E-Maritime Service Engineering: an approach to Single Window solutions

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e-Maritime Services

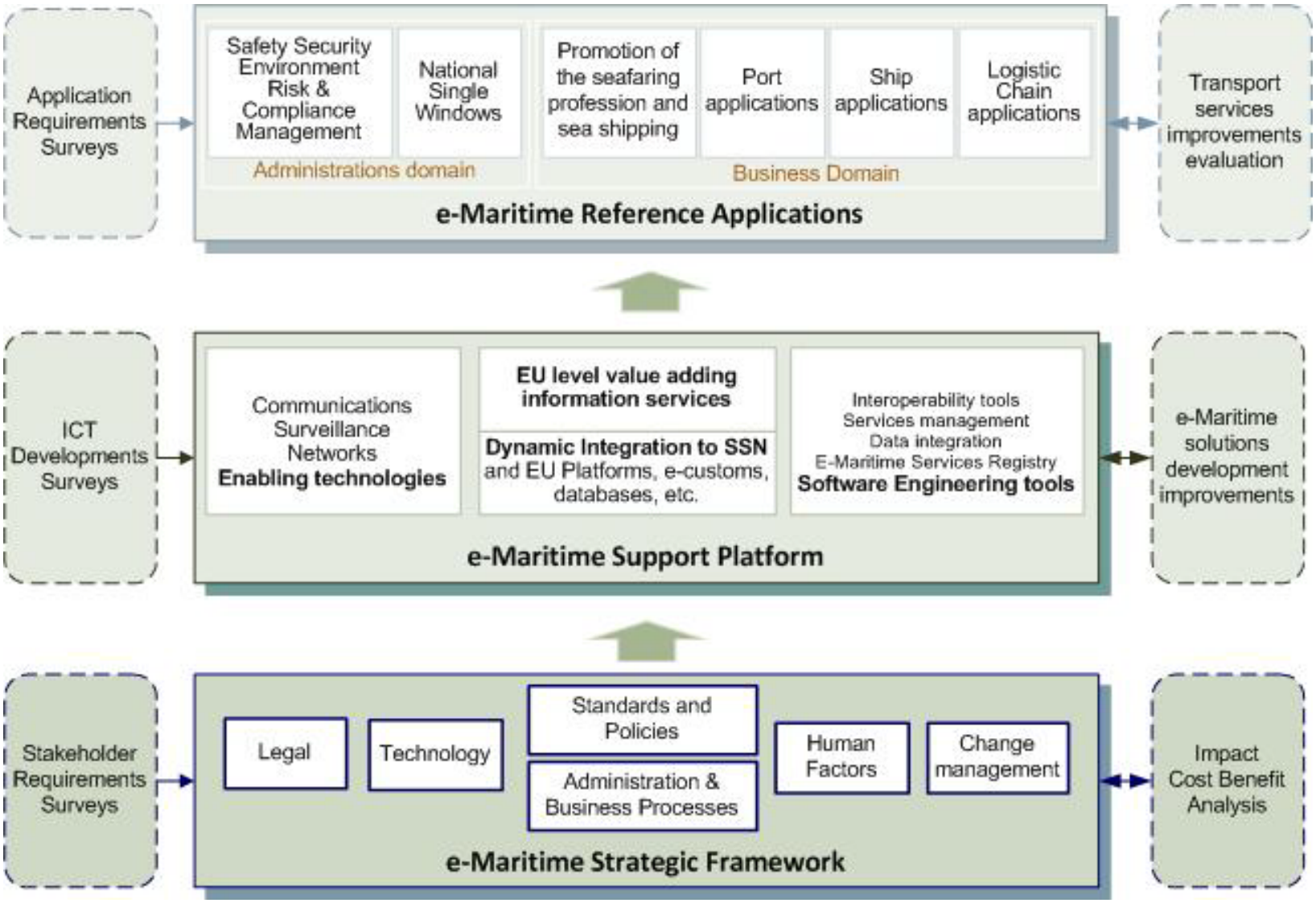
✓Improve, transform any form of transaction between involved maritime stakeholders;

by **developing** and enacting **virtual organizational arrangements**, dedicated **inter-organizational systems**, based on (inter) national institutional arrangements

✓empowering maritime stakeholders to (re)define and co-develop future e-maritime environments;

