MIS
Maritime Information Centre

Delivery A

"Identification and organization of MIS users and processes"

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ABSTRACT

A large part of the efficiency challenges in the maritime transport sector can be traced to poor information exchange between actors and between actors and IT systems, and the lack of possibilities to reuse data leads to unnecessary time and resource consumption.

The Maritime Information Centre (MIS) will contribute to increased interaction and simpler report routines between the actors in the maritime transport sector, and thus increase the competitiveness of the sector.
The main approach is the use of the Single Window concept. Because reporting to private parties has many of the same challenges as reporting to the authorities, and because the information needs of public authorities and private parties overlap, the traditional Single Window is expanded, so that not only information exchange with the authorities, but also with private actors is done through the system.

The main purpose of this delivery is to identify the MIS users and the processes related to the information centre, utilizing the ARKTRANS framework for classification. The delivery also presents related projects, both national and international.
The delivery concludes with a presentation of recommendations and requirements to the MIS centre.

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Foreword

Maritime transport is both environmentally friendly and an efficient transport form that is able to transport high volume of goods. It has become more trustworthy over time, but there are still challenges to be solved. In this report we will describe the involved user groups in a maritime transport, discuss their roles and duties, and also give an overview of information needs within each defined user group. Before we start the detailed description of the roles we will give an introduction to the terminology used regarding maritime supply chain. We will aim to bring the private and the public domains more together, as well as to bring both cargo and vessel reporting together, and see how they can cooperate in a common maritime information centre, the MIS-centre.

My hope is that this report will highlight the user needs regarding information, describe the regulations and the mandatory information, and also describe the private commercial side in maritime transport. The readers should use this report to get a better understanding as to what intermodal transport is, and how the various user groups can be placed in the transport domain. The report also describes the requirements that a user group has regarding a transport. The motivation for doing such a study is to end up with a detailed description of an information centre that can be used to receive information from the information sources and then orchestrate it such that all parties that are authorised to receive the information from the centre can receive it directly from MIS and not let the information source send to all. This will help the users and hopefully we will end up with a solution that serves the “single-point-of-reporting” terminology. This will lead to an even more efficient transport form.

Kay Fjørtoft,
Project manager

1. Introduction to the project

MIS will be an important contributor in the overall effort of increasing the efficiency within the maritime transport sector. The maritime transport sector is one of the most environmentally friendly transport means, but has increasing efficiency challenges during e.g. port operations. A large part of these challenges can be traced to poor information exchange between actors, and between actors and IT systems. Today's practice where everybody reports to each other, and reuse of data is limited, is leading to unnecessary time- and resource-demanding working days for everybody involved. MIS will contribute to increased interaction and simpler report routines between actors in the maritime transport sector, and hence the efficiency will increase and the competitiveness strengthened in the maritime transport sector.

Objectives

The main purpose of the MIS project is to develop the established Single-Window concept into a complete Maritime Information Centre (MIS). MIS will also contribute to realising Maritime ITS, and by that supporting the strategy of the e-Navigation concept being developed by IMO.

Research challenges

- Models of distributed interaction: The challenge is to identify the actors and processes, to generalise them so that they can be supported by an IT-system and to ensure that the system will take care of all important information exchange.
- Technical solutions for interaction: The challenge in establishing a technical solution is to convert the process models into system architecture, and to support the external conditions defined for MIS.
- Messages and standards: The challenge is to identify a selection of messages and standards for MIS that is open (such as e.g. XML) and it has to be based on existing standards and new message formats being developed in other ongoing projects.
- Integrated environmental report: The challenges are in general to identify the information needed from ship and port, and what parameters shall be reported to whom.

Benefits for the Users

The results from MIS will be a wide range of applications suitable for different types of users:

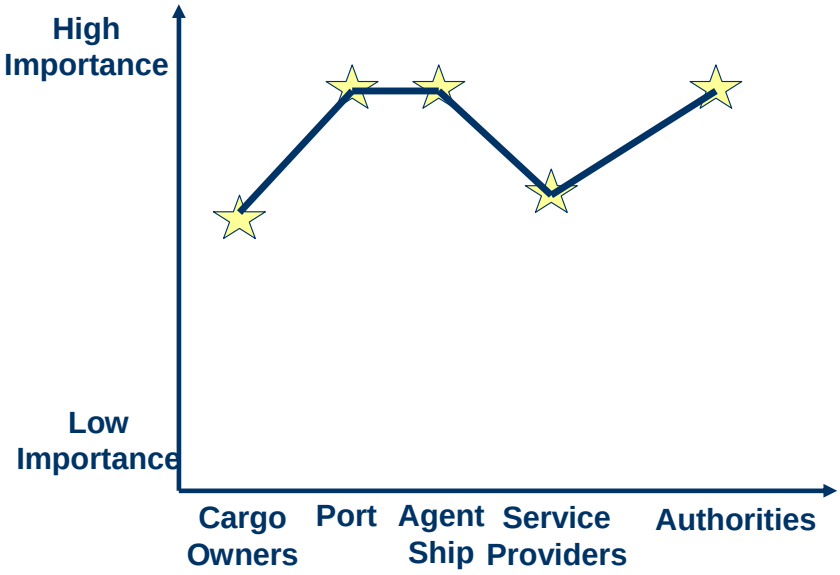
- Ports and terminals: MIS will make the ports more efficient and more visible in the logistic chain and by that lead to an increased share of transport at sea.
- Public authorities: MIS will simplify the information exchange necessary for monitoring and execution of public services such as regular inspections, traffic

regulations, navigation assistance and environmental surveillance and monitoring.

- Cargo owners, agents and operators: Private actors will be able to move towards a more service oriented working day and by that lighten the burden of manual reporting and information exchange and increasing the efficiency within the company.

Project participants

Importance vs. role



The figure above shows the importance of the MIS centre for the different role groups describing the users of an information centre. We believe that the centre will be of high importance for the ports, ships and agents, and the authorities, and important to cargo owners and service providers.

1.1 Introduction to Workpackage A - Identification and organization of MIS users and processes

Research challenges

- Task A-1: Develop plan for Investigation: Make questionnaires, identify investigation targets, time plan, planning of work shops.
- Task A-2: Identify existing MIS actors and roles, including MIS end users and systems and port related processes. Investigations must include all MIS partners, and also external actors (for instance Customs, Police, Fylkesmann etc). This includes both commercial and authority related actors and processes. The MIS-concept is an intermodal approach.
- Task A-3: Development of a descriptive port reference process model. This is based on the results of the investigations done in Task A-1 and A-2 (state-of-the-art), and includes description of both public and commercial information exchange. The port and port related actors model must be put into a higher level ship transport process reference model. Some starting point is available in HD2008, FreightWise, ARKTRANS, Efforts and Flagship models. Validation of the process models must be done among all actor groups.
- Task A-4: Identify potential legal challenges that must be addressed to the MIS-concept:
- Task A-5: Field studies to identify best practice, other initiatives in other countries, standardisation efforts, etc. This task will describe how the reference processes from A-3 actually is implemented today (As-Is).
- Task A-6: Arrange work shops and dissemination activities

1.2 Overview of other work packages in the MIS project

The MIS project has been divided into the following work packages:
A. Identification and organization of MIS users and processes.
B. Processes and interoperability.
C. Technical solutions and system architecture.
D. Message formats and international standards.
E. Environmental calculations in MIS.
F. Basis for a requirements specification for MIS.

Work package B analyzes the interaction between the different user groups. This will lead to the functionality and application groups that should be a part of the centre. Among the challenges will be the juridical borders between involved parties. It is expected that the analysis will reveal many of the “unwritten rules” in the business.

Work package C will result in technical solutions and system architectures that will show how the MIS centre can be realized. The architecture is developed in close cooperation with SINTEF’s SiSaS, which has the goal of creating a platform for service-oriented systems based on the Software as a Service-concept and the Internet of Things philosophy. This platform may function as a basis for the MIS system,

where the focus of the architecture is to offer well-defined services with clear limits for transport users in stead of an integration of large applications. This will increase the possibilities of system component reuse in new application areas, and will also ease the integration with other services that are available, e.g. payment services and access control to the MIS centre.

Work package D will focus on message formats and international standards. The intention is to "think large" and possibly create a suggestion to the ISO that describes the Single Window concept, with the intent of using results from the MIS project in an ISO work group for the creation of "a Recommendation to a Single Window".

Work package E will investigate the possibilities of using MIS as a centre for environmental reporting and calculations for the maritime users.

Work package F will contribute to the specifications of the next generation of port information systems, which also will be a necessary basis for the requirements specification for the information centre. Mobility, integrity, security and environmental requirements are topics that should be investigated for this purpose.

2. Introduction to other projects and relevant terminology

2.1 Single Window

Single Window
"A facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfill all import, export, and transit-related regulatory requirements. If information is electronic then individual data elements should only be submitted once"
Source: Trade facilitation, UN/CEFACT Recommendation 33

In the MIS project we have pointed out that the Single Window should cover both private and public information. Private information is more open to free definition of information contents than public, which is more regulated by international standards based on directives and agreements. Private information is commercially based, and information can be more sensitive than the public information. Systems commonly described as a Port Community System (PCS) or a Port Single Window (PSW) are mentioned when the private definition of a Single Window is expressed,. Public information is more strictly regulated, and e.g in Norway the "ShipRep" system is considered the National Maritime Single Window.

2.2 Public-private partnership

Public-private partnership (**PPP**)
"Describes a government service or private business venture which is funded and operated through a partnership of government and one or more private sector companies. Private sector is that part of the economy which is both run for private profit and is not controlled by the state. These schemes are sometimes referred to as PPP, or P3".
Source: *Wikipedia.org*

The benefits of having a private-public partnership can be increased trust, support of good business practices in legislation, or the use of incentives such as adjustment of constraints (agreed terminology, based on standards, etc).

MIS will consist of both private and public information, which is showed in the following figure.

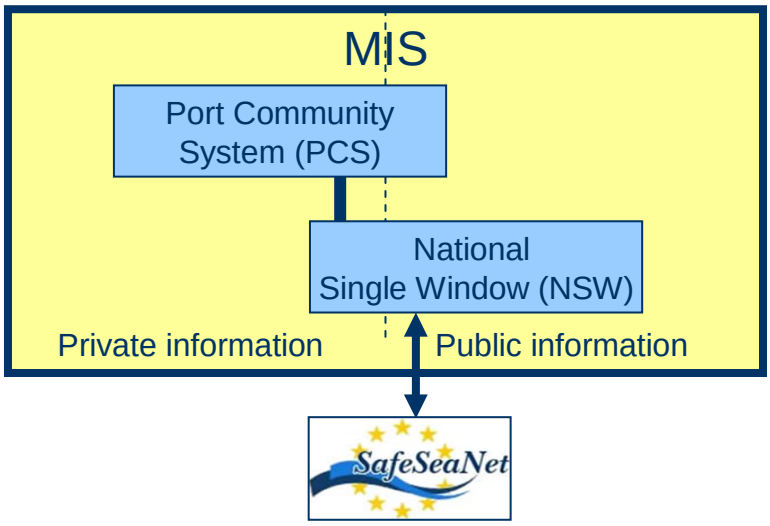
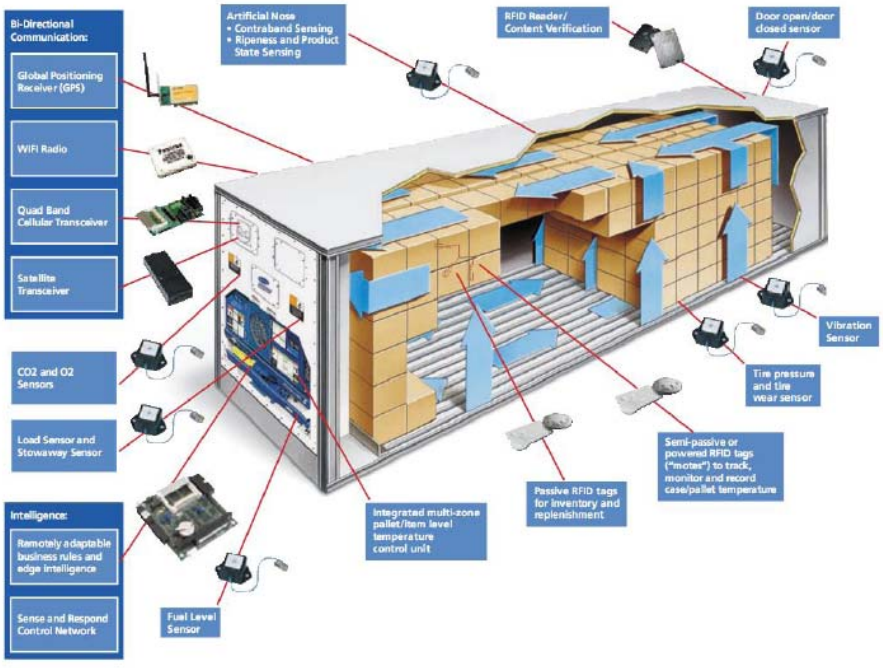


Figure 1 – MIS Single Window

From the figure we can see that there is a link from the National Single Window to SafeSeaNet. The SafeSeaNet icon in the figure means the European SafeSeaNet portal by the EMSA. The NSW is the Norwegian Maritime Single Window that is also refered to as ShipRep in Norway. We also see that there must be a strong link between the PCS and the NSW so the two domains can exchange information. We believe that much of the information in one of the domains will also be highly relevant for the other domain.

2.3 Sensors



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In addition to reporting, automatic capture of data and sensor technology will provide data inputs to the information centre. The Automatic Identification System (AIS) gives important information on vessels' identity, position, speed and course. Also, sensors at port, in containers or in the vessels may give information of interest to the users of the centre.

2.4 IMO e-Navigation

The International Maritime Organization (IMO) has described e-Navigation as; 'the harmonised collection, integration, exchange, presentation and analysis of maritime information onboard and ashore by electronic means to enhance berth to berth navigation and related services, for safety and security at sea and protection of the marine environment'

Source: IMO NAV 53

e-Navigation is intended to meet present and future user needs through harmonization of marine navigation systems and support of shore services. It is primarily related to safety management and aids to the nautical operators. e-Navigation is an ongoing initative by the International Maritime Organisation (IMO) to implement next generation navigation and safety systems for shipping. The activity in e-Navigation is coordinated with the e-Maritime initiative of the EU Commission.

As for MIS, e-Navigation will be supporting ship critical information as well as vessel reporting to shore based sites. Information coming from the AIS-transponders, the ISPS-documentation, as well as more ship specific information will be of relevance.

2.5 EU e-Maritime

"e-Maritime" stands for online interactions between all the different stakeholders in the maritime sector:

- ***The EU E-Maritime initiative embodies a set of policies, strategies and capabilities facilitating the development of "e-Maritime" in support of an efficient and sustainable waterborne transport system throughout Europe, fully integrated within the transport logistic chains***
- ***The results must be defined through measurable economic, social and environmental benefits***
- ***The applications will focus on improved***
  - ***safety, security and environmental performance***
  - ***competitiveness***
  - ***working conditions***
- ***A virtual network in an electronic environment based on open platform and standards to ensure interoperability between different maritime-related applications***

- ***This network should enable administrative and commercial communications betweenships, between ships and shore, including port communities, administrations, operators, freight forwarders and other hinterland actors***

Source: European Commission, Christos Pipitsoulis

The EU e-Maritime applications will aim at supporting the development of sustainable transport in Europe through the application of systems based on the latest information, communication, and surveillance technologies in line with the EU transport policy objectives

The e-Maritime initiative embraces a set of European capabilities, strategies and policies facilitating the development of web-based and online interactions between all the different stakeholders in the maritime sector in support of an efficient and sustainable waterborne transport system fully integrated in the European transport system

The strategic aims are:

- Improving the safety and security of maritime transport services and assets and environmental protection
- Increase the competitiveness of the EU maritime transport industry
- Supporting competence development and working conditions for seafarers

The objectives in the e-Maritime concept are relevant for the MIS project since the SafeSeaNet, the e-Navigation concept, and the single window is central in its work. E-Maritime is also focusing on the private-public relationship as important. Improved efficiency, co-modality or door-to-door supply chains, and port operation is also central elements. Advanced Port Single Window and Port Community systems are said to be key elements for success within e-Maritime. Finally, promotion of technology that allows seamless communications across diverse communications media and protocols is also said to be part of the objective list within the e-Maritime concept.

2.6 EUROSUR

The Commission outlines a three-phase common technical framework for setting up a "European border surveillance system" (EUROSUR) designed to support the Member States in their efforts to reduce the number of illegal immigrants entering the European Union by improving their situational awareness at their external borders and increasing the reaction capability of their information and border control authorities.

Source: Europa – Summaries of EU legislation

EUROSUR is not directly relevant for the MIS project related to Norwegian requirements, but will be more relevant to a specification of a maritime information centre for countries belonging to areas where illegal immigrants are a problem.

