# Advanced Transport Telematics Systems and user requirements: An approach based on the experience gained in the port of Piraeus from the EUROSCOPE Project

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# Advanced Transport Telematics Systems and user requirements: An approach based on the experience gained in the port of Piraeus from the EUROSCOPE Project*

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**Abstract**

The article refers to the results of a survey that was conducted during the EUROSCOPE project in the port of Piraeus. The market research revealed the trends and needs of the port users and the drivers of the trucks, for proper information diffusion and application of special advanced transport telematics systems. These results are presented after being elaborated and also the system architecture that resulted from the survey. These results were presented in the E.U. within the framework of EUROSCOPE project.

**Keywords:** Transport telematics, user requirements, port facilities, traffic information

## 1. The port of Piraeus and the EUROSCOPE Project

The Port of Piraeus -Passenger and Commercial- stands as the most important part of the Greek port systems and tends to turn into one of the key ports of the international navigation. The Port of Piraeus is the leading maritime transportation hub in the Eastern Mediterranean and serves the Mediterranean as a whole. The Port's strategic location in a central position in the Mediterranean Sea, just 48 hours steaming time from the Suez Canal, makes it an ideal cargo relay point for lines such as those engaged in Europe Far East Trade. The demand for import cargo, from the heavily populated hinterland around Piraeus and the ability to pick-up export cargo provide an added incentive for container lines to utilize Piraeus as a transshipment center. The container handling is considered as very important for the development of the National Economy. The Port of Piraeus is recognized as a pioneering force in the introduction of container handling operations in the Mediterranean and today occupies a leading position in this important trade.

Due to the Commercial Port's existence there are several problems caused by trucks, around the port area. They create long queues during the time they wait to enter the port, along with sound pollution. This situation is becoming worse due to lack of parking areas around the port. Finally, it should be added to the problem the frequent loading and unloading machinery damage.

The solution of the aforementioned problems could be assisted through the development of Telematics systems. Based on this concept the city of Piraeus formed a local consortium to participate in the EUROSCOPE project. EUROSCOPE is a large

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3-year (1996-1998) urban demonstrator project in the Transport Telematics sector of the TAP programme of FP4 (DG XIII). EUROSCOPE builds on the experience and the achievements of the SCOPE project and on the collective experience of the partners involved. EUROSCOPE (**E**fficient **U**rban T**R**ansport **O**peration **S**ervices **C**o-**o**peration of **P**ort Cities in **E**urope) is a project which comes to solve mainly traffic related problems with the aid of Telematics (the application of information and communication technologies and services, usually in direct combination). The project aims to develop and validate telematics applications in the sites of Cologne, Hampshire/Southampton, Piraeus, Rotterdam, Strasbourg, Hamburg, Genoa, Cork and Brandenburg. The main objective of the project is to develop, implement and validate transport telematics services that will provide information to travelers, and will assist in the management of the network and the freight operations, in the sites. The higher level objective behind these working objectives is the improvement of the network efficiency, the improvement of environmental conditions and the contribution towards a modal split favoring public transport.

One of the Piraeus/EUROSCOPE applications has as a major objective to examine the feasibility of Advanced Transport Telematics Systems Development, in the Commercial Port of Piraeus. Telematics services related to the operation of the commercial port are not planned for development within the duration of the project. However, user requirements and an outline design of potential applications for the commercial port have been completed.

## 2. The User Requirements

For the user needs analysis stage, the objective was to identify the users, and to find out what their needs are in relation to the transport telematics services. A detailed analysis of user needs and requirements assessment, in terms of traveler information, was performed.

For the users of the commercial port, background data has been collected: daily departures and arrivals, traffic volumes, number of heavy goods vehicles, number of employees and activities related to the commercial port (paramaritime).

The method which was originally proposed for the assessment of user needs was the interview for the intermediate users (travel agents, maritime bureau, freight hauliers etc) and the survey for the end-users (mainly existing and potential passengers).

