European Commission

JRC TECHNICAL REPORTS

eIWT

Electronic tool for Inland Waterways Transport

Requirements

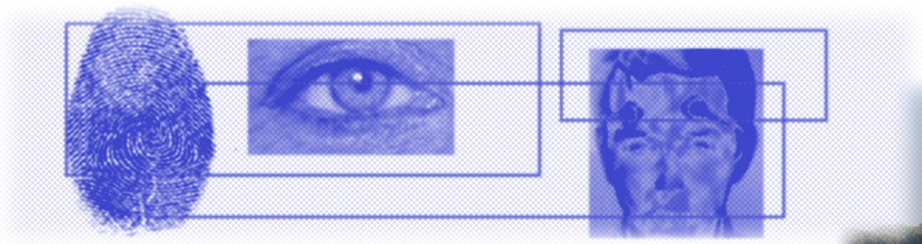
A.A. MOVE/2014/B.3/2014-629/SI2.693428

Deliverable 3

Final report

Fivos Andritsos

2016



Joint Research Centre

EUR 28074 EN

Contact information
Name: Fivos Andritsos
Address: TP 361, Joint Research Centre, Ispra (VA), Italy
Email: fivos.andritsos@jrc.ec.europa.eu
Tel.: +39 0332 78 9599

JRC Science Hub
https://ec.europa.eu/jrc

JRC102516

EUR 28074 EN

PDF ISBN 978-92-79-61297-8 ISSN 1831-9424 doi:10.2788/19691

Luxembourg: Publications Office of the European Union, 2016

How to cite this report: Andritsos, F.; *eIWT: Electronic tool for Inland Waterways Transport: Requirements*; EUR 28074 EN; doi:10.2788/19691

Contents

Contents 3

Acronyms 5

1 Introduction 7
1.1 Background 7
1.2 Purpose of this report 8
1.3 Methodology 9
1.4 Structure of the document 10

2 Terms & definitions 11
2.1 General 11
2.2 IWT specific 13

3 Concept & architecture 15
3.1 Functional requirements 15
3.1.1 High level objectives 15
3.1.2 Functional objectives 15
3.1.3 Functional requirements 15
3.2 Concept 16
3.3 Central databases & services 18
3.4 eIWT in DINA 18

4 Use-cases 21
4.1 UC1: Vessel initialization 21
4.1.1 Actors 22
4.1.2 Current procedures 22
4.1.3 eIWT procedures 23
4.1.4 Notes / issues 23
4.2 UC2: Crew card initialisation 24
4.2.1 Actors 24
4.2.2 Current procedures 25
4.2.3 eIWT procedures 25
4.2.4 Notes / issues 26
4.3 UC3: Voyage initialisation & end 26
4.3.1 Actors 26
4.3.2 Current procedures 26
4.3.3 eIWT procedures 27
4.3.4 Notes / issues 28
4.4 UC4: Crew embarking & disembarking 28
4.4.1 Actors 29
4.4.2 Current procedures 29
4.4.3 eIWT procedures 29
4.4.4 Notes / issues 30
4.5 UC5: Controls & inspections 30
4.5.1 Actors 31
4.5.2 Current procedures 31
4.5.3 eIWT procedures 31
4.5.4 Notes / issues 32
4.6 UC6: Professional qualification upgrade 33
4.6.1 Actors 33
4.6.2 Current procedures 33
4.6.3 eIWT procedures 33
4.6.4 Notes / issues 34

4.7 UC7: Professional qualification revocation 34
4.7.1 Actors 34
4.7.2 Current procedures 34
4.7.3 eIWT procedures 35
4.7.4 Notes 35
4.8 UC8: Inland navigation vessel certificate revocation 35
4.8.1 Actors 36
4.8.2 Current procedures 36
4.8.3 eIWT procedures 36
4.8.4 Notes / issues 37
4.9 UC9: Working time registration 37
4.9.1 Actors 37
4.9.2 Current procedures 37
4.9.3 eIWT procedures 38
4.9.4 Notes / issues 38

5 Preliminary impact assessment 39
5.1 ICT in inland water transport 39
5.2 Claimed eIWT advantages 39
5.2.1 Electronic instead of paper documents 39
5.2.2 Automatic coupling of vessel and crew data 40
5.2.3 Single point of access for IWT vessel documents 40
5.2.4 Single point of access for IWT crew 40
5.2.5 Single point of access for infrastructure requirements 40
5.3 eIWT costs 41
5.3.1 Investment cost for IWT operators 41
5.3.2 Running costs for IWT operators 41
5.3.3 Cost for the EU and MS administrations 41
5.4 Likely impacts 41
5.4.1 Economic 41
5.4.2 Social 42
5.4.3 Environmental 42
5.4.4 Fundamental rights 42
5.4.5 Simplification & administrative burden 42