From the web-pages following information are quoted: Communication examines the parameters within which a European border surveillance system (EUROSUR), focusing initially on the Union's southern and eastern maritime borders, could be developed, and proposes a roadmap for setting up such a "system of systems" over the next few years. It focuses on enhancing border surveillance in order to:

- reduce the number of illegal immigrants who enter the European Union undetected;
- reduce the number of deaths of illegal immigrants by saving more lives at sea;
- increase the internal security of the EU as a whole by contributing to the prevention of cross-border crime.

A European border surveillance system (EUROSUR) should help the Member States achieve full awareness of the situation at their external borders and enhance the reaction capability of their law enforcement services. "Situational awareness" measures the capability of the authorities to detect cross-border movements and find reasoned grounds for control measures; "reaction capability" measures the lapse of time required to control any cross-border movement and the time and means necessary to react adequately to unusual circumstances.

EUROSUR would provide the common technical framework required to rationalise cooperation and 24-hour communication between the Member States' authorities and foster the use of cutting-edge technologies for border surveillance. One essential operational objective must be to create an information-sharing (excluding personal data) environment among national and European systems.

2.7 e-Freight

e-Freight solutions will encompass legal, organisational and technical frameworks to enable transport operators, shippers/ freight forwarders, customs and other government administrations to seamlessly exchange information in order to improve the efficiency and quality of freight transport logistics.

Source: The e-Freight Technical Annex

The e-Freight project will be a follow-up from the Freightwise project in the sense of defining an intermodal framework that can be used to have co-modal transport

between different stakeholders. The Single Window concept will be central to the project, as well as the relationship between authorities and private business.

2.8 e-Cutsoms

The Commission will propose that the new rules should enter into force in 2010. The Commission considers that amending the Regulation laying down provisions for the implementation of the Community Customs Code is an expedient way to realise one of the main goals of the European maritime transport space without barriers, namely significantly reducing the administrative burden imposed to intra-Community maritime transport, without inducing adverse effects on other categories of sea transport carrying third-country goods. This will add to the benefits expected from the Modernised Customs Code and e-Customs in terms of reduction of administrative burden for transport.

Source: COM(2009) 10/2, Decision No 70/2008/CE13

From the report we have quoted following sentences that also support the MIS work:

> *Stakeholders considered the administrative procedures for maritime transport to be too often unnecessarily complex, redundant and not harmonised between Member States or ports. Operations for incoming and outgoing vessels to/from ports are slowed down, generating higher costs, and loading and unloading operations tend to be delayed.*
>
> *Indeed, sea ports in the Community are part of the EU's external border and a ship calling in these ports is faced with a range of administrative procedures on arrival and departure, comprising a wide set of EU and international legislation, ranging from customs and tax rules, to border control rules, trade, statistics, environment and waste, plant-health, veterinary and health protection, transport and security and safety regulations (see the list in Annex A of the impact assessment report). Such regulations are not always properly coordinated, leading on occasion to delays, overlaps and excessive administrative costs.*
>
> *Port authorities or customs may not allow loading/unloading operations to start until the ship reporting formalities have been completed. The closing times of Customs offices in some ports cause delays in processing information.*
>
> *The stakeholders reported problems with divergent practices, depending on the organisation of the operator in the port of loading. For instance, in some Member States certain customs documents have to be given in original to a customs office, which might be located far away from the quay, and opening times or the location of customs offices may cause logistical problems. In some ports, unloading of a ship can start only after all documentary formalities have been completed, which can take up to half a day.*

Apart from these issues, there are other administrative bottlenecks which the Communication seeks to address:

- *The transport of dangerous goods is restricted, costly and complicated at sea due to the overlap between bodies of technical legislation, and often sea transport is not an option and goods are transferred by land.*

- *Language difficulties are another major bottleneck as some authorities in ports refuse ship manifests and certificates in languages other than their own.*

- *Pilotage services can be a serious problem. Vessels on SSS runs call regularly at the same ports, and their masters are familiar with the physical features. Nonetheless, in many cases pilot assistance is compulsory. While some countries do offer a Pilotage Exemption Certificate (PEC), there are often national requirements that make a PEC difficult to obtain.*

- *Electronic manifests are not universally accepted by all ports in the EU. Only 55% of ports use electronic systems for handling ship and cargo information, with the use of fax and telephone still common.*

- *Only a few Member States have a national single window approach. The linkage between the SafeSeaNet and the port networks is very limited, and data exchange happens when the national authorities ask for it. The exchange of electronic messages between ports is practically non-existent.*

2.9 Arktrans

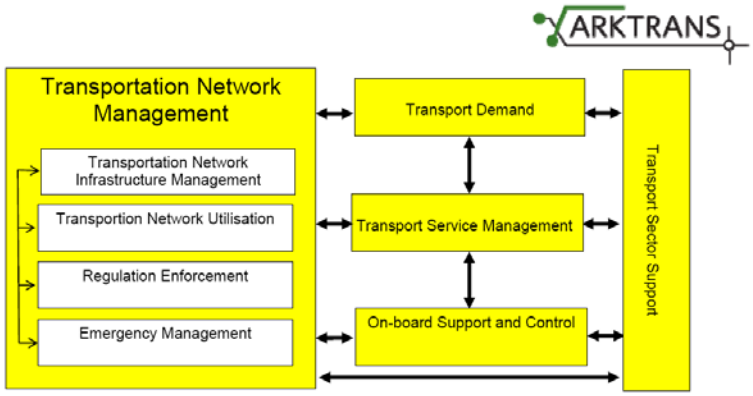
ARKTRANS is the Norwegian multimodal framework for ITS. The whole transport sector is addressed, and the specifications are valid for all transport modes (road, sea, rail, and air), as well as freight and passenger transport. ARKTRANS provides a multimodal (common to all transport modes) specification of responsibilities, functionality, processes, and information flows in the transport sector.

In short, ARKTRANS
• Provides a holistic and mode-independent understanding of the responsibilities, relations and dependencies within the transport sector.
• Defines multimodal terminology and concepts (semantics) for the transport sector.
• Supports specification and implementation of ITS solutions that are in compliance with a common and holistic view of the transport sector.
• Supports analyses and simplifications of transport solutions by different abstraction levels and views.

Source: www.arktrans.no

ARKTRANS is a framework utilized in the MIS project in its studies and classification work. In ARKTRANS, the reference model shows the overall decomposition of the transport sector, and specifies the main responsibilities related to each domain:

• The Transportation Network Management domain arranges for safe, efficient and environmentally friendly transport. It includes the management of the physical transportation network infrastructure (e.g. road, railways, fairways and terminal areas), traffic management (of traffic flows and individual transport means), regulation enforcement (e.g. customs), and emergency management.
• The Transport Demand domain represents the transport user, which defines the transport demands, does transport planning, requests the required transport services, and follows up the transport.
• The Transport Service Management domain is responsible for providing transport services to the transport user in the Transport Demand domain. This also includes the management and execution of the transport operations (e.g. transport, passenger/goods handling, document handling, etc.).
• The On-board Support and Control domain is responsible for the safe and efficient operation of the transport means (e.g. navigation and adaption to traffic situation).
• The Transport Sector Support domain provides generic services to the other domains, (e.g. different types of information services).



The ARKTRANS Reference Model

In next chapter we will define a MIS Reference model and highlight which of the areas that are of interest for the project.

2.10 ShortSeaXML

Shortsea XML is a message standard for exchange of data between parties in a shortsea transport chain. Its aim is to reduce administration work and costs and therefore encourage more freight to transfer from road to shortsea shipping.

Source: ShortSea XML

The ShortSeaXML message standard is of interest for the MIS project since it utilizes the UN CEFACT library to build an XML message that can be used to report information concerning shipping. The following messages from the project must be considered in the MIS-centre in the future:

- Schedule: For description of short sea schedules and contact details.
- Booking: For booking of port-to-port and door-to-door shipment of consignments and transport equipment (containers and trailers).
- Manifest: For cargo documentation for loading, unloading, pre/on-carriage and government reporting.
- Status: For tracking and tracing of cargo transport.

2.11 Freightwise

The Freightwise project

Freightwise have defined a framework to be used in co-modal transport where both private and public interests are part of the framework. The project ended up with a set of four stakeholder groups that are involved in the trade domain. It is about goods transport, not about vessel reporting or person transport. The project also ended up with a set of information packages that can be used to exchange information.

1. Transport users (shippers, freight forwarders, etc) will be able to identify and use direct or combined transport services most suited for their purpose.
2. Transport service providers in all modes will provide information about their service offerings and exchange information electronically with all relevant actors through planning, executing and completing transport operations.
3. Transport infrastructure providers will be able to facilitate the best possible use of the complete transport infrastructure and support transport users by providing relevant information about the available transport infrastructure and how to use it.
4. Transport regulators will be able to obtain in the simplest possible way the required information for monitoring compliance with applicable regulations, and to exchange information with other authorities for collaboration in security and environmental risk management.

Defined information packages

These are

- ***Transport Execution Status***
- ***Transport Operation Status***
- ***Transport Execution Plan***
- ***Transport Service Description***
- ***Transport Network Status***
- ***Goods Item Itinerary***

Source: The Freightwise D13.2 document

The information packages defined in Freightwise as well as the list of user groups involved in trade will be used in the MIS project. The information packages will be mapped to the "To-Do" studies where we are searching for future solutions regarding exchange of information. The User groups are part of this delivery. Freightwise is based on the ARKTRANS architecture and is therefore also aligned with what we are doing in many of the architecture studies performed currently in Norway.

2.12 Efforts

The EU FP-6 DG Research Integrated Project "Effective Operations in Ports (EFFORTS)" aims to improve the competitiveness of European port operations and the quality of the ports labour conditions and market, being a prominent one in coastal regions.

Three Research areas:

- ***Navigation in Ports***
- ***Ports and Environment***
- ***Port Organisation***

Source : The homepage of Efforts

The aim of Efforts is to provide the methodology and necessary tools to create interoperability solutions between stakeholders in ports. This is achieved by capturing and visualising all important relevant port and terminal processes with related stakeholders. ICT requirements and standards are also concerned that all analyses are in their conformity. The MIS-project will be using the methodology defined by Efforts and will as far as possible be using the existing results from the project.

2.13 VITSAR

Virtual Integration of Terminal Services and Resources, a project that is finalised but is one of the building stones to the MIS-project. The ultimate goal of the VITSAR project was to extend relevant computer systems in such a way that they support virtual integration of terminal resources across company borders. It will then be possible to have new methods of organising and operating a multimodal terminal. The results was a resource hub solutions that is now taken in to the MIS project, and a message, the VITSAR-XML message, that have the contents of information elements that are part of the messages used in shipping and trade.

Source: The VITSAR project

The VITSAR project demonstrated the integration of systems that different user groups are involved in. The project demonstrated information exchange between the following Norwegian systems: Gatship, VOSS, ShipRep (Norwegian National Single Window), Portwin. The xml-message defined will be used as one of the key messages for further work in the MIS project. We will also use the prototype of the resource hub in other workpackages in MIS.

VITSAR XML

Header	Ship	Voyage	Crew/passengers	Cargo	SSN

2.14 HD2008

HD2008, or Havnedata 2008, was a project run by the Norwegian Port association where the aims were to end up with a technical specification of a port community system. HD2008 was the first building stone to the MIS-project that have a wider scope to serve a co-modal transport and not only focus upon port processes and port single windows.

Source: The requirement report from HD2008

HD2008 provided a starting point for a technical requirement report regarding a port community system. It described the different technical requirements, system requirements, architectural requirements, and the operational and support requirements. The report will be used as input to this workpackage as well as to remaining MIS-work packages.

2.15 Customer Requirements to intermodal transport

The collection and analysis of identified variables affecting customer's choice of transport mode reveal the following ranked variables as important:

1. ***Reliability (certainty of meeting the time window) is a critical variable that should become a clear mandatory element of a MoS service.***
2. ***Cost (total price of D2D transport per shipment) is a crucial decision factor. Still, transport services should not be marketed as cost-competitive. Cost is not an isolated criterion and lower costs tend to create scepticism. Besides, an increase in road transport costs is expected to have a greater impact on customers' choice of alternative solution than a decrease in costs of the alternative itself.***
3. ***Customer Service was revealed as an important criterion. However, customer service is a broad term, and despite the definition given in the survey (effectiveness and efficiency of service: track and trace; customers relationship), respondents may have associated it with other quality criteria, like flexibility and reliability.***

Source: PROPS – Promotional Platform for Short Sea Shipping and Intermodality

Launched in 2008 the PROPS project works on establishing a Promotional Platform for Short Sea Shipping and Intermodality, aiming at supporting ongoing promotion activities across Europe, notably through a European-wide promotional campaign.

The project is financed by the European Commission's FP7 Sustainable Surface Transport programme.

Ever since The EC launched the programme for promotion of Short Sea Shipping in 1999, alongside with the 'Bottleneck Exercise', it has been one of the central issues in the European Commission's attempt to increase the share of waterway in European freight transport. As a result, identifying and developing solutions for removal of transport bottlenecks hampering use of SSS and intermodal transport activities has been a key focus in several EU projects since the start-up.

Further, but also very important for choice of transport solution is the *matter of perception.* Short Sea Shipping is in general very well perceived, but once integrated in an intermodal set-up the perception is that of *low reliability*, *long lead time* and *not necessarily lower costs* than road.

The project states that a harmonised/standardised ICT architecture/system is a key asset and facilitator for achieving the above. The provided solution must therefore be user friendly, collect and filter the requested information to the various stakeholders, and be readily available for promotional activities. Altogether showing that "single window" for maritime transport contributes to increase reliability and customer service, while also reducing the transport cost. In a medium to long-term, this will also alter the perception of the service/ transport solution. Especially for the new users that have little experience with exploring intermodal transport. To summarize the relevances to the MIS project, reliability, more cost efficient maritime operations, as well as good customer services to maritime operations are key elements to succeed in more sea related trades.

2.16 Efficiency in Short Sea Shipping

A new generation Short Sea Shipping
To succeed with ShortSeaShipping a list of identified targets of a series of essential parameters that need to be secured in order for the concept to achieve success, the following are of specific relevance to the MIS project:

- ***Lead time - From a logistics perspective "lead time" corresponds to total time spent from the order is received by the supplier until the goods have been delivered at the customer site***
- ***Availability (incl. Ease of use and Visibility). Availability of a transport mode means ensuring that transport is available when needed.***
- ***Reliability. For ShortSeaShipping to be competitive the services provided must be reliable, meaning they must achieve an acceptable, if not better, level of trustworthiness in comparison to road only solutions.***

Source: Create3S – Innovative Concepts Realised by Advanced design & production to improve Total Efficiency of new generation of Short Sea Shipping

CREATE3S is a FP6 funded project aiming to develop a new generation Short Sea Shipping (SSS), with a main objective of developing a ship concept that will elevate the utilisation and competitiveness of short sea shipping to a new level.

The project identified of a series of identified essential parameters that need to be secured in order for the concept to achieve success, the following are of specific relevance to the MIS project:

Lead time
From a logistics perspective "lead time" corresponds to total time spent from the order is received by the supplier until the goods have been delivered at the customer site:

- the administrative time to process the order
- the standard time from the order is placed to the cargo is picked up
- the total transport time from point of loading until the final delivery at the dispatch point (this includes all waiting and idle time)

When evaluating alternative transport modes, customers often consider the transit time as the main criteria of choice (in addition to cost). For the lead time to be a short as possible in intermodal transport, the transit time between modes is a key issue.

Availability (incl. Ease of use and Visibility)
Availability of a transport mode means ensuring that transport is available when needed. While a truck may be called upon at short notice, availability of sea transport is very often associated with high frequency of operations. Further, availability may also mean availability for all the cargo that is being transported by road, i.e. volume capacity of vessels and cargo type capability.

Reliability
For SSS to be competitive the services provided must be reliable, meaning they must achieve an acceptable, if not better, level of trustworthiness in comparison to road only solutions. This means that cargo must be delivered according to schedule (on-time and right place), and without any damage. For the logistics chain, this implies:

- Reliable sailing (despite weather, traffic, time slots, equipment failure, etc.)
- Reliable cargo handling (despite time slots, equipment failure, etc.)

The main rationale is to develop a service (vessel concept), that contributes to meeting the requirements of the customer.

2.17 ISO 28005-2 Ships and marine technology — Electronic port clearance (EPC) — Part 2: Core data elements

ISO

ISO (International Organization for Standardization) is the world's largest developer and publisher of International Standards.

ISO is a network of the national standards institutes of 163 countries, one member per country, with a Central Secretariat in Geneva, Switzerland,

that coordinates the system.

ISO is a non-governmental organization that forms a bridge between the public and private sectors. On the one hand, many of its member institutes are part of the governmental structure of their countries, or are mandated by their government. On the other hand, other members have their roots uniquely in the private sector, having been set up by national partnerships of industry associations.

Therefore, ISO enables a consensus to be reached on solutions that meet both the requirements of business and the broader needs of society.

Source: ISO – International Organization for Standardisation

The ISO 28005 standard contains technical specifications that facilitate efficient exchange of electronic information between ships and shore for coastal transit or port calls. The two first parts define a structure for the messages in an Electronic Port Clearance, as well as the core data elements. The MIS project will aim at introducing a third part that gives a guideline for Single Window systems.
There is international consensus that there is a need for setting up the Single Window system in maritime transport, taking into account and building upon existing standards.