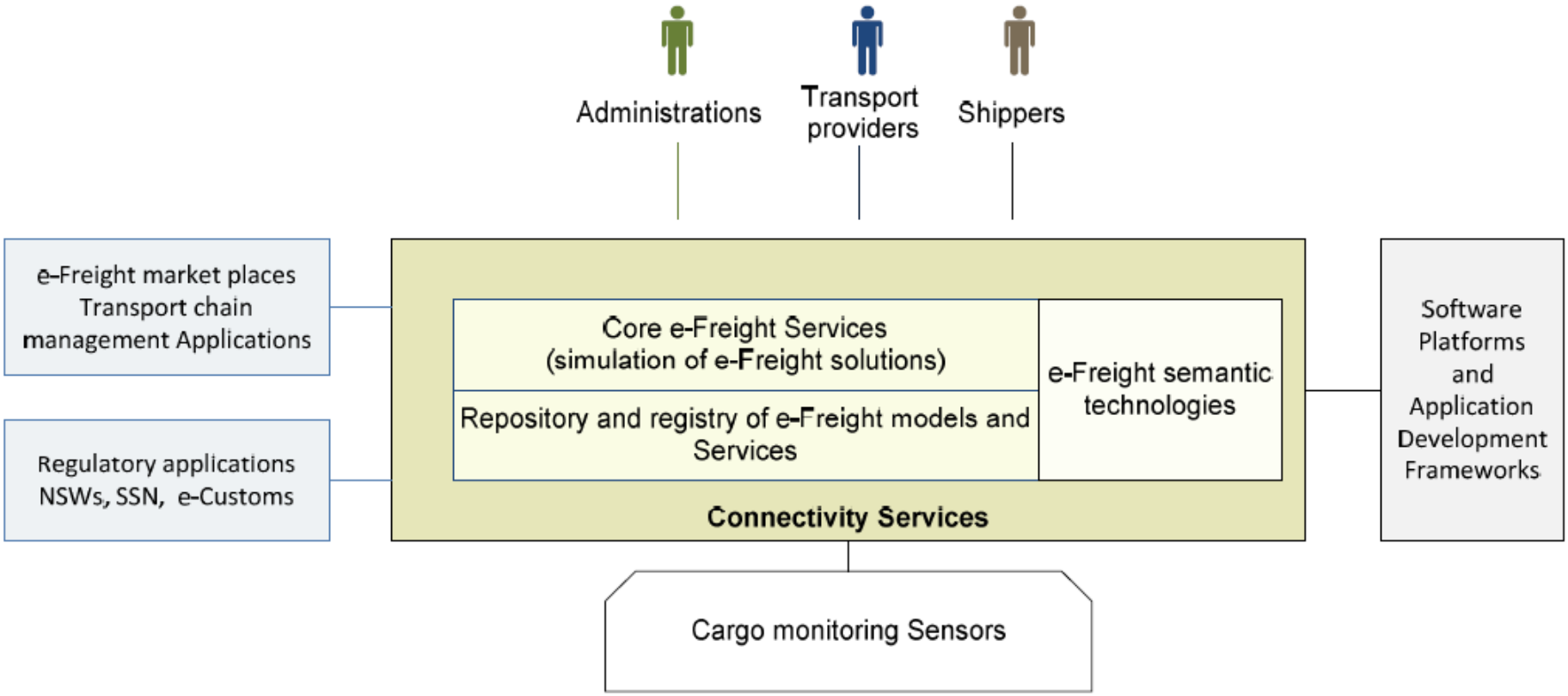
in a manner that reflects stakeholders' interests, perceptions and aspirations by employing **adaptive, intelligent, self-managed e-maritime services**

E.U. e-Maritime Initiative

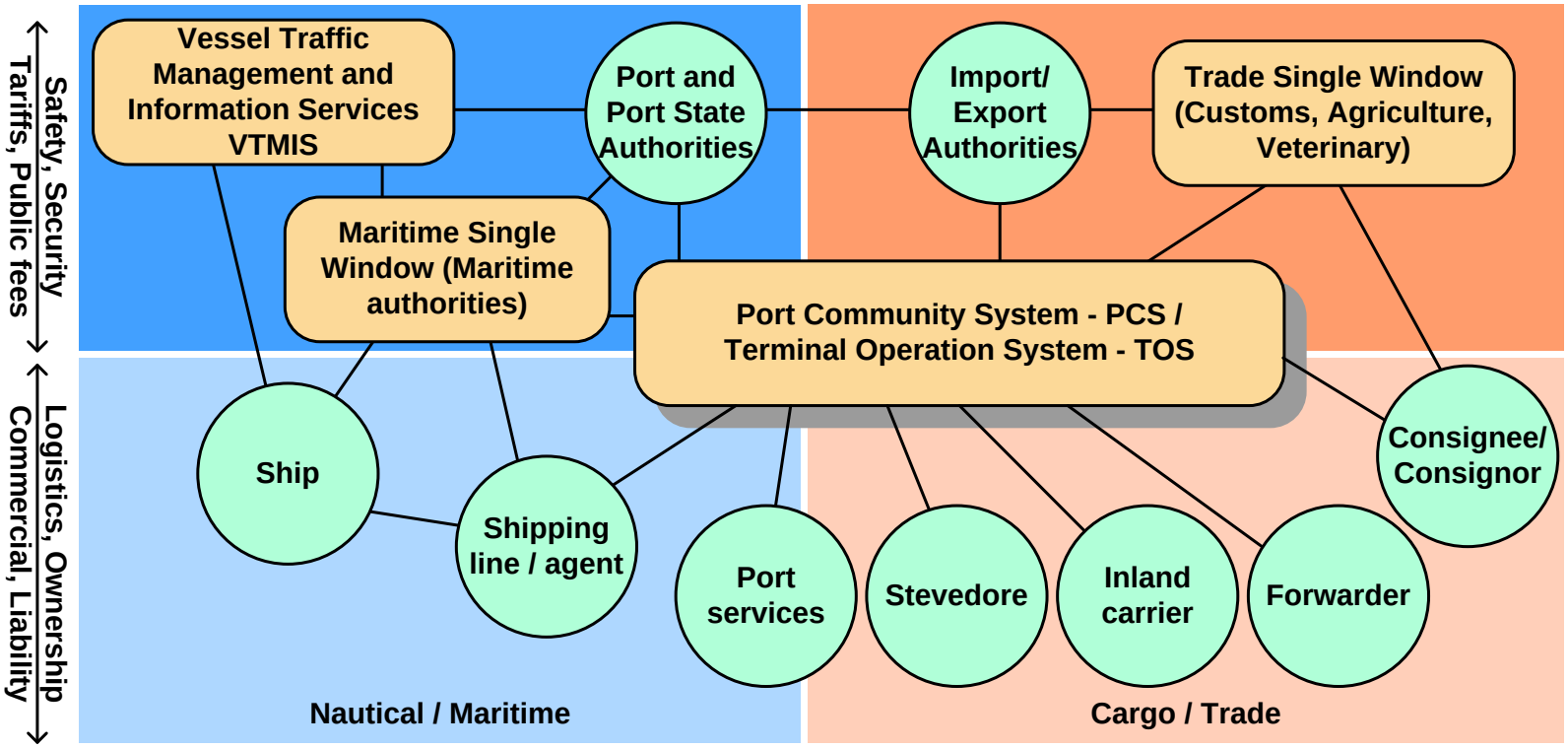


Efreightproject.eu

“European e-Freight capabilities for co-modal transport”

