7h European Framework programme

Call: FP7-GALILEO-2011-GSA-1

Proposal Part B

Marine park Enhanced applications baseD on Use of integrated GNSS Services

MEDUSE

Type of instrument	Collaborative Project
Activity	7.4.1 Exploiting the full potential
Area	7.4.1.7 New and innovative applications and services
Work programme topics	GALILEO-2011-1.7.1
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DECLARATION: This proposal does not concern a security sensitive project

List of participants

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3	**Blue Thread S.r.l.**	IT	BLUETHREAD
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5	**Parco Nazionale "Arcipelago di La Maddalena"**	IT	PNALM

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Acronym List

APRS	Automatic Packet Reporting System
COM	Communication
CS	Commercial Service
DIL	Deliverable Item List
EDAS	EGNOS Data Access System
EGNOS	European Global Navigation Overlay Service
ENC	Electronic Navigation Charts
EU	End User
ETSI	European Telecommunications Standards Institute
FW	Firmware
GKMF	Galileo Knowledge Management Facility
GNSS	Global Navigation Satellite System
GPRS	General Packet Radio Service
GSA	Galileo Supervisory Authority
HMI	Human Machine Interface
HW	Hardware
KOM	Kick Of Meeting
LBS	Location Based Services
LCS	Liability Critical Services
NAV	Navigation
NICE	Navigation In Case Of Emergency
NMEA	National Marine Electronics Association standard messages
NCU	Navigation and Communication Unit
O&M	Observations and Measurements
OGC	Open Geospatial Consortium
OS	Open Service
PC	Personal Computer
PDA	Personal Digital Assistant
PNT	Position, Navigation and Time
PRS	Public Regulated Service
PVT	Position Velocity Time
RAD	Rapid Application Development
R&D	Research and Development
SAASM	Selective Availability Antispoofing Module
SAS	Sensor Alert Service
SBAS	Satellite Based Augmentation Service
SES	Sensor Event Service
SIS	Signal in Space

SOL	Safety of Life
SP	Service Provider
UMTS	Universal Mobile Telecommunication Systems
UT	User Terminal
VTS	Vessel Traffic Service
VHF	Very High Frequency
WBS	Work Breakdown Structure
WCS	Web Coverage Service
WFS	Web Feature Service
WMS	Web Map Service
WNS	Web Notification Service
WP	Work Package
WSN	Web Service Notification

1 Scientific and/or technological quality, relevant to the topics/activities addressed by the call

1.1 Objectives

1.1.1 Project objectives

The main objectives of the MEDUSE Project can be summarised as follows:

1. To develop a prototype service infrastructure for the delivery of innovative location based and park monitoring support services within restricted access maritime areas (parks, reserves) to the following customer categories:
   I. Institutional – Marine parks and restricted marine areas management organizations;
   II. Private - Marine parks and restricted marine areas users (leisure boats);
   III. Commercial – Commercial operators acting within restricted areas (e.g. cruise boats);
   IV. Law Enforcement – Marine police authorities (Coast Guard, Police, Park Marine Control body).
2. To demonstrate a significant set of services and applications that shall be enabled by the service infrastructure for all the above listed customer categories;
3. To analyse commercial sustainability of the service infrastructure in order to identify and characterise the critical mass of applications and services that shall bring sustainability and define associated service models towards the different customer categories.

Marine parks: statement of the problem

Marine parks are areas which deserve an extremely accurate care of the ecosystem and as such are usually subject to severe restrictions applied to their end users, first of all leisure boats and local operators.

Those restrictions are often different for the various areas depending onto the level of threat that anthropogenic activities may exercise on local environment. As an example, in some areas boat transit may be fully prohibited, in others fishing and anchorage, in others night anchorage, etc.

In order to limit and control the access to restricted areas and the transit speed, very often parks management organisations force users to request for a permit (e.g. daily or weekly, free of charge or not) without which the boats are not allowed to enter the marine park. In compliance with the different ways for accessing the park, also permits are different (e.g. transit and anchorage, shore fishing, sea fishing, scuba diving…).

The controls associated with the above defined levels of access are exercised both by the park management organisation and by the Coast Guard as police authority and safety and security responsible. In addition, Coast Guard has also the responsibility for more “traditional” and non-park related law enforcement controls, such as boat speed monitoring and speed limits control, documentation and safety package control, etc..

The above described control tasks are extremely difficult to exercise, mainly because:

- Park areas are often very wide;
- Control resources are limited;
- The conventional “paper based” permit system does not enable “remote” control and requires controller to approach the boat to be controlled, thus consuming time;
- It is difficult to manage adequately the control of different levels of permit for different activities;
- A marine park is characterized by a very high number of visitors (and as consequence a significant increase of the need of services, assistance and controls) during the summer season.

On the other hand, from the park user perspective, the (often quite expensive) access to park areas is often seen as an unfair fee, as, in practice, the access to park resources is almost never coupled with the delivery of those services (e.g. guidance, mooring, information...) that would enable an efficient exploitation of the visit to the park, while providing economic resources to park authorities for the management of the institutional activities.

In addition, the conventional permit systems usually adopted do not satisfy, often, the end users, because they do neither provide enough flexibility nor fairness w.r.t. the real, effective exploitation of the access to park resources. An example of this concept is when the user buys a permit in advance (e.g. through internet) and the weather does not allow him to enter the park. The same applies often to charter boats which use to buy weekly permits that sometimes cannot be or only partly be used due to weather conditions.

As a consequence, it often happens that **a significant percentage of park users access without respecting the access rules and paying the access fee**.

The situation described above does not allow an efficient management of park resources nor an effective protection of the environment and of the ecosystem, with obvious negative social and economic consequences on the capability for exercising an efficient preservation strategy of the extremely valuable asset constituted by the protected area and, on the other hand, an efficient exploitation and promotion of the park attractions through authorized and controlled tourism.

Concept Solution

The project **MEDUSE- Marine park Enhanced applications baseD on Use of integrated GNSS SErvices** aims at **developing an advanced IT infrastructure** and **providing additional information and value-added services** to the park users and **specific tools and services to the marine park authorities** through **a two-way data link** by **tracking and tracing all private and commercial vessels within marine restricted areas**.

This solution allows the **substitution of paper-based park access permits with low cost terminals to be mandatorily taken on board, or, alternatively, a software package to be mandatorily installed on tourist own terminals** by the park user during the whole visit to the marine park to access the service available through the park portal.

The provision of the added value services is based on an IT infrastructure composed by two main sub-systems:

A. one Control & Service center to be deployed at the Park Authority Premises;

B. a bundle of ad-hoc terminals and commercial ones, on which a specific developed application has to be installed, connected to the Control & Service center,

A high level picture of the MEDUSE system architecture is presented in the Figure 1:

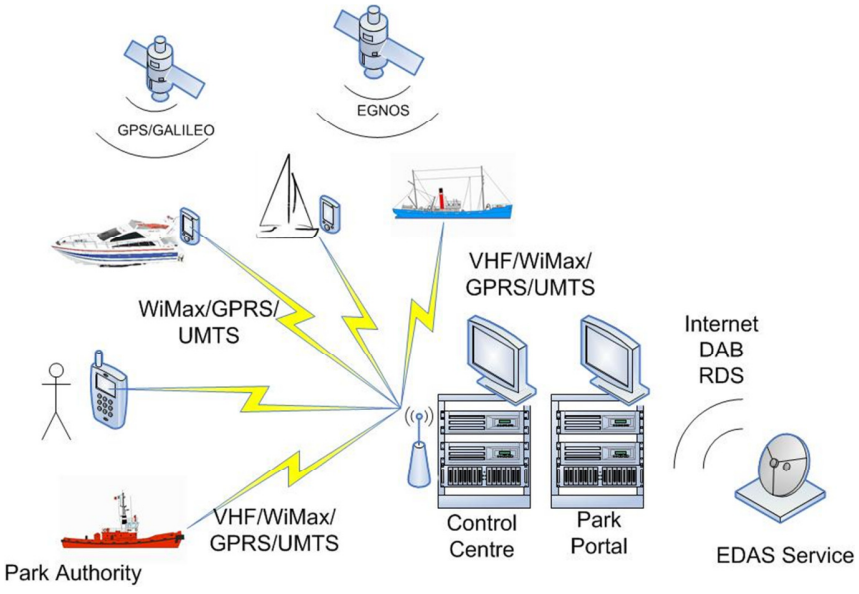

Figure 1: Meduse high level view

The proposed IT architecture will allow the park marine authorities the delivery of the following services (not exhaustive example list):

I. Institutional

i.1 Monitoring of restricted areas accesses and access duration, and implementation of a pay-per use policy;

i.2 Remote control of permits (via terminal interrogation) and management of different access levels (such as entrance, anchorage, fishing, scuba diving...);

i.3 Monitoring violations via the analysis of user traces;

i.4 Planning and monitoring the entire itinerary of the "Tourist boat" fleet, authorized from the Park, for computing the park resource exploitation through the analysis of overall end-user flux with, as a consequence, a significant enhancement of park management capabilities (such as e.g. implementation of limits in the number of concurrent accesses, planning of route and park visiting sites, etc..);

i.5 Reception of special (environmental) information / warnings from cooperative users (e.g. wild fauna detection, violations, waves, oil spill etc.).

II. Private

Touristic services, such as:

ii.1 Location-based tourist information and services (e.g. POI information, navigation to POI, specific service requests and booking);

ii.2 Social network;

ii.3 Fishing rules and hints;

ii.4 Reception of special (environmental) location based hints from park managers (e.g. wild fauna location);

ii.5 Other information related rules and activities available in the park.

Navigation services, such as:

ii.6 Anchorages, danger and prohibitions, special approaches and behavioural rules;

ii.7 Where available, link to port services: (e.g. booking of a dock, to-dock navigation, repair works booking.);

ii.8 Where available, booking and navigation to mooring buoys within coves;

ii.9 Location based weather alerts and weather routing (e.g. navigation to protected coves).

III. Commercial

iii.1 Location based weather alerts and weather routing;

iii.2 Traffic based routing (e.g. dynamic routing based on current fleet traffic patterns);

IV. Law Enforcement

Monitoring for infringement of navigation rules, such as:

iv.1 Speed limits exceeding;

iv.2 Illegal anchorage (with respect patterns allowed zones and / or w.r.t. minimum distance from the shore).

The above specific services are built over two fundamental services which constitute the baseline on which built the add-value ones:

- Location Service => Based on the short term on GPS augmented by the EGNOS open service available from the 1st October 2009 and in the medium/long term on the Commercial Service provided by Galileo
- Multichannel Communication Service=> It will allow an always available communication channel between the remote terminals and the Service Centre. The communication is realized with an automatic switching system that allows to use the most convenient communication mean in terms of Cost saving, Band availability and

Reliability of communication. The foreseen communication will be based on GPRS/UMTS, WiMax and WiFi (where available). VHF channel will be taken into account, especially for professional and institutional services

MEDUSE service model can be represented schematically, as follows:

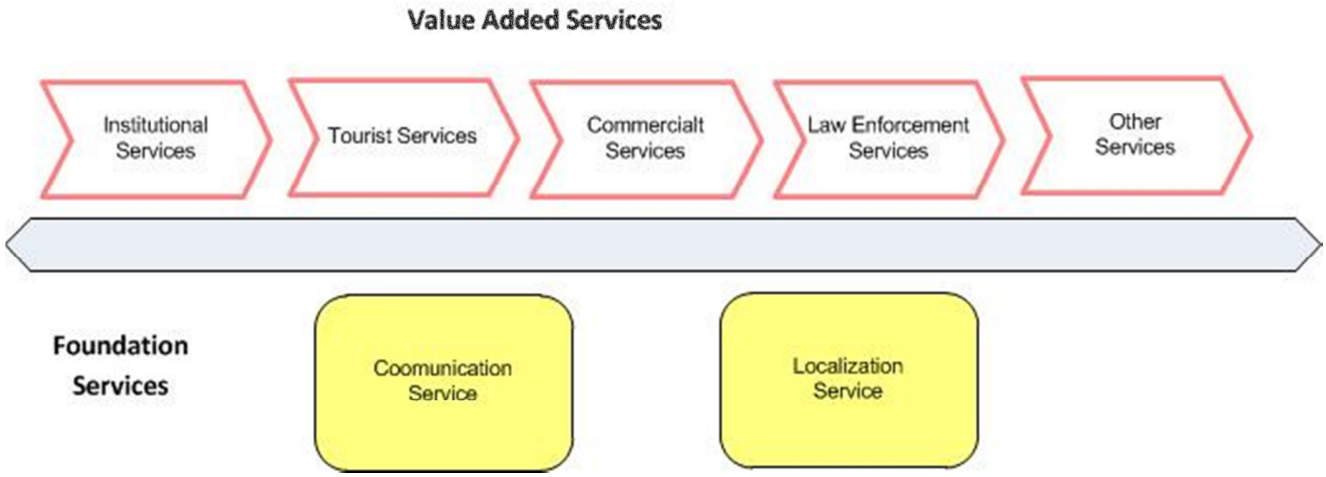

Figure 2: Service composition schema

The MEDUSE Control & Service center architecture shall be based on a Services Oriented paradigm (SOA). This mean that the value added services provided by the platform will be built by using basics services provided by elements internal to the platform and by services provided by external entities.

Figure 3 depicts the logic architecture of the MEDUSE Platform. The following main elements can be highlighted:

- **Front End**: is the component that allows the access to the service applications. The MEDUSE customers can be connected to the Control & Service center using a dedicated marine UT and mass market devices such as: smartphones, PCs and so on. For this reason the Front End is responsible for recognizing such media and adapting the output of the services according to the end users terminal.
- **Application Layer**: this layer implements the application logic of the platform. It contains a set of elements providing:
  - internal services such:
    - Access Management. It is responsible for the authentication, registration and profiling of end users. A mechanism of Single Sign on authentication should be used, so only one authentication is necessary to access all the services subscribed by the user. Only subscribed services will be available for end user.
    - Communication Services;
    - Positioning services.
  - Orchestration element responsible for the integration of internal services with the external ones, in order to build value added services. It responds to the need to build a complex mechanism able to describe and bring together a business process by aggregating simple tasks (e.g. invoke services, manage response, assign a value to a variable, terminate process, etc.) and structured ones, where simpler activities are grouped for set loops, conditional operations, sequential execution, concurrent execution, etc.

    When a request for a service comes in to the MEDUSE Service center, the Orchestration element loads the work flow describing the sequence of steps to be performed then execute them.
- **Back-End**: this layer contains two basic elements:
  - **Database**, used as data repository necessary to the service providing. It could contain also all the configuration information used by front end and application layer.
  - **Back-end services**: are basic services offered to external entities to support them in service delivery.

- **Service Bus:** is the components used by each "Service Provider[1]" to publish the interface necessary to access its own services.
- **External Service Provider**: these entities provide basic services necessary to build value added services. Examples of such entities are: Weather information providers; Hotels giving an access for booking services and so on;
- **Monitoring & Control**: responsible for check the status of the entire platform, MEDUSE UT included. It will, at least, responsible for Fault, Performance Management and Security Management.
- **Communication Layer**: It will allow having always available communication channel between the OBU and the Services Centre. With the reference to the Telepass terminal, the communication is realized with an automatic switching system that allows to use the most convenient communication mean in terms of Cost saving, Band availability and Reliability of communication
- **Navigation Layer**: it gives position services to the OBU. Based on the short term on GPS augmented by the EGNOS open service available from the 1st October 2009 and in the medium/long term on the Commercial service provided by Galileo, the terminal will always know his geographical position.
- **The MEDUSE User Terminal**: is the only means available by end user to access the services provided by the platform. In the frame of the MEEDUSE project, the consortium will develop both a set of HW and SW components, which shall be referred as the MEDUSE UT. It allows users the access of the services offered by the platform through the use of the under lying communication and localization layers. The basic characteristics of the UT are represented by an embedded satellite positioning module (Gps/Egnos/Galileo) and a transmitting module for data transmission. The communication technology shall be flexibly chosen depending on the cost and the network coverage. Moreover it allows the access to the bundle of services developed in the frame of the project and the exchange of data between UT, based on user community paradigm. It is important to underline that the MEDUSE UT is composed by two distinct subsystems: the devices and the software application. The visitors have the possibility to choose whether using the MEDUSE UT, i.e. the combination of the MEDUSE device and the software application, or to install the software application on the proprietary device, exp. PDA, smartphones, etc..