6 Next steps 43
6.1 PROMINENT demo 43
6.2 eIWT workshop 43

References 44

Abstract 45

Acronyms

AIM	Access & Identity Management
AIS	Automatic Identification System
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
CCNR	Central Commission for the Navigation of the Rhine
CESNI	Comité Européen pour l'élaboration de Standards dans le domaine de la Navigation Intérieure (European committee for drawing up standards in the field of inland navigation)
CISE	Common Information Sharing Environment
CNG	Compressed Natural Gas
DC	Danube Commission
DG	Directorate-General (of the European Commission)
DG MOVE	Directorate-General for Mobility and Transport
DINA	Digital Inland Navigation Area
DMN	Digital Multimodal Nodes
DT	Digital Tachograph
EBU	European Barge Union
EC	European Commission (referred also as *Commission*)
ECDIS	Electronic Chart Display Information System
ECQD	European Crew Qualifications Database
EFIP	European Federation of Inland Ports
EHDB	European Hull Database (of IWT vessels)
ERDMS	European RIS Reference Data management System
ESO	European Skippers Organisation
eIDTS	Electronic ID for the Transport Sector
eIVU	Electronic Inland Vessel Unit, also referred to as *vessel unit*
eIWC	Electronic Inland Worker's Card, also referred to as *crew card*
eIWT	Electronic IWT – system/tool implementing eSRB and eLBK
eLBK	Electronic Logbook
ERCA	European Root Certification Authority
eSRB	Electronic SRB (Service Record Book)
EU	European Union
GIS	Geographical Information System
GPS	Global Positioning System
ICAO	International Civil Aviation Organisation
ICT	Information & Communication Technologies
ID	Identity Document
ILO	International Labour Organization
IMO	International Maritime Organization
INE	Inland Navigation Europe
IR	Infra-Red
ISO	International Standards Organisation
ISRBC	International Sava River Basin Commission
ISPS	International Ship & Port facility Security (code)
IT	Information Technologies

ITS	Intelligent Transport System
IWT	Inland Water Transport
JRC	Joint Research Centre
KSS	Knowledge of Specific Sectors (of inland navigation)
LAN	Local Area Network
LBK	Logbook, vessel activities log
LNG	Liquefied Natural Gas
MARSEC	Maritime Security Committee
MS	Member States (EU)
NAIADES 2	EU policy package on quality inland waterway transport
NFC	Near Field Communications
NTS	Notices to Skippers
OCR	Optical Character Recognition
OTP	One Time Password
PIA	Privacy Impact Assessment
PIN	Personal Identification Number
PKI	Public Key Infrastructure
PLATINA 2	European Coordination Action supporting the implementation of NAIADES 2
PSO	Port Security Officer
PSP	Port Security Plan
RF	Radio Frequency
RFID	Radio Frequency ID (technology, tag)
RIS	River Information Services
SME	Small or Medium Enterprise
SRB	Service Record Book, boatmen’s service log
UID	Unique Identifier
UNECE	United Nations Economic Commission for Europe
VTS	Vessel Traffic Service
VU	Vehicle Unit (DT)
WAN	Wide Area Network
WLAN	Wireless Local Area Network
WP	Work-package
XML	eXtensible Mark-up Language

1 Introduction

1.1 Background

Inland waterway transport (IWT) is a cost-saving and energy-efficient transport mode that could be used more efficiently to support the European Union's energy efficiency, growth and industrial development goals. However, its contribution is hampered by difficulties in the labour market in terms of mobility and attractiveness of the professions.

The Commission adopted in February 2016 a proposal for a Directive on the recognition of professional qualifications in inland navigation[1]. The main objective of the initiative is to facilitate labour mobility in the IWT sector by ensuring that skilled workers' qualifications are recognised throughout the Union. The proposal sets a new competence based approach, which will allow the recognition of qualifications across the EU and provide for new career opportunities.

In that context, among the barriers to labour mobility, the recognition by national authorities of Service Record Books (SRBs)[2] and of the information contained therein was identified as a specific difficulty. The Commission proposal foresees the harmonisation of the format and procedure related to SRBs and logbooks (LBKs)[3] at EU level and facilitates the electronic exchange of information through the setting up of registers and a central database. By doing so it paves the way for the introduction of electronic tools, with a view to reduce the administrative burden whilst rendering the documents less prone to tampering. Indeed, not only the content of SRBs has been identified as a problem but also their format. The paper format is considered outdated and generates administrative burden for both the authorities in charge of verifying documentation and crew members. With no secure mechanism for registering data, manipulation of SRBs remains easy. The fact that it is easy to impede verification makes efficient or effective enforcement difficult. Regular abuses also create unfair competition between those that play by the rules and those that do not, negatively affecting working conditions, attractiveness of the profession and safety[4].