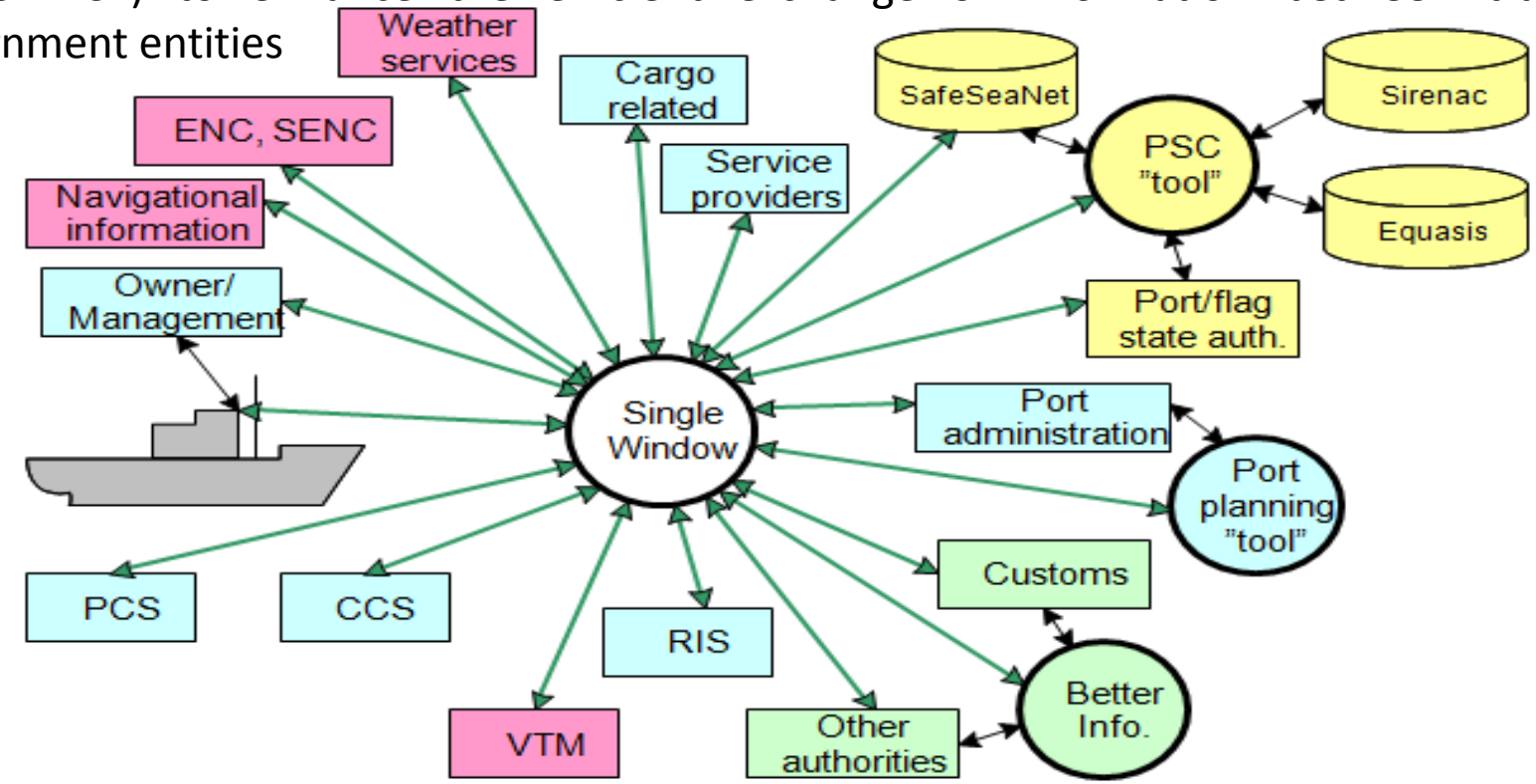


e-maritime and SW services



Single Window service model

Introduced by United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) to enhance the efficient exchange of information between trade and government entities