During the preparation of the questionnaire it was taken into account, that the aim of the whole project application, was to give to the port users an on-time (dynamic) information, in order to achieve “reduction of the number of trips”.

In order to define the need for information, the potential users of the messages were divided in six categories. In order of priority, the users had the following rank :

1. Drivers of heavy good vehicles (HGV)
2. Workers in the Navigation Base of Perama.
3. Workers in the wider area of the port
4. Seamen working in vessels that make use of the port's services

5. Workers in para-maritime activities which are directly related to the port's services.
6. Tourists in Salamina Island who use the line of Perama-Salamina.

From the above categories, workers in the Navigation Base of Perama (category 2), workers in the wider area of the port (category 3), the seamen working in vessels that make use of the port's services (category 4) and the workers in para-maritime activities which are directly related to the port's services (category 5), were found, through interviews and contacts with their professional organizations, to have common needs and characteristics .

A common characteristic of these groups is that they know very well the port area and the road network. At the same time, they know very well the time period of congestion as well as the way to avoid it by using a different time schedule and route selection. The common needs of these categories, in terms of the information that would interest them, are focused only on the level of urgent (incident) needs. (i.e.accidents e.t.c).

The last category that refers to the tourists of Salamina Island, has characteristics that define demands for specific messages (time of provision : weekends & holidays).

These characteristics are as follow:

1.They are residents of Athens
2.They visit the island mostly on holidays and at weekends
3. They use their own means of transportation for their travels.

Based on the above, the need for information is defined by references to:

- streets with traffic congestion
- routes with reduced traffic congestion
- information about the traffic around the vessels that serve the specific line (Perama- Salamina).

Finally the most significant and difficult category of users to be described, is the heavy good vehicle drivers (first category). In order to define the needs and characteristics of this category, a questionnaire survey has been conducted.

## 3. The Data Collection Process

### 3.1 Heavy Good Vehicles (HGV)

An on site visit was made in the Piraeus Commercial Port in order to verify that the specific survey area was suitable.

259 HGV drivers were interviewed by one of the seven junior researchers that were employed for this research. The interview was consisted of questions on topics, such as:

- the route HGV drivers follow to enter the port
- the route HGV drivers follow to exit the port
- frequency of their port visits
- duration of their port visit

- their time schedule
- port cargo machine delays
- reasons for those delays
- their origin - destination

Prior to that, the questionnaire was tested on 2 Heavy Good Vehicles (HGV) drivers and then a three-day survey took place. During that period, 259 questionnaires were filled in.

During the first, the second and the third day 46, 100, and 113 questionnaires were collected respectively. According to the port authorities, the Heavy Good Vehicles population that visits the port on a daily basis is around 900. This means that the sample that was managed to be collected was around 28.8 % of the total population. This statistically means an excellent sample (usually samples range from 3 % to 7 %).

Interviews took place from 6.30am up to 7.30am and from 14.15pm up to 15.00pm. During that time Heavy Good Vehicles (HGV) drivers were entering the port area in order to load or unload their cargo. This time intervals were identified from interviews with the port authorities and continuous visits to the port. It must be noted at this point that the gates of the port open at 7.30 am and 15.00 pm each day, which means that the queue at the entry gates is mainly before those opening hours.

### 3.2 Unions of Truckers and Unions of Workers at the Shipyards.

Additionally, the unions of truckers and the unions of workers at the shipyards were contacted. Both they were asked questions on :

- the route they follow to enter the port
- the route they follow to exit the port
- port cargo machines delays
- reasons for those delays
- their time schedule
- frequency of their port visits