2.18 Situations in European Ports

- ***Ports have developed their own information systems with different objectives and for different purposes, implying different requirements.***
- ***Ships must produce much documentation containing redundant information.***
- ***The national organisations of ports and maritime authorities in Europe vary from one country to another***
- ***Harmonisation, standardisation and simplification of processes, procedures and information exchanges between maritime authorities and ships (agent / master) is functionally and technically feasible***
- ***Information exchanges have to be harmonised, simplified, coordinated (some authorities require the same data element, some times with different deadlines, electronically or manually…)***
- ***Combined with a better and higher utilisation of electronic messages, the use of the Single Window concept (as recommended by UN/ECE, i.e. a single coordinating virtual electronic desk allowing vessels to***

accomplish all the required official procedures upon port entry, stay and exit without filling paper documents) and of Port Community Systems (provided that the issue of liability is solved as presently the master is responsible for the timeliness and the quality of the documents) would allow great improvements of the situation, helping to reduce the amount of documents and data requested from the masters and improving efficiency of competent authorities

- ***The simplification, standardization and harmonization of the various transactions between ports is indeed a very difficult process involving many countries, organizations and people.***

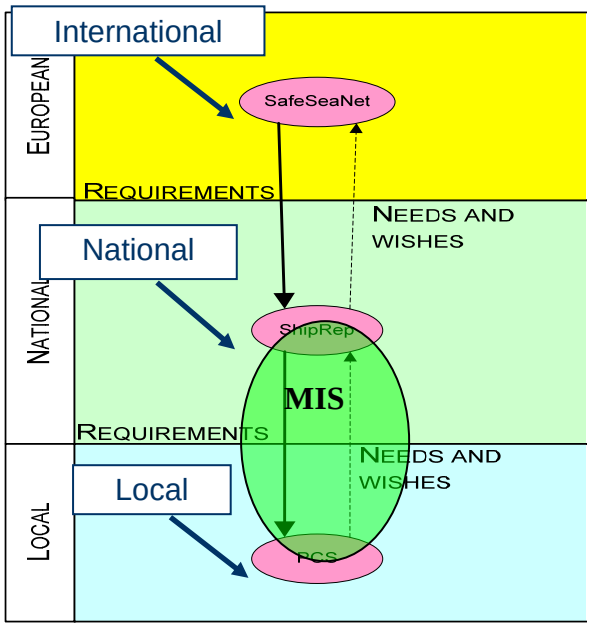
Source: MarNIS

MarNIS was an Integrated Research Project in the 6th Framework Programme, bringing together 50 partners to develop Maritime Navigation and Information Services on a pan-European basis.

The MarNIS consortium comprises a wide spectrum of experienced partners and subcontractors who will endeavour to find innovative global and European solutions for operations and activities performed and experienced daily in the maritime sector.

Some of the conclusions from the EU project have been directly used as objectives within the MIS project. This is mainly to bring the private and public domains together, to use standardised information, and to establish a single window solution.

The MarNIS project is looking at the requirements and needs at different levels from international to local; the following figure shows the different requirements addressed from a European level down to a Local level. We also see the MIS project where the scope will be on a local port level as well as at a national maritime level.


International
EUROPEAN
SafeSeaNet
REQUIREMENTS
NEEDS AND WISHES
National
NATIONAL
ShipRep
MIS
REQUIREMENTS
NEEDS AND WISHES
Local
LOCAL
PCS

3. User Group Analysis

3.1 Description of User Domains

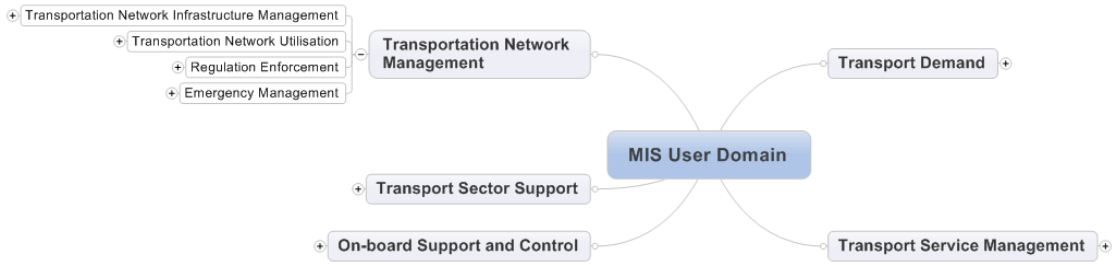


Figure 2 – MIS User Domains

The user roles relevant for MIS are grouped in the following domains according to ARKTRANS, and [ARKTRANS]: This is done to get an overview of the user groups and related information need

Transport Demand

The Transport Demand domain supports transport preparation and planning, transport booking, and follow-up for freight as well as passenger transport. The aim is to support the Transport User, which may be both the party who wants to travel or to send goods and a third party who is organising the transport on behalf of any Transport User (travel agency, forwarding agent, logistics provider[1]).

Transport Service Management

This domain addresses the management and provision of transport services to the Transport Demand domain. Such services may for example be provided by transport companies or terminals. A service may for example be transport along predefined and scheduled routes; ad hoc routes based on actual demands; document handling services; and terminal services like loading, unloading and transhipment.

On-board Support and Control

The On-board Support and Control domain addresses navigation, the integration of Transport Modes and Transportation Network Users in traffic operations (pedestrians and cyclists included), and safety issues related to the operation of the Transport Means. Adaptation to traffic situation, traffic regulations, Transportation Network conditions, security and efficiency are emphasized. On-board equipment provides information and supports safety during operation of the Transport Means.
The Transport Means' driver and the operation of the Transport Mean itself may also be monitored.

[1] Third Party (3PL) Logistics provider

Transport Sector Support

The Transport Sector Support domain provides information and supportive services to the other parts of the Reference Model shown in Figure 3. However, the services do not represent core transport or traffic activities, as these are covered elsewhere in the Reference Model (e.g. transport service management). Several types of services may be offered to the other domains.

Transportation Network Management

The Transportation Network is the infrastructure provided by roads, fairways, railways, air corridors and Transfer Nodes. A Transfer Node is in this context a location or area where goods and passengers enter, leave or transfer between Transport Means. The Transportation Network arrange for mobility in general. (The term transport, and not transportation, is used about the specific transport services offered by transport companies, and others and the mobility demands of the users of these transport services.)
A wide spectre of tasks must be supported related to the Transportation Network, such as the management of the physical infrastructure; traffic management during normal and abnormal traffic situations; emergency management; and regulation enforcement. Responsibilities of this part of the transport sector are as follows:

- To arrange for the safety and security of persons; property and environment that are involved in or affected by transport
- To arrange for the availability of public transport services

The Transportation Network Management domain is further divided into four domains:

- Transportation Network Infrastructure Management
- Transportation Network Utilisation
- Regulation Enforcement
- Emergency Management

- **Transportation Network Infrastructure Management**:
  The Transportation Network Infrastructure Management domain provides functionality required by those who are responsible for the physical Transportation Network infrastructure, the physical infrastructure of Transfer Nodes such as terminals and stations infrastructures included.
- **Transportation Network Utilisation:**
  The Transportation Network Utilisation domain supports the use and utilisation of the physical Transportation Network infrastructure, Transfer Nodes included. The responsibilities of this domain are as follows:
  - To do strategic and tactical traffic and transportation planning
  - To manage the traffic in the Transportation Network infrastructure (the flow of Transport Means in general as well as the behaviour of individual Transport Means) in order to optimise safety, efficiency, security and environmental protection.
  - To manage the assignment and use of Transportation Network Resources

- To provide supportive services to the Transport Means that are using the Transportation Network to arrange for safe and efficient traffic flow and manoeuvring.

- **Regulation Enforcement:**
  The Regulation Enforcement domain provides functionality required by transport regulators. The overall functions are to a large extent generic and common to several regulators, but the area in which they work will vary. These functions include decision-making (based on the laws), operative control as well as the establishment and maintenance of directories holding relevant information. The domain has the following responsibilities:

  - To manage registries, licences, fee collection and statistics with transport related information enabling regulation enforcement
  - To make transport related decisions
  - To supervise and control in order to detect rule and regulation violations;
  - To prevent undesirable situations and unlawfulness
  - To enforce the laws and regulations

- **Emergency Management:**
  The Emergency Management domain provides functionality required by those responsible for emergency response related to transport. The responsibilities towards the other parts of the Reference Model are:
  - To manage information about incidents, accidents and pollution related to transport, and to derive knowledge about safety and environmental threats.
  - To establish emergency and pollution preparedness plans.
  - To provide guidelines and requirements for emergency preparedness, pollution control, and pollution preparedness;
  - To support search and rescue operations.
  - To support pollution response operations.
  - To support salvage operations.
  - To support the investigation of accidents, pollution and incidents.

Based on the contents described above we have ended up with the following figure as a reference model in the MIS-project.. The green *colour means high relevance*, the *blue is relevant but only partly*, while *white is not of relevance* for the MIS-project.

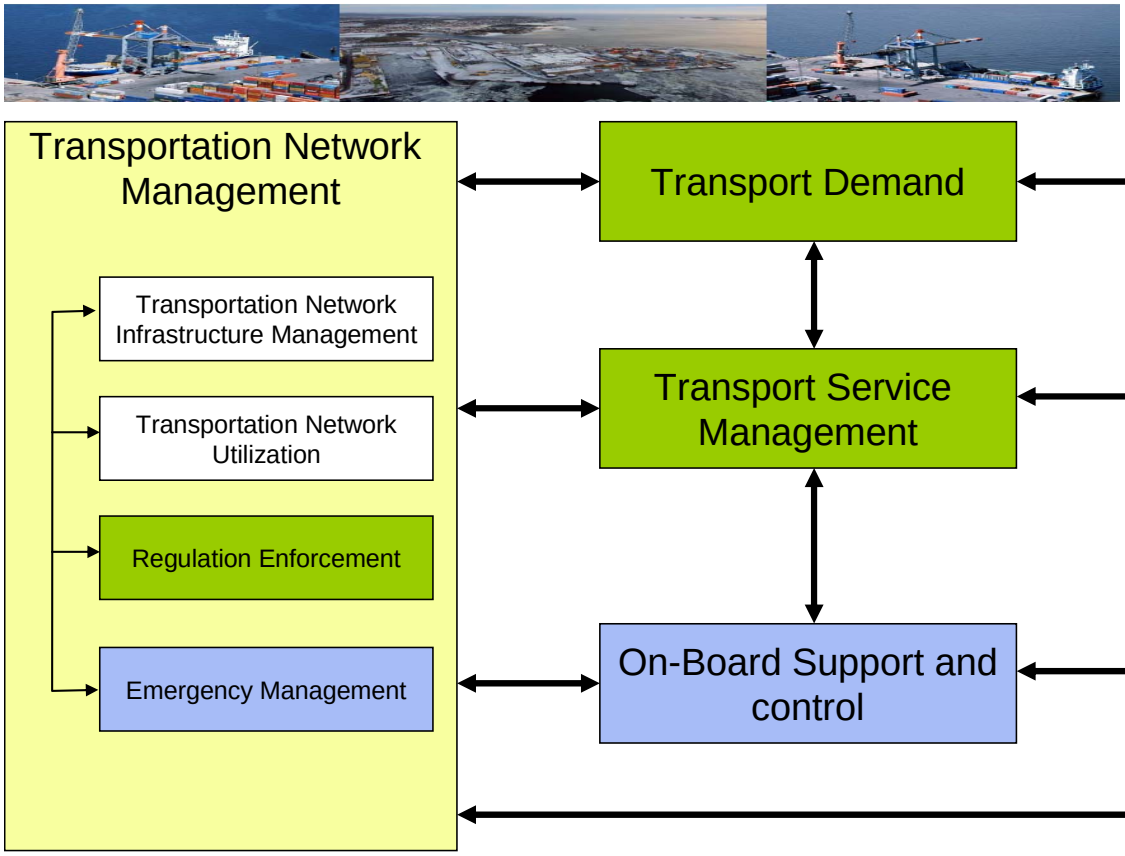
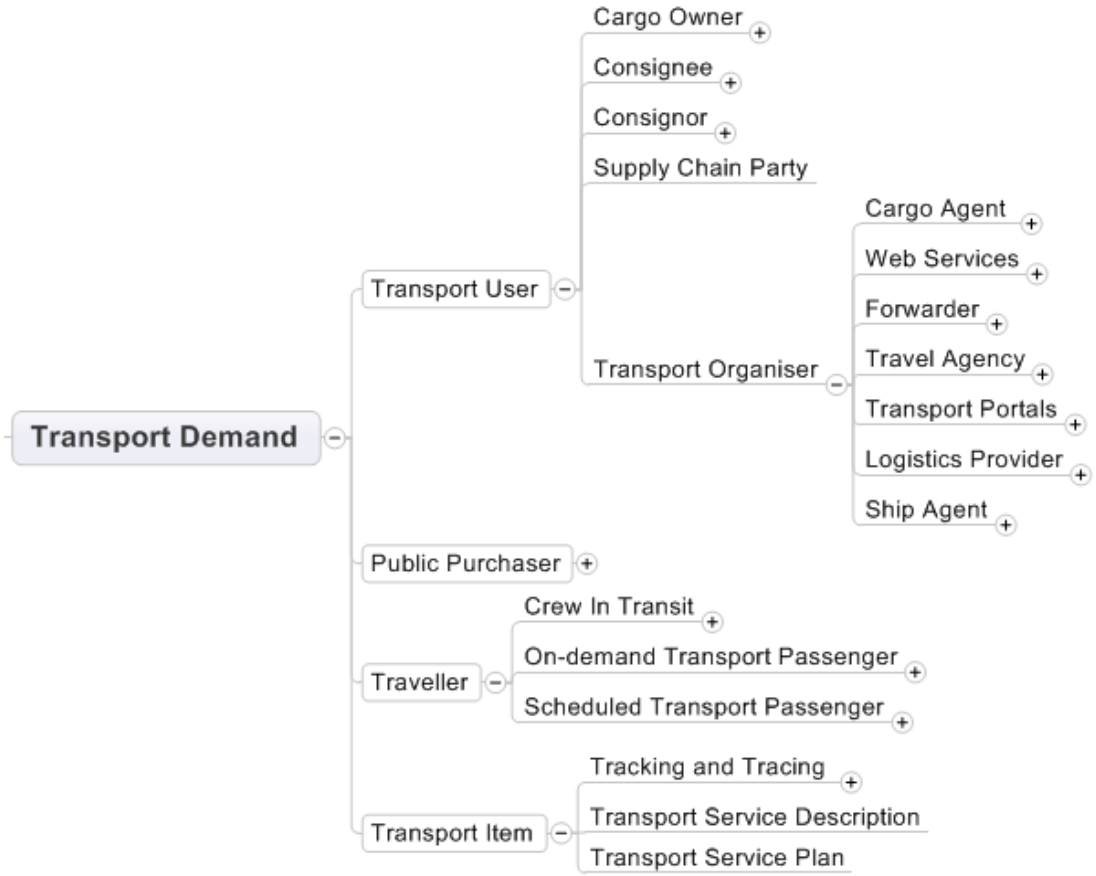


Figure 3 - MIS reference model

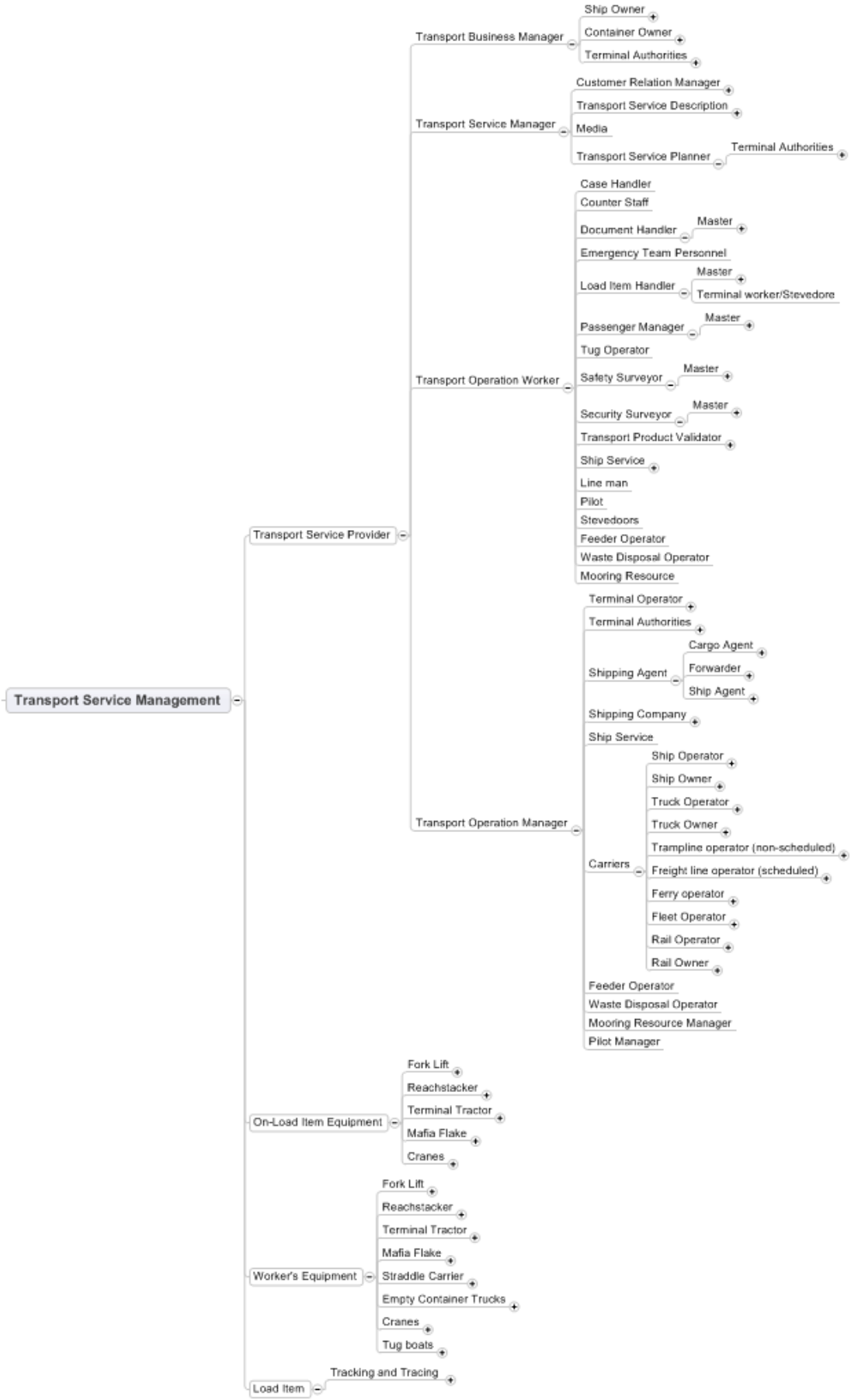
In the next sub-chapters we will describe the different domains and highlight their MIS-relevance.