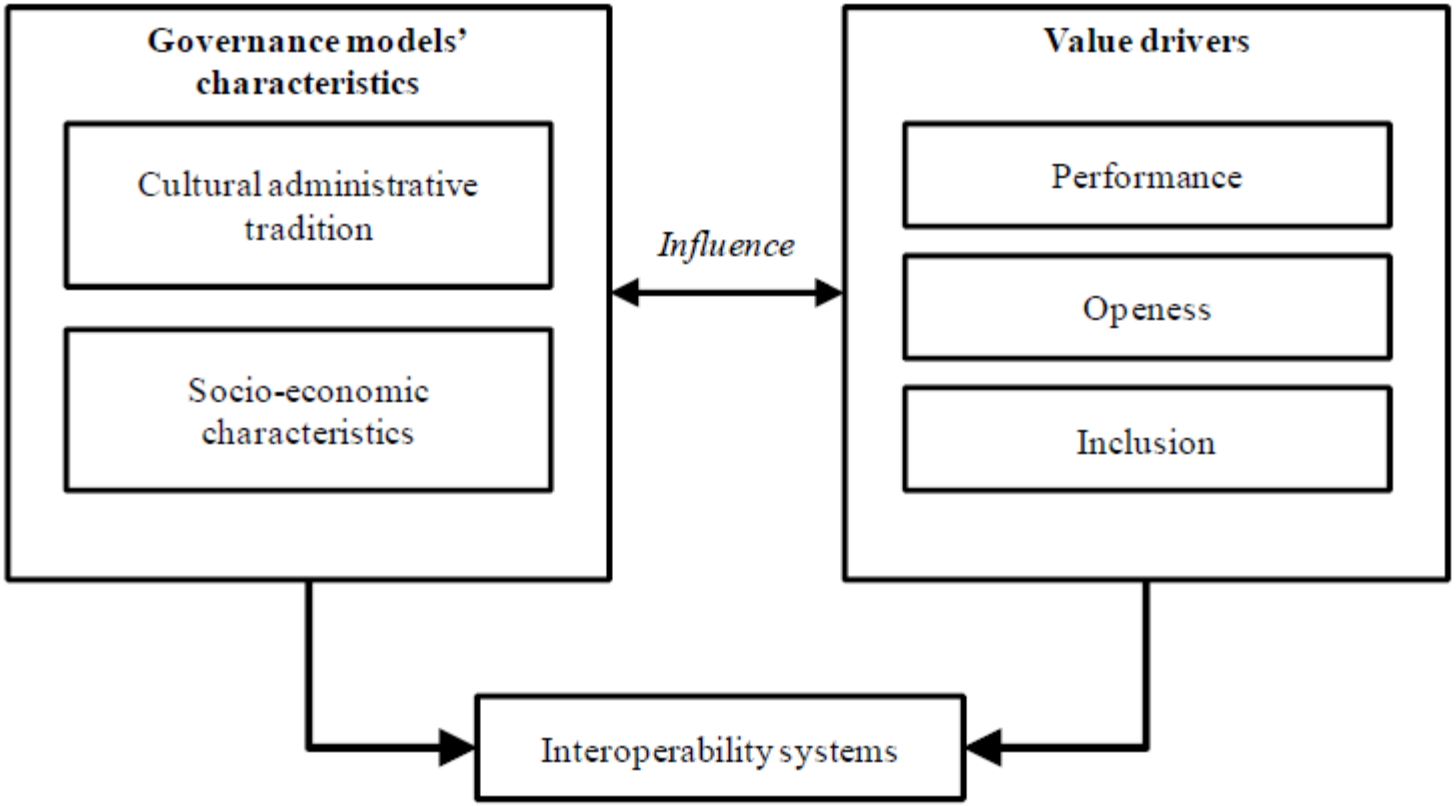


*A single window is defined as a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfill all import, export, and transit related-related regulatory requirements. (*Recommendation 33, ECE/TRADE/352)

Towards a harmonized SW business model

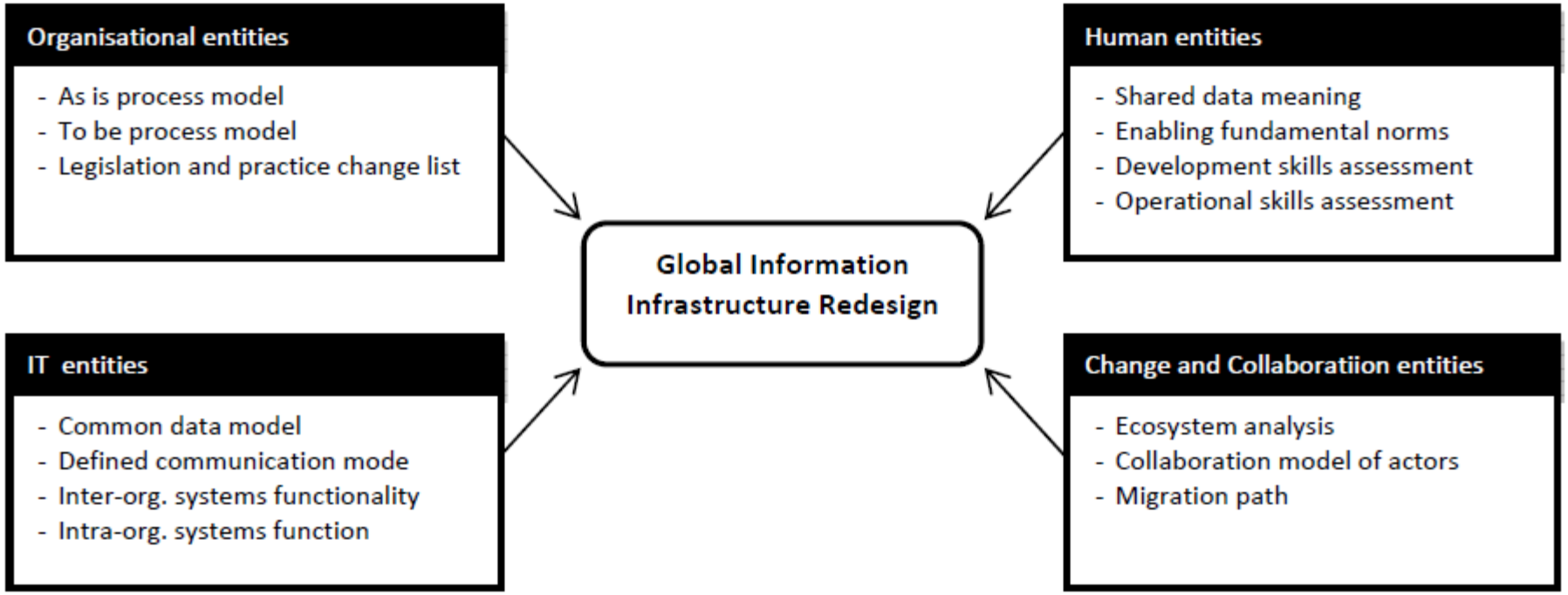
- The SW service paradigm aims at streamlining the observed operational inefficiencies in mandatory regulatory reporting and control processes.
- Two main SW development streams, namely SWs for trade facilitation (customs-centric) and transport SWs for monitoring vehicle and cargo movements (maritime authorities or port-centric) have been evolved independently;
- Different types of SW exist in terms of offered functionality, namely ship clearance, cargo clearance, port clearance.
- Often, vested interests and policy choices dictate the dominance of one model implementation over the other. The level of the SW competent authority, namely regional, national, local is an important differentiating factor, as well.
- Currently EU policy initiatives examine and cautiously promote their unified and integrated development.
- Modern ICT tools may significantly help to organise and improve the efficiency of a SW design and implementation process.