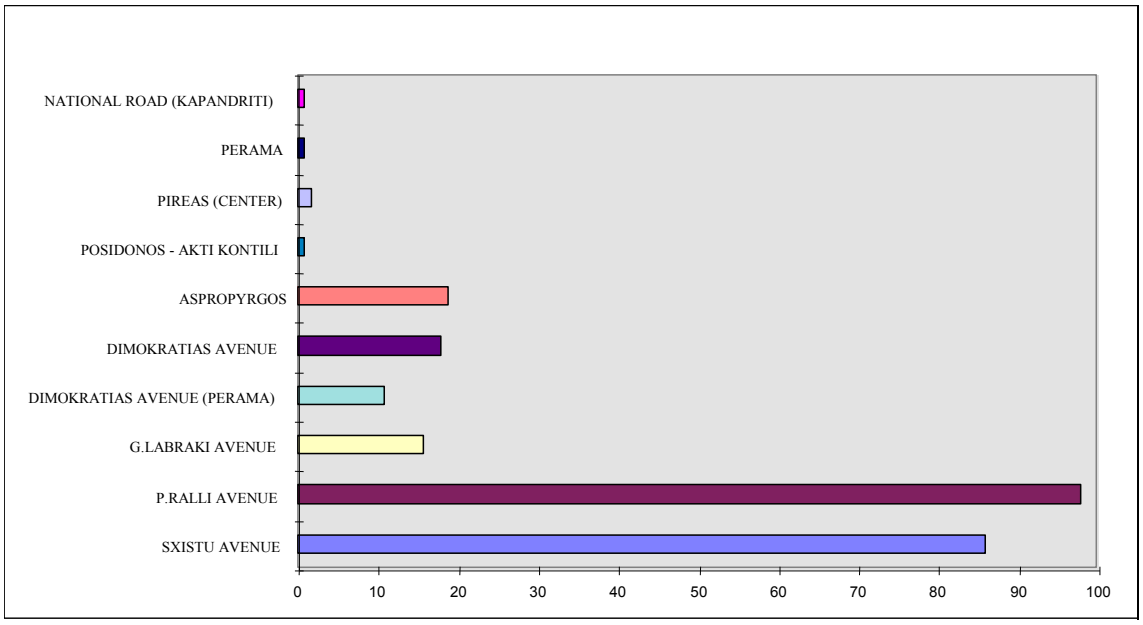
Truckers requested for information on traffic conditions while approaching and traffic/weather conditions while exiting. Shipyards' workers requested for information on traffic conditions.

From the interviews with the paramaritime activities' workers on the same subjects, it was found that information on weather conditions and on locations of ships for supplies would be needed.

## 4. The results of the research

The basic and more substantial conclusion of the research is the one that refers to the drivers' choice of route to and from the Commercial port. A solid conclusion is drawn, that there are two streets the drivers prefer for their arrival to the port area (Diagram 1).

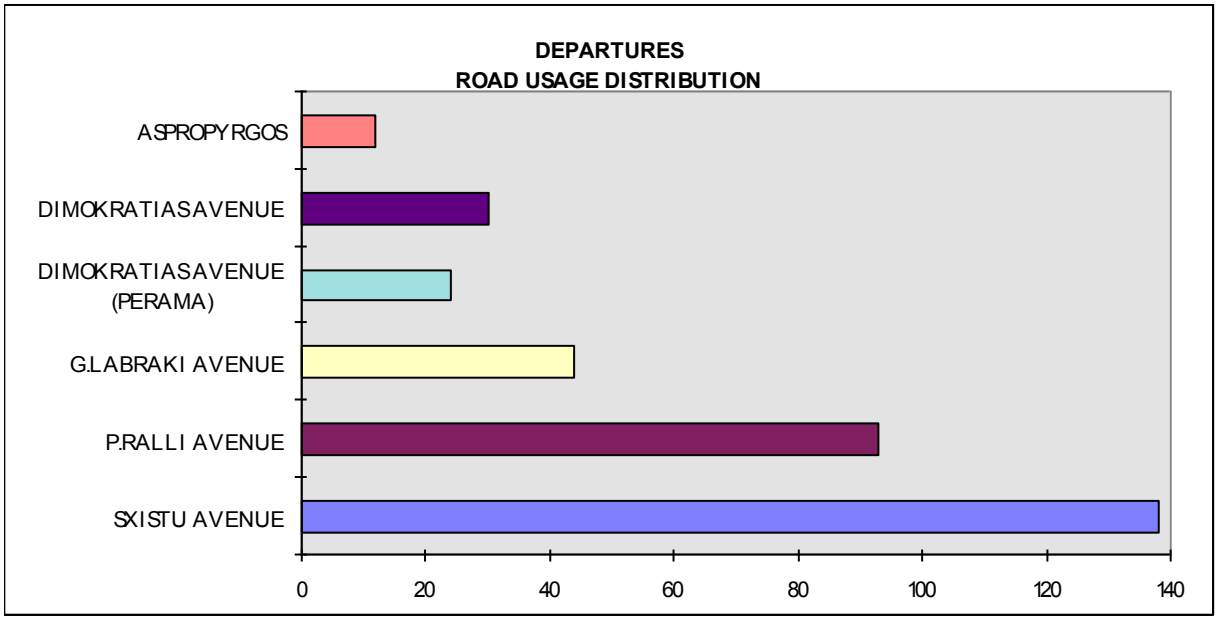
**Diagram 1: Street Usage Distribution For Those Who Follow Only One Route**