3.2 MIS Definition of User Domains



Domain	Transport Demand definition
Arktrans	The Transport Demand domain supports transport preparation and planning, transport booking, and follow-up for freight as well as passenger transport. The aim is to support the Transport User, which may be both the party who wants to travel or to send goods and the party who is organising the transport on behalf of this Transport User (travel agency, forwarding agent, logistics provider). They both need much of the same functionality. The Transport Items (passengers or goods to be transported) and the transport chains are defined. The transport chains may include several legs served by different transport modes. Transport services are requested from the Transport Service Management domain and followed up. The responsibilities of the domain are: • To support preparation, planning and identification of relevant transport chains and services • To define the Transport Item properties • To support the ordering of the required transport services • To support the establishment of a Transport Execution Plan (TEP) • To support the execution of the transport chain (information exchange towards the transport service providers and authorities as well as coordination) • To support the follow up of the transport chain and corrective actions in case of deviations

	• To capture experience gained so that it can be reused
MIS Relevance	• To define the Transport Item properties • To support the execution of the transport chain (information exchange towards the transport service providers and authorities as well as coordination) • To support the follow up of the transport chain and corrective actions in case of deviations (e.g. made possible through "track and trace" and supply chain visibility) The most important role for MIS is the Transport User (Cargo Owner and Agents). The Transport Item is important when it comes to tracking and tracing and also as a part of the description of the transport service. The transport service description is an information package used by the Transport Service Providers to publish information about various services related to the transport, both physical transport of cargo, terminal handling services, document handling or organisational services. The public purchaser is important only as a transport user. Travellers are only relevant to MIS when it comes to crew.

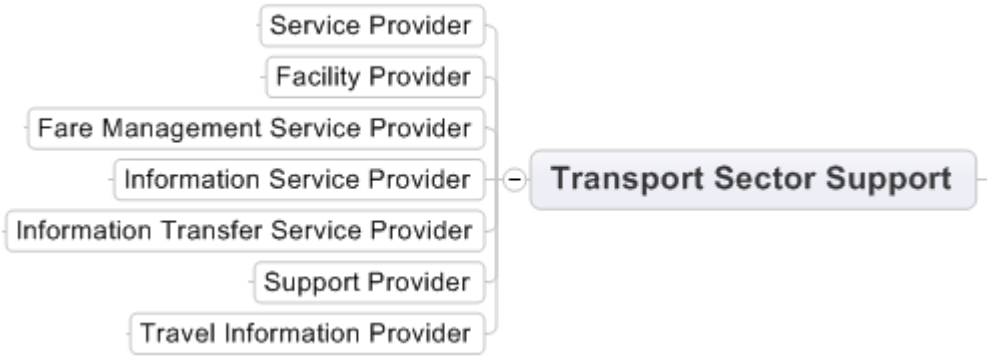

Transport Service Management
Transport Service Provider
Transport Business Manager
Ship Owner
Container Owner
Terminal Authorities
Transport Service Manager
Customer Relation Manager
Transport Service Description
Media
Transport Service Planner
Terminal Authorities
Transport Operation Worker
Case Handler
Counter Staff
Document Handler
Master
Emergency Team Personnel
Load Item Handler
Master
Terminal worker/Stevedore
Passenger Manager
Master
Tug Operator
Safety Surveyor
Master
Security Surveyor
Master
Transport Product Validator
Ship Service
Line man
Pilot
Stevedoors
Feeder Operator
Waste Disposal Operator
Mooring Resource
Transport Operation Manager
Terminal Operator
Terminal Authorities
Shipping Agent
Cargo Agent
Forwarder
Ship Agent
Shipping Company
Ship Service
Carriers
Ship Operator
Ship Owner
Truck Operator
Truck Owner
Trampline operator (non-scheduled)
Freight line operator (scheduled)
Ferry operator
Fleet Operator
Rail Operator
Rail Owner
Feeder Operator
Waste Disposal Operator
Mooring Resource Manager
Pilot Manager
On-Load Item Equipment
Fork Lift
Reachstacker
Terminal Tractor
Mafia Flake
Cranes
Worker's Equipment
Fork Lift
Reachstacker
Terminal Tractor
Mafia Flake
Straddle Carrier
Empty Container Trucks
Cranes
Tug boats
Load Item
Tracking and Tracing

Domain	Transport Service Managment definition
Arktrans	This domain addresses the management and provision of transport services to the Transport Demand domain. Such services may for example be provided by transport companies or terminals. A service may for example be transport along predefined and scheduled routes; ad hoc routes based on actual demands; document handling services; and terminal services like loading, unloading and transhipment. The provision of transport services is planned and managed based on actual and foreseen demands and information about the Transportation Network infrastructure and traffic conditions. This is based on information provided by the Transportation Network Management domain. The planning includes decisions about routes, schedules, service types and use of resources. The execution of the transport operations (movement of passenger/goods, cargo handling, document handling, etc.) is monitored and controlled. The latter may involve interactions with the On-board Support and Control domain. The domain's exchange of information with the Transport Demand domain shall support effective coordination and accomplishment of the whole transport chain, which is managed in the Transport Demand domain. This may include transport and terminal operations managed by several Transport Service Providers (transport companies, terminals, etc.). Responsibilities of this part of the transport sector are: • To provide transport Services to the Transport Demand domain according to orders and regulations o To plan the transport services to be provided o To publish information about the transport services o To support booking of transport services o To provide status information that may support the management of the transport chain • To manage ongoing transport operations o To find the most optimal routes and schedules and the most optimal use of resources. o To support efficient, safe, secure and environmentally friendly execution of the transport operations. • To accomplish the required information exchange with authorities • To support the execution of the transport operation o To handle the Load Items (cargo or passengers) according to regulations and agreements, dangerous goods included. o To report status and deviations related to transport operation (delays, problems, etc.) o To report Load Item status (damage, condition, loaded, unloaded, etc.).
MIS Relevance	• To support information needed by the Transport Service Providers. • The transport service providers will be important end users of MIS when it comes to both information provision and information consumption (e.g. allows the service provider to align its transport services towards user requirements) . Transport Service Providers are

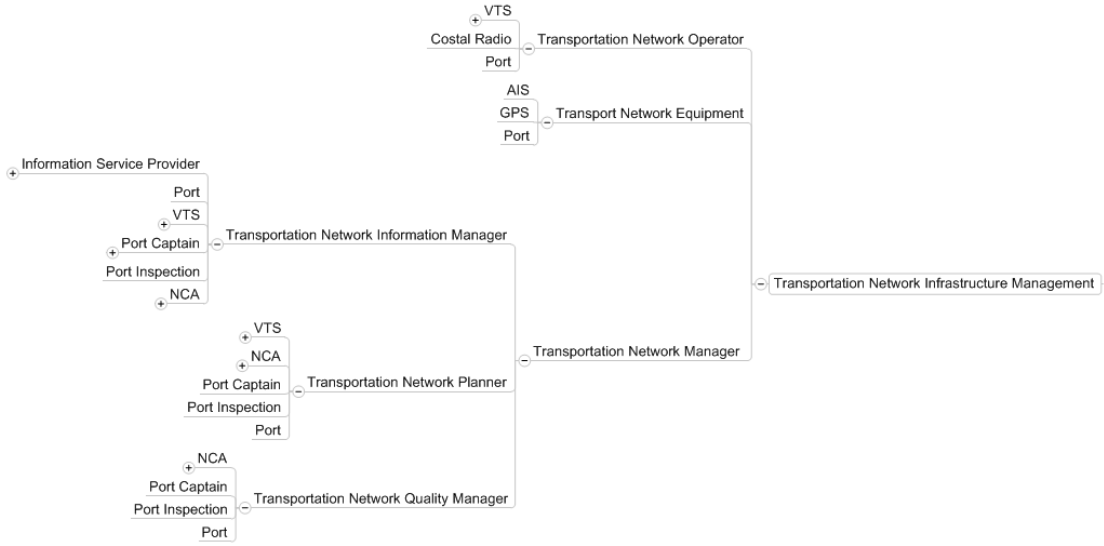
	related both to the vessel (ship owner, ship agent, tug operator, pilot, ship services etc), the cargo (terminal worker, cargo agent, stevedoors etc.), and also to the terminal (terminal authorities, terminal operators etc.) • Load item is relevant for tracking and tracing. • On-board item equipment and worker's equipment are related to MIS in that they need information on vessel movements and cargo characteristics. However, sending information to this equipment is outside the scope of MIS. This information is rather sent to the service providers, for instance the terminal operators.

Domain	On-board Support and Control definition
Arktrans	The On-board Support and Control domain addresses navigation, the integration of Transport Modes and Transportation Network Users in traffic operations (pedestrians and cyclists included), and safety issues related to the operation of the Transport Means. Adaptation to traffic situation, traffic regulations, Transportation Network conditions, security and efficiency are emphasized. On-board equipment provides information and supports safety and the operation of the Transport Means. The Transport Means' driver and the operation of the Transport Mean itself may also be monitored. Responsibilities of this part of the transport sector are: • To control and monitor the operation of the Transport Means in such a way that dangerous situations can be detected and if possible avoided. • To monitor the Load Items in such a way that damage and irregular or dangerous situations can be detected and if possible avoided. • To inform the Transportation Network Management domain about dangerous or irregular situations. • To promote safety and efficiency by providing information and support to the persons onboard in case of dangerous or irregular situations.
MIS Relevance	• The Master is an important source for various ship reporting information used by MIS. • On-board equipment, for instance AIS, is important for receiving notifications on positions to MIS to get updates on arrival times. • Crew related to safety and traffic operations are important sources

	for environmental data and ISPs information. • The Transportation Network user role (seafarer) is not relevant for MIS since this is covered by other roles. • The transport means (vessel) as such is not relevant for MIS since this is covered by other roles. • Driver's equipment is not relevant for MIS since this is covered by the on-board equipment role.

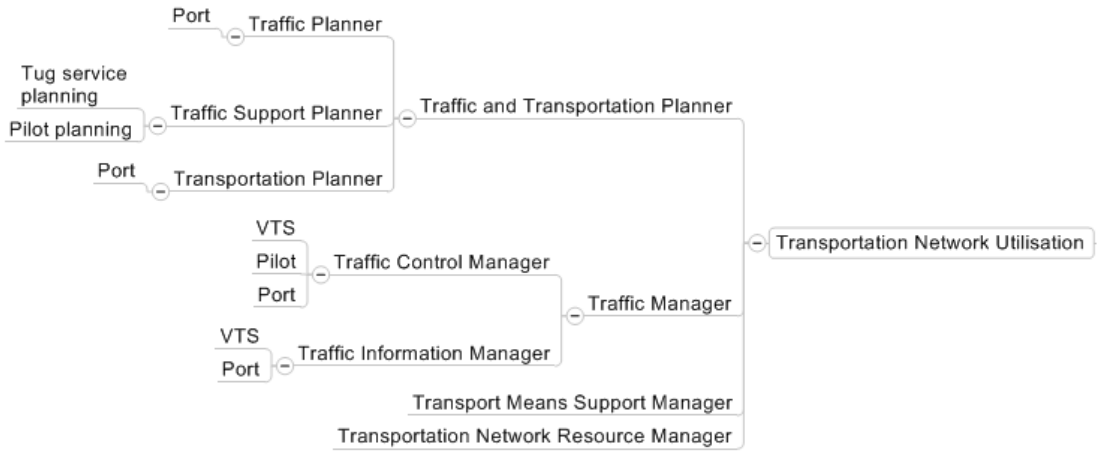


Domain	**Transport Sector Support**
Arktrans	The Transport Sector Support domain provides information and supportive services to the other parts of the Reference Model (but the services do not represent core transport or traffic activities – they are covered elsewhere in the Reference Model). Several types of services may be offered to the other domains. Responsibilities of this part of the Reference Model are: • To provide generic information services about the transport sector. This may for example be information about transport services, resources, infrastructure, environment, etc. • To provide services that support efficient information exchange between the parties in the transport sector. This may for example be gateways or hubs for reception, transformation and distribution of information. • To provide generic services to the transport sector. This may for example be fee collection services, directory management, travel product retailing, etc. • To provide services that support the operation and administration of Transport Means (e.g. assistance provision, supply services, certificate issuer, etc.) • To provide services and equipment that support incident and emergency handling (e.g. oil protection equipment, salvage services, etc.)
MIS Relevance	The MIS system itself has the role of information service provider since one of its goals is to support efficient information exchange between the parties in the port and also for parties related to the port. However, none of these roles are related to the information exchange itself since this is covered by other roles, for instance roles in the Transport Demand domain and Transport Service Management domain.



Domain	Transport Network Infrastructure Managment definition
Arktrans	The Transportation Network Infrastructure Management domain provides functionality required by those who are responsible for the physical Transportation Network infrastructure. This includes the physical infrastructure of Transfer Nodes such as terminals and stations.. The domain has the following responsibilities towards the other parts of the Reference Model: • To plan and establish Transportation Network infrastructures (Transportation Network Resources and Transportation Network Equipment included) that optimise the benefits of investments and provide the required capacities and qualities • To establish and manage information about the Transportation Network infrastructure. • To ensure proper operation of the Transportation Network infrastructure, including the Transportation Network Resources, Transportation Network Equipment and required navigation aids. o To monitor the state and the capacity of the Transportation Network infrastructure o To do strategic and tactical planning of infrastructure maintenance and improvements o To mange deviations and continuous operation of the infrastructure • To operate the Transportation Network infrastructure according to instructions received from the Transportation Network Utilisation domain. The management of the actual maintenance and the improvements of the infrastructure are however not within the scope of ARKTRANS.
MIS Relevance	• Transportation Network Operator is responsible for the daily operation of the physical Transportation Network infrastructure and related equipment. This role is fulfilled by the port as a terminal operator. • The port is also responsible for the management (planning,

	maintenance etc) of the terminal having the role of Transportation Network Manager.