The conceptual model: a foundation for interoperability implementation plans and programmes



Eliciting different configurations of interoperable e-maritime governance systems (adapted from Misuraca et al, 2011**)**

NG e-maritime Service Environment



Global maritime information infrastructure redesign (adapted from Henningsson et al, 2011**)**

e-Maritime Interoperability

• **Technological interoperability**: includes both hardware and software issues; concerns connectivity and protocols (e.g., TCP/IP), a common syntax (e.g. XML) for data, and also standards for messaging (e.g. SOAP and WSDL).

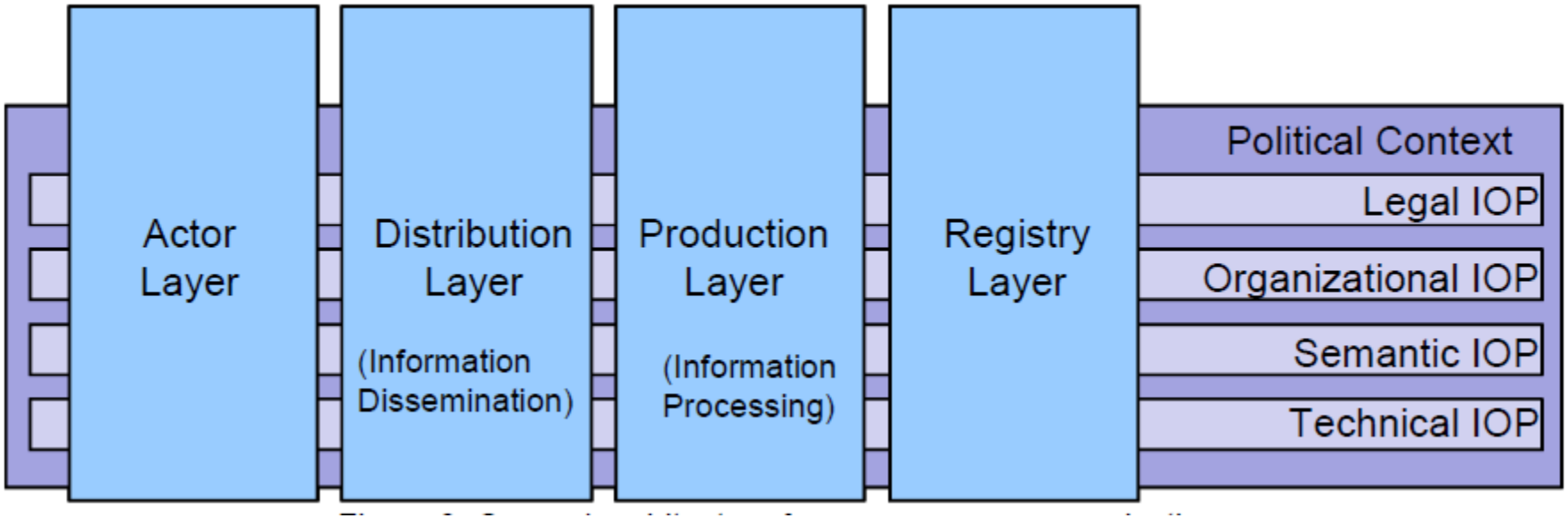
• **Semantic interoperability**: implies that, despite divergences in the structure, organization and content of the exchanged data, the intended meaning is correctly conveyed, the information is correctly acquired and the expected actions are understood and undertaken.

• **Organizational interoperability**: means that the two (or more) cooperating organizations are able to effectively perform a cooperative task, exchanging information and services; also is generally supported by adopting an appropriate framework, such as ebXML, TOGAF, or e-GIF.

• **Political Context:** Collaboration and cooperation across boundaries require political support; the vision and goals of the involved actors must be aligned; sufficient priority and resources must be available on an ongoing and timely basis to address the political context.

• **Legal Interoperability**: legality is a precondition for collaboration across jurisdictional and organizational units; an alignment of diverse legislation may be required; interoperability can be affected by differences in administrative law, intellectual property rights, privacy and data protection, public administration transparency or the re-use of public sector information. Exchanged data need to be in accordance with the law of its place of origin. Furthermore, data originated in another jurisdiction must be mutually recognized.

Generic Architecture for Interoperability Support



An architecture of interoperable e-maritime systems (adapted from Kuehn et al, 2011**)**

e-maritime Service Engineering

•**Service engineering:** emerging software engineering and computer science techniques, namely model driven, formal integrated requirements engineering, development and testing techniques

•**SOC paradigm:** autonomous, platform-independent computational entities (services) that can be described, published, categorized, and dynamically discovered and assembled for offering distributed, interoperable, self-configuring systems and applications

–**Efficiency and Reliability** of large, distributed and highly dynamic e-maritime freight applications

✓unknown system configuration in automated service discovery and composition

✓functional and QoS requirements for different deployment configurations

✓adaptive behaviours by real time service configurations' modifications and service optimization

e-maritime Service Engineering

Applying SOC principles to e-maritime applications design enables us to:

- **effectively communicate expectations and requirements** of maritime transport business users as well public authorities users to the implementation plane

- leverage human-understandable business vocabularies, machine-understandable **ontologies, business rules, and process models into a unified design realm with complementary robust, formal reference models and software development artifacts** for service-oriented systems