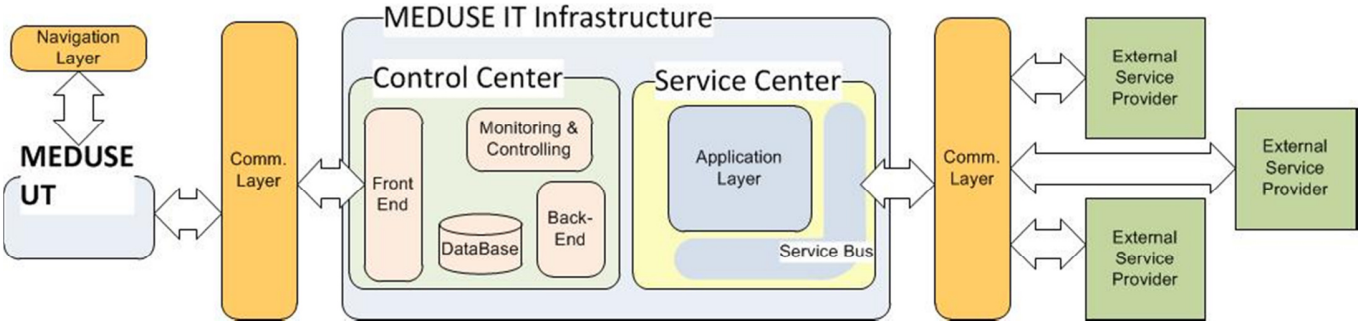

Figure 3: MEDUSE reference logic architecture

The Meduse UT inherits the outputs of the **Marine Telepass** project, which has been awarded in 2010 at European Satellite Navigation Competition for the innovative contents and aims to position on the marine market segment a useful device, contributing to the protection and fruition of marine environment, and to a safer navigation for leisure crafts. See http://www.galileo-masters.eu/index.php?anzeige=final10_lombardy.html

In order to achieve some of the above functionalities, EGNOS performances are essential, especially in terms of accuracy. Specifically, the functions i.1, i.2, i.3, ii.6, ii.7, ii.8, iv.1, iv.2 require as a minimum the use of EGNOS in order to be implemented. In addition it is clear that, in perspective, the use of GNSS signals for implementing pay-per-use policies and law enforcement actions shall require the implementation of authentication and privacy

[1]In this context Service Provider shall mean any entity / system that provide a basic service, both internal and external to MEDUSE.

protection mechanisms that shall imply the necessary use of Galileo services. In addition, the use of Galileo shall enable the future implementation of additional value added services that require enhanced performances, such as precision routing and navigation support (including e.g. in-cove navigation, anchorage stability alert, etc.).

Institutional customers are involved actively within the proposing Consortium. The participation of the "Parco Nazionale "Arcipelago di La Maddalena" (PNALM) and the possibility to involve the newly established Italian-French international marine park "Bocche di Bonifacio" (established in April 2010 through the integration of the two national marine parks, "Réserve Naturelle del Bouches de Bonifacio" and PNALM) shall enable the establishment of the fundamental expertise to achieve the proposed objectives. Moreover the Park Authority developed a basic infrastructure and services (park portal, e-Ticketing) that constitute the most advanced baseline for marine park management in Europe

Communication technology

The service proposed are conceived to be specific for near cost navigation or in port area and for these reasons terrestrial communication technologies (UMTS, WiMax, HSDPA, GPRS) shall be the target communication means. It is clear that, in order to have a seamless connection between the UT and the Control & Service Center in marine environment, satellite communication is generally essential. At the moment are available different technologies, L-band, Ku-band and S-ban.

In Figure *4*, the terrestrial and satellite communication technologies available are highlighted.

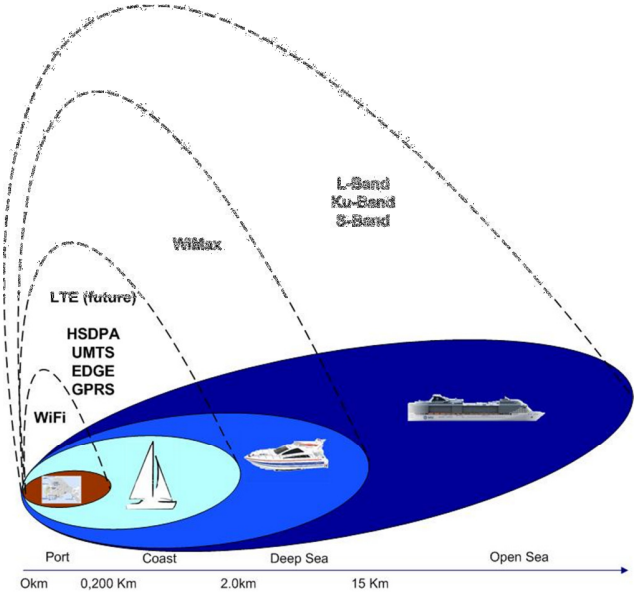

Figure *4*: Communication Technologies

The MEDUSE project will not investigate the possibility to adopt satellite communication for the following reason:

I. The boundary of marine park areas is close to the coast, where terrestrial communication assures a good coverage; moreover the geographical scope of the identified services is the coastline. The PNLM in its developing strategy is planning the deployment of low cost communication services for park visitor.

II. The visitors of Marine Park use a great variety of boats, which in general are for coastal navigation and the owner are not keen to invest money in specific technology and may face problems to install all the required components for a satellite communication.

III. It is fundamental to reduce the cost associated to the communication, otherwise all the value added provided by the new services will be absorbed by the telecom operators.

The management of communication will be tailored the following envisaged scenarios:

- For "enhanced" (i.e. private user) and "basic" terminals (transmitting via GPRS, UMTS or Wi-Max) data transmission for institutional application (i.e. positioning reference) shall be configurable (in amount and

frequency) on the basis of uplink limits of the end-user. In addition, the terminal shall provide data recording capability for off-line download of positioning reference data.

- Law enforcement application shall be based on a "management by exception" philosophy. As such, it will not require for significant data transmission budgets.
- Data transmission costs of Private and Commercial services (i.e. Internet connection via UMTS or Wi-Max) shall be bared by the end-users. However, specific analyses shall be performed on services operational functionality aimed at sizing required upload/download budget on the basis of most common low cost profiles provided by telecomm operators.

In the specific case of Parco Nazionale Arcipelago "La Maddalena", data transmission problem is additionally simplified by the availability of Wi-Max connectivity on the whole coastal areas. This will further improve the sustainability of the business case as preliminary described in Section 3.2.

1.1.2 R&D objectives of the project and their relation to the Topic

As suggested within the specific Guide for Applicants, the following table describes compliance with specific Galileo 2011.1.7-1 topic description, by means of addressing, for each relevant technical requirement / statement, the section and paragraph where compliance is discussed / demonstrated.

Sec	Sentence	Compl.	Reference / Remarks
II.1	The aim of the topic is to explore new applications and business models for location enabled applications in any application domain.	Y	Sec. 3.1.1 Impact
II.1	The project should result in the development of an application or a part of an application that can be integrated rapidly in an existing application. GNSS should be used as the primary positioning technology in the application and positioning should be a key enabler of the application. Application development should be seen in a broad context. It includes the development, adaptation and/or integration of new software, hardware, services, datasets etc.	Y	Sec. 1.1.1 Project objectivesScientific and/or technological quality, relevant to the topics/activities addressed by the call
II.2.1	Within the context of this topic, the proposal should aim to be innovative, going beyond the state of the art, especially in the use of GNSS. This could mean the application of technologies such as Galileo, EGNOS or EDAS to new markets, applications or business models. It should also aim to be built on already fairly mature application or business concepts, leading to products and/or services at the end of the project that can be brought to the market quickly.	Y	Sec. 1.2 Progress beyond the state-of-the-art
II.2.3	The consortium should have a clear intention to commercialise the products and services developed in the project. Hence there is a requirement to provide a convincing market entry plan in the proposal. The consortium should also highlight previous achievements in the specific market of the application developed. The project should also contribute to the adoption of Galileo, EGNOS or EDAS e.g., early Galileo signals are used, EGNOS or EDAS technologies are applied in new ways, the application facilitates wide adoption of EGNOS, the application leads to an increased understanding of the market or user requirements in	Y	Sec. 1.2 Progress beyond the state-of-the-art Sec. 3.1.1 Impact Sec. 1.2.1 GNSS as Key enabler for Marine Park Application Sec. 3.2 Market and potential users

Sec	Sentence	Compl.	Reference / Remarks
	fields that are particularly relevant for Galileo, the project contributes to the identification and resolution of obstacles for the adoption of Galileo and EGNOS. Furthermore the project should aim to create impact in terms of public benefits (e.g., reducing carbon emissions, increasing safety, providing security). Regarding impact through dissemination, the release of practical tools to the GNSS developer community (function libraries, sample code, algorithms etc.), ideally with free open source license – are a particular area of interest.		
II.2.4	The project should take into account, to the extent feasible, relevant standards and regulations on safety, security and other aspects.	Y	Sec. 1.2 Progress beyond the state-of-the-art
II.2.4	The project should use, to the extent feasible, iterative/incremental development methodologies which enable early demonstration of results.	Y	Sec. 1.3 S/T Methodology and associated work plan
II.2.4	The consortium may employ PhD students to carry out RTD activities	Y	

Table 1: Cross match between the Call and the project objectives

1.2 Progress beyond the state-of-the-art

Although the maritime leisure Private users community accepts a wide series of location based services that would improve their safe and efficient navigation and although almost all Private users vessels are currently equipped with fixed or portable GNSS devices, the state-of-the-art of location based services for the maritime leisure market is still at its infancy.

At present, there is no technological barrier that can prevent the diffusion of commercial services in this area, provided that the economic sustainability of specific services is demonstrated. However location based services for the maritime leisure market is still at very early stage of development. The main reason is to be attributed to the fact that leisure vessels, location devices (i.e. transponders or specific software) are not yet broadly adopted, due to lack of specific International regulation imposing the broadcast of vessel position (as it is the case of AIS for large commercial vessels), nor the users yet feel the necessity to buy and install specialized vessel location devices (or install dedicated software) due to lack of adequate location based services.

If the diffusion of location based commercial services for the private maritime community is not yet developed, the market of regulated applications is at "zero" stage. For the sake of understanding, we define as "regulated" applications those applications that involve the implementation of rules or payment schemas which are subject to legal disputes, i.e., in our context, Institutional and Law Enforcement applications.

This lack of solutions for the implementation of location based payment and law enforcement policies constitutes, in our opinion, an extremely important missed commercial opportunity of utilisation of EGNOS and, more specifically, Galileo services within a numerically significant market, for several reasons:

1. As addressed in the previous section, marine restricted areas access and payment control is a real problem for the management organisations, leading to significant loss of incomes;
2. There is a demonstrated tendency to increase the number of areas subject to restrictions and payment access for environmental protection and park management economic sustainability purposes;
3. Although marine protected areas management organisations constitute a "niche" market, the implementation of an operational schema requiring that all parking visitors embark an interactive device

opens the doors to the huge market of private visitors and local operators (i.e. our Commercial and Private applications). This enables the implementation of a market exploitation strategy targeted to park (private and commercial) users to be implemented in agreement with restricted areas management organisations (see also Chapter 3);

4. The implementation of regulated applications implies the need for using adequate privacy policy and data authentication mechanisms, as well as certified on board devices. These elements constitute real differentiators, as they require Galileo services to be implemented. Hence, we deem that the first research and experimentation on low cost maritime terminals for private use providing capabilities for implementing regulated applications is an extremely important path to the introduction of Galileo differentiators within the maritime market.

Taking into account the time required for the development of regulated applications related technologies and for the availability of services enabling data authentication, MEDUSE proposes an implementation solution that satisfies both the urgency of developing concrete operational and commercial responses to end user needs and the need for preparing the way to "full enabled" regulated applications by means of exercising two on board terminal solutions in parallel:

- A "commercial" solution enabling the utilisation of a user-owned terminal (e.g. i-phone) with the addition of software applets required for the operation of regulated applications;
- A "basic" MEDUSE terminal solution constituted by a prototype dedicated to regulated applications.

From an operational viewpoint, the restricted area visitor, before entering the area would be able to select between two options:

A. To download and install park access monitoring software within its own terminal;
B. To embark, for the park visit duration, the "basic" MEDUSE terminal provided by the management organisation.

Both of the above solutions shall provide a wide-band interactive connectivity between the park users and a service centre, responsible not only for controlling restricted areas access and utilisation ("Institutional" and "Law Enforcement" applications), but also for the provision of commercial services ("Private" and "Commercial" applications) to the users.

The above scenario presents several advantages:

- Solution A), although not rigorous from the point of view of regulated applications (no certified terminal) enables an early implementation of an "electronic" park access "pay per use" payment policy and a more efficient organisation of access procedures (no need of "physical" interaction between park management and user). Thus, it represents a good intermediate solution before certified and authenticated services shall be available, boostering the utilization of the proposed services
- Solution B) in its implementation within MEDUSE project represents the first experimental path to certified and authenticated regulated services.
- The co-existence of solution A) and B) shall enable a full coverage of the park users in the short-medium term, thus enabling the implementation of a "remote access authorisation control" policy (via terminal interrogation) with a consequent significant increase of park incomes (via much greater detection capability of not authorised accesses and access violations) as well as enabling the ability of reaching all park users for the provision of location based commercial services.

It is clear that the implementation of the above concept is possible only within areas of restricted access within which there are severe limitations implemented by specific laws, such as in the case of marine parks. Only in this case, in facts, it is possible to force private users to keep a tracking device (or dedicated software) on-board. The natural reluctance of the user to embark in a "big brother" type of system shall be fully compensated by the availability of a potentially enormous number of services which the user will take benefit from during his visit to the park (including pay-per-use pricing policies).

In addition, the proposed concept enables the implementation of location based applications without requiring the universal adoption or/and upgrading of vessel location devices on board (and consequent need for International regulations) nor it requires purchasing and installation of specific devices. In synthesis, it is deemed that by implementing the above scenario there will be a clear fostering action of growth of new services and new users for location based services in the maritime leisure area. In addition, the idea per-se represents an highly innovative proposition in terms of new applications and associated services models, as concepts like the described institutional and law enforcement applications have never been implemented before, while some services for private and commercial customers already exist but almost with no relevant location based characteristics.

Although market numbers for the proposed services are very promising (see following section) an important element for the sustainability of the newly defined services are its operational costs, which shall be driven by communications needs. Therefore, specific care (and innovation) will be put also in the development of built-in terminal optimisation software dedicated to the event-driven and dynamically-configurable management of data transmission between the user terminal and the service centre.

1.2.1 GNSS as Key enabler for Marine Park Application

In maritime environment, the framework of maritime transport requirements for radio-navigation systems performance is formed by two IMO resolutions: A.915(22) "Revised Maritime Policy and Requirements for a Future GNSS" and A.953 (23) "World-Wide Radio-navigation System".

Resolution A.953 (23) gives the formal requirements and procedures for accepting new systems as components of the World-Wide Radionavigation System (WWRNS).

Resolution A.915 (22) defines the operational requirements of various types of maritime operation and must be viewed as guidance for future developments of GNSS, addressing the future satellite navigation systems such as Galileo or the second generation Global Position System (GPS).

Moreover The IMO resolution A.915(22) states that only GPS and Glonass are WWGNSS systems available for the maritime environment, recognizing that differential corrections are available from geostationary satellites such as the European Global Navigation Overlay System (EGNOS) for Europe, Wide

	Area of navigation		
	Harbour entrances, harbour approaches and coastal waters		
Parameter	High volume of traffic and/or a significant degree of risk	Low volume of traffic and/or a less degree of risk	Ocean waters
Position accuracy (horizontal, 95%)	≤ 10 metres	≤ 10 metres	≤ 100 metres
Coverage	adequate to provide position-fixing throughout this phase of navigation		Global
Update rate (computed and displayed position)	≤ 10 seconds	≤ 10 seconds	≤ 10 seconds
Update rate (if used for AIS, graphical display or direct control of ship)	≤ 2 seconds	≤ 2 seconds	≤ 2 seconds
Availability	≥ 99.8% (2 years period)	≥ 99.5% (2 years period)	≥ 99.8% (30 days period)
Continuity	≥ 99.97% (3 hours duration)	≥ 99.85% (3 hours duration)	NA
Time-to-alarm	10 seconds	10 seconds	as soon as practicable by Maritime Safety Information (MSI) systems.

Table 2: Performance requirements for radionavigation systems according to IMO Resolution A.953(23) adopted 5th December 2000

Area Augmentation System (WAAS) for the United States and the Multi-transport Satellite-based Augmentation System (MSAS) for Japan.

It also states that the future shipborne equipment for GNSS(s) should have a data interface capability with other shipborne equipment to provide and/or use information for navigation and positioning such as:

ECDIS, AIS, the GMDSS, track control, VDR, ship heading and attitude indication and ship motion monitoring. More important is the recognition that future GNSS should have the operational and institutional capability to meet additional area-specific requirements through local augmentation, but the augmentation provisions should be harmonised worldwide to avoid the necessity of carrying more than one shipborne receiver or other devices.

The resolution provides the minimum maritime user requirements for general navigation and the minimum maritime user requirements for positioning, as reported in the next tables.

Two tables are of particular interest for the MEDUSE project: Minimum maritime user requirements for general navigation and Minimum maritime user requirements for fishery, recreation and leisure time, reported below.

	System level parameters				Service level parameters			
	Absolute Accuracy	Integrity			Availability % per 30 days	Continuity % over 3 hours	Coverage	Fix interval[2] (seconds)
	Horizontal (metres)	Alert limit (metres)	Time to alarm[2] (seconds)	Integrity risk (per 3 hours)				
Ocean	10	25	10	10^{-5}	99.8	N/A[1]	Global	1
Coastal	10	25	10	10^{-5}	99.8	N/A[1]	Global	1
Port approach and restricted waters	10	25	10	10^{-5}	99.8	99.97	Regional	1
Port	1	2.5	10	10^{-5}	99.8	99.97	Local	1
Inland waterways	10	25	10	10^{-5}	99.8	99.97	Regional	1

Table 3: Minimum maritime user requirements for general navigation

	System level parameters					Service level parameters			
	Accuracy		Integrity			Availability % per 30 days	Continuity % over 3 hours	Coverage	Fix interval[1] (seconds)
	Horizontal (metres)	Vertical (metres)	Alert limit (metres)	Time to alarm[1] (seconds)	Integrity risk (per 3 hours)				
Fisheries	**Absolute accuracy**								
• location of fishing grounds	10	N/A	25	10	10^{-5}	99.8	N/A	Global	1
• positioning during fishing[2]	10	N/A	25	10	10^{-5}	99.8	N/A	Global	1
• yield analysis	10	N/A	25	10	10^{-5}	99.8	N/A	Global	1
• fisheries monitoring	10	N/A	25	10	10^{-5}	99.8	N/A	Global	1
Recreation and leisure	**Absolute Accuracy**								
• ocean	10	N/A	25	10	10^{-5}	99.8	N/A	Global	1
• coastal	10	N/A	25	10	10^{-5}	99.8	N/A	Global	1
• port approach and restricted waters	10	N/A	25	10	10^{-5}	99.8	99.97	Regional	1

Table 4: Minimum maritime user requirements for fishery, recreation and leisure time

In this context EGNOS potentially fulfils the maritime transport requirements not only as component of the current World-Wide Radio-navigation System (Res. A.953 (23)) but as “Future GNSS” (Res.A.915 (22)) as well.