Introducing electronic SRBs (e-SRBs) and electronic LBKs (e-LBKs) as a measure in Commission proposal on the recognition of professional qualifications was envisaged. However, such measure requires a very specific and multidimensional cost-benefit analysis because those electronic tools may be used more widely than for professional qualifications in IWT. The Commission therefore decided not to include this measure in that proposal and to consider the introduction of e-SRBs and e-LBKs in a second step after carrying out a separate impact assessment.

The main regulatory actors in the sector at international level are the EU, the CCNR (Central Commission for the Navigation of the Rhine), the Danube Commission and the UN-ECE (United Nations Economic Commission for Europe).

---

1 COM(2016)82 final of 18.12.2016.

2 The SRB enables the boatman to attest his physical and mental fitness, his experience in navigation, and his qualification. SRB is not mandatory in all EU countries. Formats and content may vary. The logs into the SRBs are entered by the boatmaster of the vessel. SRB's have to be inspected regularly by a competent authority that will usually compare the entries in the SRB with the entries into the logbook of the respective vessel.

3 A logbook is an offical record of the journeys made by a craft, crew present aboard and their resting time.

4 Law enforcement authorities complain about the efficiency and effectiveness of the controls under the present system; see AQUAPOL report of 2007

None of these organisations has put in place or issued recommendations on e-SRBs or e-LBKs.

With the perspective of a forthcoming possible EU initiative on the introduction of electronic instruments related to work in inland navigation, the Commission relied on its Joint Research Centre (JRC) to obtain the necessary technical and research expertise for the characterization and contribution to the assessment of impacts of various options for a system architecture covering such digital tools.

1.2 Purpose of this report

The ultimate purpose of eIWT is an ICT system that would implement, at least, an electronic version of the SRB (eSRB), applicable across all EU inland waterways. Such a system requires a certain harmonization in what regards the professional qualifications across the MS. By the word *professional qualifications*, we understand the categories of crew members as defined in the Commission proposal on the recognition of professional qualifications in inland navigation. These entails, where relevant, compliance with:

- The required competence level for each category
- The required navigation time to obtain the qualification
- Other requirements related to age and medical fitness

And therefore, the system requires to cover:

- The certification of the professional qualifications
- Possible conditions of revocation of the qualification

Vice-versa, eIWT can be a driver for harmonization, especially if the ICT tools introduced serve for facilitating the work of all IWT actors and further enhancing the overall efficiency of IWT. Under such a point of view, it was decided that eIWT should aim, right from the beginning (i.e. the functional specification phase), at a system with much broader functionalities than just the eSRB and, in particular, incorporate, as a minimum, the functionalities of the *vessel logbook* (LBK) or (eLBK) when in electronic form. Each eLBK should be uniquely and unambiguously linked to a particular vessel much the same way as each eSRB should be uniquely and unambiguously linked to a particular person i.e. crew-member. Indeed, the basic architecture, already outlined in D.1, was built with the purpose to combine these two functionalities (eSRB and eLBK), uniquely linking the vessel and the crew-members working on it. Hereafter, such system shall be referred to as eIWT, encompassing, at least, both eSRB and eLBK functionalities. Furthermore, it was pointed out that it could be very advantageous to provide some additional functionalities, the most obvious of which is the registration of the crew *working* and *rest time*.

Lately, the DINA (Digital Inland Navigation Area) concept has been launched by the Commission with the aim of further integrating and rationalizing the digital services related to IWT. The concept and basic architecture of eIWT, which will aggregate and link information regarding the crew and the vessel, could indeed become one of the key implementation tools for DINA. Especially if it will be linked, through the *river information services (RIS)*, to the river infrastructure and, through corporate programs, to the cargo management functions.

This report (D.3 – Requirements) is the 3rd and final deliverable of the study. It has the purpose of outlining the functional requirements of the eIWT system, as conceived and outlined already at the *inception report* (D.1) and further elaborated in the intermediate report (D.2).