It is obvious from the above that SCHISTOU AVENUE and PETROU RALLI AVENUE are the roads with the most serious problem of heavy traffic caused by trucks.

The aforementioned indication is supported by the fact that a rather high percentage (76%) of the users interviewed, choose one and only route to and from the port. The Diagram 2 presents, in detail, the percentage of the drivers that choose one or two or more alternative routes.

**Diagram 2: Drivers that choose one or two or more alternative routes**




Drivers are in their majority Greek citizens and this means that the information will be provided in one and only language (i.e Greek). They know very well the port area, since a high percentage (87%), visits the port at least once a day. As Diagram 3 shows, few of the drivers (2%) visit the port once a month and the rest (11%) once a week.

The great majority of the drivers (73,7%), enter the port between 6.00am-8.00am to load their cargoes (Diagram 4), whereas the respective percentage of drivers who come to unload their cargoes at the same period of time, is hardly 29.9% (Diagram 5). So we have a period of congestion in the morning that is mainly caused by drivers who come to load their cargoes and not by them who come to unload them. The last ones seem to be entering the port on a regular basis during the day as we see in Diagrams 4 and 5.

The definition of the arrival and departure time as it was previously approached, concerns the usual and normal function of the port. The stay of the trucks within the port area in order to load and unload their cargoes lasts max. 4 hours for most of them (80%). This period depends partly on the normal function of the port's services. A substantial factor of delays is thought to be caused by damages of the load and unload Equipment. More specifically, the delays due to equipment damages last 3 hours according to the 90% of the responses.

