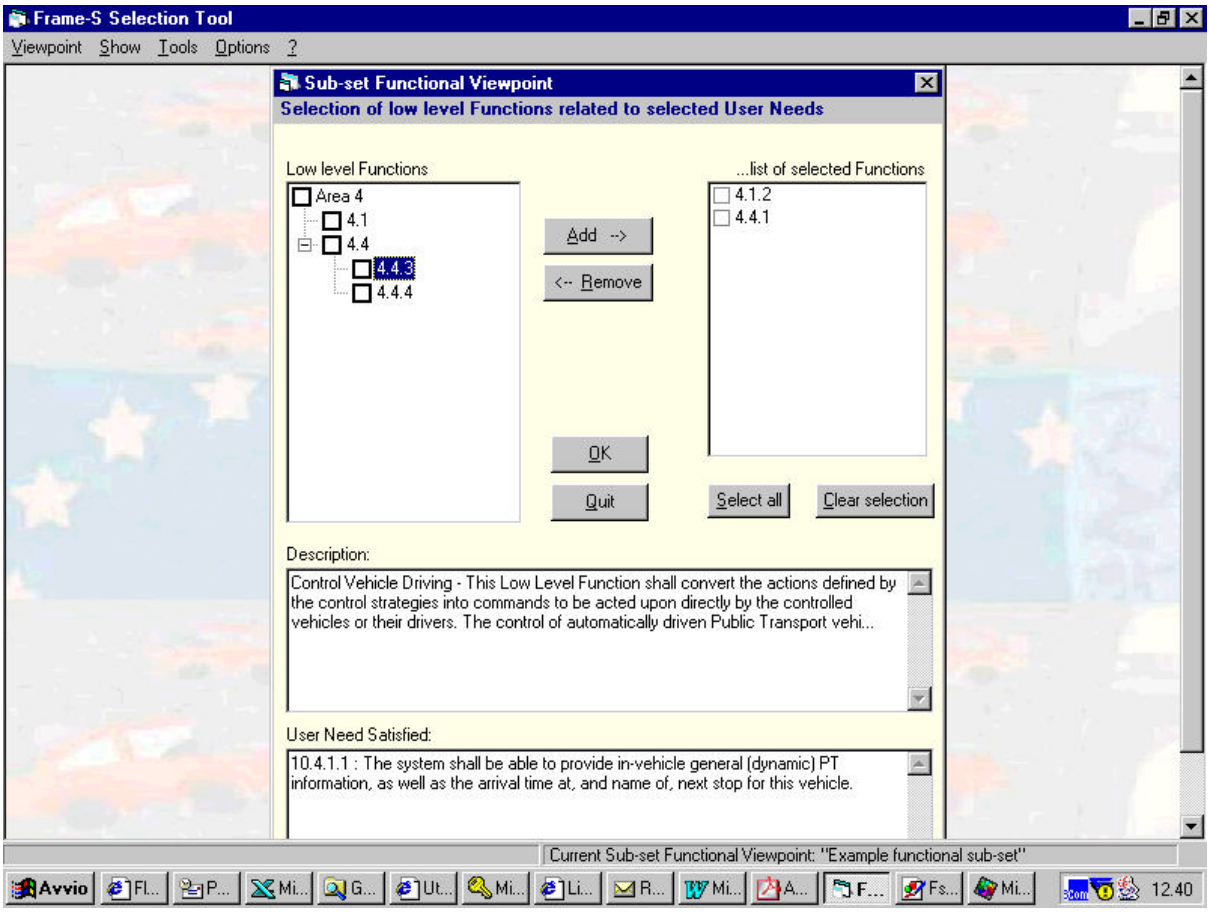
3.3 Selection of the Functions

Screen 2

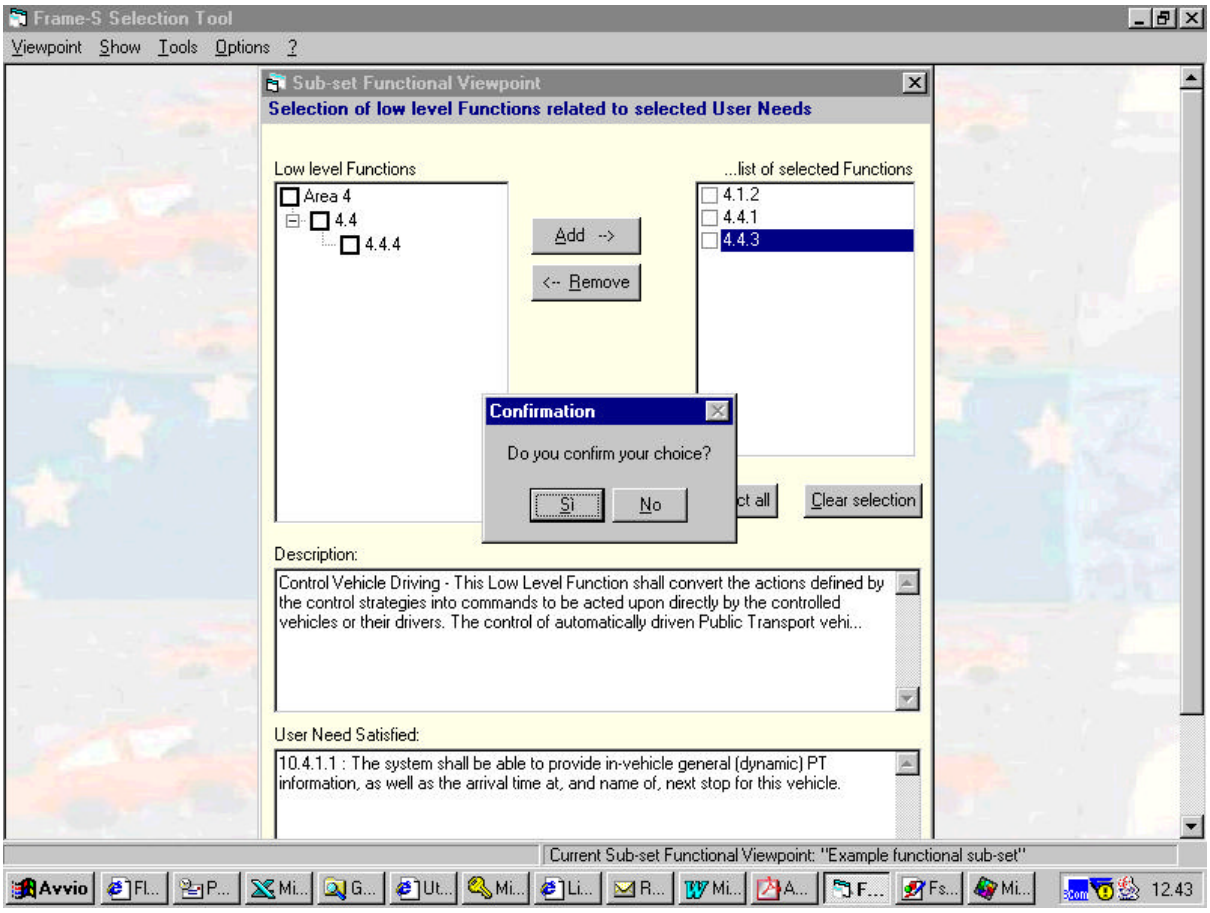
The User Needs that have been selected will be satisfied by one or more Low Level Functions. However, the cross-referencing process is not an exact science and it is necessary to confirm that each of the Low Level Functions that have been suggested is actually needed.