1.3 Methodology

The eIWT architecture and basic set of functional requirements are being discussed with all IWT major actors, in particular the two main river commissions, the NAIADES 2 forum, the PROMINENT consortium and the competent national administrations. The basic idea is to ensure a close cooperation and create synergetic effects to the benefit of all projects and all actors and stakeholders, involve early in the process all the relevant actors. The scheme followed is depicted graphically in Figure 1 below. On that purpose JRC:

- Participates and seeks consensus at a number regular meetings of the sector
- Organises many bilateral meetings as appropriate
- Has started organise a dedicated workshop at its premises, at Ispra

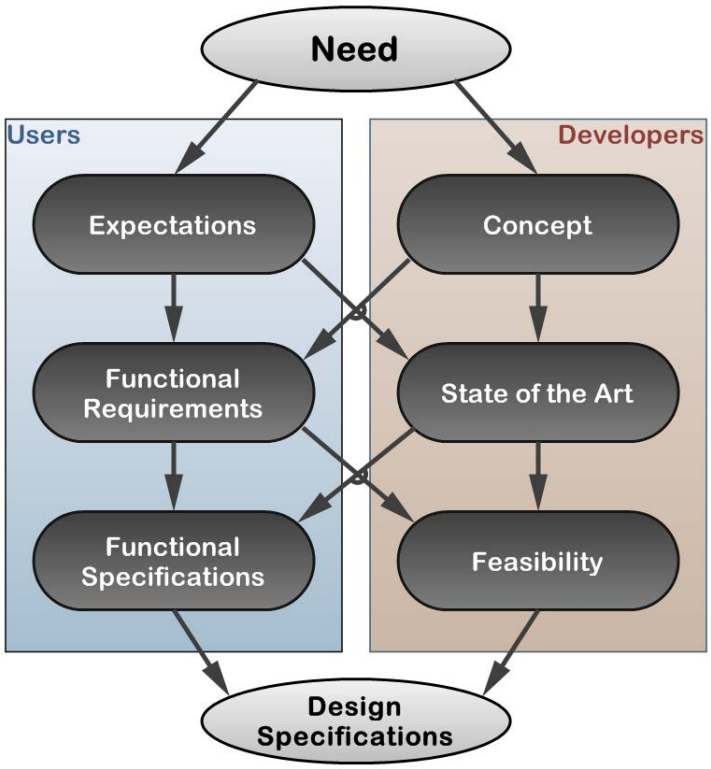


Figure 1: Pre-design development process

Report D.1 has been the starting point of the process described in Figure 1 above; it provided a first concept of an eIWT system[5] (eSRB plus eLBK), which became the basis for discussion with the IWT users/actors (EC, national authorities, CCNR, etc.). This report is placed, grossly, at the middle of the process depicted in Figure 1 above; There is now a consolidated concept (basic architecture) as well as consolidated expectations from each main user / stakeholder.

At this stage, instead of proceeding with a more detailed technical description of the eIWT functions (like information content and placeholders, storage and transmission definitions etc.), it was decided to proceed by selecting a certain number of use-cases (i.e. classes/groups of operational procedures) and, together with the main stakeholders, proceed with the detailed systematic definition of each use-case (UC), starting with the current (i.e. manual) procedures. At the end of this process, the aim is to have:

[5] eIWT system: a system encompassing both eSRB and eLBK functions.

- A consolidated list of functional requirement description for each UC, which will be discussed, further elaborated and, hopefully, agreed upon during a dedicated workshop
- A list of options regarding additional requirements[6] and implementation options
- A limited number of feasible technical solutions (architectural level[7]) and implementation options

Such consolidated list of functional requirements can then be the object of a standardization activity in the frame of European or international standardization bodies[8].

The use-cases were selected in collaboration with the main IWT actors, to whom it was forwarded a template so as to get their views on one or more use-cases according to each entity specific know-how and interests. The information requested concerned the identification of the *actors* concerned by each UC, proceeded with the current (i.e. manual or paper-based) and concluded with the views / proposals on the electronic (i.e. eIWT-based) procedures. The responses received, appended at the end of the present report in their original form, were not homogeneous and required considerable processing and further bi-lateral consultations in order to arrive at the text of sections 4.1 to 4.9, where the nine use-cases are described. The definition of the use-cases is not complete. Some of the UCs require further elaboration. Their final form will be documented at the next (final) report that will be the basis for a more formal consultation and endorsement by the IWT stakeholders during the eIWT workshop, scheduled for September 2016.

1.4 Structure of the document

This document aims to be stand-alone, i.e. to be read and understood without necessitating extensive reading of the *administrative arrangement technical annex*, the *inception* or *the intermediate report* or other documents. This report (D.3) builds on the D.2 report, completing whatever sections were missing and introducing an additional section on the preliminary impact assessment of the eIWT system.