**Diagram 3: Frequency of arrivals in the port area**

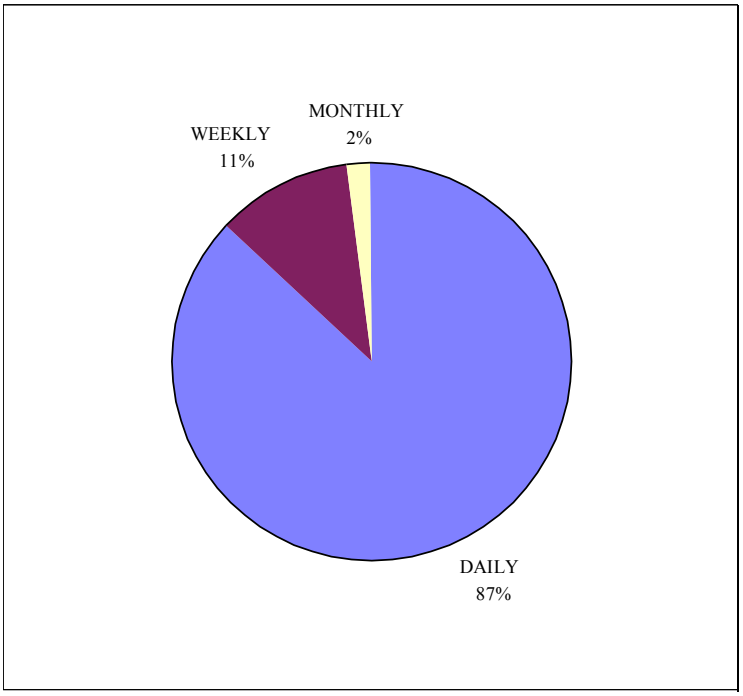



**Diagram 4: Time Distribution Of Arrivals For Loading**

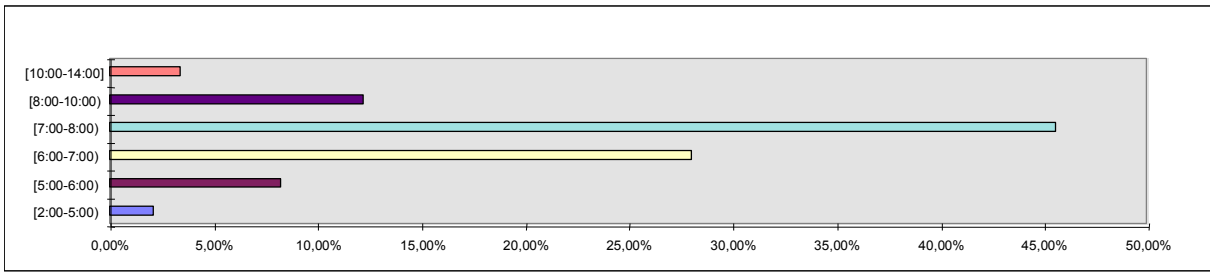
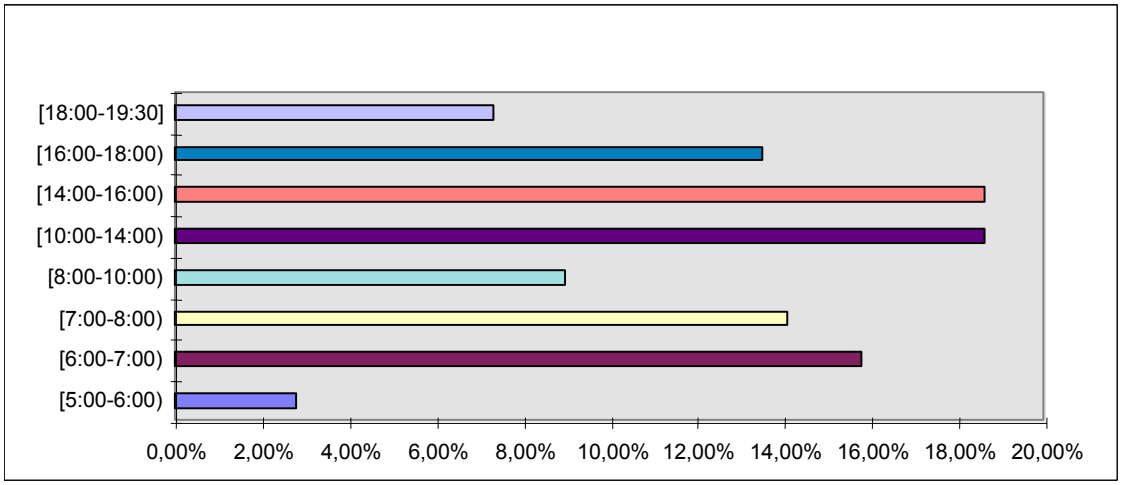
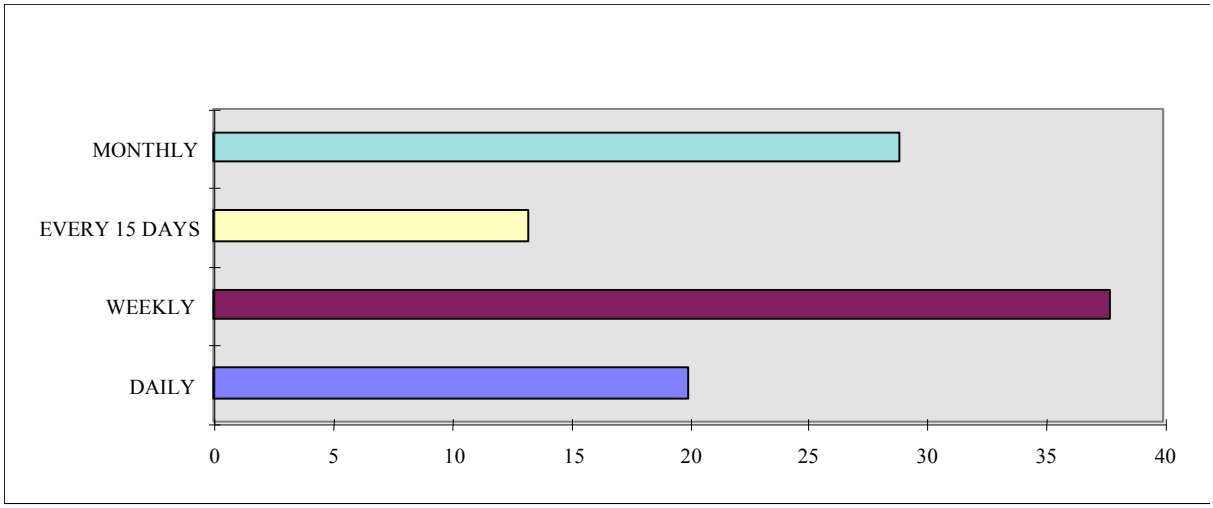