Screen 3

Once the initial selection of Low Level Functions has been made, it needs to be confirmed before proceeding to the next stage.



Screen 2 – Selection of Functions

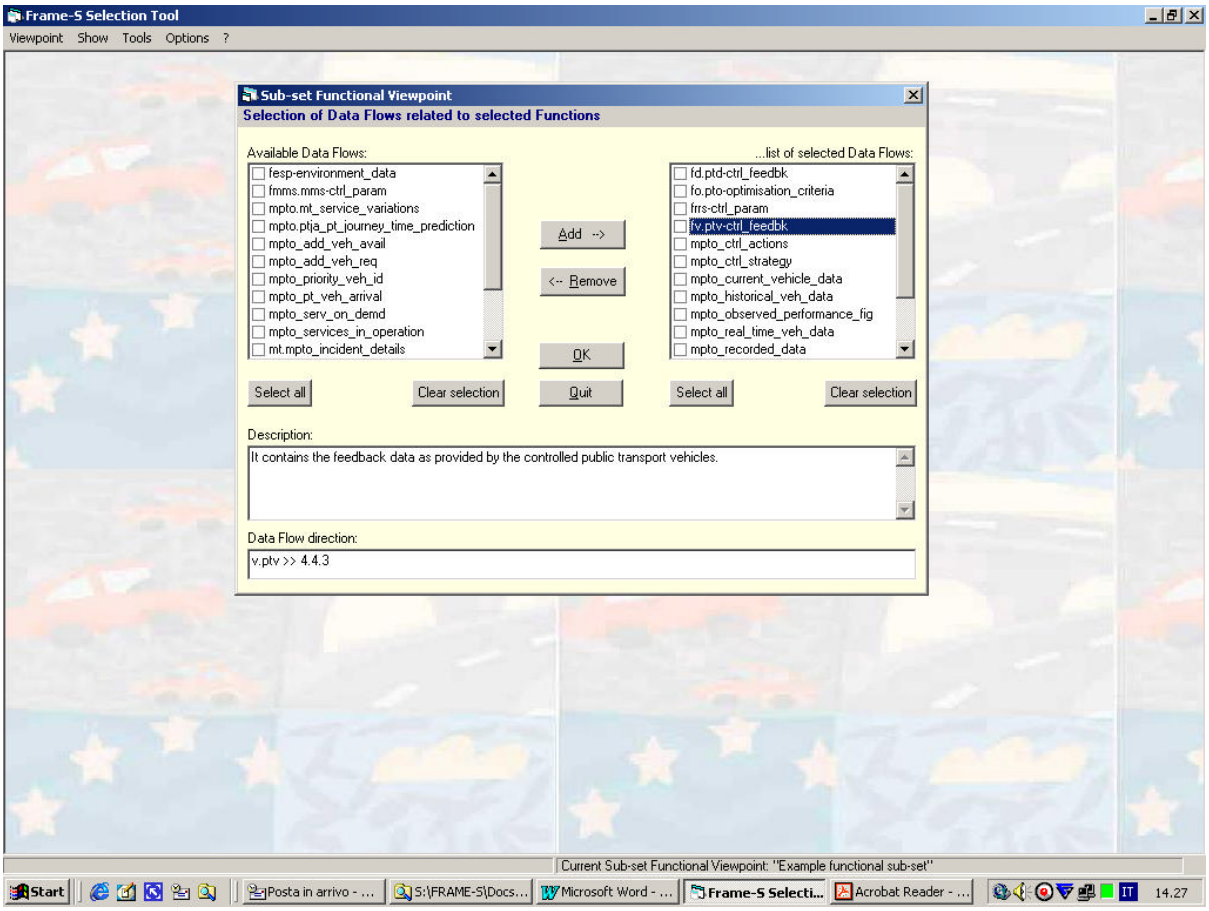


Screen 3 – Confirming the Selection of Low Level Functions

3.4 Selection of the Data Flows

Screen 4

Whilst each Low Level Function will have a number of Data Flows associated with it, not all of them may be needed for this sub-set of the Functional Viewpoint.