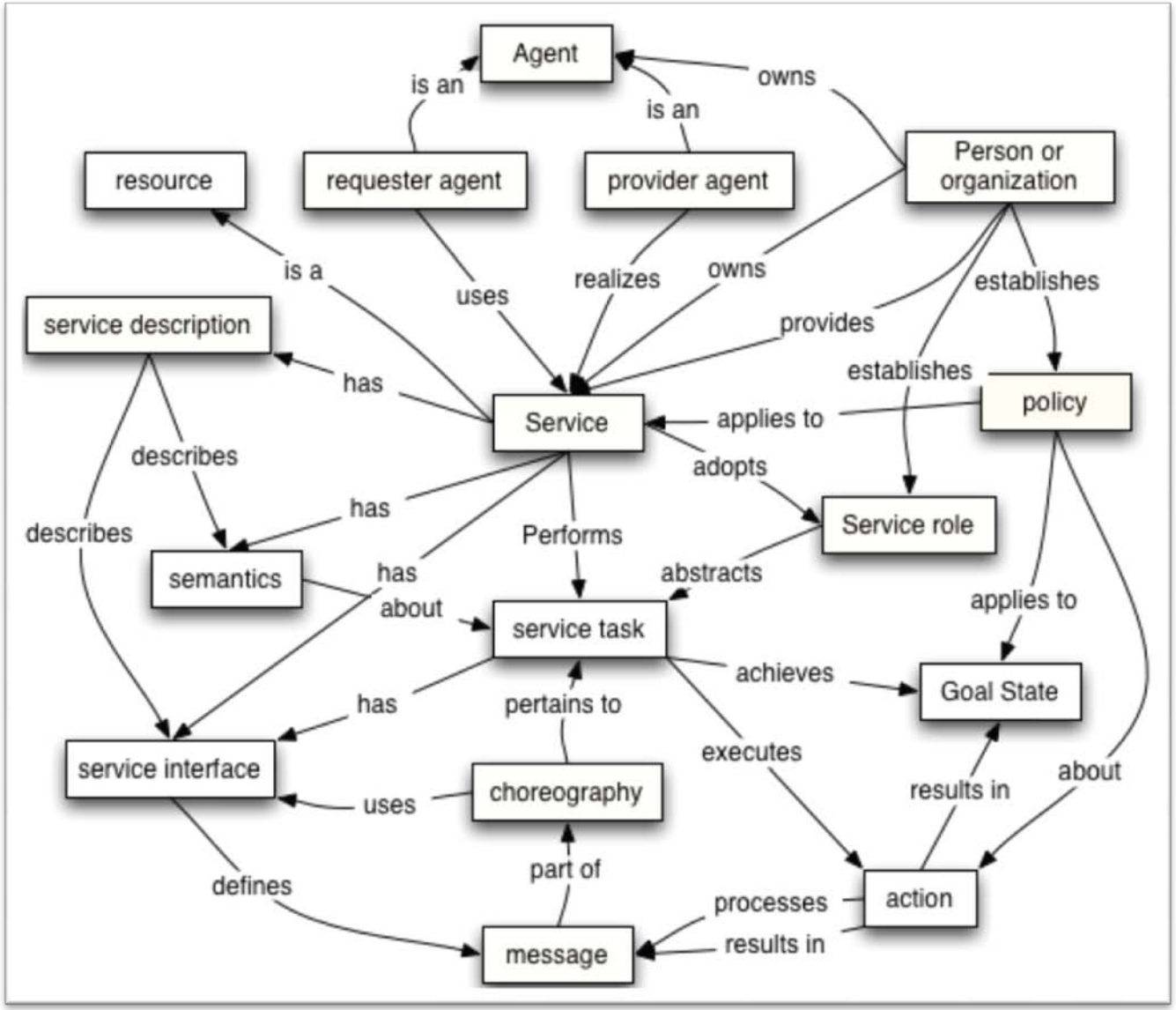
- support **automatic generation of high quality service compositions** from business process models capturing rich and sustainable maritime ontologies and rules