Moreover the results of EGNOS, as demonstrated in early trials, show that it is able to deliver users the appropriate service, with a comparable positioning accuracy to the maritime DGPS actually utilized in maritime transport.

It is important to underline that, even though EGNOS performance satisfies the requirements, the deployment of law-enforcement services, as well as financial services, the EGNOS service does not offer a signal authentication mechanism.

Signal authentication in satellite navigation systems is required in order to ensure that source of the satellite signalling is from the satellite constellation rather than from another source.

Nowadays civil GNSS (GPS and coming-up Galileo OS) comes with no inherent authentication function, preventing then deployment of location-based services requiring high-level of trust. There are a number of existing and proposed signal authentication methods which are summarized in Figure 5:

	Service	Used Authentication Method
GPS	Open service	Free access
	Military service	SCE
EGNOS	Open service	Free access
	Safety of Life	TBD[1]
GALILEO	Open Service	Free access
	Commercial Service	SCE[2]
	Safety of Life	ANM[1]
	Public Regulated	SCE[1]

Figure 5: The GNSS service and the authentication method

- Signal Authentication through Authentication Navigation Messages (ANM): The ANMs would include a digital signature authenticating the other navigation messages that contain data including ephemeris and almanac data. Using the digital signature, the certified receiver is able to authenticate the source of messages and verify their integrity. These authentication messages are created on the ground and transmitted to the satellites for broadcast. This method has a security limitation, in that the messages can be acquired by a certified receiver and modulated over a simulated signal in order to spoof the Galileo signal. This would require functionality that is not commonly found in commercial signal simulators, and would require the operation to be performed within a very small time window;
- Signal Authentication through Spreading Code Encryption (SCE): Spreading code encryption is one of the oldest signal authentication techniques, currently used by the GPS P(Y) code, an exclusively military service, and is projected to provide authentication of the Galileo CS and PRS signals. As the spreading code is secret, without knowledge of the spreading code, signal access is denied. For this reason, the spoofer cannot simulate the signal, and hence authentication of the signal is achieved when the user possesses the correct spreading code. In GPS' P(Y) code, the P code is publicly known, and the secret spreading code is obtained using P code with a Red Key, or a Black Key and the Selective Availability Antispoofing Module (SAASM) (Callaghan and Fruehauf 2003). The Black Key is the Red Key encrypted with the public key of a given SAASM allowing the Red Key to be decrypted inside the tamper-resistant SAASM which contains its private key. The Black Keying infrastructure allows for electronic key distribution and does not compromise the classified Red Key.

The MEDUSE services can target in the medium/long term the use of the Galileo Commercial Service.

In this sense, the MEDUSE project in particular will target:

[2] the official signal ICDs related to the service has not been published yet, so the associated authentication method is not officially defined.

- Costal navigation by the use of precise tracking based on EGNOS Open service compared with today's GPS-based solutions. On-board terminals, equipped with GNSS receivers able to apply EGNOS corrections, will be extensively used (possibly exploiting initial use of GALILEO Open Service SiS). In fact **on the 1st of October 2009, the official start of the EGNOS operations was announced**: the EGNOS OS is now available.
- Restricted water by the use of EGNOS corrections through the Internet, exploiting the EGNOS Data Access System (EDAS). It provides a wide range of services, including the Signal In Space through the Internet (SISNeT) data. EDAS provides EGNOS corrections in the standard RTCM SC104 format, ready to be used by DGPS receivers. EDAS service complements the EGNOS signals broadcast by GEO satellites and might be extremely important in those applications where a high accuracy is required and, at the same time, natural obstacles could block the signals from the satellites. Today EDAS has just ended its beta test and is used only in research projects or demonstrations. It is possible to foresee that EDAS will be a key element of commercial GNSS-based systems only after an intense validation campaign.

The EGNOS Data Server provides two main types of data, identified as EGNOS Products. They are:

- Data collected by the network of Ranging and Integrity Monitoring Stations (RIMS) and Navigation Land Earth Stations (NLES);
- EGNOS augmentation messages, as it is received through the GNSS antenna directly from the GEO satellites;

These data are intended to be provided to Service Providers for further processing according to the specific needs of their application. As mentioned, the EGNOS products are provided to the Client (service provider) software in real-time, with stringent latency requirements for the transmission of the data (between 150 ms and 300 ms, depending on the type of product).

EDAS advantages

EDAS builds on the qualities of EGNOS to provide a reliable high level of service to users and offers the following key advantages:

- Reliability and assurance: EGNOS will be a certified SoL system requiring a highly reliable and resilient infrastructure. This infrastructure is the basis for EDAS;
- Data delivery: EGNOS data is provided in real-time through a standard internet connection or direct fixed-line
- Data content: EDAS not only provides EGNOS broadcast data, but also Ranging and Integrity Monitoring Stations (RIMS) raw data and satellite status messages;
- European and North African coverage: EDAS data is sourced from the 34 EGNOS RIMS generating unique GNSS datasets from Europe and North Africa;
- Commercial contracts: in the future, EDAS can be provided to service providers on a long-term basis with reliable performance levels.

1.2.2 User Terminal

The currently available Automatic Identification Systems (AIS) are used by ships and vessels principally for identification and positioning along their course. AIS permits remote exchange of data including: position, course, speed, with other nearby ships and Monitoring Service stations.

The International Maritime Organization's (IMO) International Convention for the Safety of Life at Sea (SOLAS) requires AIS to be fitted aboard ships with gross tonnage (GT) of 300 or more tons, while on smaller vessels the installation of ship-borne AIS should be issued for use on a voluntary basis.

In the segment of small/medium size leisure vessel the use of AIS Class B (characterised by low cost and easy installation) have recently become available, permitting a small vessel to receive the information from the big ships and to transmit a subset of parameters (or not transmitting at all in case of passive AIS).

In this scenario Blue Thread proposed the development of an innovative terminal for on-board applications with low cost and easy installation characteristics, additional features respect to standard AIS, and flexible programmability to fulfil requirement of specific applications (marine reserve, restricted waters, ports, sport competition, fishing).

Visitors of marine reserve are an increasing niche that would benefit of a small on-board device allowing them to visit the park in the easiest and most flexible way, providing also additional services.

The MEDUSE project will develop a new set of innovative services for marine parks, triggered by GNSS and based on a new class of marine terminals based on an evolution of the Marine-Telepass to be installed on-board. The new class will be composed by a set of User Terminals developed specifically to satisfy the needs of the different set of possible users: visitors, marine park personnel and law enforcement bodies.

The different models of terminal that will be developed are presented in the following paragraphs.

The basic terminal is a low cost transponder with embedded positioning and transmission capability, with no need of user interaction. It simply transmits the navigation data of the vessel to the monitoring centre permitting the tracking of the vessel and charging the user for park access.

The enhanced device provides an increased level of interactivity, permitting to send and share information relevant for port authorities and for other visitors; particular observations, weather data, warnings, emergency signals.

It can be interfaced (via Wi-Fi, Bluetooth) to other on-board sensors (webcam, anemometer, wave-accelerometer), exchanging and extended set of significant data with the monitoring station.

It is worth to point out that, as also described in the previous sections, the application software that allows connecting to the MEDUSE Service center will be also available for commercial Smartphone.

On-Board BASIC Terminal

The basic terminal is a simple transponder capable to log and transmit the localization data of the boat. The terminal can work autonomously, and doesn't require user interaction and implements a protected working mode, so that the data and the working parameter cannot be manipulated. With this terminal a simple pay-per-use service can be provided to the end user.

On-Board ENHANCHED Terminal

The enhanced terminal offers to users the possibility to interact with the Service center, maintaining the protected working mode, so that the data and the working parameter cannot be manipulated. It will provide a direct interaction with the Service center, thus allowing the basic park oriented functionalities (access fee, tracking, etc.) plus all other functionalities related to the provision of specific services to the user and to the "cooperative" interactions.

Display
Embedded GPS/Galileo and
Wifi,Wimax module

Wireless interface for additional sensors

Anemometer
Webcam
Wave accelerometer
…

Customized on-board terminal for park administration authority (Querying/Supervision System)

Additional customized on board terminals will be designed for law enforcement authorities.

In particular this equipment will have the possibility to display the displacement of all boats in the protected area, integrating navigation data coming from the transponder to other sources (radar and satellite images), reproducing on the controlling unite all the data available at the monitoring station.

Thanks to the accurate position obtained by EGNOS module and the encrypted data transmission (the navigation data are univocally associated to the terminal and cannot be manipulated by the user) the device can be used for regulatory applications.

The introduction of this innovative class of devices simplifies enormously the monitoring and controlling procedures carried out by the marine authorities, with a consequent economic advantage due to the cost reduction achieved.

At the same time the visitors benefit of the fact that this simple device on-board avoid any need of further control procedure, and permits to access and visit the park flexibly, simplifying also the final billing procedure based on the duration of the trip.

Thanks to the interactive capability the devices can be seen an aid for the port authorities for monitoring the application of the reserve marine regulation, and can also be seen, from the point of view of final user (cruisers and visitors), as a useful tool for improving the access to marine reserve, avoiding misinterpretation of the regulations and reducing risk of infraction.

1.2.3 Cartography

In maritime community, Electronic Navigation Charts (ENC) is the standard to plot/tag geo-referred. It is referred to in chapter V of the SOLAS Convention, Safety of Navigation. The official producer of ENC is the national Hydrographical Office, which supplies commercial producers with source data. The ENC users are commercial shipping, Navy, Coast Guard, VTS centres, Pilots.

Hereafter the main potential cartography providers have been identified:

- Jeppesen offers three different types of electronic marine charts NT+, MAX, MAXPRO.
  - The NT+ main features are: Global coverage, rich detail and information, port & tide Info, continuous and seamless chart data, easy on-screen query of all chart objects displayed, detailed display of NavAids, north-up and course orientation
  - MAX features are: Photos and diagrams, points of interest (POIs), fully animated worldwide tide and current data, dynamic elevation data, guardian alarm technology, three different details (Standard coverage, Larger Coverage, Maximum Coverage, all with MAXimum detail)
  - MAXPRO features are: 3D "Virtual World" display, quick-sync updating, 2D & 3D Satellite overlay, tidal height and velocity database, C-Marina pilot book database, coastal roads and POIs, navigational photo database, multi-language support, anti-grounding alarms, land elevation shading, value added databases (VAD)

All the Jeppesen Marine's electronic chart database is available on CDs for use with navigational software.

- Garmin offers three different types of electronic marine charts:
  - BlueChart® g2 Vision® => Highly detailed offshore marine maps, plus satellite imagery, enhanced 3-D maps, Auto Guidance technology, aerial photographs and coastal roads with points of interest.
  - BlueChart® g2=> Detailed offshore marine maps to help you navigate — plus enhanced 3-D maps and rich detail and content.
  - BlueChart® => Packed with detailed offshore marine maps for a great day on the water.
- Navionics offers four different types of electronic marine charts:
  - Platinum+ Charts => panoramic pictures, 3D/2D views with satellite imagery, coast pilot guide, POI, high-definition fishing detail.
  - Gold => 2-dimensional Features include tides, currents, wrecks, port plans, marsh areas, marine services, coastal roads.
  - Classic => marine charts that are easy to read at all zoom levels. Depth contours, spot soundings, port plans, port service guides, navigation aids.

Among the several Institutional, Private, Commercial and Law Enforcement applications/services identified in section 1.1.1, the following ones (i.1, i.2, i.3, ii.6, ii.7, ii.8, iv.1, iv.2, see section 1.1.1) particularly requires high accuracy position that imposes the use of accurate cartographic products.

In the course of the project the consortium will use the official maps provided by the Parco Nazionale Arcipelago “La Maddalena”. It is important to underline that the consortium will investigate the option to develop a dedicated service to Marine authorities to increase the quality of the available maps to support the increase the quality of maps by the organization of surveying campaign, taking advantage of the intrinsic quality of EGNOS/EDAS.

1.3 S/T Methodology and associated work plan

MEDUSE is broken down into 5 work packages as in Figure 6. The two RTD work package: Design, and Development correspond with the main application areas of the proposal.

The WP2, Design, sets up all of the technical work to be conducted on MEDUSE. It will include user requirements, application definition (including service management and operations) as well as the HW/SW design documents and the definition of validation process, while the WP3, Development deals with the implementation of all the components need for the provision the proposed services.

Our software development will follow the RAD software development. This approach provides us with flexibility in the workplan, to revisit earlier steps or to tackle later steps in different ways. The individual tasks (see section 1.4) are indicated at the appropriate stages.

One of the primary characteristics of RAD is that there is a focus on delivering projects in small pieces, each of which is planned and delivered individually. With a series of smaller projects, each can be delivered more quickly and in a less structured manner.

- Deliverables, including the final solution, are created using a repeating process of analysis, design, construction, and testing. Prototypes are created early and evolved to more detail over time. This repetitive delivery process is one of the major characteristics of the RAD model.
- There is an emphasis on reuse. This includes the reuse of code, processes, templates, and tools. It is usually faster to assemble pre-built components than to build everything from scratch.

The overall flow of the RAD model is as follows:

Planning. Just as in the waterfall methodology, the project needs to be planned first.

Analysis. Instead of spending the time to gather a precise set of detailed requirements, first the high-level requirements are gathered. The focus is on the main features and functions to be delivered, as well as the overall batch and online processes.

Prototyping. Utilize the requirements you received in the previous step to build a high-level prototype of the application. Even though the Design Phase is not a separate entity the consortium will build a flexible technical architecture.

Repeat Analysis and Prototyping as Necessary. When the initial prototype has been completed, we utilize it to gather additional, more detailed business requirements from the client.

Conclusion of Prototyping. The consortium will agree on a fixed number of prototyping iterations. Usually three iterations is a good number. After you have completed the third iteration, you should have a sizeable portion of the solution completed. Test and then implement the final solution. The testing may include full system testing and formal user acceptance testing.

Implementation. Normally you do not prototype the implementation phase (although you may run a pilot test, which is different). So, the implementation phase would proceed similarly to the waterfall method.

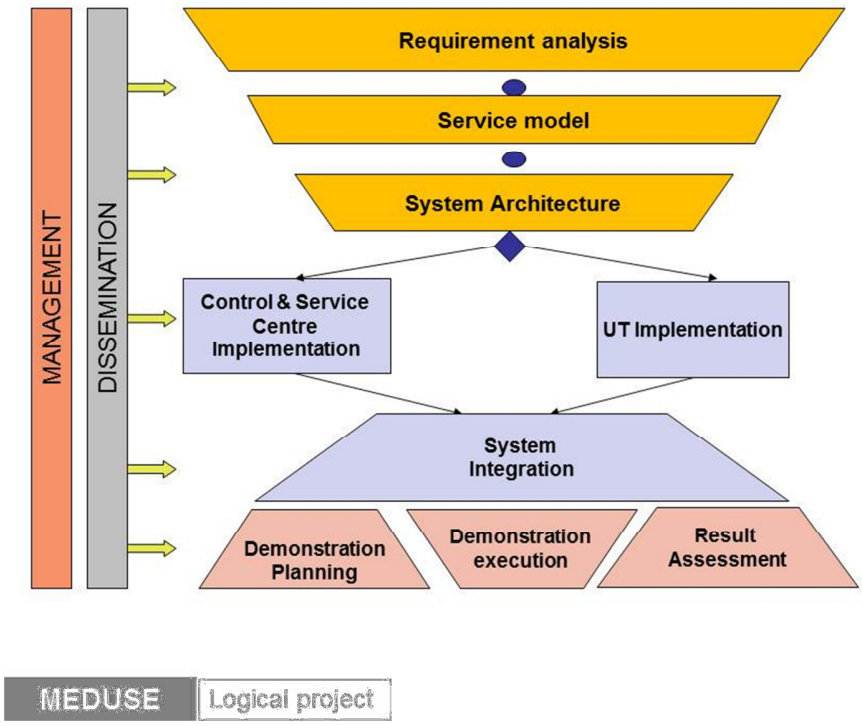

Figure 6: Meduse logical decomposition

Dissemination will focus on ensuring that that the results and progress of the project are communicated to the business community, the GNSS community and to the general public in an easily digestible format. It will involve contributing to a GSA managed "user forum". It allocates time for both planning strategies for targeting conference and journal papers and also for the writing of those papers. Dissemination material will be produced early and updated regularly including a slide show, report, poster and audio-visual presentation. Furthermore an interactive, user-friendly project website will be established and gather all public project outcomes. This website will also feature a newsletter for registered users; include links to other relevant projects; provide a project and consortium overview; enable feedback via e-mail or web form and feature an open discussion forum for posting questions, comments and ideas. The website will be optimised to facilitate turning up in search engines.

Exploitation will be led by the commercial partners and will work towards the production of a business and exploitation plan which includes a rigorous cost-benefit analysis. It will explore the added value of **services provided**.

Demonstration

The WP 4 involves conducting significant trials (obtaining direct feedback from used users) of the final services.

The Demonstration work package will be concerned with the demonstration of the full-scale results and will be conducted in realistic scenarios, with the support of interested business entities.

The **system demonstrator** will be based on a client application, to be installed on a specifically developed terminal and on an Off-the-Shelf terminal and a prototype Service & Control centre.