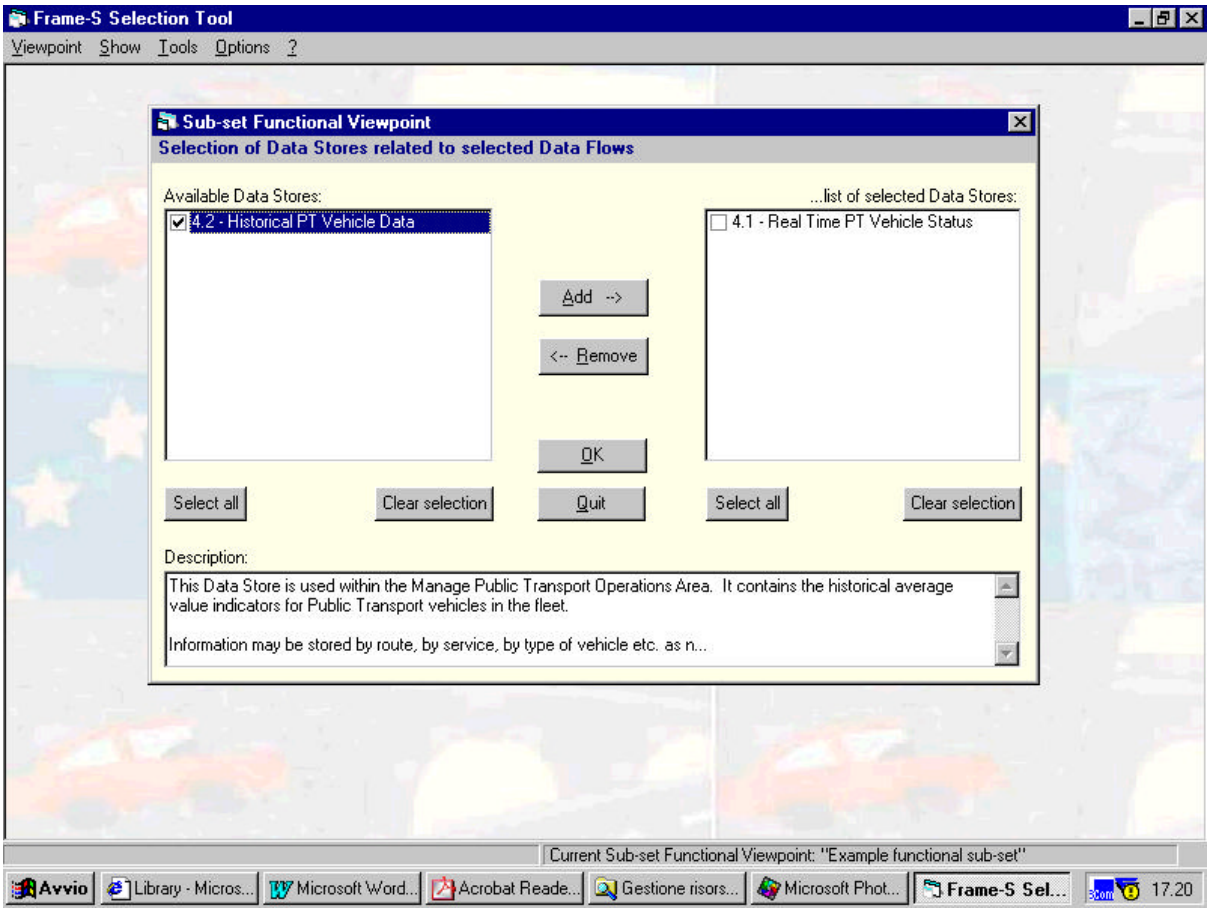


Screen 4 – Selection of the Data Flows

3.5 Selection of the Data Stores

Screen 5

Some of the Data Flows that have been selected may go to or from one or more Data Stores.

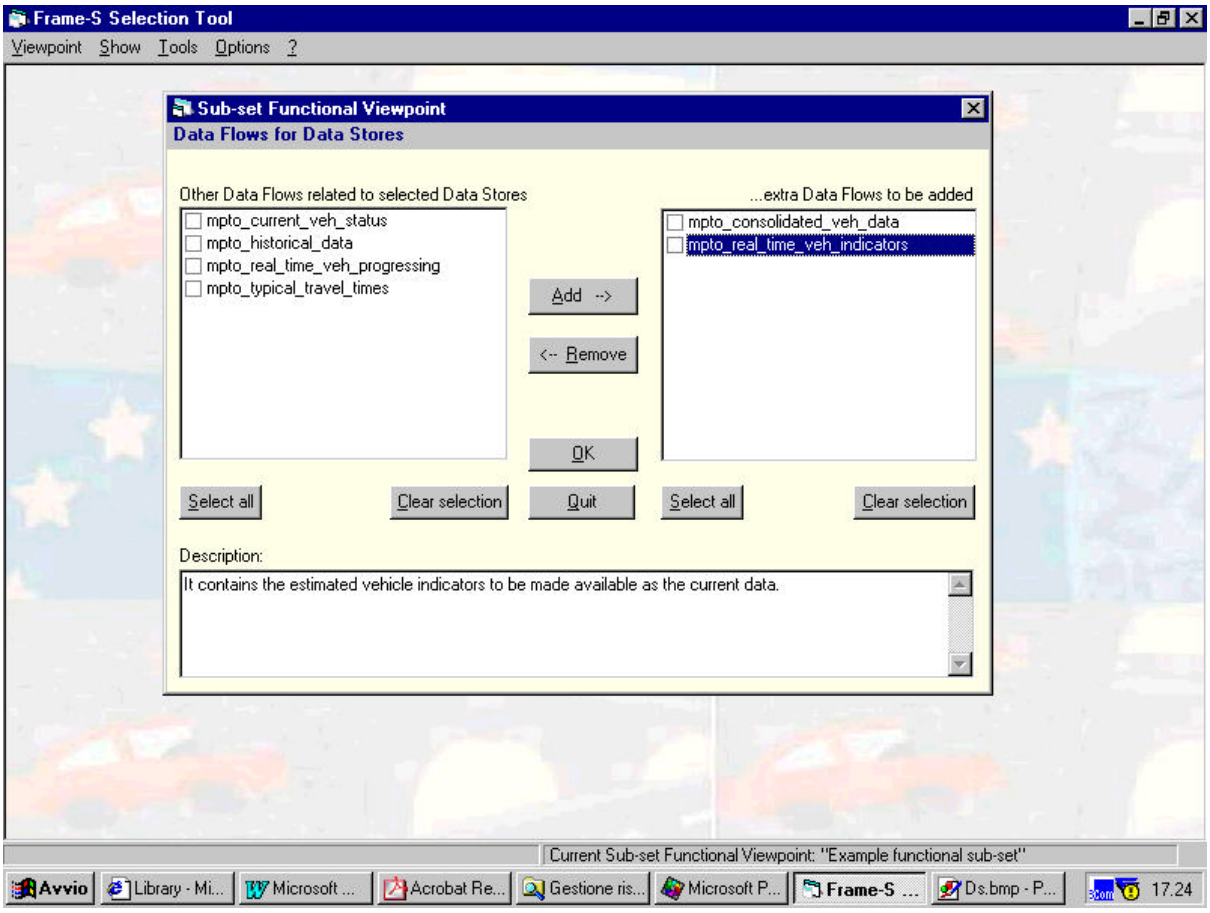


Screen 5 – Selection of the Data Stores

3.6 Addition of the Data Flows for Data Stores

Screen 6

If some Data Stores have been selected in the previous screen, then they will have their own Data Flows associated with them, though not all may be needed for this sub-set of the Functional Viewpoint.