**Diagram 5: Time distribution of arrivals for unloading**



Delays due to damages are one of the elements that must be taken under serious consideration, about the driver's information need, since they are frequently repeated. The 85% of the drivers replied that mechanical damages appear at least once a week (Diagram 6).

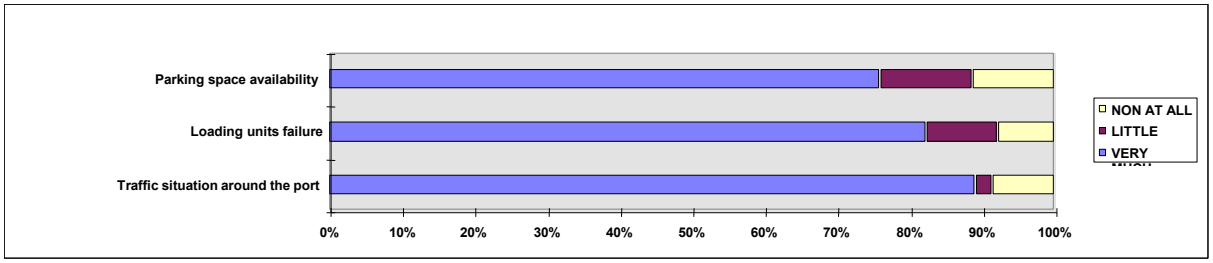
**Diagram 6: Frequency Distribution Of Loading Units Damages**




The drivers' needs for information have been identified by the survey using the question : What are your needs for information? In this question the drivers were also asked to rank the importance of certain information concerning the situation around and in the port area. As shows in the diagram 7 the three more important information needs concern (ranked according to the answers) :

a. traffic information on the streets around the port.
b. loading and unloading machinery damage
c. the parking availability

**Diagram 7: Drivers interest expression in information messages available to them**



## 5. The proposed exploitation of the survey results

There are several problems caused by trucks, around the port area. Trucks create long queues during the waiting time to enter the port and sound pollution. This situation becomes worse due to lack of parking areas around the port. Finally, it should be added to the problem the frequent loading and unloading machinery damage.

This is the situation that Telematics Applications should aim to improve. With the provision of information (time of messages transmission on 6.00-8.00 and 14.00-16.00) on the traffic around and inside the port area, it is aimed to reduce the congestion that exists today. The target is to activate a system that will guide all trucks in more efficient way, causing a reduction of the traffic congestion. Each truck by using the information is expected to avoid the congested roads.