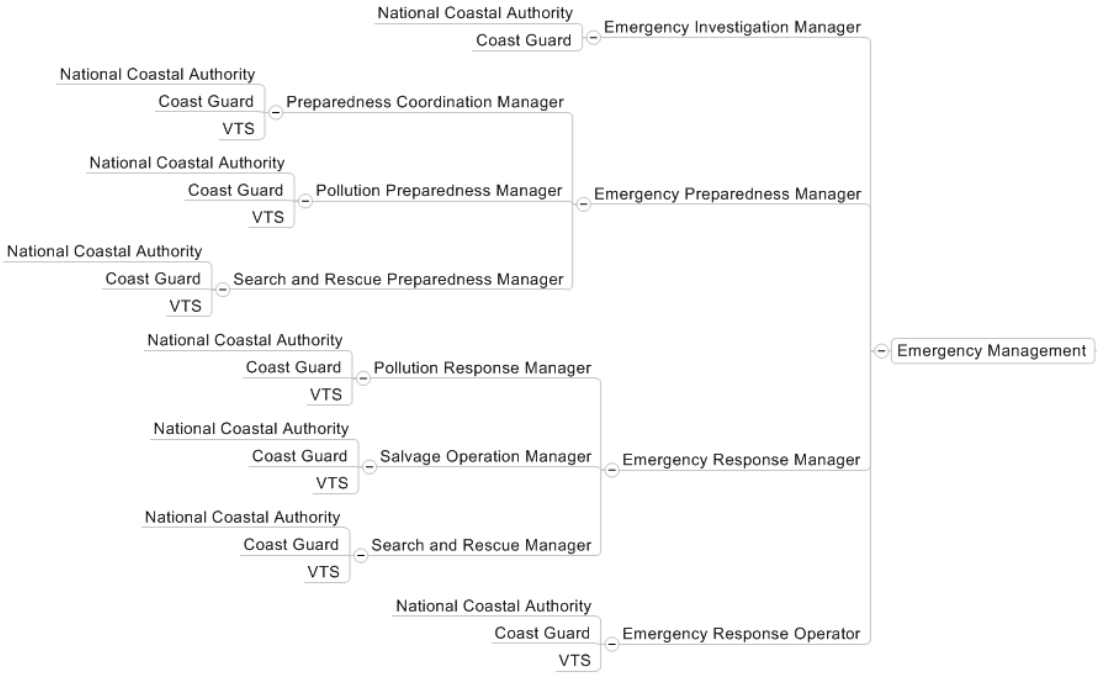


Domain	Transport Network Utilisation definition
Arktrans	The Transportation Network Utilisation domain supports the use and utilisation of the physical Transportation Network infrastructure, Transfer Nodes included. The responsibilities of this domain are as follows: • To do strategic and tactical traffic and transportation planning o To clarify the rules and regulations with respect to the traffic management. o To ensure the availability of supportive services to Transport Means o To provide guidelines or requirements for public transport with respect to capacities, routes, services, fees, etc. (Public transport will however be established and operated as a part of the Transport Service Management domain) • To manage the traffic in the Transportation Network infrastructure (the flow of Transport Means in general as well as the behaviour of individual Transport Means) in order to optimise safety, efficiency, security and environmental protection: o To plan how to handle normal and abnormal traffic situations and extraordinary transport operations o To arrange for traffic that is in conformance with laws and regulations. o To manage and provide traffic information o To manage the access to and use of Transportation Network Sections o To handle foreseen and occurred deviations and incidents in a way that minimise the threats to safety, environment, security, efficiency and property. o To register deviations, accidents and incidents. • To manage the assignment and use of Transportation Network Resources • To provide supportive services to the Transport Means that are using the Transportation Network to arrange for safe and efficient traffic flow

	and manoeuvring.
MIS Relevance	• The Traffic and Transportation Planner role is important for the planning of the port area towards securing efficient and effective cargo flow. • The Traffic Manager role is important for the planning of the traffic flow in the port, for instance related to berth allocation, monitoring of the traffic situation, detection of bottlenecks, registration of information about the traffic situation, etc. • The Transport Means Support Manager role is relevant for MIS since it covers how services are offered to the vessels during port stay. • The Transportation Network Resource Manager role is relevant since it relates to efficient management of port resources that is needed during a port stay.

Domain	Regulation Enforcement definition
Arktrans	The Regulation Enforcement domain provides functionality required by transport regulators. The overall functions are to a large extent generic and common to several regulators, but the area in which they work will vary. These functions include decision-making (based on the laws), operative control as well as the establishment and maintenance of directories holding relevant information. The domain has the following responsibilities:

	• To manage registries, licences, fee collection and statistics with transport related information enabling regulation enforcement • To make transport related decisions o To inspect and issue certificates and licenses according to rules and regulations o To establish fare policies o To take decisions on regulations (based on the laws) • To supervise and control in order to detect rule and regulation violations; • To prevent undesirable situations and unlawfulness o To provide information to the public about rules and regulation; o To provide qualified advice to individual actors on desired behaviour; o To intervene (in accordance with laws and regulations) to prevent undesirable situations and unlawfulness; • To enforce the laws and regulations o To register and handle regulation offences o To handle rule or regulation violations. o To manage statistics
MIS Relevance	These roles are relevant for MIS as follows: • MIS is used for collecting information that can be distributed to various regulatory authorities. • Collect statistics that can be used by regulatory authorities or by the port.



Domain	Emergency Managment definition
Arktrans	The Emergency Management domain provides functionality required by those responsible for emergency response related to transport. The

	responsibilities towards the other parts of the Reference Model are: • To manage information about incidents, accidents and pollution related to transport, and to derive knowledge about safety and environmental threats. • To establish emergency and pollution preparedness plans. • To provide guidelines and requirements for emergency preparedness, pollution control, and pollution preparedness; • To support search and rescue operations. • To support pollution response operations. • To support salvage operations. • To support the investigation of accidents, pollution and incidents.
MIS Relevance	Emergency management is out of MIS scope.

4. Information needs versus Role

Marked blue in the below figure, this chapter identifies the roles and actors that are considered to be relevant as users to a MIS information centre.

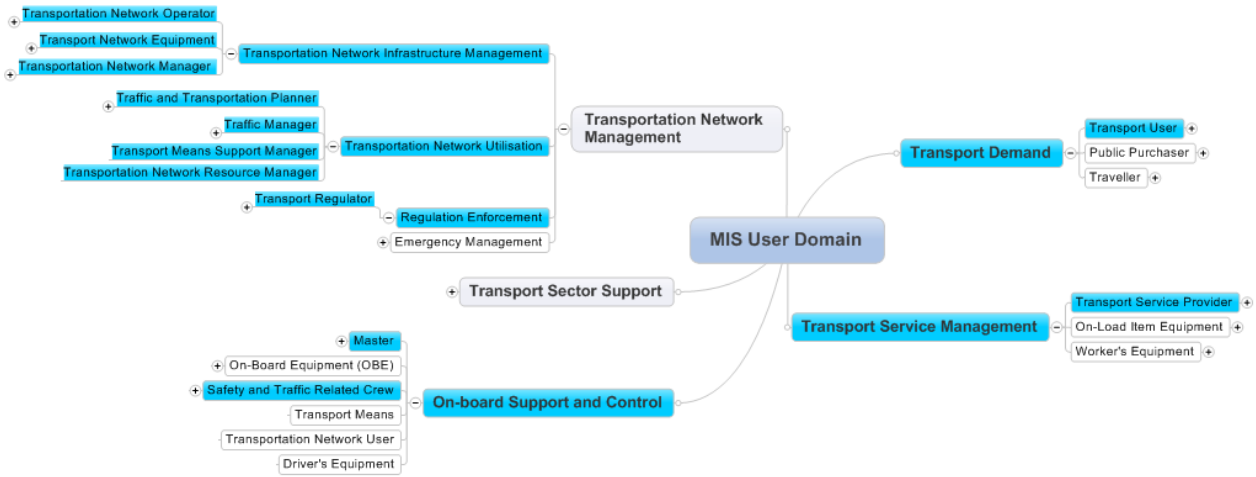
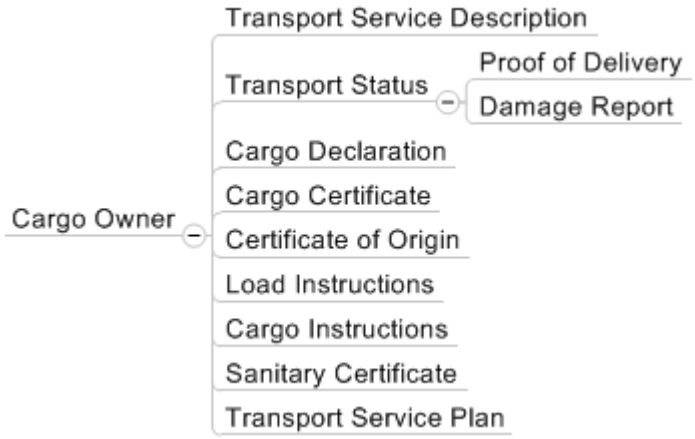


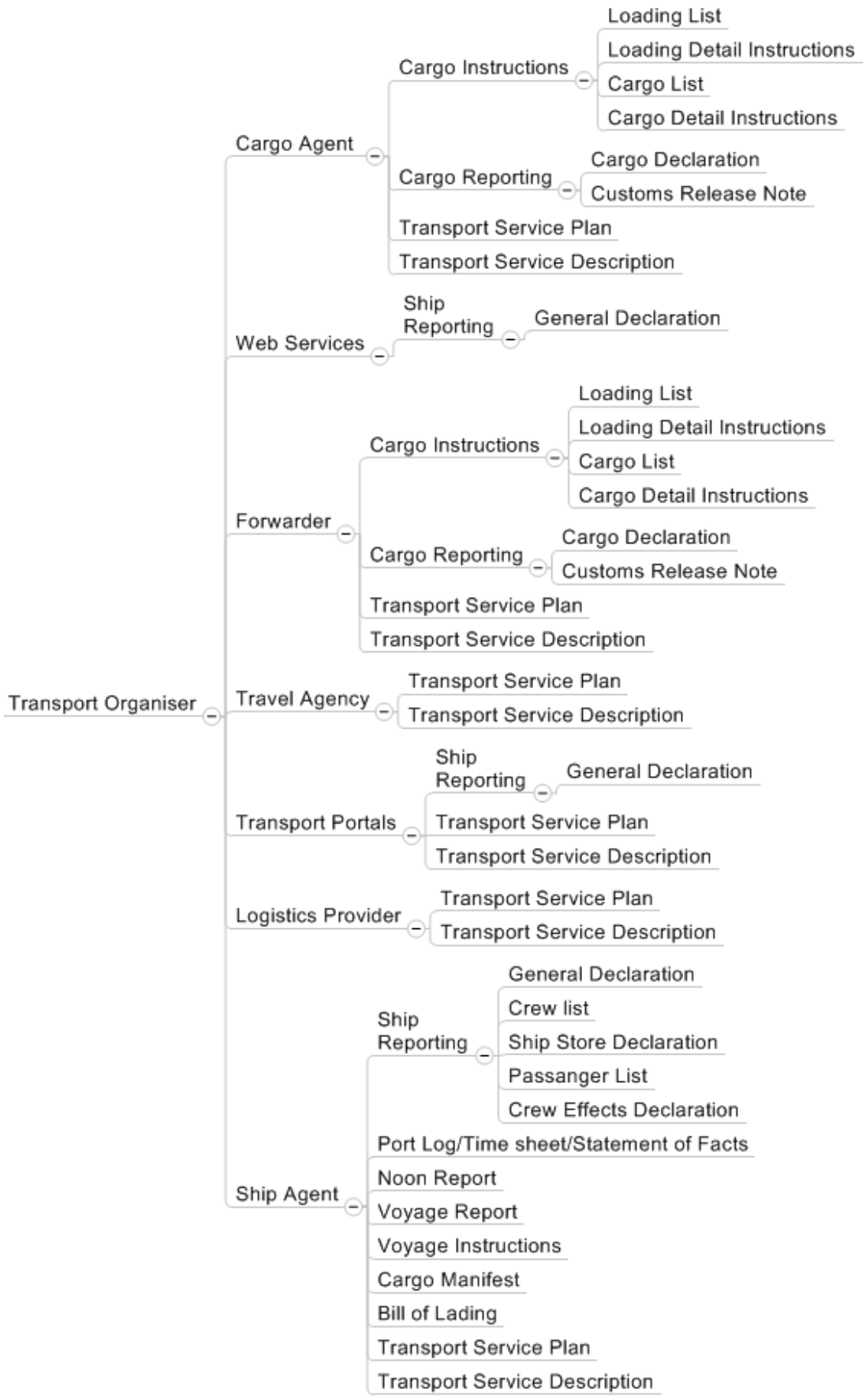
Figure 4 – Roles of relevance in MIS

Thus, in the following sub-chapters we present and describe the rationalisation of relevant MIS roles, using description of Arktrans terminology as a basis.

4.1 Transport Demand

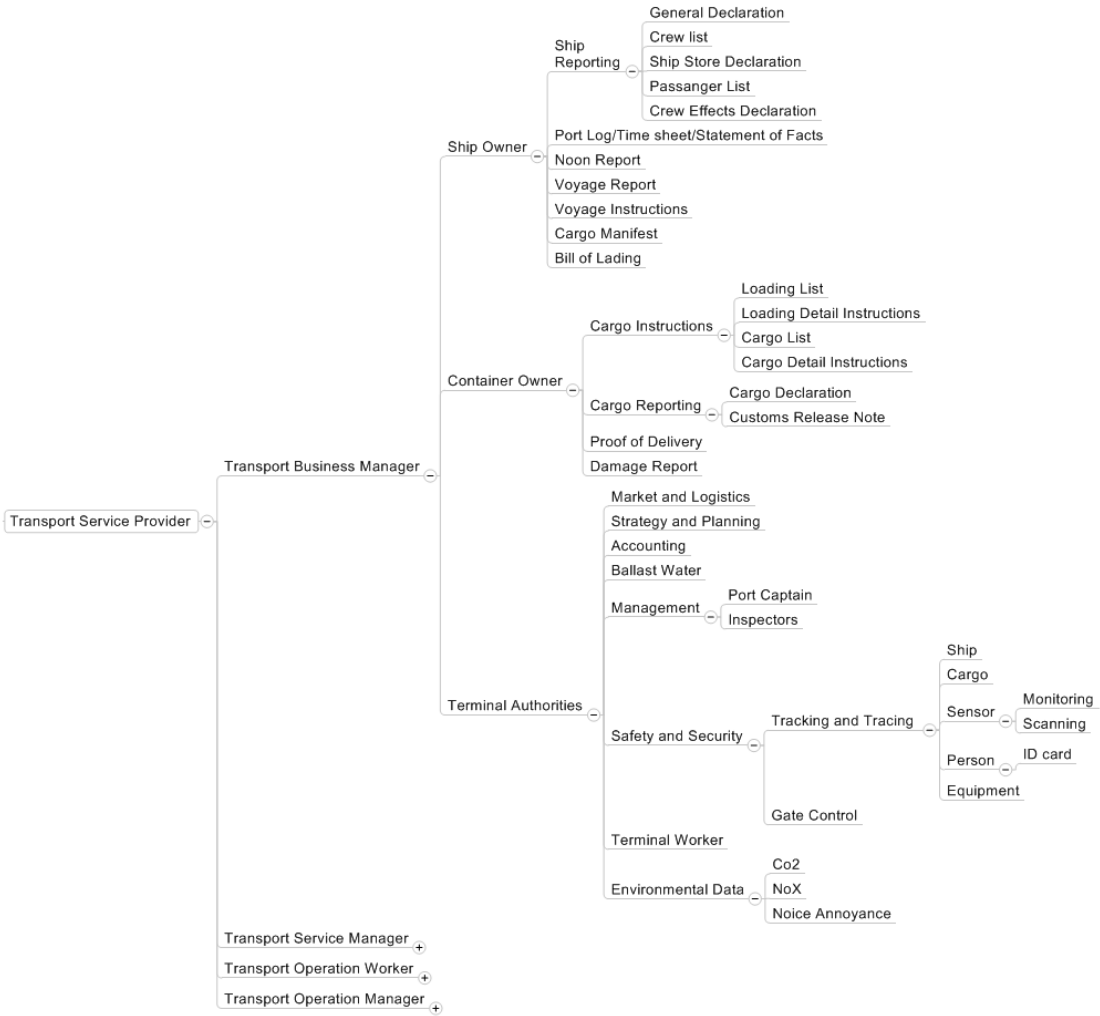


Domain	Cargo Owner information needs
Arktrans role definition	The owner of the cargo to be transported
MIS Relevance	The information needs from a Cargo Owner's point of view are: • *Transport Service Description*, which is the detailed description of a service used in a transport • *Transport Status* is the proof of delivery at a terminal. A status message can also be report on loss of cargo and/or damage during transport and transit operations. • *Cargo declaration* is the detailed description of the cargo. This includes categorisation cargo as well as hazmat definition etc. • *Certificate of origin* is a document that follows the cargo during the transport (i.e. from origin to end destination). It describes whom have defined and declared the goods, as well as where the cargo originated from. • Exporter, Importer: different information needs.