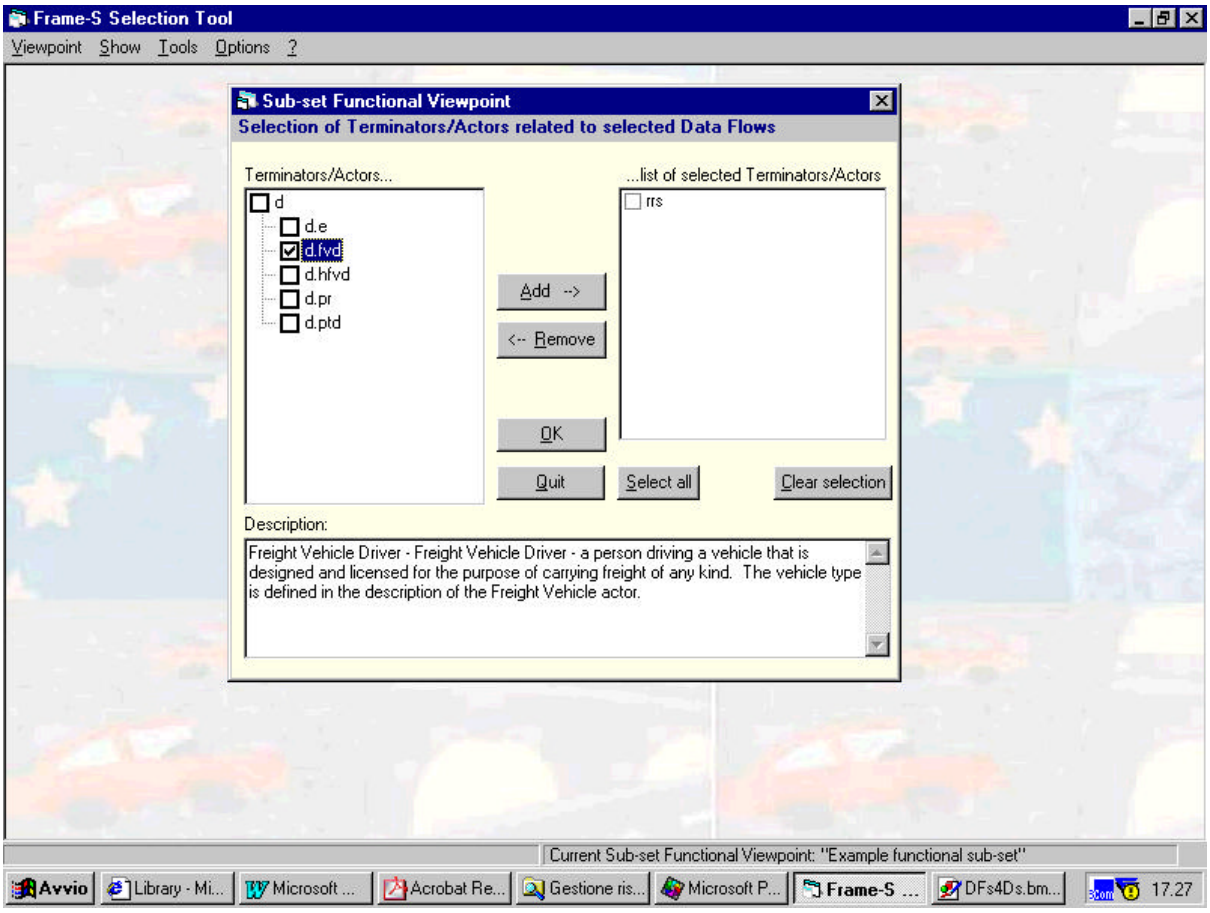


Screen 6 – Addition of the Data Flows for Data Stores

3.7 Selection of the Terminators and Actors

Screen 7

Some of the Data Flows chosen so far will be associated with Terminator and/or Actors. It is necessary to confirm this association by selecting the ones that are needed for this sub-set of the Functional Viewpoint.



Screen 7 – Selection of the Terminators and Actors

3.8 Report of the Consistency Checks

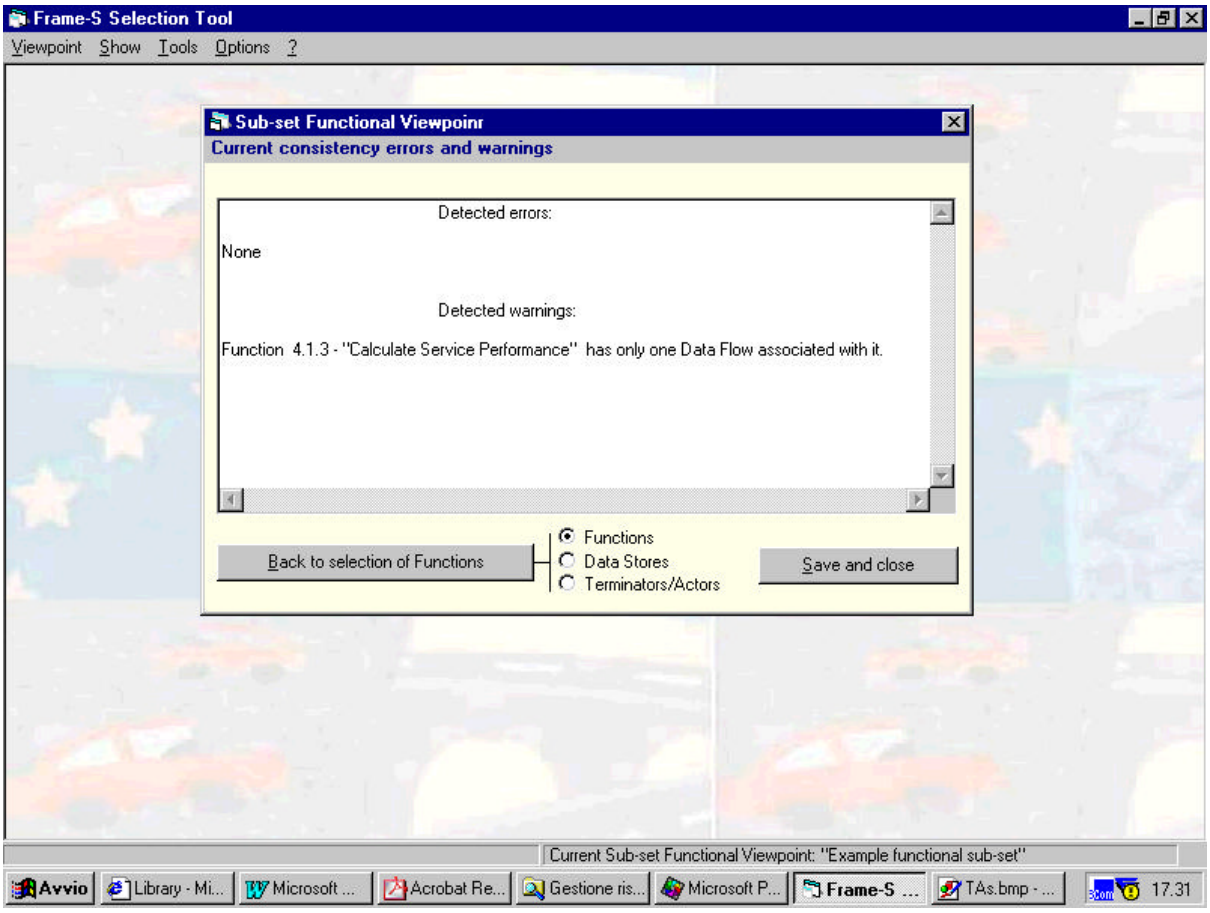
Screen 8

Once the initial selection process has been done a consistency check is performed on this chosen sub-set Functional Viewpoint. It is not unusual to find that:

- Data Flows do not have a source and/or a sink (target) – this could be a Function, Data Store or Teminator;
- Functions may not have any Data Flows associated with them;
- Data Stores may not have any Data Flows associated with them.

It is therefore necessary to resolve these inconsistencies by adding, or subtracting, elements to, or from, the sub-set Functional Viewpoint. In order to do this it is necessary to go back to an earlier part of the process to modify the selection.

It can be useful at this stage to view the elements that have been selected so far; this can be done by producing one or more “Reports” from under the “Tool” command.