Requirements engineering, formal specifications techniques

Ontological engineering, semantic technology

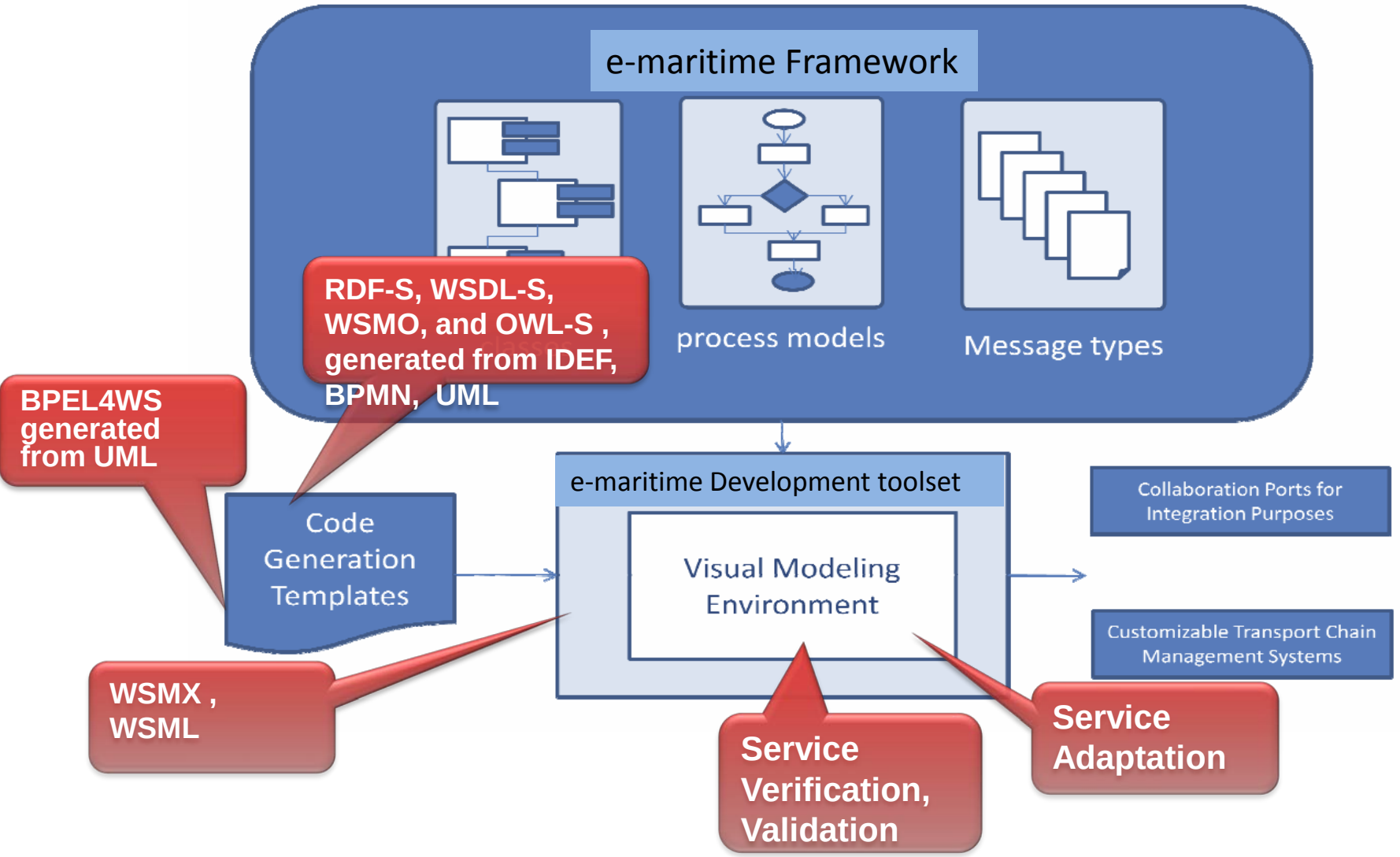
e Freight platform

e-maritime/SW Service Engineering

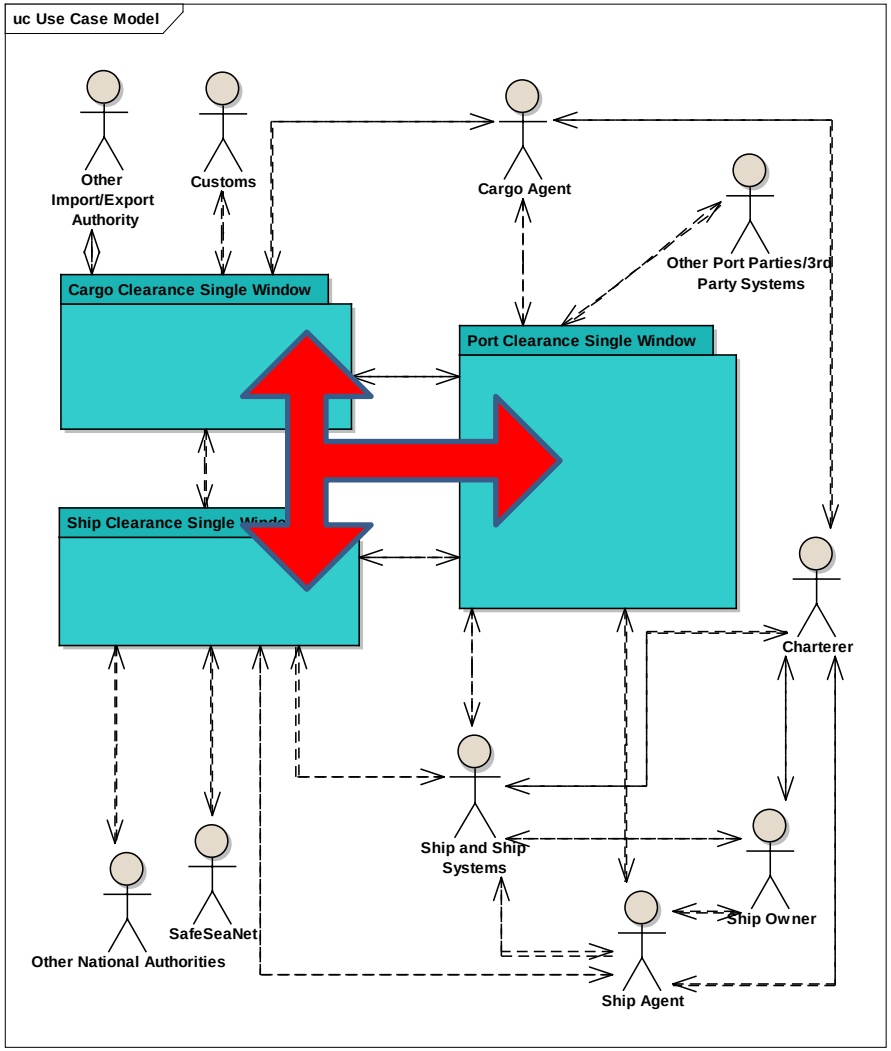


The W3C Service-Oriented Model

e-maritime/SW Service Development Environment



Towards a harmonized and extensible SW business model



Single Window for cargo	
Description	A SW for customs clearance normally contains information about cargo for either import or export.
Users	The users are Consignor's and Consignee's, the Customs, as well as cargo agents
Characteristics	The goods to be defined for import and export will need a release number before the transport can progress from an import area at a terminal. A main functionality for this SW is the cargo clearance process.
Objects	Cargo information and definition, Ownership, The itinerary of the goods, Handling instructions, General statusinformation about the cargo
Functionality	Registers: Goods group, Location register, Tax code Automation: XML and Web-based user interface Accessibility control Hand-over mechanism with other SW-solutions

Single Window for ship clearance	
Description	A SW for Ship clearance contains information about the ship, the voyage, the cargo, the passengers, the crew and information that is required by the SafeSeaNet directive.
Users	The users are the ship it self, agents, the providers on the ship, or the governmental bodies that need statuses and information for controlling duties, for mainly safety/security purposes. Governmental bodies can be Police, Coast Guard, Navy, Coastal Administration, Health authorities, or the ports.
Characteristics	The main purpose of such a SW is to have a good overview of the safety and security issues regarding sea transport. It could be either a site where information about a ship transport could be achieved in a distressed situation, or it could be more used in a controlling purpose where i.e. the crew and passenger list is matched with the list of criminals by the Police authorities. A main functionality for this SW is the ship clearance process.
Objects	Ship information, Cargo information, Crew and Passenger information (also effects), voyage information. Notification messages (hazmat, security, alert, ship) between the different states should also be considered
Functionality	Registers: Goods group, Vessel, Location Automation: XML and Web-based user interface (both ways) Acceptance report/Clearance notification (automatic) Use of sensor data for report purpose Ordering of transport services such as pilot age services Hand-over mechanism with other SW-solutions as well as commercial systems from service providers