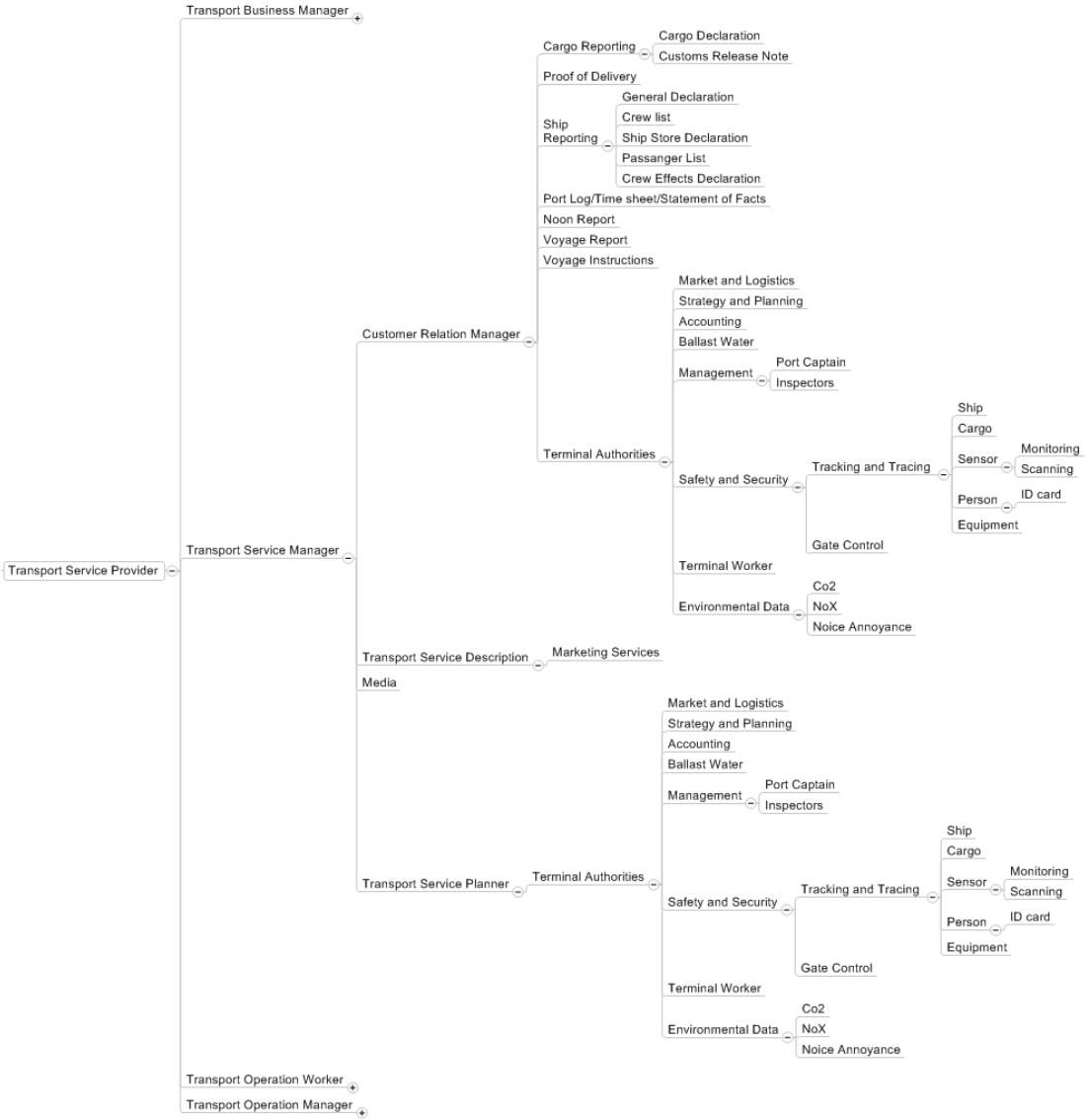

Transport Organiser
Cargo Agent
Cargo Instructions
Loading List
Loading Detail Instructions
Cargo List
Cargo Detail Instructions
Cargo Reporting
Cargo Declaration
Customs Release Note
Transport Service Plan
Transport Service Description
Web Services
Ship Reporting
General Declaration
Forwarder
Cargo Instructions
Loading List
Loading Detail Instructions
Cargo List
Cargo Detail Instructions
Cargo Reporting
Cargo Declaration
Customs Release Note
Transport Service Plan
Transport Service Description
Travel Agency
Transport Service Plan
Transport Service Description
Transport Portals
Ship Reporting
General Declaration
Transport Service Plan
Transport Service Description
Logistics Provider
Transport Service Plan
Transport Service Description
Ship Agent
Ship Reporting
General Declaration
Crew list
Ship Store Declaration
Passanger List
Crew Effects Declaration
Port Log/Time sheet/Statement of Facts
Noon Report
Voyage Report
Voyage Instructions
Cargo Manifest
Bill of Lading
Transport Service Plan
Transport Service Description

Domain	Transport Organiser information needs
Arktrans role definition	Organises the transport.
MIS Relevance	In the MIS project a transport organiser is defined to include the following stakeholders: agent, freight forwarder, travel agency, transport portals, logistics providers, or even a web portal. The information needs from a Transport Organiser's point of view are: • Information about the cargo for those who organises the freight (for instance cargo agent) • Information about the vessel for those who organises the transport means (for instance ship agent) • Information about the transport services (for instance transport portals and logistics providers) Most important for MIS is the cargo agents and shipping agents.

4.2 Transport Service Provider

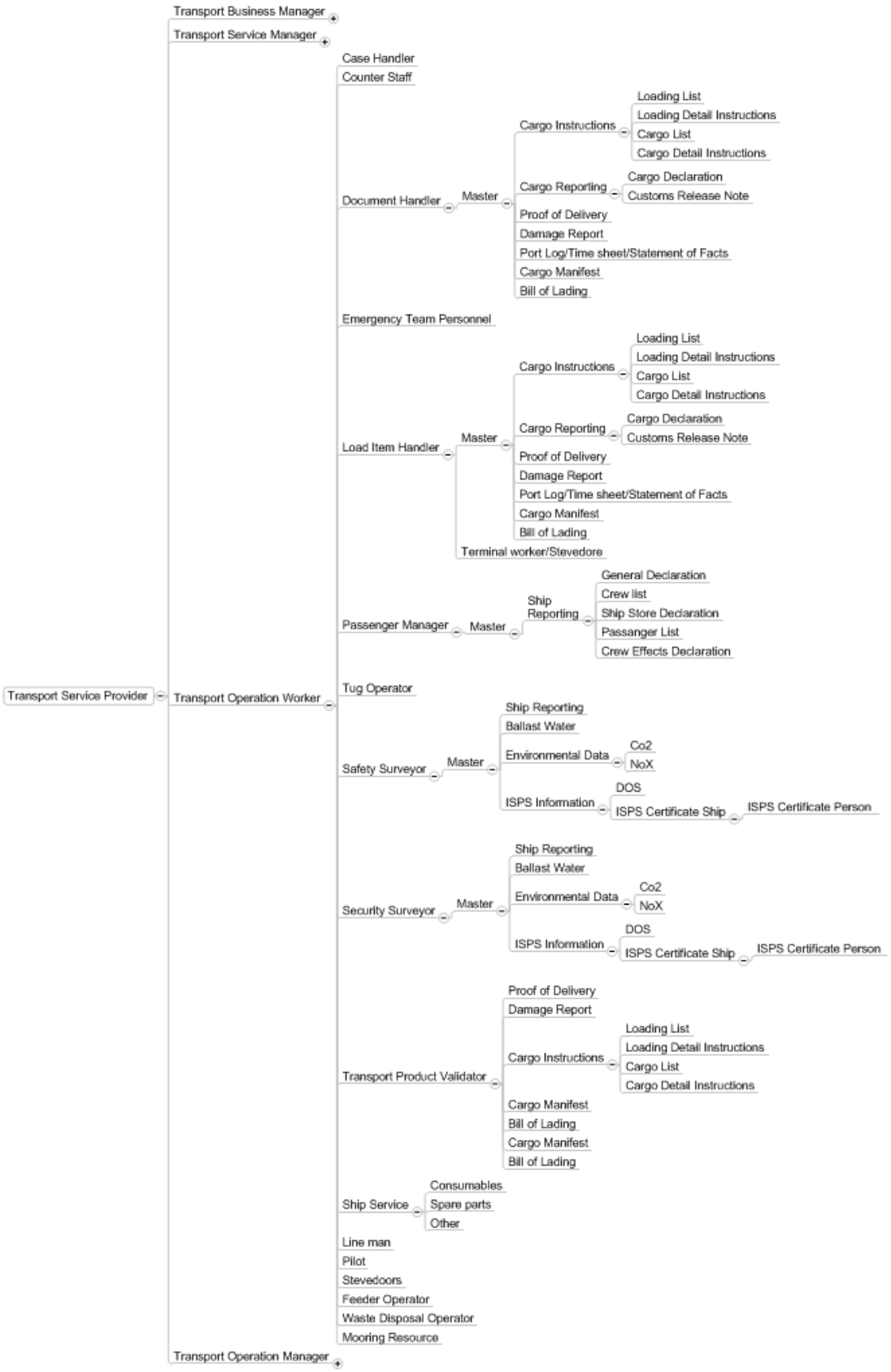


Domain	Transport Business Manager information needs
Arktrans role definition	Responsible for • Transport resources (e.g. Transport Means, crew, load units, trucks, etc), including their condition and qualifications. • Gathering of information for administrative purposes • Providing business related information to other parties, e.g. statistics and information for fee collection.
MIS Relevance	This role is important for the MIS-project since it is a user that issues information about the resources used in a transport. More specifically; • Information regarding the availability and capacity of transport means • Information regarding need to improve, update, and renew transport resources (training of crew, maintenance of infrastructure, etc). • Cargo flow and traffic information (e.g. needed by agents and freight forwarders, providing information regarding on-time deliveries, etc.).



Domain	Transport Service Manager
Arktrans role definition	Responsible for the • The planning of the services to be provided, including: price policy (if not committed to the guidelines of the Fare Authority); • The publishing of information about available transport services • The customer relations (i.e. contact with the Transport Users). This Includes; Formal agreements with customers; transport service provision; status reporting, etc. • The delegation of responsibilities for the fulfilment of transport needs to the Transport Operation Managers.
MIS Relevance	Transport Service managers is one of the most central group in the MIS-project. The role will also be using the resource hub that will be part of the project delivery. Further, it offers services to the trade community based on statistics, but also possibilities for working out transport service plans. Of particular importance is the ability to establish a closer relation between available transport services and the transport users (i.e.

	connecting and aligning transport supply and demand through improved communication and targeted marketing). It can also be a source for developing new and improved transport services.



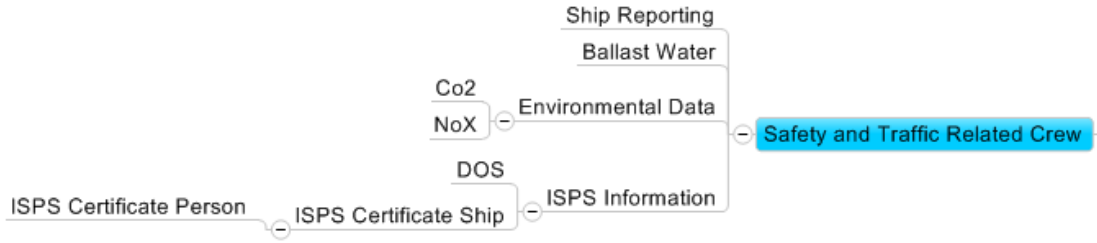
Domain	Transport Operation Worker information needs
Arktrans	Responsible for

role definition	• The execution of the actual transport operation and the related handling of the Load Items (loading, unloading, delivery, pick-up, document handling, etc.) according to instructions from the Transport Operation Manager and according to laws and regulations. (The actual operation of Transport Means is however the responsibility of the Transportation Network User). • Status reporting to the Transport Operation Manager.
MIS Relevance	Instructions and status reporting is mainly the information needs of most importance in this domain. Transport operation workers is both physically treatment of cargo as well as issuing status information.

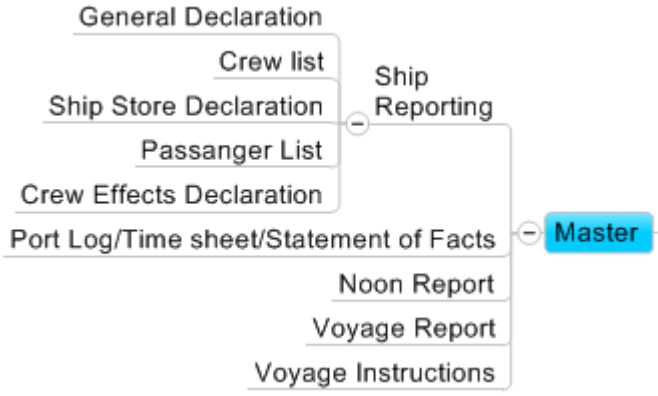
Domain	Transport Operation Manager information needs
Arktrans role	Responsible for • Decision on how to fulfil the transport demand by means of one or more transport operations, e.g. transport from one point to another; Load Item handling (e.g. at terminal); warehouse operations; document handling

definition	related to Load Items (e.g. customs), etc. • The planning of the transport operations (resource utilisation, time schedule, etc.). that can be carried out according to rules and regulations • The management of ongoing transport operations, including monitoring and follow up of the transport operations carried out by the Transport Operation Worker and the use of Transport Means (in On-board Support and Control). • Reporting related to transport operations (e.g. to authorities); etc. (if not done by the On-board Support and Control domain)
MIS Relevance	Instructions and status reporting is mainly the information needs of most importance in this domain. Transport operation workers is both physically treatment of cargo as well as issuing status information

4.3 On-board Support and Control



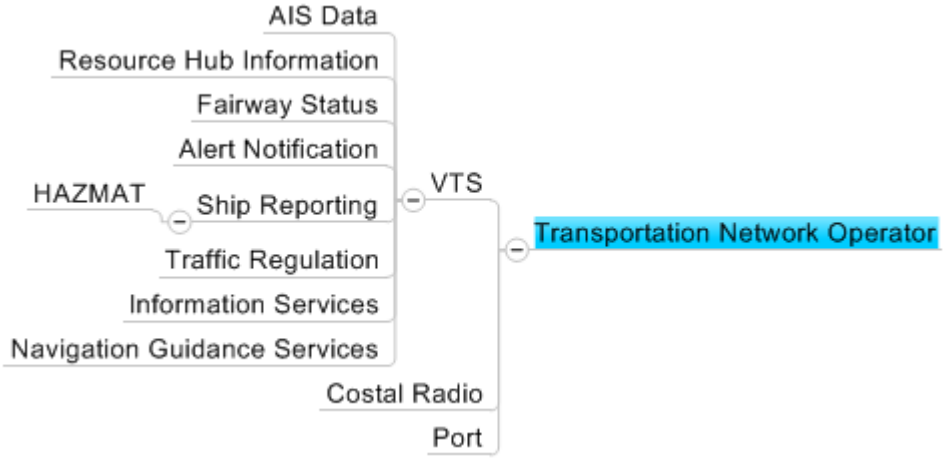
Domain	Safety and Traffic Related Crew information needs
Arktrans role definition	Responsible for the safety, security and traffic related operation of the Transport Means (Note that tasks related to the *on-board commercial handling of cargo* and *passengers* are the responsibility of the Transport Operation Worker in the Transport Service Management domain).
MIS Relevance	This domain is mainly an issuer to the MIS centre. It is not considered to be a high priority group for MIS, but some safety information regarding dangerous cargo as well as ISPS related information might be of interest for MIS.



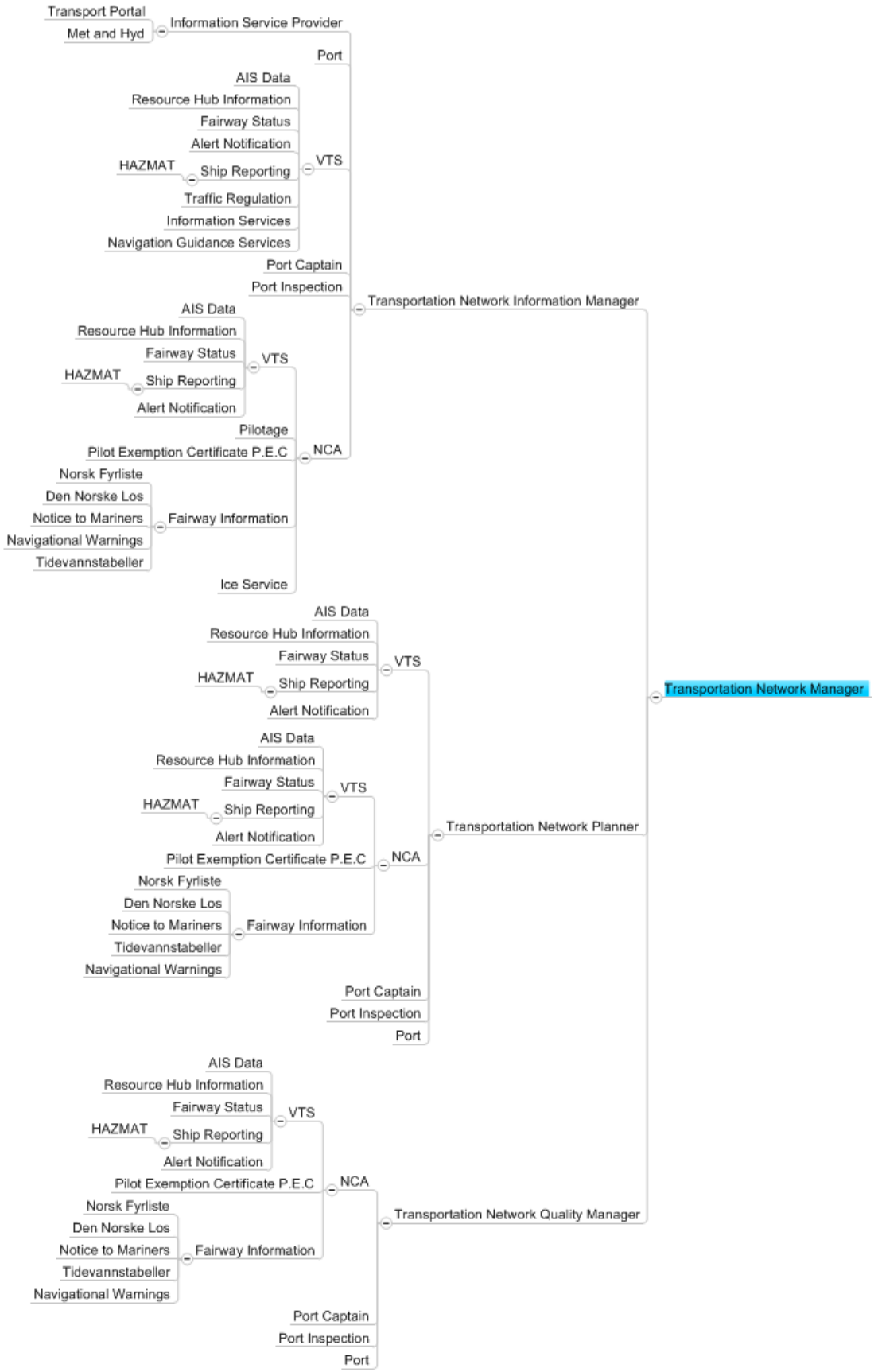
Domain	Master information needs
Arktrans role	The highest authority over the Transport Means responsible for • Safety on-board, security and environmental protection • The state of the Transport Means and the crew with respect to qualifications

definition	and licences. • The navigation and operation of the Transport Means • The compliance with the traffic regulations and traffic management measures.
MIS Relevance	The master is an issuer of information about the vessel as well as about the cargo on board the ship. The master's role is sometimes handled by a ship or cargo agent, but not always since a ship can report everything directly themselves. Most relevant information from a master is ship reporting, status messages, as well as instructions to terminal workers or own resources onboard the ship. The main duty of a master is to perform a safe navigation and safe nautical operations, while also securing operations according to pre-determined contract and/or routes (e.g. meeting timeslots in ports).