As addressed in section 1.1.1, within MEDUSE project some of the identified services shall be developed at a prototype stage for demonstration purposes. In the particular emphasis shall be put on:

- Regulated applications (i.e. Institutional and Law Enforcement, see section 1.1.1 services I "Institutional – Marine parks and restricted marine areas management organizations;" and IV "Law Enforcement – Marine police authorities (Coast Guard, Police, Park Marine Control body)., as they provide the maximum degree of innovation w.r.t. state of the art and clear differentiator elements. In the analysis of the problem it will be specifically considered whether to transmit to law enforcement the speed violation or rather to give a warning to the User (since it seems more appropriated in order to facilitate the adoption of the terminal). For this purpose, all operational functionalities related with regulated applications shall be developed within MEDUSE prototype.
- Private applications, as they provide the best commercial perspectives. In principle there are many private applications that could be taken into account for prototype development. However, the consortium have preliminary chosen the following private applications (list to be validated and refined in the context of the architectural phase of MEDUSE Project).
  - ii.2 Social community services (e.g. find friends). The reason for demonstrating this application resides in its high perceived commercial value. Social community services are spreading at a very interesting growth rate. The maritime leisure users constitute per-se a strong community (usually fleets of friend boats navigate together during vacation periods), and community interactions are continuously exercised through conventional means (mainly VHF). Therefore applications like "locate your friends" have a natural great appeal within the maritime community.
  - ii.4 Reception of special (environmental) location based hints from park managers (e.g. wild fauna location). This application is very useful to demonstrate to park visitors the value added of having an interaction capability with a service provider which can use visitor location information in order to provide the visitor with valuable information on the park and its resources.
  - ii.8 Booking and navigation to mooring buoys within coves. This application is useful to exercise and demonstrate GNSS differentiators (specifically accuracy through EGNOS EDAS) in the perspective of utilizing Galileo services.

The demonstration campaigns will be conducted in the "Parco Nazionale dell'Arcipelago di La Maddalena" areas since it offers a variety of conditions and environments which can fully demonstrate the added value of the

developed services. Moreover the Italian park authority takes the action to invite the new established international marine park “Bocche di Bonifacio” to actively participate in the demonstration phase.

The Service & Control center will be installed in the park office and it also offers the possibility to take advantage of the already developed services; in addition the park authority will support the demonstration by installing on its own fleet the User Terminal to simulate real case intervention scenarios. In this sense the demonstration can be considered as a real pre-deployment use case toward the full delivery of the proposed services.

In the Figure 7 it is provided the map of the La Maddalena Arcipelago, which highlights the border of the marine park within which an authorization for the Park Authority is needed to access it and the different zones in which the marine park is divided with the different access limit imposed by the Park Authority.

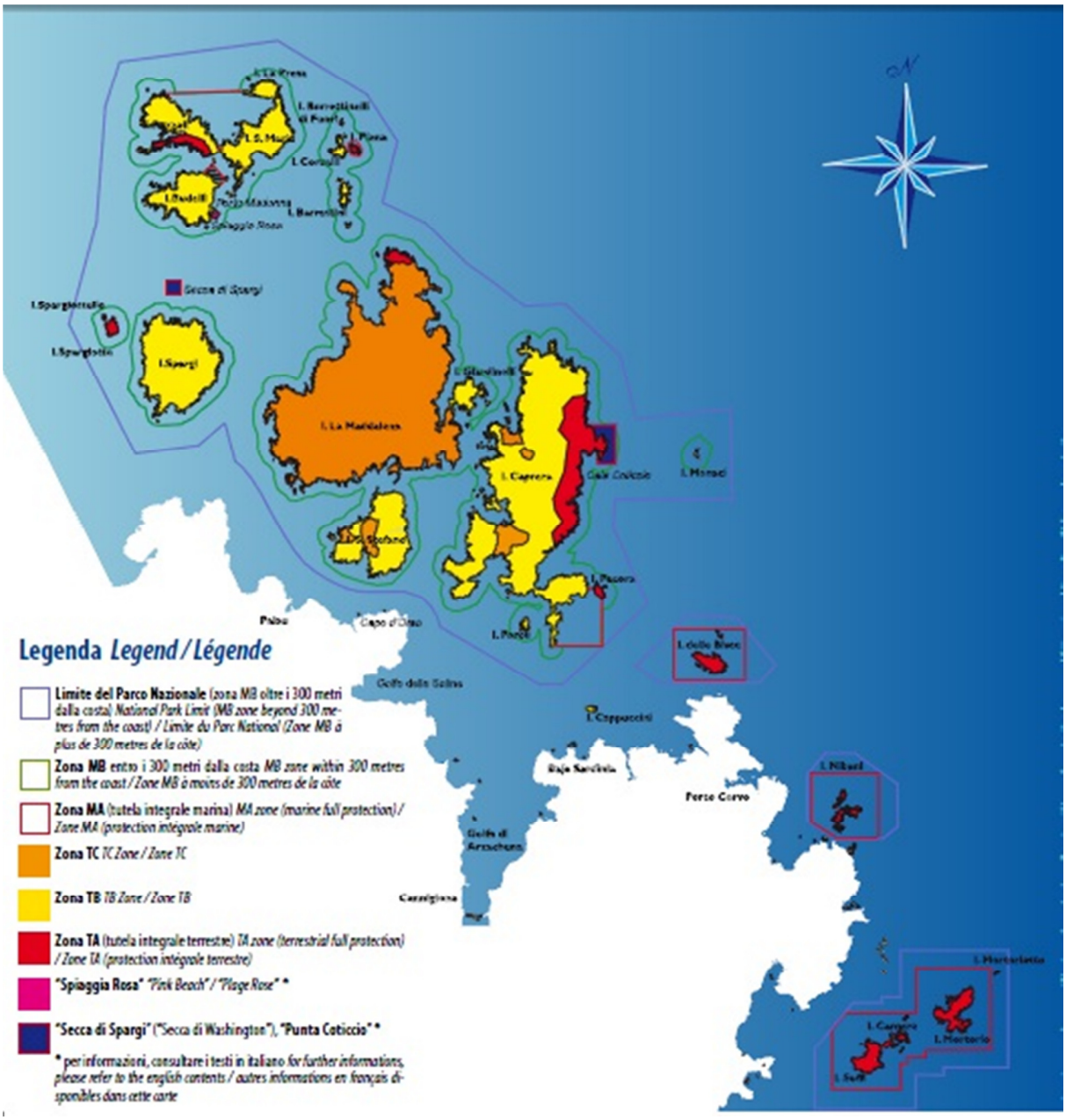

Figure 7: Parco Nazionale dell’Arcipelago di La Maddalena zoning map 2010

1.3.1 Work Plan and Work Breakdown Structure

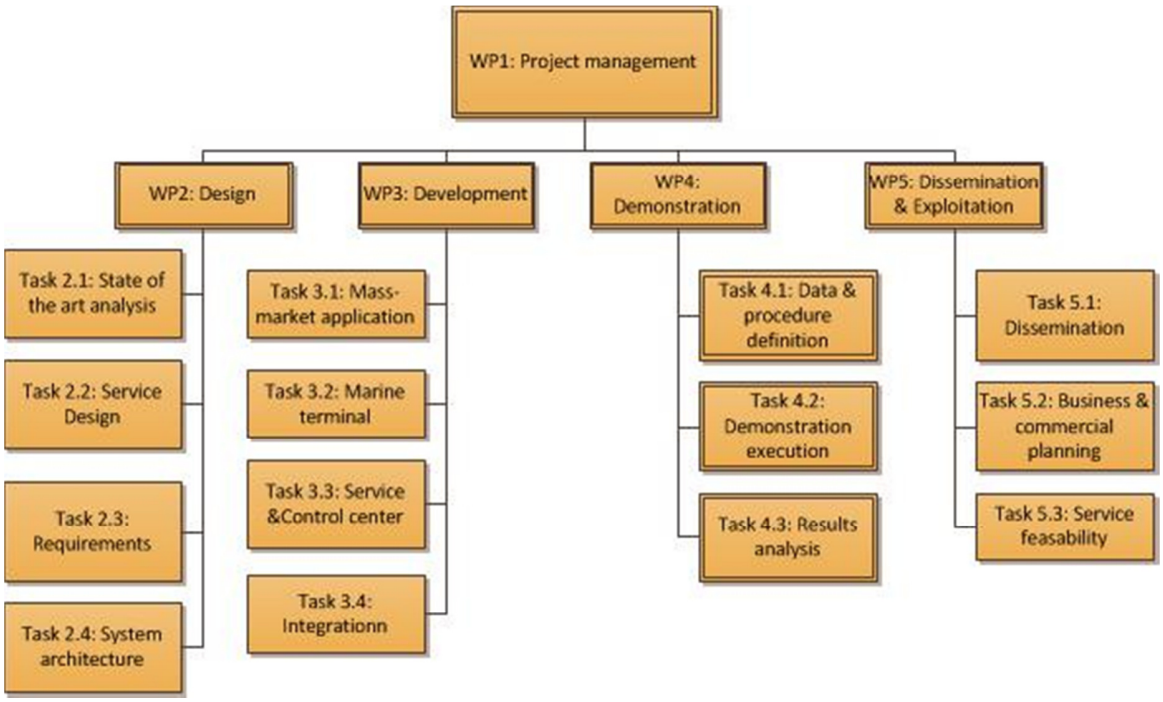

Table 5: MEDUSE WBS

Work package No[3]	Work package title	Type of activity[4]	Lead participant No[5]	Lead partic. short name	Person-months[6]	Start month[7]	End month[5]
1	WP1: Management	MGT	1	NXA	6	T1	T18
2	WP2: Design	RTD	3	NXA	19	T1	T9
3	WP3: Development	RTD	1	NXA	32	T8	T16
4	WP4: Demonstration	DEM	5	PNALM	11	T15	T17
5	WP5: Dissemination & exploitation	OTH	2	VTCB	9,5	T1	T18
	TOTAL				**77,5**		

Table 6: MEDUSE WP efforts

3 Work package number

4 RTD = Research and technological development (including any activities to prepare for the dissemination and/or exploitation of project results, and technical coordination activities); DEM = Demonstration; MGT = Management of the Consortium; OTHER = Other specific activities, if applicable.

5 Number of the participant leading the work in this work package.

6 The total number of person-months allocated to each work package.

7 Measured in months from the project start date T1

1.3.2 Project Planning

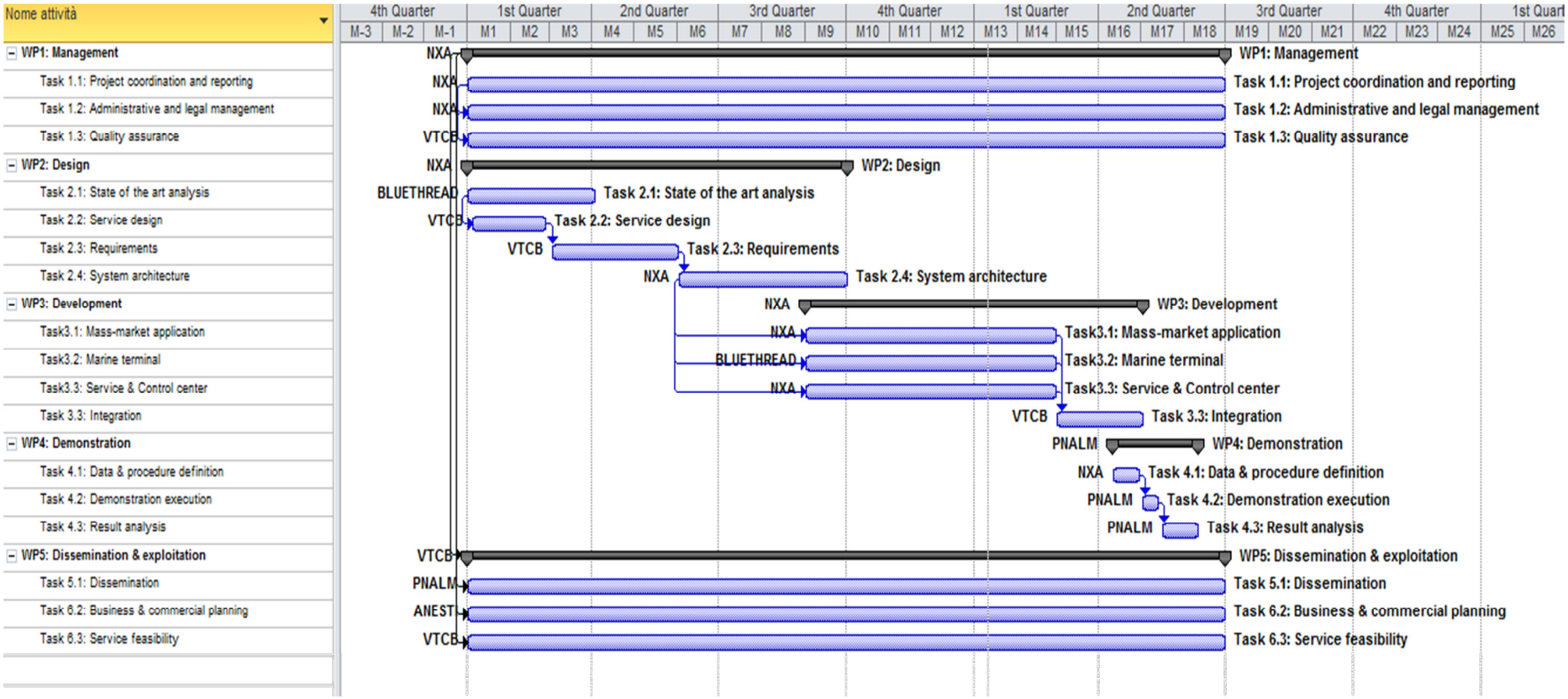

Figure 8: MEDUSE GANTT

1.3.3 Deliverable Item List

All the deliverables refers to the project starting date T1 (KoM).

Del. No.	Deliverable title	version	WP no.	Nature	Dissemination level	Delivery date
D1.1	Project Management Plan	1.0	1	O	CO	T1+2
D1.2.1	Progress report	1.0	1	R	CO	T1+3
D1.2.2	Progress report	1.0	1	R	CO	T1+6
D1.2.3	Progress report	1.0	1	R	CO	T1+12
D1.2.4	Progress report	1.0	1	R	CO	T1+15
D2.1	State of the art	1.0	2	R	PP	T1 +9
D2.2	User, system & functional requirements	1.0	2	R	RE	T1+9
D2.3	System architecture	1.0	3	O	RE	T1+9
D3.1	HW/SW prototype for the Control & Service Center	1.0	4.1	P	CO	T1+16
D3.2	HW/SW prototype for the User Terminal	1.0	4.1	P	CO	T1+16
D4.1	Demonstration Plan	1.0	5	O	RE	T1+16
D4.2	Demonstration Report	1.0	5	R	PU	T1+18
D5.1	Dissemination Plan	1.0	6	O	RE	T1+9
D5.2	Dissemination Report	1.0	6	R	PU	T1+18
D5.3	Project Web site	1.0	6	O	PU	T1+2
D5.4	Project leaflet	1.0	6	O	PU	T1+2
D5.5	Presentation for the general public	1.0	6	O	PU	T1+2
D5.6	Market potentialities, business and exploitation plan	2.0	7	R	RE	T1+18
D5.7	Exploitation Report	1.0	7	R	PU	T1+18

Table 7: List of deliverables

Nature:

R = Report

P = Prototype

D = Demonstrator

O = Other

Dissemination level:

PU = Public

PP = Restricted to other programme participants (including the GSA).

RE = Restricted to a group specified by the Consortium (including the GSA).

CO = Confidential, only for members of the Consortium (including the GSA).

1.3.4 List of milestones

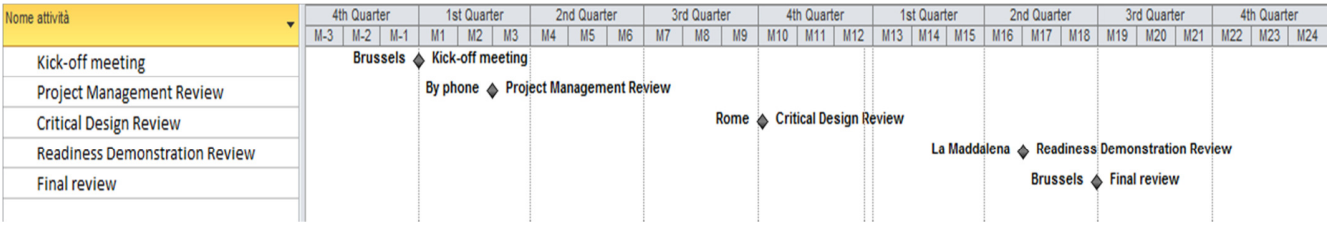

Figure 9: Project phase & reviews

The project milestones are strictly related to the preliminary project plan presented in section 1.3.2 of the project proposal.

Milestone name	Work package(s) involved	Expected date	Means of verification
Kick-off meeting	WP1	T1	Update project plan after the negotiation process must be available.
Project Management Review	WP1	T1+2	Formal presentation of the Project Management Plan
Critical Design Review	WP2,WP3	T1+9	The overall system architecture at the HW and SW level must be completed. Initial commercial feasibility study and initial market potentialities assessment must be available.
Readiness Demonstration Review	WP4,WP5	T1+16	The integration process must be completed and the system must be ready for the on-field demonstration activities
Final review	ALL	T1+18	Direct check of the project results on the basis of the user experience must be achieved.