Given the fact that there is no parking space today around the port area and that traffic information will be given before the time trucks will enter the greater Piraeus area, HGV drivers will make use of the parking space that exists out of town. In addition loading and unloading machinery damages information will become immediately available to the HGV drivers and accordingly they will be able to avoid congestion out of the port's main entrance.

These applications of Telematics cannot of course heal completely today's situation. In order to have a reduced congestion around the port area, a new parking area is additionally needed (it is already under construction by the port authority) and also the substitution of all the old loading and unloading machinery from new will prove to be helpful, in order to reduce any delay caused by out of order machinery.

## 6. System Architecture

The major objective of the proposed system is to provide real time traffic information on the network conditions around the commercial port area, terminal services information, such as operational problems and delays, and parking information (available spaces).

Advanced Transport Telematics (ATT) systems were introduced in the Piraeus Passenger port area in order to improve network efficiency, through an integrated traffic management approach. The transfer of this Telematics approach has been considered for the Commercial port of Piraeus.

The expected impacts of the applications under consideration are improved network efficiency, better informed travelers, reduction of traffic congestion, noise emissions, environmental pollution and better use of the commercial port facilities.

The commercial port applications will take advantage of the system already installed at the passenger port area of Piraeus. The applications that will be installed in the commercial port provide two types of services to the end-users:

- *Collective Traffic Guidance*, through Variable Message Signs (VMS), referring to the dissemination of traffic information on the network around the commercial port area, terminal services information (operational problems, delays), parking information (available spaces).

- *Traffic Information*, through RDS-TMC terminals, for the dissemination of information displayed on the vehicle, providing the drivers with information regarding the traffic conditions around the commercial port area.

Such applications are presented in the following Figures.

***Figure 1. Fleet Management***

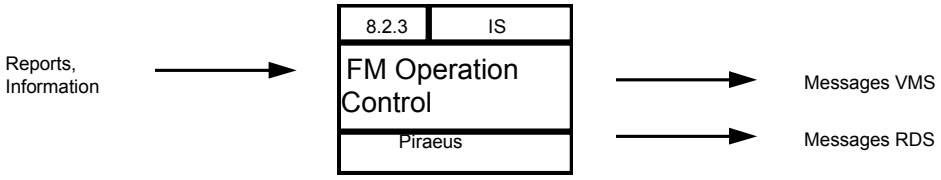



***Figure 2. Vehicle and Cargo Management***

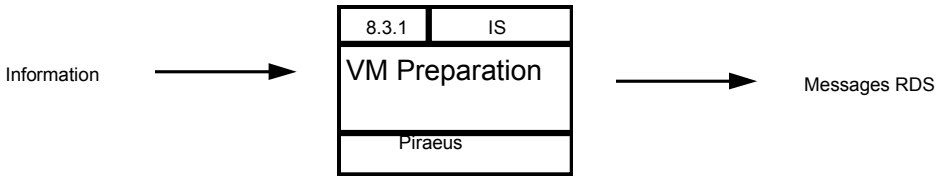



***Figure 3. Demand restrains***

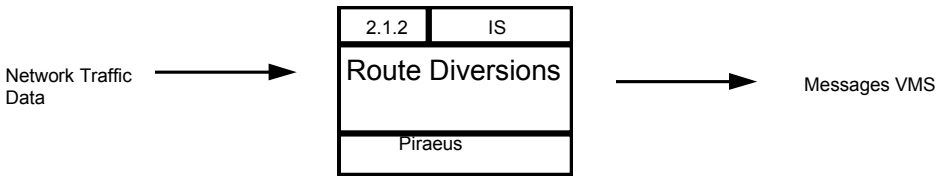
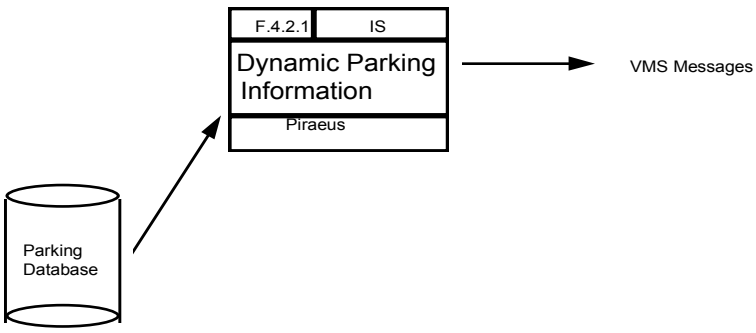