4.4 Transportation Network Infrastructure Management

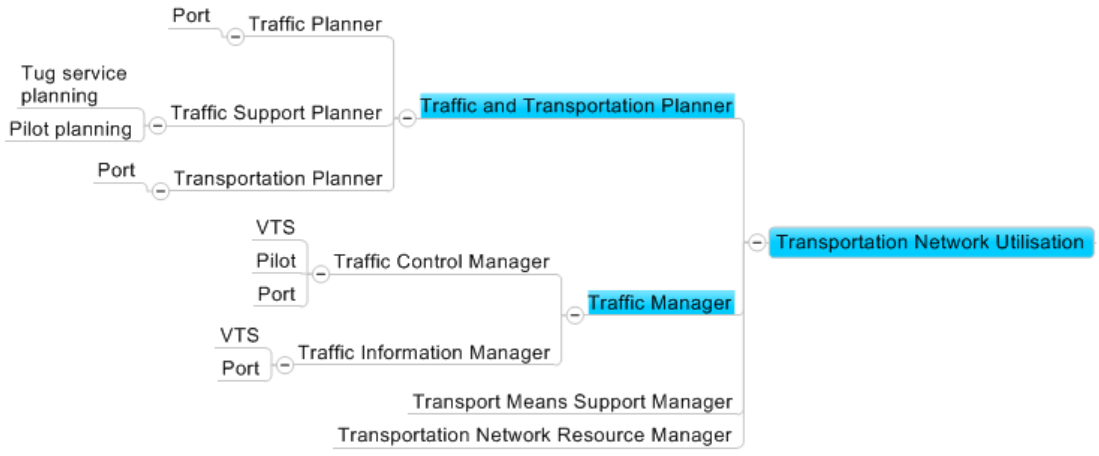


Domain	Transport Network Operation information needs
Arktrans role definition	Responsible for the fulfilment of the instructions from the Transportation Network Quality Manager for • The daily operation of the physical Transportation Network infrastructure • The daily operation of equipment related to the infrastructure (installation, operation and maintenance) • Improvements
MIS Relevance	This domain is probably not the most relevant domain in MIS. However, some services and information might be of relevance for the users regarding safety of journey/operations. E.g. the issue of AIS-data showing operational status. Also utilising AIS-data for producing statistics and information on traffic flows can be used for selecting safe transport corridors.


Transport Portal
Met and Hyd
Information Service Provider
Port
AIS Data
Resource Hub Information
Fairway Status
Alert Notification
HAZMAT
Ship Reporting
VTS
Traffic Regulation
Information Services
Navigation Guidance Services
Port Captain
Port Inspection
Transportation Network Information Manager
AIS Data
Resource Hub Information
Fairway Status
HAZMAT
Ship Reporting
VTS
Alert Notification
Pilotage
Pilot Exemption Certificate P.E.C
NCA
Norsk Fyrliste
Den Norske Los
Notice to Mariners
Navigational Warnings
Tidevannstabeller
Fairway Information
Ice Service
AIS Data
Resource Hub Information
Fairway Status
HAZMAT
Ship Reporting
VTS
Alert Notification
Transportation Network Manager
AIS Data
Resource Hub Information
Fairway Status
HAZMAT
Ship Reporting
VTS
Alert Notification
Transportation Network Planner
Pilot Exemption Certificate P.E.C
NCA
Norsk Fyrliste
Den Norske Los
Notice to Mariners
Tidevannstabeller
Navigational Warnings
Fairway Information
Port Captain
Port Inspection
Port
AIS Data
Resource Hub Information
Fairway Status
HAZMAT
Ship Reporting
VTS
Alert Notification
Pilot Exemption Certificate P.E.C
NCA
Norsk Fyrliste
Den Norske Los
Notice to Mariners
Tidevannstabeller
Navigational Warnings
Fairway Information
Transportation Network Quality Manager
Port Captain
Port Inspection
Port

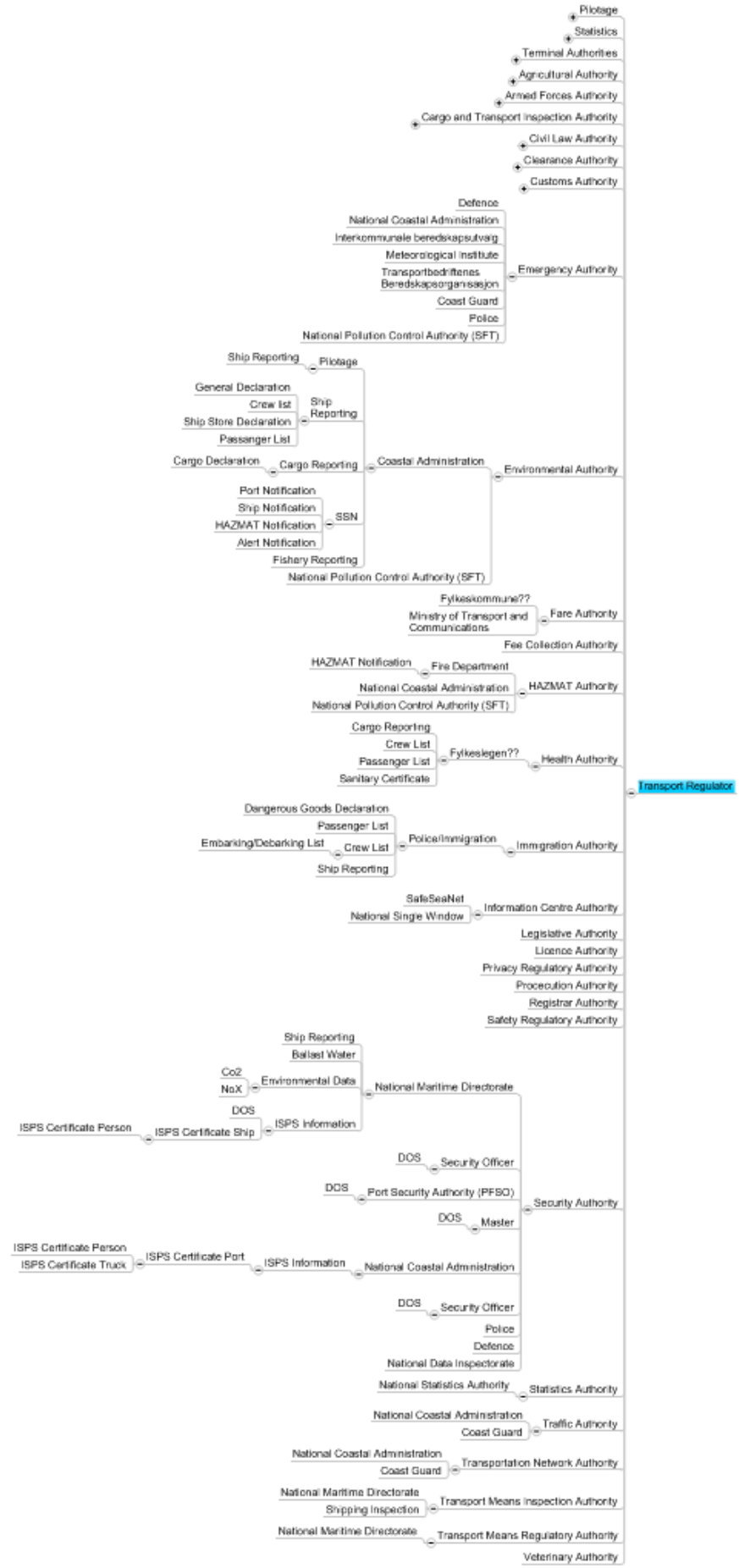
Domain	Transportation Network Manager information needs
Arktrans role definition	Responsible for • The physical Transportation Network infrastructure (operative planning, establishment, operation, maintenance, etc.). Safety, efficiency and protection of the environment are emphasised. Such a Transportation Network infrastructure may be a collection of transport links and Transfer Nodes and may include several sub-infrastructures (that are managed by Transportation Network Operators). • The management of information about the physical Transportation Network. **Transportation Network Information Manager** is Responsible for • Management of information about the physical Transportation Network **Transportation Network Planner** is Responsible for • The strategic planning of the Transportation Network infrastructure and related equipment. The quality must be according to regulations. • Contracts with the Transportation Network Operator **Transportation Network Quality Manager** is Responsible for the quality of the Transportation Network. This includes • Quality requirements with respect to service level, safety (e.g. infrastructure safety measures, the availability of emergency equipment), security (e.g. infrastructure that takes care of the security issues such as security checks, access control, etc.) and environmental protection. • Improvement plans. • Establishment and follow-up of the contracts for continuous operation and maintenance with Transportation Network Operator • The fulfilment of the quality requirements.
MIS Relevance	This domain is probably not the most relevant domain in MIS. However, some services and information might be of relevance for the users regarding safety of journey/operations. E.g. the issue of AIS-data showing operational status. Also utilising AIS-data for producing statistics and information on traffic flows can be used for selecting safe transport corridors..

4.5 Transportation Network Utilisation



Domain	Transportation Network Utilisation information needs
Arktrans role definition	The Transportation Network Utilisation domain supports the use and utilisation of the physical Transportation Network infrastructure, Transfer Nodes included. Traffic and Transportation Planner is Responsible for Strategically and tactical planning of traffic and transportation issues in an area Traffic Manager is Responsible for • The best possible traffic flow during normal and abnormal traffic situations (Network and Traffic Status – NTS) through efficient traffic management and incident handling. • Provision of information about the traffic situation (Network and Traffic Status – NTS) and the Transport Means supporting facilities and services.
MIS Relevance	Transportation Network Utilisation is also considered as having a low prioritisation in MIS. The relevance is to give an overview of relevant services in a terminal, as well as traffic statuses. Ordering of pilotage is part of the Norwegian Single Window and will therefore be part of the MIS.

4.6 Regulation Enforcement


Pilotage
Statistics
Terminal Authorities
Agricultural Authority
Armed Forces Authority
Cargo and Transport Inspection Authority
Civil Law Authority
Clearance Authority
Customs Authority
Defence
National Coastal Administration
Interkommunale beredskapsutvalg
Meteorological Institute
Transportbedriftenes Beredskapsorganisasjon
Coast Guard
Police
Emergency Authority
National Pollution Control Authority (SFT)
Ship Reporting
Pilotage
General Declaration
Crew list
Ship Store Declaration
Passenger List
Ship Reporting
Cargo Declaration
Cargo Reporting
Coastal Administration
Environmental Authority
Port Notification
Ship Notification
HAZMAT Notification
Alert Notification
SSN
Fishery Reporting
National Pollution Control Authority (SFT)
Fylkeskommune??
Ministry of Transport and Communications
Fare Authority
Fee Collection Authority
HAZMAT Notification
Fire Department
National Coastal Administration
National Pollution Control Authority (SFT)
HAZMAT Authority
Cargo Reporting
Crew List
Passenger List
Sanitary Certificate
Fylkeslegen??
Health Authority
Transport Regulator
Dangerous Goods Declaration
Passenger List
Embarking/Debarking List
Crew List
Ship Reporting
Police/Immigration
Immigration Authority
SafeSeaNet
National Single Window
Information Centre Authority
Legislative Authority
Licence Authority
Privacy Regulatory Authority
Prosecution Authority
Registrar Authority
Safety Regulatory Authority
Ship Reporting
Ballast Water
Co2
NoX
Environmental Data
DOS
ISPS Certificate Person
ISPS Certificate Ship
ISPS Information
National Maritime Directorate
DOS
Security Officer
DOS
Port Security Authority (PFSO)
DOS
Master
Security Authority
ISPS Certificate Person
ISPS Certificate Truck
ISPS Certificate Port
ISPS Information
National Coastal Administration
DOS
Security Officer
Police
Defence
National Data Inspectorate
National Statistics Authority
Statistics Authority
National Coastal Administration
Coast Guard
Traffic Authority
National Coastal Administration
Coast Guard
Transportation Network Authority
National Maritime Directorate
Shipping Inspection
Transport Means Inspection Authority
National Maritime Directorate
Transport Means Regulatory Authority
Veterinary Authority

Domain	Transport Regulator information needs
Arktrans role definition	Responsible by or under national law for regulation, enforcement of laws, administrative provision and international agreements with respect to traffic and transport. The will at least be to: • Provide general information to the public and to individual actors about rules and regulation and desired behaviour; • Take care of a national information collection and processing; • Decide on regulations • Enforce laws and regulations by means of: • Inspections and certification; • Supervision of the actual behaviour of individual actors in order to detect law and regulation violations; • Handling of law or regulation violations (investigations included) • Provide information to and cooperate with other authorities (national and international)
MIS Relevance	The regulatory role in MIS will be prioritised. This is mainly because: • The issuing of certificates that must follow in a trade • The issuing of information to other nations, mainly through the National Single Window • Issuing of regulations to be followed by the transport companies, such as the ballast directive

4.7 User groups and responsibilities

As a summary from the previous sub-chapters we have four main groups that have a relation to the MIS-centre. The following sub-chapters will also define the information the role groups issue as well as receive.
The four groups are:

- *Transport User:* The users of transport services
- *Transport Service Provider:* Provides information, planning, execution and completions of transport services
- *Transport Infrastructure Provider*: Facilitates the use of transport infrastructure
- *Transport Regulators:* Obtain required information for monitoring compliance with regulations

4.7.1 Transport User

The transport users are the users of transport services. The owners of cargo that is transported, passengers, shippers etc. are examples of transport users.
Information about the transport needs, details about transported items, contract information and status information are part of the information flow to and from the transport users.

Common definition	Transport User
Sub groups	Transport users (shippers, freight forwarders, etc) will be able to identify and use direct or combined transport services most suited for their

	purpose. Role example; Cargo owner
Responsibilities	**INPUT / INFORMATION ISSUER** • Definition of cargo details • Load instructions to transport service providers • Contractual agreements • Terms of transport • Transportation plan • Certification of cargo • Cargo declaration • Custom clearance **OUTPUT / INFORMATION RECEIVER** • Transport statuses • Proof of delivery • Damage reports • Contractual agreements • Custom clearance release

4.7.2 Transport Service Provider

The transport service providers provide the actual transport, services directly related to the transport, and the information about transport.
Among the information to and from the service providers are description of services, cargo declaration, vessel information and reporting and transport status.
In later work packages, the group may be split, putting vessels in a group separate from other transport service providers.