Table 8: List of milestone

1.3.5 List of meeting and travel plan

Meeting description	Location	Participants from the Consortium	Nature	Expected date and duration
Kick-off meeting	Brussels	ALL	KoM	T1, 1 day
Project Management Review	By telephone	NXA	PMR	T1+2, 1 day
Critical Design Review	Rome	ALL	CDR	T1+9, 2 day
Readiness Demonstration Review	La Maddalena	ALL	RDR	T1+16, 2 day
Final review	Brussels	ALL	FR	T1+18, 1 day

Table 9: List of deliverables

1.3.6 Payment plan

The project payment plan is reported in Table 10. Payments are linked to the appropriated project milestones and given as a percentage of the expected overall EC contribution.

Percentage	Milestone	Expected date
30%	Kick-off meeting	T1
35%	Critical Design Review	T1+9
35%	Final review	T1+18

Table 10: Payment plan

1.4 Work Package Description

Work package Title	**Management**					**WP nr**			1
						Start date/event			Month 1
						End date/event			Month 18
Activity type	MGT								
Responsible partner	NXA								
Participant number	1	2	3	4	5	6	7		Total
Participant short name	NXA	VTCB	BLUETHREAD	ANESTI	PNALM				
Effort per participant (expressed in person-months)	4	2	0	0	0				6

Objectives: This work package covers the management of the project to ensure the completion of all deliverables in time and within budget. Specific objectives include:

- Manage the overall legal, contractual, ethical, financial and administrative aspects of the consortium
- Manage the technical and knowledge co-ordination aspects of the project to support the delivery of the various specified outputs on time and budget and at the required level of quality

Description of work: The main tasks which will be undertaken in WP1 are outlined below:

Task 1.1: Project coordination and reporting (NXA)

This task will address the overall project management including the development of a shared project vision and supervision of the RTD, demonstration and dissemination activities of the project as detailed in section 1.3 and 3.3. Key activities will include producing a Detailed Project Plan within the second month of the project based on a project management methodology used by the coordinator, thirdly progress reports and a final report on all activities including R&D, exploitation, dissemination.

Task 1.2: Administrative and legal management (NXA)

T1.2 will be concerned with managing the overall legal, contractual, ethical, financial and administrative aspects of the consortium as described in section 2.1.

Task 1.3: Quality assurance (VCTB)

A quality plan specifying quality criteria, measurements, controls and corrective mechanisms for all deliverables will be specified and implemented in an integrated manner with the review activities build in the Detailed Project Plan and project evaluation activities of WP5. It is acknowledged that quality assurance is a challenging task in collaboration projects and therefore special care has been taken to integrate quality principles in each of the project's RTD tasks.

D1.1 Project Management Plan

D1.2.x Quarterly progress reports

Work package Title	**Design**					**WP nr**			2
						Start date/event			Month 1
						End date/event			Month 9
Activity type	RTD								
Responsible partner	NXA								
Participant number	1	2	3	4	5	6	7		Total
Participant short name	NXA	VTCB	BLUETHREAD	ANESTI	PNALM				
Effort per participant (expressed in person-months)	5	7,5	3	0	3,5				19

Objectives: This work package will analyse user requirements, assess the technical feasibility of the applications and validate them versus these requirements. It defines the service requirements and the architecture of the entire system.

Description of work: The main tasks which will be undertaken in WP2 are outlined below:

Task 2.1: Technology State of the art (BLUETHREAD)

This task aims to review the state-of-the-art for all relevant technologies, tools, components and services available on the market and their trends to produce a valuable trade-off for the subsequent activities.

The most current research in the area of GNSS receiver and service paradigm will be considered outlining the most recent perspectives on this issue and pointing out the critical points and the needs for further research.

Task 2.2: Service design (VTCB)

The task aims at defining the foreseen services in term of target customers, defining quality to provide to the business communities, i.e. definition of the expected Quality of Service expected, and defining the coverage area

Task. 2.3: Requirements (VTCB)

This task will establish the technical and operational requirements of the proposed services, which will drive the MEDUSE design activities (as in Tasks 2.4). Requirements will be settled according to the service definition (Task 2.2) and the output of the state-of-the-art review (Task 2.1).

Task 2.4: System architecture (NXA)

Objective of this task is to design the operational service infrastructure able to support MEDUSE innovative service, enabling the demonstration and case studies. The infrastructure will be based on an open architecture, with distributed functions, that will allow the management of service from different contexts and functionalities. It has the objective to design the common platform that allows each of the elements constituting the system and all functionalities of each element, to interact correctly. It encloses sub-activities such as:

- Design of the Application instances (e.g. integration of the Framework, Persistent Data,

Components and Services) under the common elements of the platform ▪ Design the Components and Service Enablers (including reusing of existing systems and Components) Proper means to interface the above entities will obviously depend on the centre structure and on the external entity requirements, but baseline for this are always public standards. Contents of the interfaced data are obviously functional to the supported applications.
D2.1 State of the art report **D2.2 User, system & functional requirements** **D2.3 System architecture**

Work package Title	**Development**					**WP nr**			3
						Start date/event			Month 8
						End date/event			Month 16
Activity type	RTD								
Responsible partner	NXA								
Participant number	1	2	3	4	5	6	7		Total
Participant short name	NXA	VTCB	BLUETHREAD	ANESTI	PNALM				
Effort per participant (expressed in person-months)	12	14	6	0	0				32

Objectives: The objective of this work package is to:

- implement all the components of the MEDUSE system as identified in the Architecture (WP3)
- perform incremental system integration activity
- execute appropriated tests to validate the system

At the end of this work package the system will be ready for the demonstration phase.

It is worth to point out that the components/elements developed will be in a prototype state, allowing demonstrating the basic system functions and services but not readying for a production use.

Description of work: The main tasks which will be undertaken in WP3 are outlined below:

Task 3.1: Mass-market applications (NXA)

This task will focus on the implementation of the software application to be installed on the commercial "user terminals" of the MEDUSE architecture. The software will be developed for a specific Smartphone platform (Android, iPhone or Symbian is the initial set of candidates), but will be implemented with portability to other platforms in mind.

Task. 3.2: Marine Terminal (BLUETHREAD)

This task will focus on the implementation of the User Terminal component of the MEDUSE architecture in all its different versions ("basic" and law enforcement park management) but in a prototype stage, meaning that only a subset of the potential set of services/functions identified in the MEDUSE system architecture will be implemented.

Task 3.3: Service & Control Center (NXA)

Objective of this task is to implementation of the operational service infrastructure able to support MEDUSE innovative service, enabling the demonstration and case studies. The infrastructure will be based on an open architecture, with distributed functions, that will allow the management of service from different contexts and functionalities. It has the objective to design the common platform that allows each of the elements constituting the system and all functionalities of each element, to interact correctly. It encloses sub-activities such as:

- Implementation of the Application instances (e.g. integration of the Framework, Persistent Data,

Components and Services) under the common elements of the platform

- Implementation of the Components and Service Enablers (including reusing of existing systems and Components)

Proper means to interface the above entities will obviously depend on the centre structure and on the external entity requirements, but baseline for this are always public standards. Contents of the interfaced data are obviously functional to the supported applications.

Task 3.4: Integration (VTCB)

The integration task ensures the integration within the vertical tasks of WP 3 to create the complete MEDUSE system. Integration within the work packages is necessary to ensure that the expertise of the individual partners working on the different aspects are harmonised and integration between the work packages is necessary to ensure the cohesiveness of the complete system advocated by MEDUSE.

The system will be integrated in Rome at the NEXTANT premises.

D4.1 HW/SW prototype for the Control & Service Center

D4.2 HW/SW prototype for the User Terminal

Work package Title	**Demonstration**					**WP nr**			4
						Start date/event			Month 15
						End date/event			Month 17
Activity type	DEM								
Responsible partner	PNALM								
Participant number	1	2	3	4	5	6	7		Total
Participant short name	NXA	VTCB	BLUETHREAD	ANESTI	PNALM				
Effort per participant (expressed in person-months)	3	2	1,5	0	4,5				11

Objectives: The objective of this work package is to demonstrate the final system that we develop over the course of the project to our end-users. This is in effect a market trial from which we can obtain invaluable feedback including technical and user experience.

Description of work: The main tasks which will be undertaken in WP5 are outlined below:

Task. 4.1: Data & procedure definition (NXA)

This tasks aims at planning of the demonstration. Therefore scenarios will be aligned to the end users support possibilities and to the practical relevance. Requirements and Data to be received have to be defined

Task 4.2: Demonstration execution (PNALM)

Objective of this task is to demonstrate in the real cases, the results of the project activities. In this task pilots defined in T4.1 will be developed in order to verify if the implemented solutions satisfy the objectives fixed in the proposal. The pilots will be tested in the experimental environment before being installed in the users' sites. Appropriate logistics and appointment of suitable equipment is foreseen to maximize the impact in case of real events and in simulations.

Task 4.3: Result analysis (PNALM)

This task will perform an analysis of the data collected during the trial campaign, including user feedback, as well as an assessment of the results gathered.

This task consists in evaluate the effectiveness of the technology implemented in terms of performance (response time, reliability, etc.).

Thus the validation assessment will contain the following items:

- Compilation of statistics comprising qualitative as well as quantitative data derived from the trials executed, including technical performance.
- Assessment of the developed applications based on statistics generated taking explicitly the evaluation of operational benefits introduced by the demonstrator into account.
- Analysis of verification results and of their impact on the system security requirements.

D5.1 Demonstration Plan

Work package Title	**Dissemination & exploitation**					**WP nr**			5
						Start date/event			Month 1
						End date/event			Month 18
Activity type	OTH								
Responsible partner	VTCB								
Participant number	1	2	3	4	5	6	7		Total
Participant short name	NXA	VTCB	BLUETHREAD	ANESTI	PNALM				
Effort per participant (expressed in person-months)	1,5	4	0,5	2,5	1				9,5

Objectives: The objectives of this work package are:

To prepare a realistic business plan aiming at the commercial exploitation of the MEDUSE project's results in a pan-European scale.

To define different business models for the exploitation of the products and services developed.

To analyse the viability and profitability of each business model of the authentication service.

To elaborate alternative exploitation strategies for those project outcomes that cannot be commercialized following traditional business methods, such as knowledge, project best practices, criteria and guidelines regarding the application of new technologies, methodologies, reusable components, interoperability protocols, surveys results, etc..

To disseminate the research outputs of our project to the GNSS community, potential customers and the general public

Description of work: The main tasks which will be undertaken in WP6 are outlined below:

Task. 5.1: Dissemination (PNALM)

This task will be responsible for the main dissemination activities. It will begin with the production of the Project Presentation deliverable. This will be produced in multiple media, i.e. slide-show, report, poster and animated audiovisual presentation. This presentation will have 3 revisions. The first will be produced in the first 3 months indicating our proposed work. The second will be published after the architecture has been developed and the final will be published when the final demonstrator is available. NEXTANT will be responsible for coordinating the production of the project presentation and all partners will both contribute relevant material and be responsible for publishing a share of the leaflets. All partners will contribute presentations. MEDUSE intends to submit conference papers in all of the relevant research areas in which it is contributing. This task will also cover attendance at and preparation for special events. It is the aim of the consortium to attend at least two exhibitions or conference. To do this we need to prepare suitable material for the exhibitors; posters, demonstrations, and videos etc.: which will allow the task of attending these exhibitions to be spread fairly among the consortium. PNALM will be responsible for coordinating the special event attendance but all partners will contribute material and take turns in

attending.

Task. 5.2 Business & commercial planning (ANESTI)

This activity will run for the whole duration of the project and through a specific methodology will monitor the current market status and conditions as well as the latest business and technological developments in the area of GNSS LBS services. This task will analyse related market reports in order to explicitly define market trends, challenges and barriers. This information will serve as valuable input to the exploitation partners in order to a) identify the value proposition of the proposed authentication service b) their potential competitors and c) position themselves in the most promising market segments. To maximise the impact in the market we will identify using well-defined measurable market and business criteria those exact categories of LBSs that MEDUSE could impact more and define market-driven strategies per sector to maximise that impact both in business and in social utility terms.

Task 5.3: Service feasibility (VTCB)

This activity aims at assessing all aspects related with commercial services provision for the purpose of characterising those service models which provide the best expected revenue to cost ratio. Specifically, different service provision schemas shall be identified and described with respect to variable parameters such as definition and content of different functional service packages, different user terminal distribution profiles and distribution mechanisms, service payment schemas and associated prices, partnership schemas among different services provision actors. Different possible solutions shall be analysed per-se and in relationship with market analysis results in order to specify best promising commercial services characteristics.

D5.1 Dissemination Plan

D5.2 Dissemination Report

D5.3 Project Web site

D5.4 Project leaflet

D5.5 Presentation for the general public

D5.6 Market potentialities, business and exploitation plan

D5.7 Exploitation Report

1.4.1 Summary of staff effort

Participant nr.	Participant short name	WP1	WP2	WP3	WP4	WP5	Total person months
1	NXA	4	5	12	3	1,5	25,5
2	VTCB	2	7,5	14	2	4	29,5
3	BLUETHREAD	0	3	6	1,5	0,5	11
4	ANESTI	0	0	0	0	2,5	2,5
5	PNALM	0	3,5	0	4,5	1	9

Table 11: List of effort/Partner

2 Implementation

2.1 Management structure and procedures

This section presents the project's management process that will be established for controlling the project and the team being responsible for the administrative, technical and scientific aspects of the project. It also covers all relative decision making structures, the communication flow within the consortium, quality assurance measures, risk management policy and the procedures for resolution of disagreements within the Consortium.

2.1.1 Project Management approach

The proposed approach to Project Management provides the project with:

- a controlled and organised start, middle and end regular reviews of progress against the Proposal and against the proposed plan;
- flexible decision points;
- automatic management control of any deviations from the plan;
- the involvement of management and stakeholders at the right time and place during the project;
- good communication channels between the project, project management, and the rest of the organization.

The methodology implemented for the project is able to:

- use a defined structure for delegation, authority and communication;
- divide the project into manageable stages for more accurate planning;
- ensure resource commitment from management is part of any approval to proceed
- provide regular but brief management reports;
- keep meetings with management and stakeholders to a minimum but at the vital points in the project.

It is important to note that many of the processes within project management are iterative because of the existence of, and necessity for, progressive elaboration in a project throughout the project's life cycle. That is, as a project management team learns more about a project, the team can then manage to a greater level of detail.

2.1.2 Management Structure and Techniques

The management of the project will be organised in the following:

- The Project Coordinator, from the coordinating partner, is the main reference for the project partners and the first interface for the Commission in the management of the project. NEXTANT will appoint the Project Coordinator.
- The Project Board is composed by the Project Coordinator, and senior management representatives from each partners. It is chaired by the Project Coordinator. It manages the project by exceptions, monitors through periodic reports and controls during well scheduled meetings. It supports the Project Manager in case of problems which are outside its authority, such as:
    - conflicts between partners;
    - external events;
    - directions when options are available.

- The Project Manager is the main reference for the project board and for the Commission in the day-by-day management of the project. It is support by the Project Management Team, a structure created to provide the PM with specialized skills which may not be under its complete control.
- The Project Management Team
    - a Quality Assurance Manager defines the quality standard defined for the project and ensures that are correctly followed during the entire project life;
    - a Risk Manager monitors continuously the Risks associated to the project and proposes the eventual mitigation actions.
- Work-package Technical Manager has the responsibility of project work-packages and the execution of each task included in the work-package. Appointed at the proposal stage, each single WP has its own WP leader. It organises the suitable contacts between the partners participating to the specific activities and is in charge of producing the project deliverables associated to the WP. It reports directly to the PM.
- Technical Management Board is composed by the PM and the WP project manager to coordinate the technical work and assure a technical coherence between the different WP.
- Task Leaders have the responsibility of tasks included under the work-package. Each single tasks has its own TM, which organises the technical work and coordinates the development team. It is the ultimate responsible for the results from a technical point of view from all the partners and supports the PM in all the technical aspects of the project.

Project Coordinator

He is the supporting interface towards the EC (in cooperation with the Project Manager) for all the partners of the consortium, the responsible for the submission of quarterly management reports to the EC, and he ensures that the Consortium fulfils all its contractual responsibilities towards the Commission, including those in respect of submission of cost statements. PC receives all the payments made by the Commission and transfers those intended to other Partners within the receipt of the funds according to the contractual rules. Finally, he assigns responsibility within each participating organisation to co-ordinate issues relating to exploitation, dissemination and IPR.

Project Manager

The Project Manager is in charge of the day-to-day running of the project, with responsibility for taking and implementing appropriate decisions, agreed between the Project Board, to the benefit of the project.

The project manager is the person responsible for accomplishing the project objectives. Managing a project includes:

- identifying requirements;
- establishing clear and achievable objectives;
- balancing the competing demands for quality, scope, time and cost;
- adapting the specifications, plans, and approach to the different concerns and expectations of the various stakeholders.

Technical Management Board

The Technical Management Board, composed by technical experts from all the partners, is managed by the Project Manager and handles the technical management and execution of the project. It defines the project approach and implements the technology strategy for the project. It chooses techniques and monitors of results of each tasks. The TMB will work extensively by using electronic mail and Web based bulletin boards and will meet on regularly basis.