**Figure 3. Parking guidance**

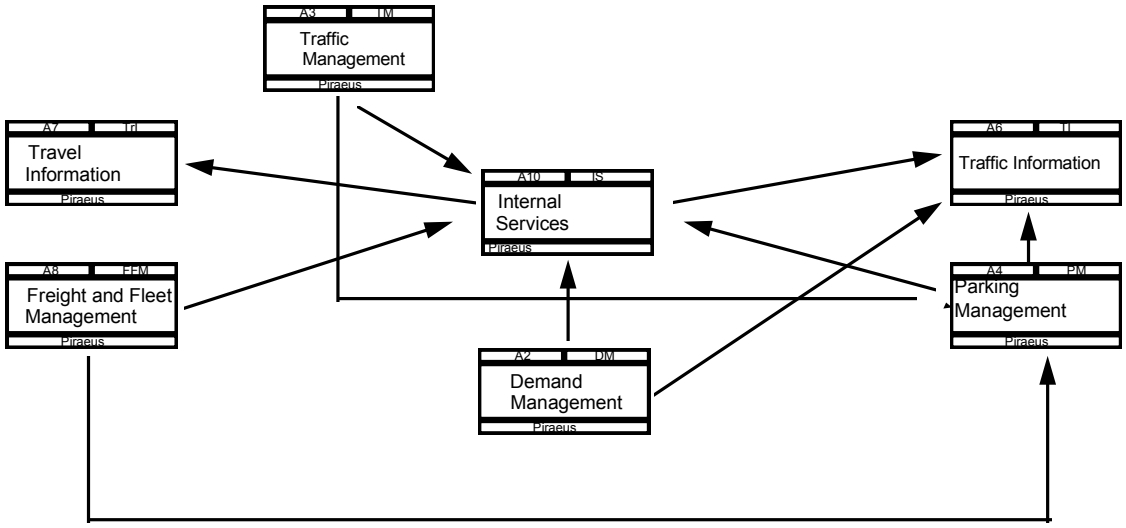


Apart from these end-user oriented applications, there are some additional ones, which aim at advancing the whole system (figure 4). These are the following:

- *Links to Traffic Management Systems (TMS) and Traffic Information*, which involves the utilization of the existing applications for the passenger port into the commercial port.

- *Integrated Management Strategies*, strategies for VMS based guidance that should be adopted, in order to achieve less traffic congestion, better utilization of available machinery for loading and unloading, more efficient use of parking space and reduction of noise emissions and pollution.

***Figure 2. System Architecture***




## 7. Conclusion

This paper provides a solution for the Piraeus Commercial port problems through the development of a telematic system.

The research conducted concluded that the main point for the solution to be proposed for the Piraeus Port is the drivers' choice of route to and from the commercial port and accordingly specified the drivers' needs for information. The paper proposes the provision of real time traffic information on the network conditions around and inside the port area with both Collective Traffic Guidance and Traffic Information System and the ability of the system to link to Traffic Management Systems (TMS) and Traffic Information and finally Integrated Management Strategies in order to reduce the congestion that exists today.

The impacts that are expected to result from the application of the proposed system will provide network efficiency, better informed travellers reduction of traffic

congestion, noise emissions, environmental pollution and better use of commercial port facilities.

## 7. Conclusion

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