Screen 8 – Report of the Consistency Checks

3.9 Initialisation of the Physical Viewpoint

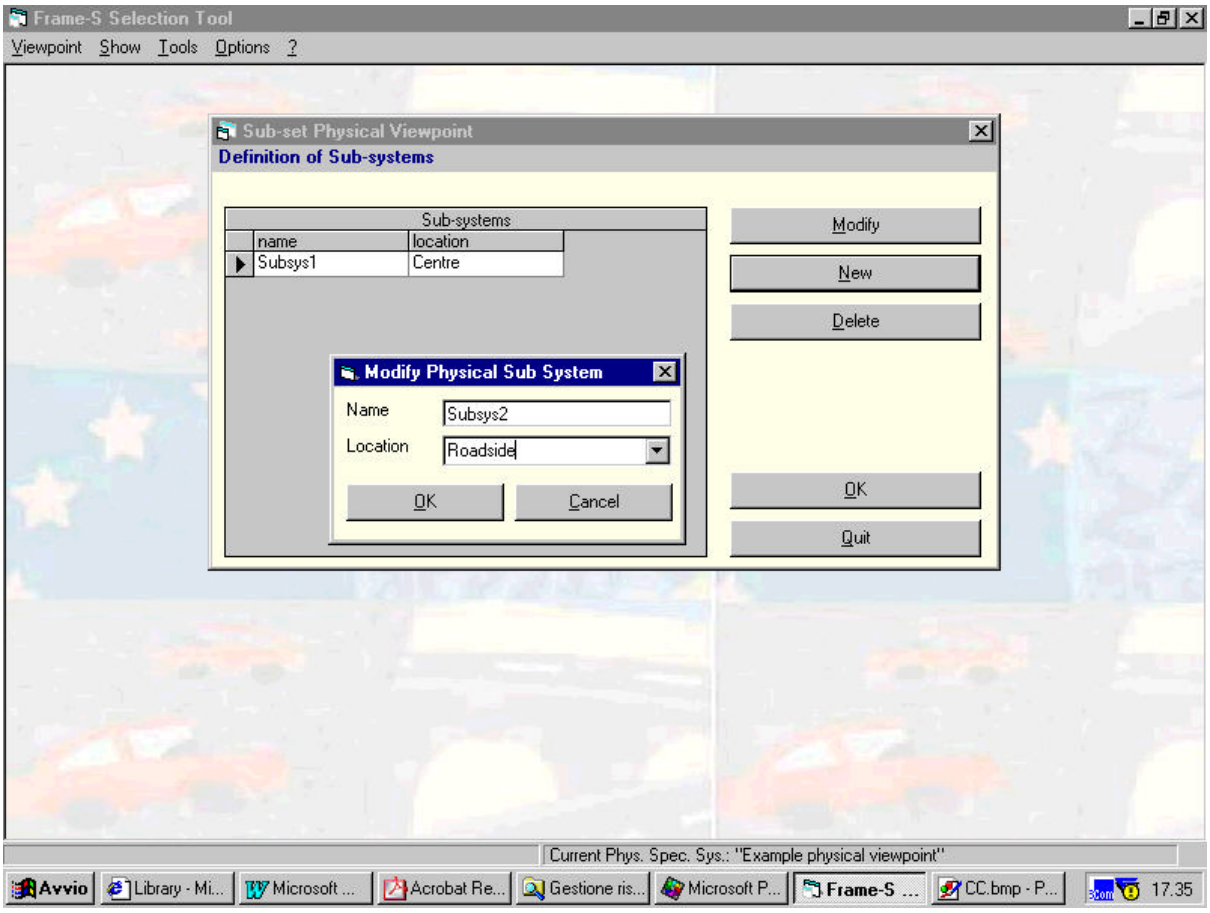
A Physical Viewpoint is created from one (only) of the Functional Viewpoints. Once a Functional Viewpoint has been used to create a Physical Viewpoint it is no longer possible to change that Functional Viewpoint.

It is possible to stop using the Selection Tool at any point and to “continue previous work” or to “edit previous work”. The former automatically continues from the point reached in the process at the end of the last session.

3.10 Definition of Sub-Systems

Screen 9

In order to describe a particular deployment of the sub-set Functional Viewpoint, it is necessary to allocate each Function and Data Stores to physical locations, or *Sub-Systems*. These Sub-Systems must be given names and a location. The location can be either generic, e.g. roadside, to actual.

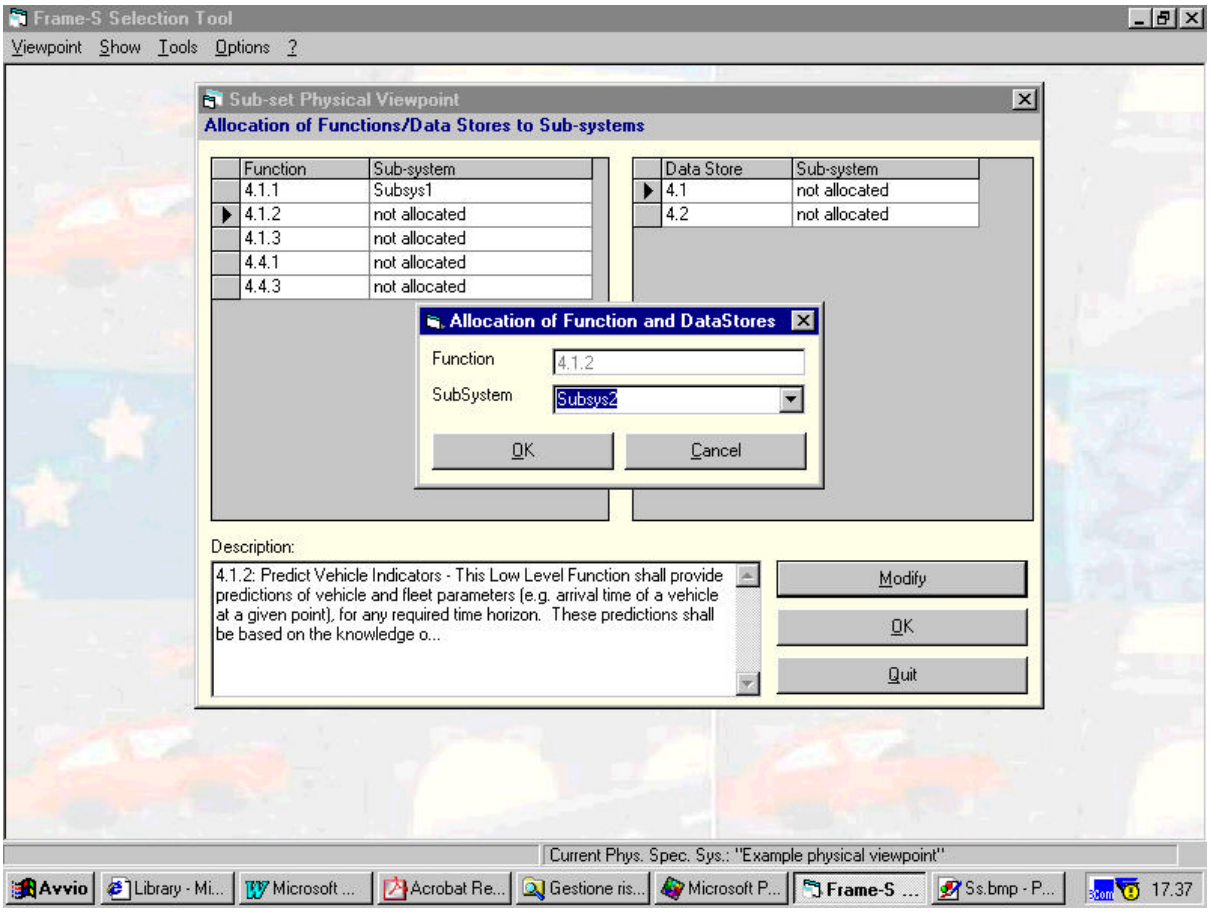


Screen 9 – Definition of Sub-System

3.11 Allocation to Sub-Systems

Screen 10

Each Function and Data Stores now needs to be allocated to the Sub-Systems.