Work-package Technical Manager

The WP leaders are responsible for the following:

- co-ordinating the technical work at WP level;
- produce the deliverable expected from the Work Package and is responsible for the review process, supported by the TMB;
- giving technical instructions to the Partners' team, in consultation with the TMB;
- preparing the WP contributions to the Project official Reports towards the Commission;
- notifying the PM of every schedule deviation or technical difficulties;
- notify any technical issue to the PM

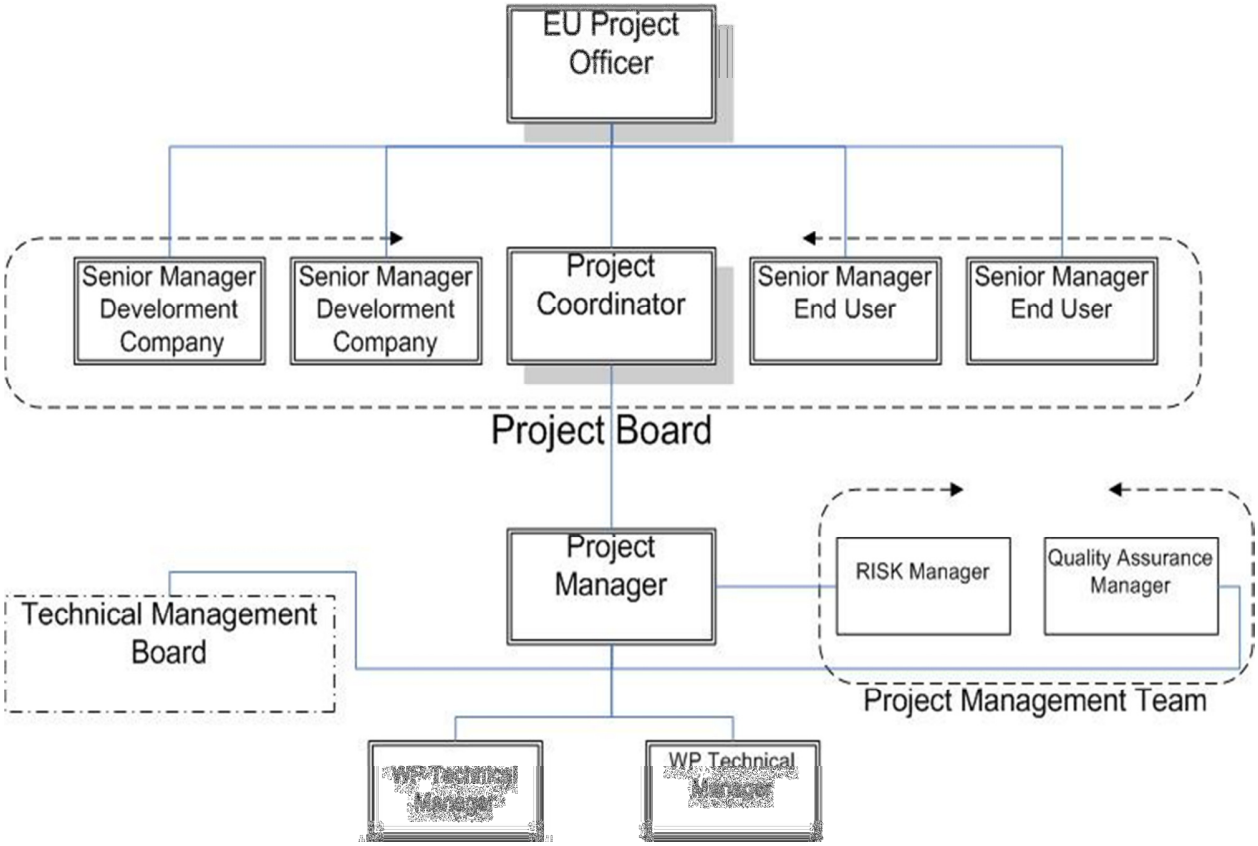

Figure 10: Project Management Structure

2.1.3 Conflict resolution

The decisions at work-package/ task level will be taken, as a general rule, by unanimous agreement by all partners involved in the work-package and present at a work package meeting. In extreme cases when this is impossible, the decision will be made by a majority vote. The voting procedures and requires level of consensus will be defined in the project handbook. Conflict resolution is done at the lowest possible level, following the below sequence:

- Within work package with the help of work package leaders and relevant site managers or between partners where applicable and possible.

- In Technical Management Board if it is a technical problem and it can be resolved without changes in controlling documents and if solution is acceptable to partners project managers.
- In Project Board by making use of consensus agreement and after advice from Steering committee where relevant.
- By the use of the consortium agreement if possible, see paragraph 3.3.2.
- By proposing a contract amendment to the Commission.

The decisions at Project Board level will be taken as follows:

- Each relevant decision concerning resources, rescheduling or re-planning shall be formalized by the originating party and addressed to each Board member for the purpose of information or action, thus ensuring that all partners and team leaders are at all times fully informed.
- The decisions on issues relevant to the contract will require a unanimous vote, e.g., review of and making proposals to the EC for amendment of:
- The terms of the Contract and its annexes.
- Cost and time schedules under the Contract and its annexes.
- Termination of the Contract.

All other decisions are to be taken on simple majority rules of the parties presented in the Board meeting unless the decision is unduly unfavourable to one or more of the partners. WP1 will continuously assess the project identifying and managing the unique aspects of the project that might prevent the development of suitable systems on-time and within budget. Risk management methodology described in more detail in section 2.3 will be used to track risks, assigning ownership and mitigation strategies.

The consortium will identify the factors that are critical to the final success of the project and control these factors. For this purpose, the consortium will define methods and procedures to identify, assess, monitor and control areas of risk. The challenge underlying the project has been carefully analysed. Significant risks and contingency plans have been already identified, and for each one a possible contingency solution has been selected. These risks were related in section 2.3.2.

2.2 Quality management

Quality Management is the process of ensuring that the quality expected by the European Commission (EU) for the products to deliver is achieved. It encompasses all the project management activities which determine and implement the Project's Quality Plan.

Project quality planning will cover the following agreements to ensure that the project delivers to the expected level of quality:

- how each product will be tested against its quality criteria;
- when each product will be tested against its quality criteria;
- by whom each product will be tested against its quality criteria.

A Quality Review is an involved partnership designed to ensure a product's completeness and adherence to standards by a review procedure. The benefits to be gained from the effective use of Quality Reviews are:

- a structured and organised approach to the examination of subjective quality criteria;
- early identification of defects in products and, therefore, a platform for product improvement with attendant reduction in the costs of the final product during development and in operation;
- as products are considered complete once they have successfully passed Quality Review, an objective measurement for management progress control is provided; progress is measured by product delivery;

- all vested interests are working together to improve product quality; this helps build the team approach to development;
- once a product has gone through the Quality Review procedure, personnel are more willing to commit to that product. As ownership of the product is shared between Quality Review participants, Users, who are represented on the Quality Review team, are much more willing to sign off a reviewed product;
- apart from defects on the part of the creator(s), defects may also be caused by deficiencies in standards and methods. Failure to use a standard may indicate that the standard is no longer practical to use. Such events should instigate a review of the suspect standards area and provide a starting point for standards improvements.

2.3 Risk Management

2.3.1 Responsibilities of Risk Management

While the project manager is the responsible toward the Project Coordinator of the risk management practice, the implementation of the risk management process is under the Project Management Team and in particular of the Risk Manager. Nevertheless every team member is required to support and help in it.

To determine the level of a risk, the project manager relies on the risk manager and on several “technical experts” since the final judgement on the rating of risks on a project is based on personal criteria.

The activities connected to risk management are costly and for these aspects the Project Manager is responsible for the provision of the resources and for the scope of the activities whose cost must not exceed the eventual cost connected to the must disruptive risk.

2.3.2 Project Risk Log

The risk log contains all risks to the project that have been identified. Explanations of the fields in the risk log are outlined below.

No	Description	Likelihood	Severity of Effect	Counter Measures	Risk Type (B, P, S)
1	The technical requirements of the project are complex	H	H	Use open standards and architectures to ease the integration Utilize design documents to clearly layout how technology fits together Review the proposed solutions by a pool of experts	S
2	The number of system interfaces is high	M	H	Use a flexible technology for the interface as possible Test Interfaces as early as possible	S
3	The subject matter is not well known by the project team	L	L	The involvement in the project of relevant end-users as partners and the plan to involve other end-users organization during the	S

No	Description	Likelihood	Severity of Effect	Counter Measures	Risk Type (B, P, S)
				project contribute to a clear and usable definition of the requirements Long duration of WP for gathering, understanding and documenting the requirements Long duration of WP for application analysis and design activities	
4	The technology being utilized partly reuse existing software and hardware	M	L	Ensure that an impact analysis is conducted before adopting new technology Set-up an independent test environment	S
5	The partners are familiar of the market	L	L	Verify the market diffusion of the proposed solution Involve the end-user in the process of acceptance of the solution	S

Table 12: Risk log

Key to Risk Log:

Risk number allocated: Unique identifier for each item in risk log.

Description: Summary of risk

Likelihood of occurrence: Provides an assessment on how likely it is that this risk will occur. Classifications are: L-Low(<30%) , M-Medium (31-70%), H-High(>70%).

Severity of effect: Provides an assessment of the impact that the occurrence of this risk would have on the project.

Counter measures: Action to be taken to prevent, reduce or transfer the risk. This may include production of contingency plans.

Risk type (business, project, stage): Classification of the risk, business risks relate to delivery of achieved benefits, project risks relate to the management of the project such as timescales and resources, stage risks are risks associated with a specific stage plan.

2.4 Consortium

The consortium consists of the following participants:

The Co-ordinator and Principal Contractor of the Project **NEXTANT Spa** is an Italian, private owned, ICT Company based in Rome, classified as SME according to the European Commission classification (96/280/EU).

The mission of NEXTANT is to develop and propose to the proper market sectors, innovative applications and services based on ICT and Satellite services (Navigation, Telecommunication and Earth Observation). To this purpose the Company has invested on Research and Innovation projects, accessing European and National funding, and in particular following the stream of R&I activities related to Satellite Navigation.

NEXTANT aims at completing the TTA process, through the industrialization of the prototypes and demonstration components, and packing them into competitive solution to propose to the market sectors requiring high degree of innovation.

In particular for the sectors Infomobility, Emergency Services, Cultural Heritage (safeguard and fruition), Maritime and Air Traffic Management, NEXTANT has already completed the process, and some of its solutions are already operative, as "systems", "services" or IT platforms:

- VECTOR: "real time monitoring system for sensitive items transportation" to monitor and control "sensible goods" such as: Cultural Assets, Fresh and Frozen Food, or Dangerous Materials, valuable goods. For the Vector application NEXTANT has also designed an innovative set of mobile terminals, integrating communication, GNSS receiver, sensors (temperature, shock, etc.)
- NESS: "Emergency Support System" is to support the Emergency Services organization (Fire Brigade, Law Enforcement, Civil Protection etc.) to intervene, to manage, to monitor and to control critical emergency situations. NESS is operative in the Fire Brigade of Rome, and is going to be installed at Regional level (Region of LAZIO).
- D3 is an IT platform to develop enhanced 3D Command and Control Centre, 3D Radar Display or Cultural Heritage fruition applications.

Relevant work and Role in the project:

NEXTANT will coordinate the project, in order to reach its objectives, design the overall architecture of the system, utilizing at the maximum extent the experiences and components (HW and SW) already available in the Team, and facilitate the integration of the innovative technology proposed in Meduse with the real needs of the User, in order to prepare the way forward to fully operative innovative applications, triggered by the Navigation services..

The key personnel involved in the project are:

Name	**Massimo Pichini**	Company	**NEXTANT SpA**
Date of birth	1962	Nationality	Italian
WPs contribution and Role in the project			
Position	Project Coordinator		
Present job & responsibilities			
	Technical Director		
	Relevant Work Experience		**Benefits to the Project**
2006 to present –	As Technical Director at NEXTANT Spa he is responsible of: • NEXTANT IT infrastructure • Turn-key systems development • Emergency Service product line. NEXTANT Spa has in its portfolio an Emergency Management Support system (NESS©) that is being operated since 2008 by the Rome Fire Brigades for the daily emergency management ▪ Sensitive Asset Transportation product line. NEXTANT Spa has developed a system (Vector©), that is being used by one of the main Europe players in the market of the cultural asset transportation for the monitoring of all their		As turn-key system responsible at NEXTANT he coordinates with the project managers to ensure that projects are delivered on time and within the allocated budget. It supports the project managers in dealing with project risks and their recovery plan and execution.

	transports. The system is operated as a "Service", hosted in the NEXTANT Data Center	He is also responsible for defining the road map for the technological evolution of the company IT infrastructure and ensure also a correct understanding of the technical implications of user requirements and needs.
2002 to 2006	Principal Consultant – Capgemini Spa ▪ Responsible of the design, implementation and validation of a distributed component framework that was adopted by a major Italian company in several military and civilian projects. ▪ Responsible for a technology evolution program for a major company operating in the military defence market. This project impacted different departments of the customer (system engineering, software development, integration and logistic support, ...) and lasted two years	
1998 – 2002	Project Manager/Team Leader at Webbridges Srl Responsible of several projects for the European Space Agency the most relevant being the Multi Mission User Information Services Product Server and Order Front-end Server	
1984 to 2002	Programmer/Team Leader – Intecs In the fifteen years at Intecs Spa he was engaged on several (military, telco, civilian, space) projects, with different roles, starting as a junior programmer up to project manager of space projects.	
Education		
2004 Solaris High Availability Foundation Services (Sun Microsystem) 2004 Project Manager certificate (Capgemini University) 2003 System Architect certificate (Capgemini University) 1981 Computer Science high school		

Name	**Silvio Martufi**	Company	**NEXTANT SpA**
Date of birth	1973	Nationality	Italian
WPs contribution and Role in the project			
Position	Technical Coordinator		
Present job & responsibilities			
	Technical Manager		
	Relevant Work Experience		**Benefits to the Project**
2006 to present –	As Technical Manager at NEXTANT Spa he is responsible of: • NESS Emergency Support System design and development, leading the team that developed the		Proved technical management experience and team leading.

	system. NESS is being operated since 2008 by the Rome Fire Brigades for the daily emergency management ▪ GALSEE AIV Data Tools development, leading the team that developed a set of data conversion tools supporting the Galileo GALSEE subsystem integration and test. ▪ SafePort mobile terminals GPS signal authentication and digital signature of messages exchanged with the control center ▪ Responsible of the INFOSAT system integration and validation task. INFOSAT is a project funded by the Italian Space Agency that aims at defining a set of services in the area on the intelligent mobility (virtual LTZ, road tolling, traffic data collection and distribution …) that will benefit from the GALILEO GNSS services.	Ensure projects are delivered on time and on budget. Very good understanding of "real" user needs and strong communication skill. Highly skilled in mobile terminal applications (currently working on iPhone terminal for SafePort)
2003 – 2006	Software Engineer – Kataweb Spa Responsible of the design, development and validation of several sites of the Kataweb portal.	
Education		
2011 Model Driver Architecture (internal course, starting in January) 2011 Air Traffic Control Systems (internal course, starting in January) 2001 Object oriented analisys & design with UML (Object Way) 1999 Bachelor's degree in Computer Science Engineering		

The Contractor **VITROCISET Belgium** (VTCB) is a company (at present around 70 employees) established in 1988 (first as Ciset International, than from 2002 as VITROCISET EPB and since 2008 as VITROCISET Belgium) by its mother company VITROCISET S.p.A. (Italy) for the purpose of progressively inheriting all the competence and expertise of its mother company in the space domain.

Throughout its yearly activities VTCB has gained a proven experience and in-depth knowledge in the field of system engineering, system integration, management, operational and technical support services, developing and implementing processes work-flow for a wide range of organizations in various business areas.

As Service Company, VTCB is structured to provide a responsive service delivery whose primary goal is ensuring at all time the highest levels of user satisfaction in operations activities, technical assistance and logistic support for system with high complexity and high availability levels.

In the specific GNSS domain, VTCB has being deeply involved in the development of Galileo system since phase C0 with responsibilities in:

- Ground Mission Segment (GMS) Galileo Sensors Stations (GSS) deployment;
- GMS Network (MDDN) contribution to integration and deployment;
- GMS Integrated logistics support (ILS);
- Ground Control Segment (GCS) ILS software tools delivery and integration;
- Contribution to In Orbit Test (IOT) activities;

- Contribution to Spacecraft Control software development;
- Galileo GSS maintenance (based on performance driven service level agreements).

In addition, since 2005 VTCB has inherited from VITROCISET S.p.A. competences related with GNSS based applications development, being involved on a number of initiatives in this respect funded by the European Space Agency, the most recent of which are Satelbus (fleet management and bus on demand) and SSMART (dangerous goods transportation tracking and tracing).

Thanks to the above experiences, VTCB constitutes currently a reference company for the administration of the Wallonie Region for what concerns the fostering of local incubation processes in Wallonie around GNSS applications. Within this role VTCB actively participates to different working groups on GNSS applications, such as Eurospace and Nereus (as an external auditor).

We deem that the "system wide" experience of VTCB, in particular for what concerns the system integration and the commercial provision of performance based operational services, coupled with the knowledge and involvement in the areas of innovative GNSS applications developments and associated groups of discussion shall ensure an effective fulfilment of COSMEMOS project as well as exploitation objectives.

Relevant work and Role in the project:

VITROCISET Belgium is involved in all the activities and workpackages of the project. In particular VTCB has the responsibility to coordinate the Dissemination WP.