After the list of abbreviations and the present introductory section, the rest of the document will comprise the following:

- A section on terms and definition (section 2)
- A section on the eIWT *concept and architecture*, where the main objectives, some basic functional requirements and some possible extension, mostly relative to DINA, are outlined (section 3)
- A section on the *use-case definition* (section 4); here is documented the bulk of the work performed after the conclusion of the *inception report*
- A section on a *preliminary impact assessmen*t of the eIWT system (section 5), assuming a fully implemented and operational eIWT system as described in the use-cases of the previous section
- Finally, section 6 summarizes / concludes the work performed to-date and proposes the planning of the work for the next few months, until the conclusion of the current AA and the eIWT workshop.

---

6 Like the required security / protection level or the remote reading etc.

7 Like centralized, distributed or hybrid architecture

8 Such as CESNI or UNECE

2 Terms & definitions

2.1 General

Access control: a system of technical means, personnel and procedures, which enables an organisation to control access to areas and resources in a given physical facility or computer-based information system. It has 3 essential functions: entitlement check, identification and documentation of the persons entering a certain controlled access area.

Actor: any person or group of persons who interacts with a system or a procedure.

Assisted GPS (aGPS): a system that, under certain conditions, improves the start-up performance of a GPS satellite-based positioning system and used extensively with GPS - capable cellular phones.

Biometrics: automated methods / technologies of recognizing a person based on a biological or behavioural characteristic.

Communication protocol: a defined communication format and set of rules containing the control procedures required for data transfer across the link interfaces and to / from the user's application programs, also including the timing, sequencing and error control of the exchanged data.

Cyber security: protection of ICT systems, information or infrastructure against damage, unauthorized use, exploitation or destruction, especially against cyber-threats such as viruses, worms, Trojan horses, phishing, denial of service (DoS) attacks, unauthorized access etc.

Entitlement: evidence of the right to benefit a service or access an area, typically a ticket, a travel or access card or an entrance permit.

Functional requirements: a set of functionalities needed and / or expected from a product or a service under development or procurement. Alternatively referred to as 'user requirements'

Functional specification: the breakdown, quantification and association of the system's functional requirements to the main system's functional components.

Functionality: the ability to perform a certain function; function is an action or use for which something is suited or designed.

Geographic Information System (GIS): a system designed to capture, manage, analyse, store, manipulate and display all types of geographically referenced information.

Global Positioning System (GPS): a satellite navigation system based on a large number of designated satellites (US DoD, Galileo, Glonass, Beidou), which transmit time signals that are received by a receiver on the ground. Transmissions received from four or more satellites calculate the position through triangulation.

Identification: evidence of identity

Identifier: a name that identifies (i.e. labels) a unique object or class of objects. An identifier following an encoding system is often referred to as: code or ID code. Identifiers that do not follow any encoding scheme are often said to be arbitrary IDs. A unique identifier (UID) is an identifier that refers to only one instance, i.e. only one particular object

Identity: whatever makes an entity definable and recognizable

Identity ecosystem: a user-centric online environment, a set of technologies, policies and standards that securely supports transactions ranging from anonymous to fully authenticated and from low to high value

Identity theft: to pretend to be someone else, typically in order to access resources or obtain credit and other benefits in that person's name

Interoperability: the capability to communicate, execute programs or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units (ISO/IEC 2382-1:1993). The property of a product or a system enabling it to work with other products or systems, present or future, without any particular restrictions or additional implementation.

Location Based Services (LBS): information or entertainment services, accessible with mobile devices through the mobile network and utilizing the ability to make use of the geographical position of the mobile device.

Minimum standard: a formal document that establishes uniform engineering or technical criteria, methods, processes and practices that set the lowest acceptable level of quality or attainment[9]. Standards can be technical[10], functional[11] or goal-based.

Personal data: any information relating to an identified or identifiable natural person ("data subject"); an identifiable person is one who can be identified, directly or indirectly, in particular by reference to an identification number or to one or more factors specific to his physical, physiological, mental, economic, cultural or social identity (EC Directive 95/46 article 2.a).

Personal data protection: all regulations, technical systems and procedures that aim at the protection of such personal data throughout the acquisition / transmission / use / storage and disposal cycle.

Privacy: the quality or state of being secluded from company or observation.

Risk: the potential that a chosen action or activity (including the choice of inaction) will lead to a loss (an undesirable outcome); the effect of uncertainty on objectives (ISO 31000).

Risk management: the identification, assessment, and prioritization of risks followed by coordinated and efficient application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events or to maximize the realization of opportunities.

Safeguards: any measure (action, procedure or technique) that mitigates risk by reducing the vulnerability of a system, the potential impact from a threat or the probability that a threat materialises.