Common definition	**Transport Service Provider**
Sub groups	Transport service providers in all modes will provide information about their service offerings and exchange information electronically with all relevant actors through planning, executing and completing transport operations. This can be an agent, a forwarder, travel agency, transport portals, logistics providers, transport service providers, terminal workers/staff, ship owner, terminal authorities, resource owner such as a container owner, on-board staff, or even a web portal
Responsibilities	**INPUT / INFORMATION ISSUER** • Cargo instruction – Loading list, loading detail instruction, cargo list, cargo detail instruction, cargo declaration, certification of origin, cargo certificate, custom clearance, damage reports, proof of delivery • Cargo reporting – Cargo declaration, Custom release note, Status messages • General – Transportation Service Description, Contractual agreements, Terms of transport, Transportation Service plan • Ship Reporting – General declaration, crew list, ship store declaration, passenger list, crew effects declaration, port log, time sheets, statement of facts, noon report, voyage report, voyage instruction, cargo

	manifest, bill of lading, ISPS-reports, environmental reporting (ballast) **OUTPUT / INFORMATION RECEIVER** • Transport statuses • Cargo – Loading list, loading detail instruction, cargo list, cargo detail instruction, cargo declaration, certification of origin, cargo certificate, custom clearance, damage reports, proof of delivery, cargo status • Cargo reporting – Cargo declaration, Custom release note, Status messages • General – Transportation Service Description, Contractual agreements, Terms of transport, Transportation Service plan • Ship – General declaration, crew list, ship store declaration, passenger list, crew effects declaration, port log, time sheets, statement of facts, noon report, voyage report, voyage instruction, cargo manifest, bill of lading

4.7.3 Transport Infrastructure Provider

The transport infrasturcutre provider group consists of roles that facilitate the use of the transport infrastructure and information about the use of the infrastructure. The status of the transport infrastructure, availability and booking of resources, hazards with transported goods are among the information that goes to and from the transport infrastructure provider.

Common definition	**Transport Infrastructure Provider**
Sub groups	Transport infrastructure providers will be able to facilitate the best possible use of the complete transport infrastructure and support transport users by providing relevant information about the available transport infrastructure and how to use it. The following actor groups has been identified in MIS: VTS, Coastal Radio, Port administration, National Competent Authorities, Port Captain, Port inspection, infrastructure information providers, Port inspections, Traffic planners, Traffic manager
Responsibilities	**INPUT / INFORMATION ISSUER** • Cargo reporting – Dangerous goods, • General – Resource Hub Information, Metrological and Hydrological data, traffic status, pilot booking • Ship Reporting – AIS-data, Ship reporting, Hazmat, Navigational warnings and guidance (ice, notice to mariners, lighthouse statuses, etc), fairway certificate, pilotage • Infrastructure status – Fairway status, alert notification, traffic regulation, information services, navigation guidance, terminal guidance, available

	resources, **OUTPUT / INFORMATION RECEIVER** • Transport statuses • Infrastructure statuses

4.7.4 Transport Regulators

The transport regulators are roles that regulate transport, e.g. authorities.
Among the information that the transport regulators send and receive are custom information, health information, environmental reporting, crew and passenger information.

Common definition	**Transport Regulator**
Sub groups	Transport regulators will be able to obtain in the simplest possible way the required information for monitoring compliance with applicable regulations, and to exchange information with other authorities for collaboration in security and environmental risk management. Roles can be; pilots and traffic centre, terminal authorities, Agriculture authorities, Health authorities, Navy/defence, Security staff/authorities, Protection authorities.
Responsibilities	**INPUT / INFORMATION ISSUER** • Cargo – environmental data, sanitary certificate • Cargo reporting – Custom release note, Status messages, cargo certificate (sanatoria, rat, origin) • General – Transportation Service Description, Contractual agreements, Terms of transport, Transportation Service plan, DOS and ISPS issuer, • Ship Reporting – Environmental reporting (ballast, waste), ship regulations, Fairway certificate, Pilotage orders, **OUTPUT / INFORMATION RECEIVER** • General, – Embarking, debarking, SafeSeaNet messages • Cargo – cargo list, cargo detail instruction, cargo declaration, certification of origin, cargo certificate, custom clearance, damage reports, proof of delivery, cargo status, dangerous goods, Fishery report, • Cargo reporting – Cargo declaration, Custom release note, Status messages • Ship – General declaration, voyage, ship details, crew and passenger details, ship store declaration, crew effects,

5. Questionnaires and Field Tests

5.1 Background

In the project we have developed a set of questionnaires to give us answers on user needs, requirements to information, and the processes regarding use of a MIS solution. The questions are summarized in the yellow text boxes and a summary of the answers are listed after each text box.
The questionnaires have been conducted among the following actors during autumn 2009:

- JP Strøm
- Ålesund havn
- Tromsø havn
- Brødrene Sperre
- Wilhelmsen Maritime Services
- Bring Logistics Ålesund
- Tyrholm-Farstad

5.2 Existing Work Processes

- How do they work today regarding reporting, processes, service availability, legal limits:
  - o What are the interfaces to which systems.
  - o Special challenges in the current situation.

Several of the actors told that their work days had become easier than before since more and more information now is handled electronically. However, a challenge still exists in that often have to enter the same cargo details and voyage information info several web sites of actors involved. This means that even though more information is handled electronically, they still need to enter the same information several times with the increased possibility of introducing errors.
Several actors replied that they where lacking interfaces to systems that would have been helpful for them, for instance to a common ship registry.
Another observation was that some of the actors wanted tighter interfaces to some systems, meaning that input given in one system should be transferred and handled automatically in their own system. An example of this is information that is handled through a mail interface, and thus must still be entered once more at the receiving party.

5.3 Requirements to MIS Services

- What services will you provide using MIS?
  - Who will be the users of these services
  - Payment Mechanisms for these services
  - Legal, legal aspects, items. in connection with cargo
  - What are the advantages you see with this? Gains of this, the issues resolve this?

We have been using the ARKTRANS framework in our work to identify users and user groups. There are four groups that will be central; the Transport User, the Service Providers, the Regulators, and the Infrastructure information providers.

One important part of the services relates to information exchange related to cargo handling. These services are relevant for cargo owners, cargo agents, but also for services related to the loading/unloading in the port.

Another important set of services are related to the voyage and contains information anout the ship, crew, security and various arrival and departure times.

Some other observation on services that a port offers:

- Administration of the fairway to the port (bouys and navigational objects)
- Presentation of meteorological data
- Maintenance of own resources
- Internet to port users
- Offers wireless network
- Surveillance cameras to be used for instance by terminal operators
- Other services to terminal operators
- Port services common for several jetties
- AIS signals: http://www.marinetraffic.com

The most important service for agents will be the single window solution where all information on the ship and cargo can be entered once, and then be distributed to all parties requesting information. Specifically, this is important for reporting to authorities.
Single Window is important since this will lead to more correct, consistent and complete information. It will be a smaller job to collect all the various information and forward it to the various recipients. Setting access rights to information is another important functionality that must be ensured. The data used for statistics will be more correct than before.

5.4 Requirements to MIS Information

- What information will you provide using MIS?
  - Who can it be available for, who are the stakeholders for this?
  - Who should it be hidden for, user groups?
  - Payment per use?
  - Legal, juridical aspects, i.e. connection with the cargo data. Who is responsible for data accuracy?
  - Timing: When in the process provides the data?
  - What are the advantages you see with this? Gains of this, the issues to be resolved?

In the previous chapter we identified the user groups, the information each actor group issued and was a receiver of, and the needs of having a MIS centre. It is important to protect the information and not let unauthorised users get information. The main benefits of a MIS centre is to report the information only once and let the centre be the middleware that send the information to authorised receivers, in an agreed format.

Agents can give the following information to MIS:

- Information on ship arrival
- Information on cargo: amount, type, dangerous goods classification
- Information on the ship: length, width, draught, number of crew (and passengers), last port, next port, last foreign port, ISPS, ISSC certificate, DOS (notice to say the ship has visited a non-ISPS area)

To do the planning as effective as possible, agents must know the arrival time of the ship as correct as possible and also link this information to all services that are booked for this port call. They need to know the updates in ETA and to link this to the resources that are booked. A possible new service is to notify the various resources that must be available during the port call. They must be notified about updates in ETA and updates in the booking. This is an important new service for WSS since the ETA is often subject to changes due to weather conditions, changes in the sailing plans etc.

A cargo owner can submit arrival notification, receive notification directly from the ship, its agent, or the sales company. They will need the MIS-centre to negotiate and distribute information about terms and contracts, nominations, agreements with service providers etc. Health certificates are issued by the health authorities but will be used by the shipping and cargo agents.

- What information will you be able to use in the MIS?
  - Who is the provider of the info?
  - Query on demand, or subscribe to this data?
  - Legal, juridical aspects, i.e. in connection with the cargo data?
  - Requirements to the data. Who is responsible for data accuracy?
  - Timing: When in the process do you need the data?
  - What are the advantages you see with this? Gains of this, the issues resolve this?

The questionnaires showed that much of the usage of information is related to the benefit of having a central, single source of information. An important example is to have access to common ship registry. Also, access to cargo related information, ship related information and voyage related information is important.
The actor both want to access on demand and to subscribe to the information.

- Services to communicate confiential information to a certain receiver in a secure way.
- Compile information from various sources, put it together and send statistics to SSB
- Receive information on traffic data
- Receive updates on status for ships, for instance on timing, berth allocation, tracking of cargo etc)

5.5 Requirements to New Services in MIS

- What new services can you offer if you have access to more and updated information and services at the right time?
- Hint: Environmental Data, safety / security, broadband to ships in port?

Few of the participants had any opinions of these, however, all of them pointed out the importance of having a single window solution covering both authority and commercial information where information can be entered once and used by others in a secure way.

5.6 Conclusions

An important result of the field studies and interviews is that both private and public information must be included in the centre. We must have a relation or integration to private systems such as agent systems, port community systems, accounting systems, maintenance systems, as well as to governmental owned systems such as a national single window, the customs system, and possibly other systems for instance common

ship registers. The solution must also be used to both store, request and retrieve information. Therefore it is important to have a strong authorisation of the user, so that confidential information will not be published to unauthorised persons. The use of well-known standards and formats must be prioritised.

Identified challenges so far are the ownership to the MIS-centre. How the legal aspect and information can be sent through a third part, that will be responsible for the information, to the end receiver and how the acknowledgement of reception can be sent back. Another challenge will be to harmonise the identifiers between the different systems. MIS will be as the following figure shows a close link between different systems, different users, and different type of information.

Several of the actors pointed out the need for the centre to maintain ownership of information. This was pointed out to be important to avoid abuse of information when sharing the information among several users. The introduction of user groups was mentioned to handle this.

6. Conclusions and recommendations

From the studies in the previous work packages there are a few observations that will be central in a Maritime Information Centre.

The figure below shows an overview of the MIS centre. The users of the centre will use the centre for reporting governmental as well as commercial information, and will also use the centre for information retrieval. Automatic data capture from AIS and sensors in cargo and terminals will also provide data for the users. Information required by authorities will be collected and sent automatically through the centre.

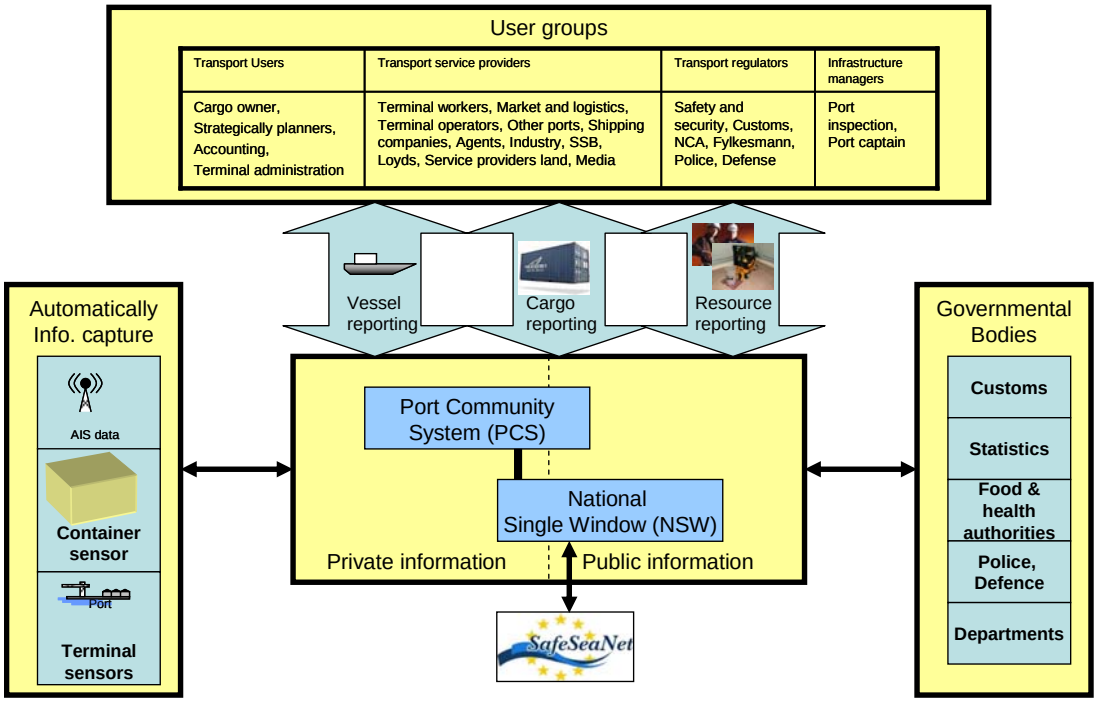


Figure 5 - The MIS centre

- **Single Window** is a solution that most of the refered projects have prioritised as important to have a more efficient transport. A single window solution was originally ment to be a solution to customs, but regarding maritime trade the understanding is a solution that the user can report both mandatory information as well as private information such that a single-point-of-reporting philosophy can be solved.
- **Private-public information.** The centre must have a private-public organisation. Because the information needs of both governmental bodies and commercial partners overlap, and the users should need to report information only once to a port community system, it makes sense to use the centre for both private and public information. Ownership of the information and privacy is an issue.
- **Connection to governmental bodies.** Governmental bodies are everything from customs to health authorities. Some of the authorities must reply with an

acknowledgement of received information, while others will only receive information for safety, statistics, or security reasons.

- **Use of sensors.** Use of automatic information capture such as reception of AIS signals has become an important addition to the port and governmental communities. Sensors in containers and terminals, and other means of automatic data capture will also provide useful information. Sensor technology will in the coming years be even more important and we will see new technologies emerging rapidly. The MIS-centre must have mechanisms to handle such an evolution of new technologies.
- **Message contents.** The number of messages used in vessel reporting as well as cargo reporting is enormous. As a commonality we can see that following information groups should be part of the centre; cargo information, vessel information, information about the crew and passengers, voyage information, and information to be used for safety and security purposes. The freightwise project has devoled some information packages to be used for cargo trades that should be used when future needs of a centre are designed.
- **Both vessel and cargo information** The MIS-centre must have information on both vessel and cargo information. Another optional solution should be a resource hub allocated to the terminal or port. That means an overview of available resources and services in a terminal that can be used in a trade operation, such as serving a ship entrance to a port.
- **User groups.** The list of users of a MIS-centre is long. To be able to define processes showing the information exchange between the groups we must group them into user group domains. So far we have a list of four different user groups that reflects the involved stakeholders; Transport User, Transport Service Provider, Regulators, Transport Infrastructure Provider
- **Standardisation.** The information used will be on a standardised format such that the integration between systems will be easier. International standards will be preferred to national (Norwegian) standards.

6.1 Requirements to a Maritime Information Centre

The requirements to a Maritime Information Centre are as following:

Presentation Layer

- Single point of entry of information.
- Collection of authority and commercial information from various sources.
- Presentation of authority and commercial information
- Publishing of authority and commercial information that is available in MIS based on computations done in Business Layer (Information Management part) -- as services
- Tool for setting Access Control: setting restrictions on what can be published based on meta data in MIS.

- Tool for setting subscription information on MIS information.
- Persistent storing of information entered to MIS.
- Tool for setting up payment of data usage: Setting up payment rules for actual service or information based on meta-data from business layer

Business Layer

- Orchestration of information based on meta models and input data from Presentation layer (from SingleWindow module)
- Maintenance of Orchestration Rules, for instance who should be notified, which format, at what time etc.
- New functionality based on usage of available information from Presentation layer (single window module) and Application layer (Resource Management module). For instance AIS+bookingInfo in pilot.
- Maintenance of available payment rules to be applied by Presentation Layer (SingleWindow)
- Business Layer sets up and maintains all available payment rules, access rules and notification rules. Presentation layer instantiates this metadata when handling information input and output:
- Includes interfaces to legacy applications, for instance:
    - Resource Hub:
        - Management of Service Bookings,Resources and Services.
        - Communication and coordination with third party service provider systems
    - KYV: ShipRep
    - Etc.
- Interfaces to applications are maintained centrally and locally by the applications.
- Orchestration of systems in the application layer are maintainted centrally
- The applications themselves are maintained locally in the port, or otherwise, based on meta data stored centrally in the Business Layer.
- NB! Only one interface for each type of information, for instance for arrival notification etc!

Database Layer

- Contains services for persistent storage of data. This includes storage of MIS data and MIS meta data.
- Data can be stored locally and centrally, since the data access in captured in database access services.
- Business layer uses data services to access data.

6.2 Benefits of using a Maritime Information Centre

The main benefits of using a MIS centre is summarised in the following list

- Easier reporting procedures
    - Single point of reporting
    - No need to report the same data more than one time
    - Reduced probability of errors
- More efficient port operations
- Information source stored one place
- Standard formats
- Easier integration with local systems
- Better status on transport