The key personnel involved in the project are:

Name	**Myriam Nemry**	Company	**VITROCISET Belgium**
Date of birth	1961	Nationality	Belgian
WPs contribution and Role in the project			
Position	Technical Coordinator and R&D Responsible		
Present job & responsibilities			
	Project Manager		
	Recent Work Experience		**Benefits to the Project**
Oct 2010	Senior Systems Engineer and Project Manager - VTCB Acquired at VTCB with the role of Technical manager of software development projects and senior software engineer. VTCB implements new systems heavily related to the provision of operational services mainly based on ground data processing systems. These are running in a complex distributed systems architecture whose design involves standard technologies as CORBA, Eclipse RCP, JAVA and C++		Long experience in the technical management and conduction of multi-platform operational systems and services. Good experience in customer-driven design and architectural trade-offs. Excellent experience in the provision of optimised application software solutions.
Nov 2006 Sept 2010	Senior Systems Engineer - HAULOGY.NET Employed by the Haulogy.Net, involved in design and developments and maintenance of applications and monitoring of transactional operations for three clients. Analysis in collaboration with the client and development of		

	a web application used to track the evolution of the situation of low skilled unemployed persons being in relation with a placement A.S.B.L Mirena, Namur Design and development of modules integrated into a product line management system for the aerospace company Sonaca. Design and development of a management system for the exchange of messages between energy suppliers (electricity or natural gaz) and other operator of the energy market : format conversion (EDIEL - XML), message reception and storage of their content in a relational DB, update of business processes representation , generation of EDIEL messages on demand. Analysis of the data model and in the choice of system architecture designed as a set of modules communicating via a enterprise messages system. Technical Environment: ▪ OS: Windows, Linux or UNIX. ▪ DBMS: PosgreSQL or Oracle ▪ ESB : OpenMQ ▪ Languages: Java (libraries JAXB, STAX, JPA, JMS, JAX-RS, ZK...), C++, Python, Bash, XML (XSL, XSD) ▪ Product line management system: PVM (Dassault product) and Protocol E DIEL for exchanged messages between operators of the energy market (E DIFACT format). ▪ Documentation: OpenOffice - Latex. ▪ Version management and monitoring of corrective maintenance: SVN, JIRA.	
Education		
Sept. 1979 June 1985: Masters (licences) in physics and computer science. June 1983: Aggregation for teaching in secondary school.		

Name	**Olivier Schmitt**	Company	**VITROCISET Belgium**
Date of birth		Nationality	
WPs contribution and Role in the project			
Position	Service Modelling and Promotion Manager		
Present job & responsibilities			
	Senior Service Analyst		

	Relevant Work Experience	Benefits to the Project
2005 to present –	Within the Galileo project (IOV phase) and GNSS applications services development, responsible of: ▪ Model and analyse the provision of Galileo technical/operational services by VITROCISET Belgium and its subcontractors and define performance based associated Service Level Agreements. ▪ Model and analyse services components and service provision methods and constraints within Galileo based applications. ▪ Define service requirements applicable to the Galileo elements to ensure that operational activities are in accordance with the applicable Galileo standards. Follow-up and verify results of subcontractor's activities and provide technical support to Galileo companies on operational services. ▪ Participate as VITROCISET Belgium member to working groups related with GNSS system and applications services development. ▪ Coordinate local incubation initiatives managed by VITROCISET Belgium for the development of GNSS applications.	Solid experience in performance based operational services definition and analysis. Strong analysis, communications and organisational skill necessary for the management of project promotion and exploitation activities. Contact with main potential recipients of project promotion activities through participation to GNSS working groups on systems and applications.
2004 to 2005	Michael Page Engineering (B) Engineering Recruitment Consultant ▪ Responsibility for the full recruitment and selection process. ▪ Prospecting and regular contacts with companies in the automotive, aerospace and process industry. ▪ Analysis, Definition and follow-up of clients' specific engineering /supply chain recruitment needs.	
Education		
2005 Certificate in Supply Chain Management at FOREM Mons, Belgium 2003 Certificate in Industrial Property at University of Louvain-la-Neuve, Belgium 2002 Graduated with a Bachelor Degree in Mechanical Engineering at University of Coventry, UK		

The Contractor **Blue Thread** (www.blue-thread.it) is a small and flexible company that offers innovative products and solutions based on satellite technology mainly addressed to marine sector.

Blue Thread has been awarded in 2010 as regional Winner at European Satellite Navigation Competition for the proposed project Marine Telepass, an innovative system targeted to leisure crafting, for enabling an easy and

remotely controlled access to marine reserves, and in general to protected areas subject to International, National or Regional regulations and navigation restrictions for their access.

More details of the project awarded as regional winner in European Satellite Navigation Competition 2010 (Galileo Masters) are available at:

http://www.galileo-masters.eu/index.php?anzeige=final10_lombardy.html

Blue Thread has recognized experience in the ambit of Navigation Technology, and in the use of Satellite Technologies for innovative marine applications. A significant project, named Space Compass, in 2010 consist of the development of an innovative Satellite Compass using GNSS technologies for retrieving the accurate heading measurement of a boat. The device has been development in cooperation with European Space Agency, that supported Blue Thread with a Technology Transfer program from Space technology to Industry.

http://www.esa.int/SPECIALS/Business_Incubation/SEMT183KV5G_0.html

In 2009 and 2010 Blue Thread has also consolidated an R&D cooperation with Tor Vergata University in Rome and Danish University of Aalborg for the development of high precision navigation system for Channel and Fluvial navigation and restricted waters.

Relevant work and Role in the project:

Blue Thread will be responsible for the design and development of the on board terminal. As described in paragraph 1.2.1 the user device is characterized by embedded positioning and transmission capability and programmable working parameters, enabling the reporting of navigation data to the monitoring center. Blue Thread will exploit its experience in Satellite Navigation and its knowledge of the market segment of leisure recreational yachting, to contribute to the definition and implementation of the system requirement that can guarantee an optimized usability of the terminal and efficiency of the whole system.

The key personnel involved in the project are:

Name	**Giacomo Mangani**	Company	**Blue Thread**
Date of birth	January, 24th 1965, Florence (Italy)	Nationality	Italian
WPs contribution and Role in the project			
Position	Blue Thread Project Manager		
Present job & responsibilities			
	Managing Director Blue Thread		
	Recent Work Experience		**Benefits to the Project**
2009- to date;	**Blue Thread S.r.l**. (www.blue-thread.it), Rome, Italy Managing Director and co-founder: Space Technology		Long experience in product and project management, in the segment of telecommunication and satellite navigation devices.
1996-2008	**Ericsson Telecommunication** S.p.A., (Rome/Stockholm) Product Manager mobile networks System Engineer, Test Coordinator wireless broadband access systems, ADSL I&V Software Designer wireless broadband access, ADSL, DECT		
Education			
1998, Quality Systems and Certifications (CMM, Sigma6, ISO 9000)			

1995, Certification in Project management 1993, University of Florence, Florence (Italy) Degree in Electronic Engineering 1992, Westminster University, London UK Doctoral stage on Neural Networks applied to GSM Technology

Name	**Alessandro Cantore**	Company	**Blue Thread**
Date of birth	November, 11th 1967, Orbetello (Italy)	Nationality	Italian
WPs contribution and Role in the project			
Position	Blue Thread Technical Coordinator		
Present job & responsibilities			
	Managing Director Blue Thread		
	Recent Work Experience		**Benefits to the Project**
Oct 2010	**Blue Thread** S.r.l. (www.blue-thread.it), Rome, Italy Managing Director and co-founder: Space Technology		Long experience in project management, filed trials, Product introduction, system integration in satellite navigation and telecom field.
2000-2010	**Ericsson Telecommunication** Responsible of Integration and Verification of Ericsson Optical Networks devices. Mobile back-hauling, Multi-haul (MHL3000), Ethernet and SDH transport technologies. QoS verification and capacity planning. Simulation and analysis tools. Interoperability Metro Access and core apparatus (DSL, Multi-haul) and Network Management system. Verification of transport protocols (Ethernet, Ethernet over SDH, MPLS, and Waveleght Division Multiplexing) and overlaying IP application. Demo to customers. First Office Application Project Manager for LMU (location measurement Unit, for mobile positioning in radio network). I coordinated Customer Acceptance testing, live test and system roll-out for the American customers, at the customers' premises in Cingular (Pleasanton), Voice Stream (Seattle), AT&T (Dallas), till the declaration of *Ready for Service* for Mobile Positioning System 5.0. I was member of Product Introduction board, interfacing the customer and planning release and system upgrades.		
Education			
2005, Università di Tor Vergata, Roma Master degree in "Enterprise Engineering" 1996, Università di Tor Vergata, Roma Degree in "Electronics Engineering" 2008, Certification in Project management, Istituto Italiano Project Management			

The Contractor **ANESTI Ltd**. is incorporated in England and Wales under the Companies Act 1985 as a private and limited company (nr 4470801).

Established in Oxford by a group of former University members the company has operated in the fields of energy, transportation, logistics, electronics and chemicals acting as consultant to various public bodies as well to private companies throughout Europe and the Far East. In Italy operates through a local Branch.

ANESTI has relevant working references having cooperated with rolling stock and mass transit manufacturing companies.

It specializes in the fields of corporate organization, competitive benchmarking, product and service strategies, forecasting and financial.

In this latter area ANESTI has also wide experience having consulted various regional governments in the field of Venture Capital legislation and incentives. It cooperates currently with Federchimica Italy on venture capital projects.

ANESTI has been consulting with contractor companies supplying equipment and services to shipyards both in Italy (Cantieri Navali di Livorno/Grimaldi) and France (Chantiers de l'Atlantique).

ANESTI also operates as consultant in the field of internationalization.

Relevant work and Role in the project:

Anesti will lead the Business Plan and Market analysis activities in the Meduse Project.

The key personnel involved in the project are:

Eutimio Tiliacos is specialist in market analysis, business models and value chain analysis, risk analysis, company's restructuring, organization, with special focus on management-by-process, "lean organization", team-work, networking, peer evaluation. Has spent (see below) long time working or consulting with manufacturing and service companies in the energy, ICT, transport and logistics sectors; in addition has been for long time (and still is) advisor to several associations of freight forwarders and manufacturers. Also acts in connection to a company (Global Financial) based in California USA to explore the European market for Venture Capital investments.

He has done extensive work in Asia, Europe and United States for contractor companies operating in the field of infrastructural projects and resource management. In this capability –in the course of the career- has co-managed as CFO in charge of financing and controllership several important projects in Europe, US and **particularly in the Middle and Far East,** (among the latters):

- Emirates Tower Building, Dubai-Emirates;
- Bank of China Building in Beijing;
- Hong Kong international airport of Chep Lap Kok;
- Sha Tin (HK) water treatment plant..

He is also a **"Business Reviewer"**, on behalf of GSA, of the projects:

SCUTUM **http://www.scutumgnss.eu/**

SAFEPORT **http://safeportproject.com/**

GOLDEN ICE **http://www.golden-ice.eu/**

GRAIL-2 **http://www.gsa.europa.eu/index.cfm?objectid=A2E87F8C-BF2C- 99AE-1F75773D2F16EF17**

He is in charge as Executive Director of the project to set up a regional Venture Capital Fund in Lazio (Italy). The financial endowment of the VCF by the Region Lazio has been authorized by the European Commission on the 1st of September 2010 as compliant with the going rules on competition.

The Contractor **Parco Nazionale dell'Archipelago La Maddalena** was the first national park to be established in Sardinia, with a law approved in 1994, and is the only one in Italy consisting of the entire territory of a single town.

The National Park of La Maddalena is managed by an administrative board, a non-profit public agency (italian "ente pubblico non economico"), which was instituted by a Decree that the President of the Italian Republic issued on 17 May 1996.

The administrative board is composed by:

- the President and the Board of directors;
- a Manager;
- an advisory body called Comunità del Parco (Park Community) within are represented the Municipality of La Maddalena, the Province of Olbia-Tempio and the Region of Sardinia;
- an auditor body.

According to this Decree and to the italian Law that regulates national and regional parks (Law n. 394 issued in 1991), the Park's policies and management priority for development may be resumed in the following:

- protecting, upgrading and increasing the value of the park's natural, historical and cultural resources;
- developing human activities compatible with the various uses made of the Park, connected with fishing, navigation, traditional shipbuilding;
- preserving and restoring natural vegetation;
- using eco-friendly sourcers of energy;
- upgrading of existing structures and facilities.

Relevant work and Role in the project:

The PNALM will support the consortium in the design WP, by providing the requirements of the services and the necessary information on the legislative and normative issues. Most importantly it is the leader of the Demonstration WP assuring the verification and validation of the services implemented.

The key personnel involved in the project are:

Giseppe Bonanno is the president of the Ente Parco Nazionale dell'Arcipelago di La Maddalena from 2007, having be the special commisioner of the Ente one year before his election as president. He coordinates the activities of the project for the establishment of the newly created international park "Bocche di Bonifacio". He manages the project ReTraParc for the building of the network between the Parco Nazionale dell'Arcipelago di La Maddalena, the Parco Nazionale dell'Asinara, Riserva delle Bocche di Bonifacio, Parco Regionale di Porto Conte, Provincia di Sassari.

He worked as teacher at the University of Sassari for teh course "Ecologia del Territorio e del Paesaggio".

2.4.1 Consortium as a whole

The description of the project clearly demonstrates the complexity of proposed project and the ambitious objectives to be met. In fact the project includes activities that range from investigation and specific studies on

the operative behaviour of the different corps and organizations to research on selected technologies associated to a particular user needs devoted to a particular User Community and from integrate existing technologies and systems to studies on the standardization, regulation and certification issues for new services and applications deployed and at the same time to develop, deploy and assess all the technical and procedural outputs.

It is clear that in order to meet the overall objectives identified by the project it is required that the project consortium is composed by companies, organizations and research centres with different profiles, going from multi-disciplinary experiences including, but not exhausting, user representatives of different User Communities, sound experienced system integrators, specialized technology developers, standardization experts, etc..

Therefore the project consortium shall have the appropriate representation from the different aspects coped by the project and built upon the above mentioned considerations and includes three main complementary groups of companies and organizations:

- End-users: representatives including final users, specific domain experts and governmental and non-governmental organizations;
- Technology partners: the technology partners involve leading SMEs with a sound research and development records in all the technological sectors coped with the project.

A close cooperation among partners is essential to exploit the appropriate synergies suitable to optimise the project outputs.

The rationale that drove the consortium composition can be summarized as:

- Create a multidisciplinary team including system integrator companies and SMEs that guarantee the success of the planned development and demonstrations;
- Ensure the technology transfer into market products;
- Select governmental and non-governmental institutions and stakeholder to assess the effective applicability of the core technologies and of the technical solutions of their specific operational domain, needs and responsibilities;
- Enrich the project objectives and expected outputs through additional contributions and inputs from the participants.

User involvement

Project partners will leverage on their extensive network of relationship with a wide range of stakeholders within and outside the European Union and perform additional "**End-User Engagement activities**", to further promote the adoption of the system developed in project timeframe.

2.4.2 Consortium suitability for fulfilling MEDUSE objectives – Coverage of required areas of expertise

Components of the MEDUSE consortium provide full coverage and complement each other within the different technical disciplines which are required by the scope of the project. The following competence matrix (simplified) highlights how all the required expertise is covered at least by one MEDUSE partner.

Competence Area	*Main Involved Partners*	*Remarks*
Project Management	NXA, VTCB	NEXTANT managed many R&D projects at national level and VTCB has inherited competence in project quality management from its controlling company VITROCISET S.p.A.
Market context	PNALM	PNALM is one of the first marine parks that introduce

		the daily fees payment to access its area. It developed and offers a limited bundle of services to visitors.
Technology Integration System Architecture	NXA, VTCB. BLUETHREAD	Recognised competence in complex systems and operational services design and development.
Location based services development	NXA, VTCB, BLUETHREAD	The companies have carried out a number of projects finalised to the provision of commercial location based services in different domains and associated service modelling analyses.
Service models analysis	VTCB, ANESTI	ANESTI is well recognized company focused in business analysis and supporting companies in approaching new market. VTCB has experience in introducing new services in the market.
Dissemination	VTCB, BLUETHREAD, PNALM	VTCB, having inherited competence in project results dissemination from its controlling company VITROCISET S.p.A. has recognised competence in the field through participation to several R&D initiatives of the Commission and national space agency; BLUETHREAD performs dissemination activities in the specific area of marine service, while PNALM organizes and attends for institutional mandate national and international forum, meetings and conferences.

Table 13: Competence matrix

2.4.3 Resources to be committed

MEDUSE is an ambitious project that needs a strong consortium to give it the best chance of success. The consortium achieves critical mass, ensuring that all of the goals of the project are achievable with the collected consortium, but that there is no redundancy. It would be almost impossible to assemble another European consortium with the same pattern and breadth of expertise in just the areas required for the MEDUSE project. The consortium commitment is ensured by involving those companies and individuals whose expertise and current research exactly matches their roles in the project.

We are budgeting €663.380 for the 18 months duration of the project. The most important resources that will be used on the project will be personnel. In total we will be employing 77.5 person-months. Of particular note is the considerable amount of person-months that we will be dedicating to system design and test and evaluation (30 person-months in total). We will be dedicating a total of 9,5 person-months to exploitation and dissemination, 6 person-months to management of the consortium activities. The remainder of the person-months (32) will be employed in the development of the systems necessary to fulfil the objectives of the project.

We have allocated €44.000 for T&S.

3 Project Impact

3.1 Expected impacts listed in the description of topics

3.1.1 Impact

The proposed Consortium has been structured in a way to ensure an optimum commercial exploitation of project results, as it includes all the expertise required within the value-added chain for the provision of the addressed kind of services (terminals & telecomm, specific applications, value added application algorithms, system integration and operational service provision), as it shall be better demonstrated in stage 2 of our proposal. In addition, the presence within the Consortium of institutional end user representatives is a guarantee of the interest of a major final customer around the project outcomes.

As it has been already addressed in the previous section, our commercial strategy is based on the capability of the institutional customer **to strongly recommend, within restricted access areas, the adoption of service terminals (or dedicated software) by private and commercial users during the visit to the marine park**. This capability shall ensure the transition from a niche market (park managers) to the extremely promising mass market of private and commercial park users (see also next paragraphs).