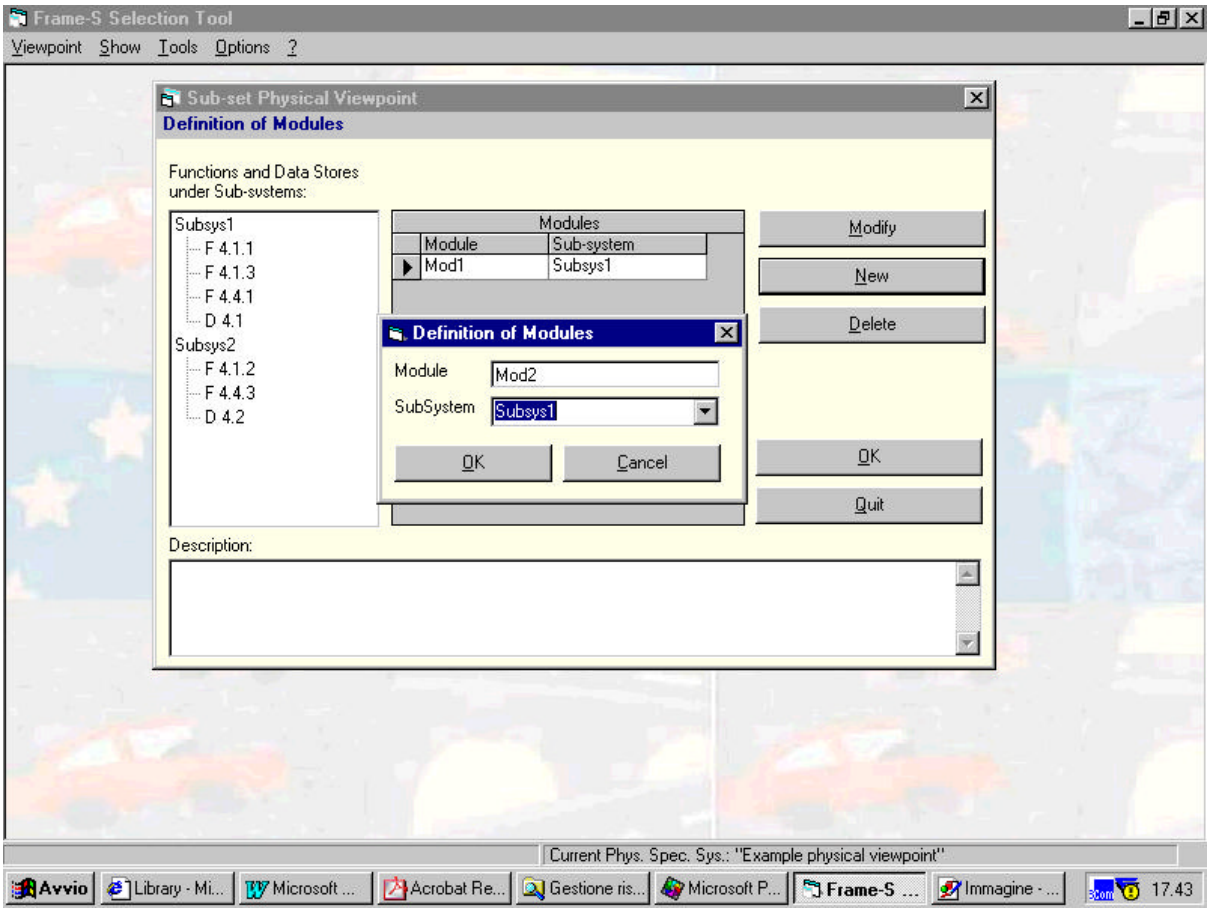


Screen 10 – Allocation to Sub-Systems

3.12 Definition of Modules

Screen 11

In some circumstance it can be convenient to divide a Sub-System into *Modules*. In this case it is first necessary to give the Modules names.