Safety: the state of being free of risk or danger (natural or accidental); being in control of recognised hazards and reducing risk of harm or damage as low as reasonably practicable. The term 'safety', when used as an attribute, encompasses all measures, actions or systems aiming at ensuring the state of safety.

---

[9] Although standards can be voluntary, they usually are understood as mandatory, especially if adopted by a government, business contract, etc.

[10] Usually imply measurable quantities

[11] Also referred to as functional specifications

Safety incident: an accidental event, of internal or external causes, that is likely to lead to some negative consequences and compromise safety.

Security: the set of means / actions through which safety is ensured, in particular against intentional threats. Thus, the term 'security' encompasses all measures, actions or systems aiming at preventing intentional threats from compromising safety.

Security incident: deliberate act intended to harm and injure, damage equipment and infrastructure, disrupt operations and compromise safety.

Ship-port interface: the interactions that occur when a ship is directly and immediately affected by actions involving the movement of persons or goods or the provision of port services to or from the ship, [Regulation (EC) No 725/2004]

User requirements: a set of needs and / or expectations of the user(s) from the product, system or service under development. The term 'users' encompasses any citizens, businesses or public authorities that might use the final product, system or service.

2.2 IWT specific

Barge: floating craft designed for the carriage of goods or passengers by navigable inland waterways without autonomous navigation (propulsion or steering) capability. Barges can only navigate in convoy with one or more push-boats (see vessel).

Boatmaster: a *deck crew* member qualified to sail a vessel on the Member States' inland waterways and to have overall responsibility on board.

Competent authority: any authority or body designated by a Member State with the responsibility for issuing, renewing, suspending or withdrawing *Union certificates of qualification*, validating the navigation time in Service Record Books, keeping the registers and combating related unlawful practices.

Crew: all persons involved in the operation of a vessel, being deck crew members or shipboard personnel.

Deck crew: all persons involved in the operation of a vessel, carrying out tasks related to navigation, cargo handling, stowage, maintenance or repair, with the exception of persons solely assigned to the operation of the engines, electrical and electronic equipment.

Inland navigation vessel certificate: certificate that a vessel is capable to navigate and operate. It is issued by a national *inspection body*, following the Union and/or national legislation. Also referred as *Vessel*, *Community* or *Rhine certificate* according to the circumstances [ES-TRIN Article 1.01 (11.4)].

Inspection body: the national authority, i.e. ministry or other national administration or other dully delegated body, which is responsible for issuing the *inland navigation vessel certificate*.

Logbook (LBK): official record/registry of all vessel activities (journeys, modifications etc.) as required by the applicable law, in paper or electronic (eLBK) form. Active LBK is an LBK open for recording data.

Navigation time (crew): the time, measured in days, that *deck crew* members spent aboard during a journey performed by a vessel on inland waterways and validated by the *competent authority*.

Rest time: the time outside working time; this term covers rest periods on a moving or stationary craft and on land. It does not include short breaks (of up to 15 minutes). On a day to day basis, *working time* plus *rest time* should be equal to 24 hours.

Sailing time: the time during which a vessel is navigating (i.e. not in port, usually with the main propulsion running).

Service Record Book (SRB): personal register recording details of a *crew* member's work history, in particular navigation time and journeys carried out. In paper (SRB) or in electronic (eSRB) form. It serves, as per the applicable law, for maintaining / upgrading one's professional qualifications.

Vessel: craft intended solely (or mainly) for navigation on inland waterways, designed for the carriage of goods or passengers. For the purpose of this report, unless otherwise stated, the term *vessel* denotes a craft that is intended to carry goods and has autonomous navigation capability (propulsion & steering).

Vessel certificate: same as *inland navigation vessel certificate*.

Voyage: the movement of a vessel from the harbour of departure to the harbour of its destination. Usually, such movement is performed for a specific operational purpose (commercial or other) and can include calls to intermediate ports.

Voyage file: file (database) that resides in the *vessel unit* (eIVU), on which are registered all data concerning, as a minimum, the vessel and the crew during a particular *voyage*.

Union certificate of qualification: a certificate issued by a *competent authority* attesting that a person fulfils the requirements for an IWT crew as per the Commission proposal for a Directive on the recognition of professional qualifications in inland navigation.

Working time: The time during which a *crew* member is scheduled to work or must be available to work (on-call time) on and for the *vessel* on the instructions of the employer or the employer's representative.