As a consequence, we can identify very clearly a commercial exploitation strategy based on the following progressive targets:

1. Acquisition of the institutional customers.

The first step shall be based on the delivery of operational MEDUSE systems to institutional end customers, i.e. marine parks management organisations. An operational MEDUSE system shall be constituted by a service centre and a number of on board terminals which is adequate to cover the maximum number of concurrent visits to park areas (taking also into account that a good percentage of users shall use their own devices). The success of this step shall be enabled by the demonstration of a positive cost/revenues balance for the end customer. Although, of course, a detailed business analysis shall be performed on this topic, we can preliminary state that numbers shall turn out to be extremely promising, when considering that:

A. MEDUSE cost shall be driven by the cost of on board terminals (and/or application software) acquisition / replacement, as operational running costs shall be very low (as an example, in principle terminals could work fully off-line, i.e. without on-line connections and associated communications costs);
B. Considering the marine park fees (e.g. La Maddalena entrance fee varies from 2 to 4 € per meter per day) the price to the park management organisation of an on board terminal can be estimated as equivalent to 5 to 10 days entrance of a single medium-size boat (obviously, application software shall be much cheaper);
C. MEDUSE system shall enable, through remote control capability, a dramatic increase of access controls and access violations detections (dedicated quantitative analysis shall be performed within stage 2 proposal). Considering the number of average daily presence within the park during summer season (in La Maddalena can be roughly estimated as 16.000 days/presence a year but concentrated in the two high season months), the amount of revenues that shall be triggered by the increase of fines, at a first stage, and later by the increase of percentage of legal accesses, can be estimated as orders of magnitude higher than overall system (not recurrent + recurrent) costs, thus breakeven is expected to be reached in a very short time.

Institutional customer acquisition shall be pursued either by direct selling of the MEDUSE system, or by a service provision co-operation agreement in case park management organisation would wish to exploit commercial opportunities of service provision to private and commercial users.

2. Acquisition of the private and commercial customers.

The availability of even a single operational instance of MEDUSE, given the number of seasonal visits to marine parks, (i.e. the availability of thousands concurrent enabled devices within a limited area) shall open the door to the exploitation of all additional value added services which are, or can in future, be identified. A dedicated business analysis shall be performed during the project in order to assess most promising applications / services and to evaluate their market potential and associated targets.

3. Acquisition of the law enforcement customers.

In perspective, the development of dedicated tracing and tracking terminals for accessing restricted areas shall enable the implementation of law enforcement applications. In this case, however, ad hoc regulatory actions would need to be taken at national (or European) level in order to enable the legal use of tracking data for law enforcement purposes.

In this context, Galileo signal authentication capabilities, coupled with suitable privacy policies, will certainly foster the process of growth of such kind of applications. It is the intention of MEDUSE to provide a concrete proof of concept through EGNOS, whilst triggering the discussion at European level on the possibilities and opportunities to use GNSS as a tool for implementing law enforcement within high value environmental assets such as marine parks and restricted areas. This constitutes also one of the reasons why MEDUSE idea is being carried out within a European rather than a national context.

Public Benefits

In the recent years the marine parks are strongly encouraged by the European Commission; this derives primarily from the need to preserve the marine environment that in the Mediterranean Sea is presented with very critical issues (such as temperature increase, pollution, over fishing etc.).

It is already proven that a marine park increases the societal awareness on the priorities concerning the safeguard of the marine environment, and offers the quantitative proof of significant increase of the fish population in the reserved areas.

At the same time a marine park represents a more interesting location to be visited thus attracting an higher number of tourists and boats.

The consequence of this is that a marine park can activate a service chain capable of generating an interesting number of employers, and demanding innovative services based on modern technologies.

In the above context, the benefits of MEDUSE research and its exploitation potentials are evident. The most important of these are summarized next:

- Capability for analysing in detail the park users fluxes, thus enabling the analysis of anthropogenic impacts onto the natural resources and the improved definition of park management policies and actions;
- Improved capability for detecting violations, thus enhancing the preservation potential of the natural environment;
- Improved capability for detecting illegal access, thus increasing the level of funding and enabling greater employment level and investment on preservation of the natural environment;
- Capability for providing navigation assistance to private and commercial users, thus improving the safety level in the marine park area;
- Capability for law enforcement and violation detection, thus improving the safety level in the marine park area;
- Capability of providing general information and assistance services to private and commercial users, thus being able to increase environmental awareness and improve the level of environmentally sustainable exploitation of the natural beauties of the park (e.g. by signalling the wild fauna position).

Maritime existing services

The consortium undertakes a preliminary analysis of maritime LBS service, which offers the elements to preliminary assess whether in the actual context of the leisure vessel market the system described in the present proposal and the related services have a real possibility to be accepted by the market.

First at all, no service provider is capable of offering the innovative services at the core of the proposal, but in addiction no service takes into account the performance of GPS respect to the quality of services provided: in fact even if some services offer navigation support also in ports and particular danger areas, no one seems to adopt augmentation systems able to provide the necessary performances to support the service provided. In this sense the intention to fully exploit the benefit of EGNOS in the short term and to aim at adopting the Galileo Commercial Service as available is a unambiguous competitive advantage of our proposed system.

Moreover most of the different services analysed have the options to use different communication channel, however, no one offers the possibility of selecting the communication channel using an intelligent choice based on the cost, type of service requested, the reliability of the channel

Finally, what also emerged is that even if some of the proposed services are available in the market, it is impossible to have the entire bundle of integrated services from one single service provider. This situation has at least the following drawbacks:

- it is very likely that it is necessary more than one terminal to invoke all the services, with an increase of costs and decrease of usability;
- different services can duplicate some information that are provided with an increase of costs and decrease of usability;
- the information provided by the different providers cannot be integrated so that the information has an intrinsic less value in comparison with the possibility to concentrate the information on only one target and use the different information in conjunction with each other;
- in case of distress situation, the need to interact with more than one device can lead to increase the possibility to make mistakes and not to make the necessary steps to manage the critical situation;
- the need of managing different contracts reduce the willingness to subscribe new services.

In this sense the proposed project may lead the companies in the consortium to propose the developed services not only to marine parks but also to wider market of services for yacht and leisure tourists (e.g.: port access control).

3.2 Market and potential users

A GNSS based system capable of tracking and tracing and at the same time providing an accurate and certifiable location based service has had widespread applications on land but it is still in the early days of application in the marine world where location services do not have commercially evolved to patterns in a new paradigmatic (referenced model) way. MEDUSE's Business and Exploitation plan is meant to investigate how these services – making use of EGNOS GALILEO- may be introduced to the marine applications market and which enablers and business models are best suited to pave the way to make easier such potential demand segment to be fully exploited.

Business and exploitation plan has consequently been thought of and organized to be initially deployed having consideration to two target markets:

1. Since the proposed solution will operate on a GNSS based system capable of tracking and tracing all private and commercial users within restricted marine areas also establishing a two-way data link for provision of additional information and value-added services to the users making possible the substitution of paper-based access permits with low cost terminals to be mandatorily taken on board, or,

alternatively, a software package to be mandatorily installed on tourist own terminals by the park user during the whole visit to the marine park in order to access the service available through the park portal, priority consideration will be paid to marine parks' requirements and commercial applications.

2. Useful elements coming from investigation of the target market listed under 1. will also be used to verify the further possibility to extend the market for applications to users other than marine parks such as marina harbours. Though out of the immediate scope of MEDUSE the project is open to future extended investigation also to users of otherwise restricted marine areas such as fishing grounds in specific coastal areas.

With respect to marine park "Parco Nazionale dell'Arcipelago della Maddalena" data recorded in 2010's peak season show a potential target market very significant and commercially interesting. During the three summer months running from June till August 2010, a total of 15,518 boats have accessed the marine park: 2,975 boats have accessed the park in June 6,364 in July and 6,179 in August.

About 55 % of such boats are more than 10 meter long making feasible to install on them OBU, without excluding from this possibility also the remaining 45 % of the boats smaller than 10,1 meter and looking for permits.

The following tables provide evidence of the potential size of the market of marine park permits of La Maddalena and do also provide an indication of the congested nature of the problem to grant permits and control the area during the peak months of June, July and August.

Year	Month	DIMENSIONI (CLASSI)							TOTAL
		Up to 10 mt	10,01 mt 15 mt	15,01 mt 20 mt	20,01 mt 25,00 mt	25,01 mt 30mt	30,01 mt 35 mt	Above 35 mt	
2009	June	467	38	2	5	4	1	13	530
	July	2684	668	227	127	70	32	130	3938
	August	3065	2055	920	446	153	83	222	6944
	Septem.	636	439	122	48	22	13	29	1309
2010	June	1197	1110	326	144	61	46	137	2975
	July	3347	1824	585	298	31	138	141	6364
	August	2405	2280	667	413	141	84	189	6179

Table 14: Boat number by dimensions accessing PNALM

YEAR	DAYS IN AUGUST			TOTAL
		ENGINE BOATS	SAIL BOATS	
2009	1/8	N.A.	N.A.	1841
	9/15	N.A.	N.A.	1978
	16/22	N.A.	N.A.	1637
	23/31	N.A.	N.A.	1576
2010	1/8	797	182	1939
	9/15	610	123	1648
	16/22	471	84	1345
	23/31	388	39	1247

Table 15: Weekly data of accesses to PNALM during the month of August

3.3 Dissemination and exploitation of project results, and management of intellectual property

3.3.1 Dissemination strategy

Communication strategy

Each partner should clearly identify a representative to be in charge of communication. The project manager is responsible for overseeing the application of the communication plan and ensuring that everyone carries out their duties according to that plan.

Within each research teams the responsibility should go to the WP leader who has the best understanding of the project. Alternatively, the project team can choose someone on the team who is at ease with or interested in communications concepts.

Target groups and audiences

The target audiences for the project are:

- the direct beneficiaries and partners in the research, for which a strategy is needed to ensure that the research results are perpetuated.
- political decision-makers, for which a strategy is needed to ensure that participatory development is better understood, adopted in other projects, and adapted to their needs.
- the development community, researchers, stakeholders, and funding agencies, for which a strategy must be aimed at gaining visibility and sharing the project results, and developing exchanges on initiatives carried out with the target populations.

Project internal communication

The communication strategy aims at keeping all the partners informed about all the activities carried out in the project, about the project status and planning to achieve optimal transparency and to increase the cohesion of the co-operation. All information (e.g. meeting minutes, reports, task activities and relevant publications) will be communicated to the Project Manager to be promptly reported on the project web server. Daily communication between all participants will be assured using electronic mail and Web based bulletin boards.

Toward the Commission the only partner authorize for the communication is the Project Coordinator. It will use formal means to provide all the necessary information to the Commission on the status of the project:

- Quarterly Progress Report, it provides information specific for all the partners and for the consortium as a whole. In particular it will provides detailed information on:
    - technical advancement in the period;
    - technical criticalities in the period;
    - proposed solution;
    - resource management;
    - risk management activities;
    - internal communication activities;
    - external communication activities.
- Whenever the project coordinator deems it necessary, it will issue an update version of the Project Management Plan.

Project external communication

The consortium will provide as project document a Dissemination Plan which will describe in details the external groups identified and the strategy to communicate in the proper manner the project and its achievements and Dissemination Report which summarizes the results obtained by the consortium in its communication strategy.

The strategy proposed by the consortium is divided in two phases:

- The first is devoted to the communication of the project objectives and expected outputs, to the promotion of the project in the relevant groups and to promote the participation of interested actors to the project;
- The second is devoted to the dissemination of the obtained results at different levels: institutional, technical, end-users.

Web site

The Web tool provided by the consortium creates an environment whereby data and information can be methodically organised, enhancing its value to suit a variety of purposes and ensuring that it is easily available for use and re-use. It also ensures that a method and a forum are in place to capture intellectual capital.

Dissemination of Results

The consortium acknowledges the important role of Dissemination through a dedicated work package (WP6000). Dissemination will be aimed at key stakeholders: marine park authorities, marine tourist offices and coast guards. Our approach will assist us to communicate in a consistent manner with a wide range of audiences across Europe.

The consortium will participate at two workshops that will be organized by PNALM as part of their normal dissemination activities: the workshop that will describe the International Marine Park of which PNALM is part of and the workshop that presents to the public the new Park Service Center that is being realized within the park. The Consortium will participate to these two events with aim of promoting the potential benefits for all users deriving by the adoption of the MEDUSE system.

There will be a plan (Dissemination Plan) to deliver sustained dissemination to raise awareness of the advantages of MEDUSE aligned to the exploitation activities. The project partners will be extensively involved to stimulate the heightened awareness of practical benefits.

The main Dissemination Objectives will be to:

1. Create a suite of dissemination materials (D5) that explain the principles of MEDUSE and the tangible and quantifiable benefits that it can deliver.
2. Establish an efficient process for preparing dissemination instruments (articles, scientific papers / reports, demonstrators, etc.) as part of the development work program to ensure that a coherent communications program can be sourced efficiently.
3. Provide a series of publications to establish the technological and scientific credibility of project outputs and to promote standardization and certification activities.
4. Maintain an interactive web site continuously updated with fresh material and links to demonstrators.
5. Devise and implement a dissemination program, focused on the key audiences and authorities that stand to gain the most from adoption of MEDUSE.
6. Create mechanisms to effectively handle enquiries from stakeholders, the media, and other interest groups.
7. Develop robust reporting and measurement techniques to evaluate the effectiveness of the dissemination activities.

Press Releases and Media Articles

Key tasks will include:

1. Devise schedule of Press Releases to mark the launch of the dissemination program and project milestones.

2. Issue press releases through selected agencies across the EU and internationally.
3. Publicize MEDUSE events such as the MEDUSE Workshops (within the events already scheduled from the Park).
4. Handle enquiries from the media and other interested groups.
5. Ensure all relevant websites utilize Press Releases materials.
6. Prepare a detailed evaluation report of all communications activities associated with each press release.

Target media groups, for the press releases, will include; marine park authorities, marine tourist offices, coast guards, Governmental – EU, national and regional, Newswires and Economic.

Outline of Dissemination programme

Organization of the dissemination launch within two months of the project kick-off meeting with press release and a fully operational web site.

1. Organize the first MEDUSE Workshop scheduled for month 15 when the services are available.
2. Initiate an electronic newsletter on MEDUSE to promote the broad engagement of target stakeholders in MEDUSE user group.

3.3.2 Management of intellectual property

At the earliest possible stage, every project partner will appoint a responsible person (IPR manager) for all their IPR-related tasks and questions. His/her responsibility will be to take all the required measures to guarantee that all the rights needed for exploitation purposes will be collected and communicated to the Steering Board. To support this activity, a documentation search on the legal situation of all research results will be be done including contracts, licenses and acquisitions relating to IP rights. The portfolio of rights as well as the shortage should be reported in interim and closing reports. The aim of the IPR management is to be able to transfer all the required rights to the project partner who asked for it.

Management of intellectual property

Intellectual property rights (IPR) will be ruled by the Consortium Agreement which will be agreed and signed by all the partners upon award of a contract by the European Commission.

The principal mechanisms that this will incorporated are as follows:

- each partner of Consortium will be bound by the terms and conditions of the European Commission contractual rules, Annex II General Conditions - Part C entitled “Intellectual Property Rights”.
- the project will draw on pre-existing knowledge and know-how contributed by the partners (Background Intellectual Property). In general, all of the intellectual property rights, documentation and source code related to the partners' pre-existing knowledge and know-how will need to be declared; it will remain the property of the partner who owns them and will only be used for those instances where access rights have been granted.
- the allocation of property and rights of use of the knowledge and know-how developed jointly by the partners during the course of the project (Foreground IP (FIP)) will have to be made available to all partners in the project under the conditions outlined in the Consortium Agreement.
- the partners will agree that the Access Rights on the knowledge, pre-existing know-how needed for carrying out the project shall be granted on a royalty-free basis.

The work developed by is for use in the public domain and is unlikely to compromise other forms of Intellectual Property (IP). However, it is still necessary to make provision to check that other forms of IP protection are not compromised and the Consortium Agreement will specify that all publications, press releases and other forms of dissemination material will have to be sanctioned by the Project Coordinator. Potential IP will be identified

through the work package leaders identifying all potential IP in their quarterly reports. All publications, press releases and other forms of dissemination material will be screened for information that could compromise the IP–protection process and sanction, following legal advice, the withholding of all data that could potentially compromise IP protection for a defined period of up to three years. It is intended for the development of the Consortium Agreement to proceed in parallel with the negotiation.

4 Ethical Issues

No ethical issues arise in the project.

ETHICAL ISSUES TABLE

	YES	PAGE
Informed Consent		
▪ Does the proposal involve children?		
▪ Does the proposal involve patients or persons not able to give consent?		
▪ Does the proposal involve adult healthy volunteers?		
▪ Does the proposal involve Human Genetic Material?		
▪ Does the proposal involve Human biological samples?		
▪ Does the proposal involve Human data collection?		
Research on Human embryo/fetus		
▪ Does the proposal involve Human Embryos?		
▪ Does the proposal involve Human Fetal Tissue / Cells?		
▪ Does the proposal involve Human Embryonic Stem Cells?		
Privacy		
▪ Does the proposal involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)		
▪ Does the proposal involve tracking the location or observation of people?		
Research on Animals		
▪ Does the proposal involve research on animals?		
▪ Are those animals transgenic small laboratory animals?		
▪ Are those animals transgenic farm animals?		
▪ Are those animals cloning farm animals?		
▪ Are those animals non-human primates?		
Research Involving Developing Countries		
▪ Use of local resources (genetic, animal, plant etc)		

▪ Benefit to local community (capacity building i.e. access to healthcare, education etc)		
Dual Use		
▪ Research having potential military / terrorist application		
I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	**X**	

End of the document