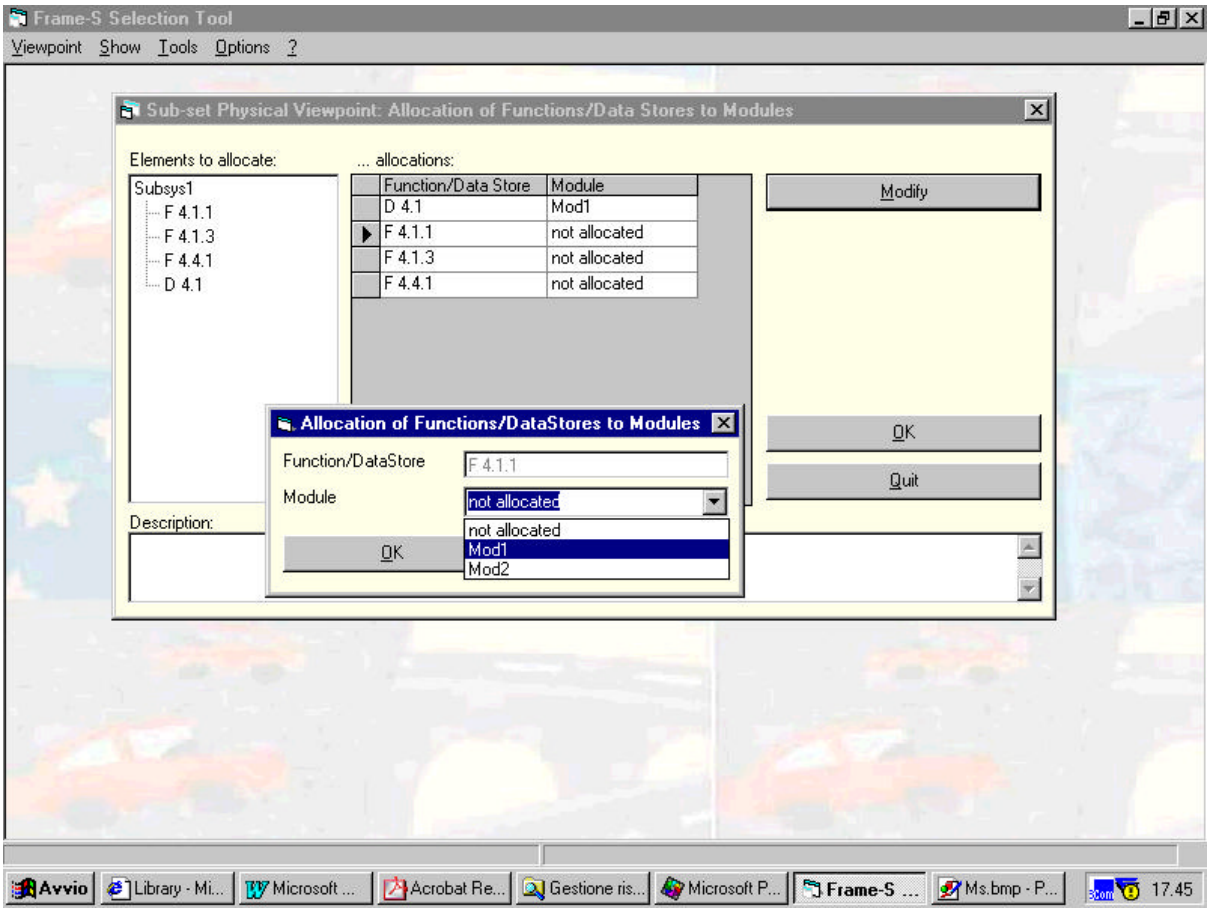


Screen 11 – Definition of Modules

3.13 Allocation to Modules

Screen 12

The Functions and Data Stores in those Sub-Systems that have been split into Modules must now be allocated to those Modules.

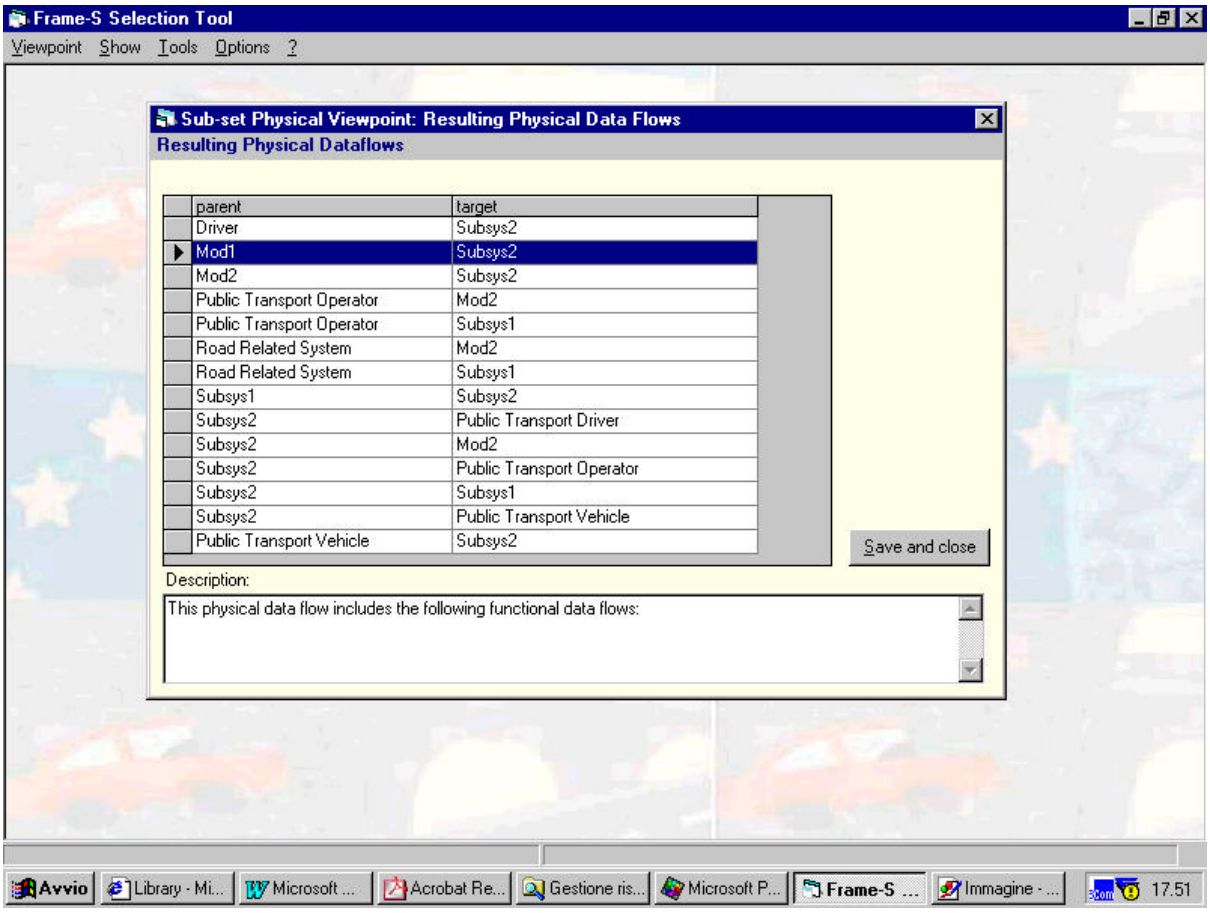


Screen 12 – Allocation to Modules

3.14 Physical Data Flows

Screen 13

The Physical Data Flows, which comprise the Functional Data Flows that pass between Sub-Systems, Modules and Terminators/Actors, are calculated automatically. The names that they have been given can be changed, but note that this change is not remembered if a change is made and the Physical Data Flows are recalculated.



Screen 13 – Physical Data Flows

4 Guidelines for use of the Selection Tool at a National Level

At a national level two different uses of the Selection Tool can be identified:

- an example for the development of a completely new tool that fits the national-specific needs better;
- a base structure to modify and/or improve through the addition of different or new facilities.

With regard to the first option; the package, which includes the software application, the data base, and this document (that are all available from the FRAME Web Site) is adequate for achieving the target.

With regard to the second option, the source software code of the Selection Tool is needed. This code is in the public domain, and therefore capable of being modified by any user that wishes to do so. The national teams can submit a request to receive a full copy at info@frame-online.net, the official contact point of the FRAME Projects.

Appendix A Overview of the Selection Tool

A.1 Top level design

The FRAME Selection Tool has one input, consisting of the European ITS Functional Viewpoint plus the User Needs, and two outputs, namely a sub-set Functional Viewpoint and one or more sub-set Physical Viewpoints. The latter is derived from the former, and both are available as textual documents (the sub-set Functional Viewpoint is also available as an MS Access Database).