Single Window for port clearance	
Description	A SW for port clearance is a reporting site for needed information regarding an entrance to a port. The information could also be about information classified as private, and used within a commercial aspect.
Users	The ship, the ship operators, the agents, the port management, the port service providers
Characteristics	This SW is used to achieve a port clearance of a ship. The information is both of a private and a public character. The ports are using the information to plan the ship entrance, to achieve the port safety and security regulations, and to calculate the fees to be sent to the users. A main functionality for this SW is the port clearance process.
Objects	Ship, Cargo, Load units, Service needs, Security information
Functionality	Registers: Goods group, Vessel, Location, Port services. XML and Web-based user interface (both ways). Acceptance report/Clearance notification (automatic), Use of sensor data for report purpose, Safety and security, Ordering of port services, Accessibility control, Hand-over mechanism/communication mechanisms with other SW-solutions as well as commercial systems from service providers, Statistics, General port information, Site for laws and regulations.

Towards a harmonized and extensible SW process model

Semantics for SW services

- **Semantics and data models**: a shared understanding and agreement between the designers/developers and the users of the SW data model, the overall conceptualization and the vocabulary of a shipping and transport data model should satisfy requirements of this particular application domain and its foreseen evolution

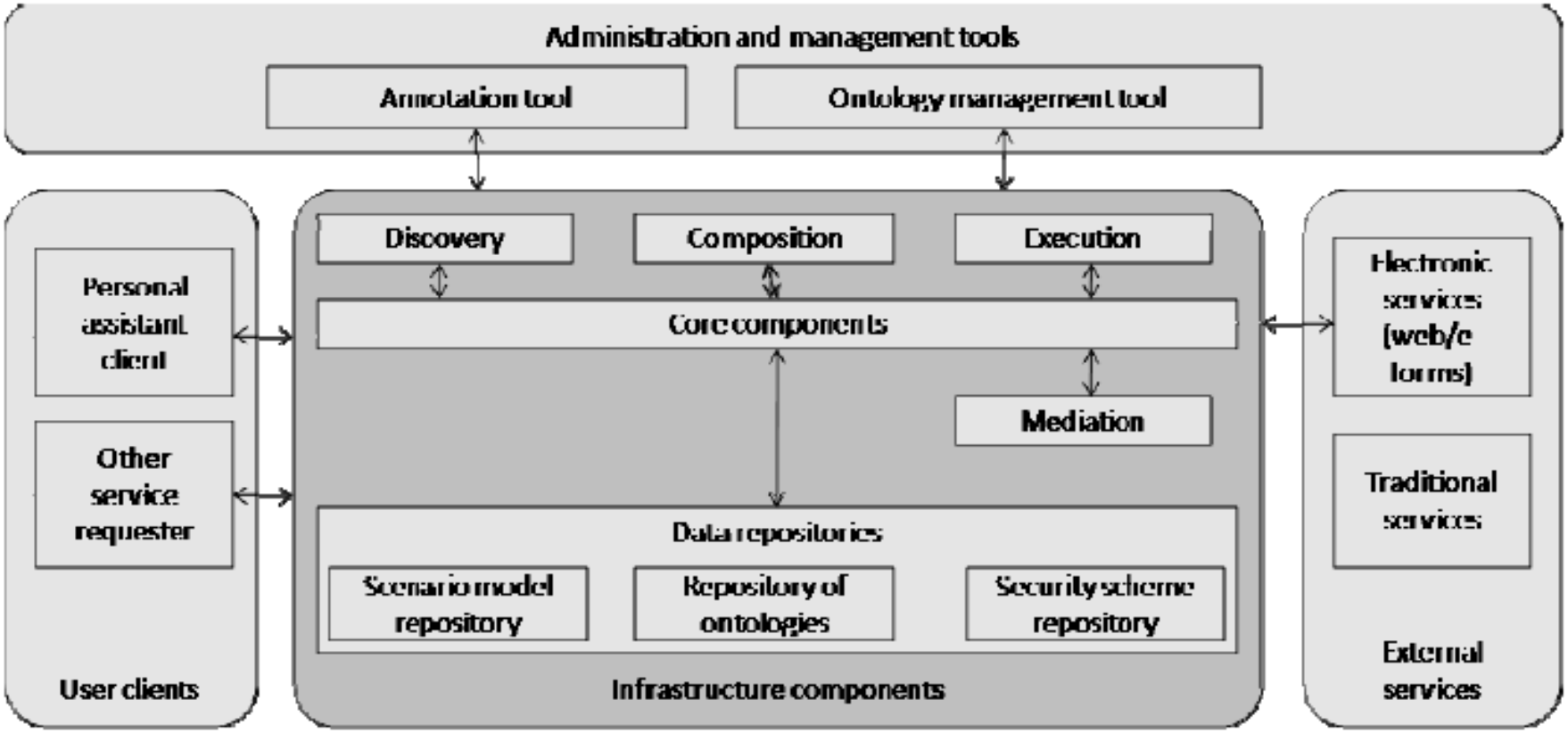
- Today there are three main standard data models that are intended for use in SW implementations:

1. The Trade Data Element Dictionary (ISO7372 2005) defines data elements used in cross border trade and is the basis for UN/EDIFACT messages

2. World Customs Organization (WCO) data model. This is also intended for cross border transport and trade and covers more generally reporting requirements to authorities

3. The International Standards Organization has published a more specific data model ISO 28005-2:2011 covering electronic clearance for ships

A SW Service Development Environment



Thank you!

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