3 Concept & architecture

3.1 Functional requirements

3.1.1 High level objectives

The high-level objective for eIWT (electronic tool for IWT, encompassing eSRB and eLBK functions) could be summarised in the following statement:

> *To ease cross border inland waterways transport while improving safety, security, fair competition and good working standards, leading to seamless and secure international goods transportation on inland waters, beneficial for growth and jobs in EU and in respect with the fundamental rights of citizens*

The above statement can be translated to the following list of high-level objectives / drivers for the eIWT implementation:

- Efficiency
- Fair competition
- Descent working conditions
- Safety

3.1.2 Functional objectives

The above high-level objectives can be further mapped into a set of functional objectives at 3 main levels / layers as follows:

1. Regulatory level: simple, effective, harmonised IWT regulations, etc.
2. Operational level: efficiency, fairness, safety and security of IWT operations, good working standards, effective enforcement of the regulations, etc.
3. Technical level: technical effectiveness and efficiency, interoperability, availability, security, cost, etc.

3.1.3 Functional requirements

A first, non-exhaustive list of functional requirements, derived from the above functional objectives, can be established as follows:

- Regulatory
  - Increased harmonization of the IWT pertinent national regulations and procedures,
  - Harmonisation / mutual recognition of the required professional qualifications,
  - Harmonization / mutual recognition of the SRBs, including proof of physical and mental fitness, service time etc.
- Operational
  - Unique logbook (LBK) associated / paired to each vessel.
  - Harmonized electronic version(s) of the SRBs and LBKs (eSRB and eLBK)
  - Automatic logging of eSRB and eLBK entries
  - Proper access for corporate and law enforcement purposes
- Technical
  - Interoperability of eSRB and eLBK
  - System availability and reliability level
  - System security (temper-proof resistance) level
  - Cost/benefit

- Future-proof

3.2 Concept

Staring from the basic assumption that eIWT should encompass eSRB and eLBK functionalities, an eIWT system should have, as a minimum, the following basic building blocks:

a. An electronic Inland Vessel Unit (eIVU), uniquely associated to a particular IWT vessel. Its primary function is that of an extended electronic logbook (eLBK). It would serve as a registry of all data associated with the vessel characteristics (like: owner, tonnage, dimensions, capacity, licences, certificates, crewing requirements, eventual modifications etc.) and activities (like: navigation time, position and speed history, boat-master and crew on board).
b. An electronic Inland Worker's Card (eIWC), uniquely associated to each IWT worker. It would have two main functions:
   b.1. Professional ID card: it should be based on some biometric or other features (i.e. picture, PIN, etc.) permitting the identification of the bearer, together with his/her professional qualifications
   b.2. Electronic service record book (eSRB): it should be based on a non-volatile on-chip memory, where the acquired information would be stored for later use.

The basic idea behind the eIWT concept is that the eIVU would register all data regarding each crewmember necessary for the eLBK while, at the same time, it would update the crewmember's eIWC with all data required for his/her SRB. There are numerous eIWT implementation scenarios / schemes, from very simple to quite complex ones. Some application examples, going from simple to complex cases, are given below:

1. The eIWT system serves only as a back-office. Its prime functionality is to produce semi-automatically papers, which are then used in the same way as the paper-based LBKs and SRBs. The prime benefit lies in the necessary harmonization of the reporting and the terminology and, to a lesser extent, to the accuracy and efficiency of the document compilation. Such system is not critical for IWT operations; therefore, it needs no high availability or reliability. Authentication, certification or security functions are also paper-based.
2. A somewhat more complex is the above scenario with the added capacity to transmit duplicates of some data to a central service. Although signed paper documents would still make proof of everything, some centralised procedures, like the issuing or update of certificates could be facilitated. Such system could offer additional benefits in what regards the policing, detection of fraud or just the gathering of statistical data.
3. Finally, a third scenario, significantly more complex from bullets 1 and 2 above, would be that of completely replacing the paper version of SRB and LBK by their electronic counterparts, i.e. the eIWC cards and the eIVU units. In this case, the requirements for certification, authentication security and availability would be quite high. A significant infrastructure for issuing and maintaining the certified cards / units, very similar to the road transport *digital tachograph*, would be needed.

Extensive consultation with the IWT stakeholders indicated that the most interesting scenario is the last one, i.e. the one calling for a replacement of the actual paper based SRB and LBK by their electronic versions: eSRB and eLBK.

Figure 2 below depicts a schematic representation of the eIWT. Vessel unit (eIVU) has access to GPS, RIS or other services to evaluate the vessel states (position, velocity etc.). It interacts primarily with the eIWC card of each crewmember, updating (and printing) the crewmembers eSRB (as part of eIWC) as well as its own (i.e. vessel's) *logbook* as appropriate. Occasionally, eIVU interacts with other *actors*, like service providers or authorities. Optionally, eIVU links / synchronizes with a remote server, which can optionally be seen as a master, i.e. the place where the original documents are issued / stored / certified. The same option exists also for the personal cards that can link / synchronize to a remote server, either via the eIVU or independently.