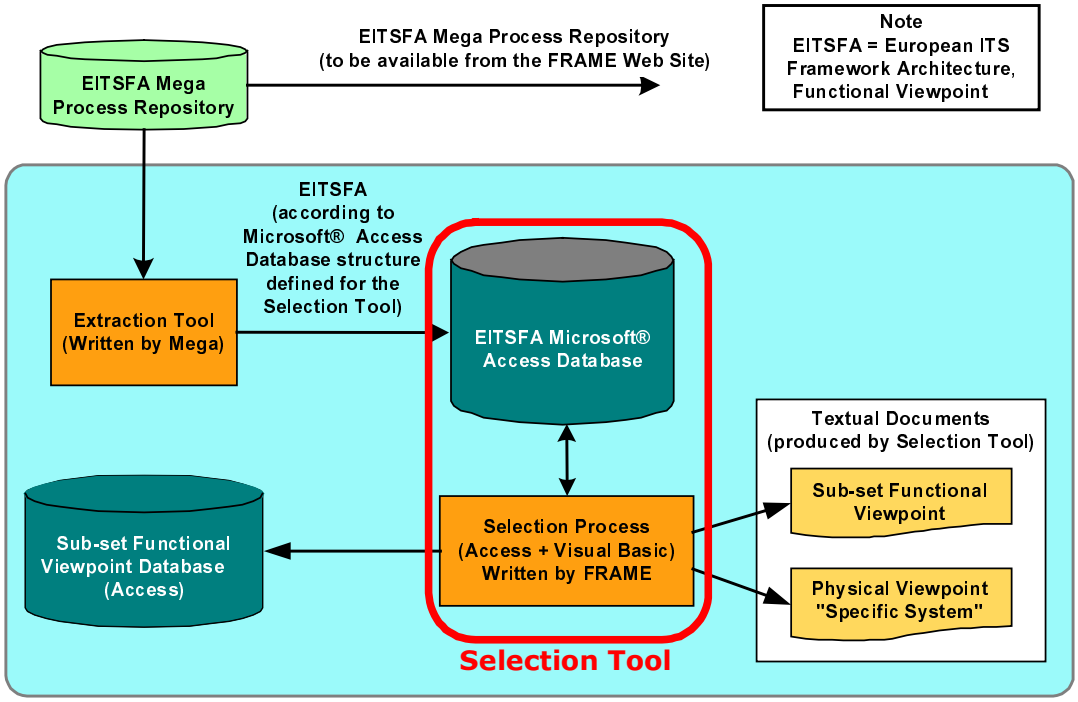


Figure 4

The Selection Tool is a free-standing application, which is available from the FRAME Web Site as a package. Once the user has downloaded the file and installed the application on a personal computer, the Selection Tool can be used without the need of an Internet connection.

A.2 Detailed design

Software architecture

As shown in Figure 5, the Selection Tool is a two-layered application. The top layer is the user interface. The relational database is the bottom layer, and it contains details of the European ITS Functional Viewpoint and User Needs, together with the work done and saved by the user.

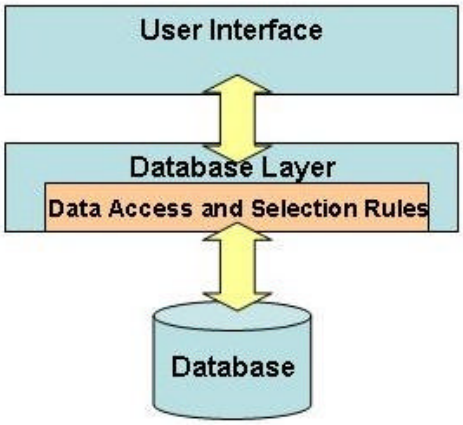


Figure 5

The Selection Tool has been created using Microsoft® Access and Visual Basic.

Data model

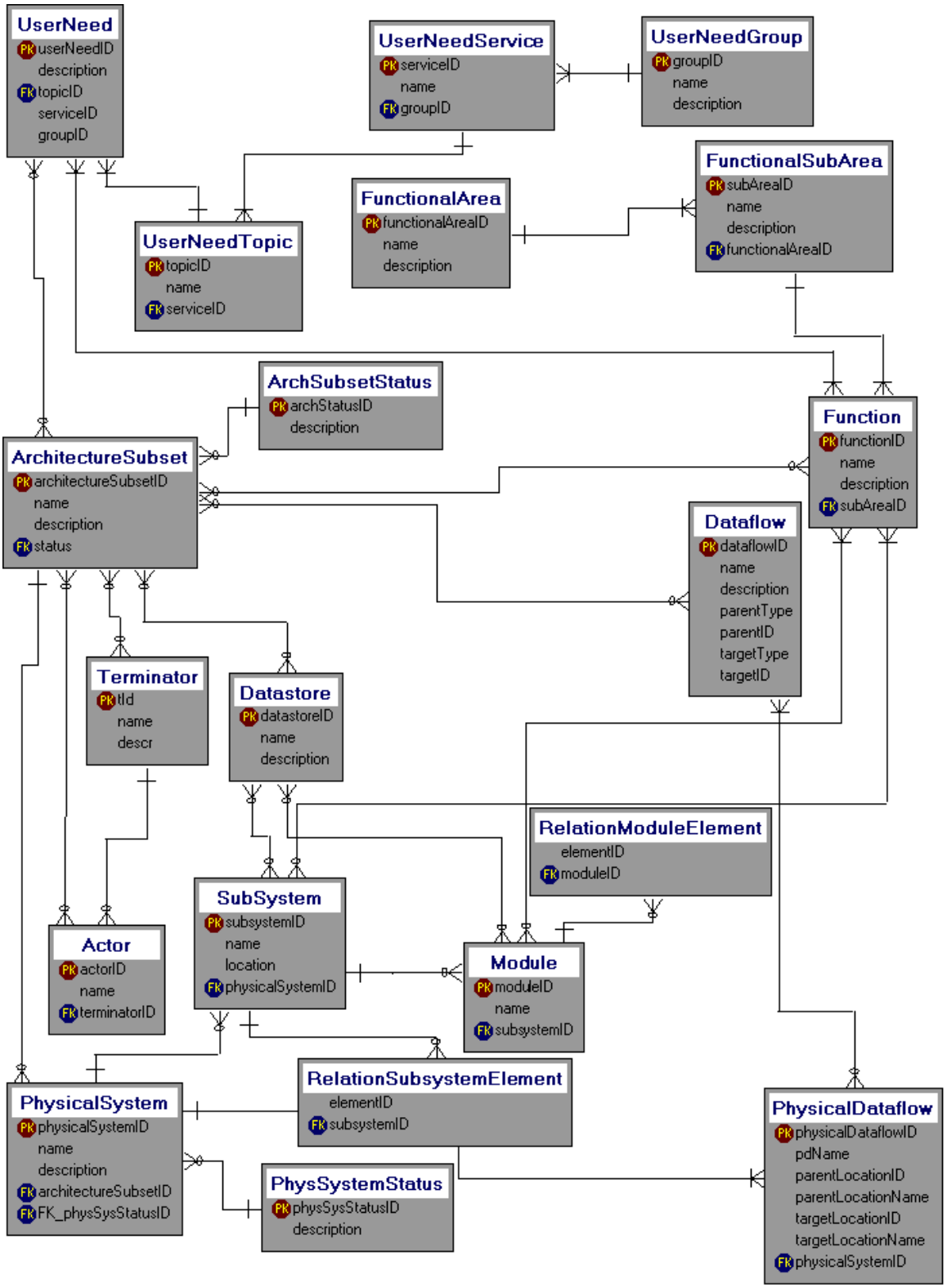


Figure 6