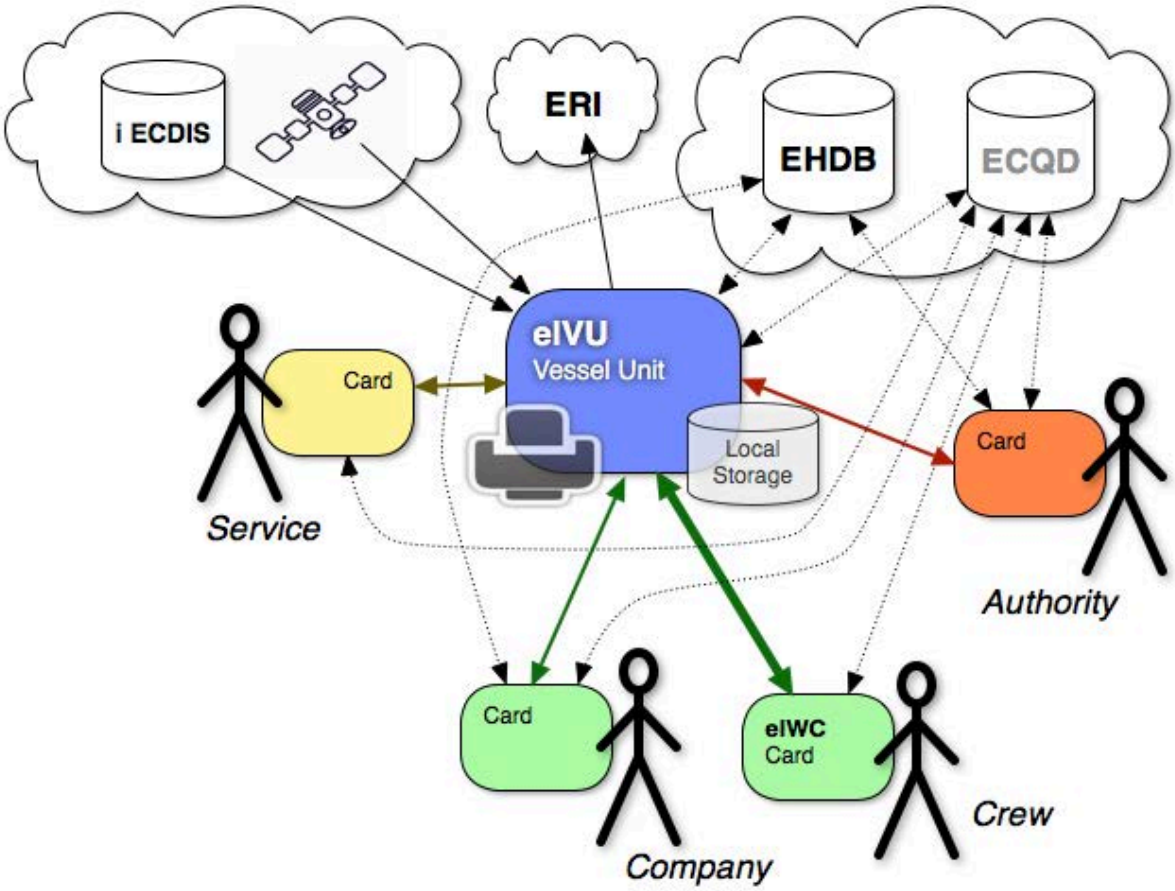


Figure 2: Schematic representation of the eIWT scheme

This eIWT scheme is quite generic and allows many implementation scenarios, including the 3 cases mentioned above. Some first issues, which will be tackled in much more detail at the later stages of this study, are:

- Types of cards and access rights: how many card types should exist and what access rights should each card type have? For example, how many subcategories should there be under the generic *crew* category? Boatman & boatmaster only?
- Should there be a 4th category for the company?
- Are the cards (and the vessel unit) official documents? Are they copies of official documents?
- Is there one (or more) remote central database where the master documents (eIWC and eIVU) or the master information resides?
- Vice-versa, are the eIWC and eIVU to be considered as masters?
- What happens in case of communication or other technical failure: vessel should be able to continue operating but procedures should be in place for promptly redressing the situation (in analogy with the AIS equipment).

These and other similar questions are very important for the technical implementation of the eIWT system, in particular the requirements for availability and security (authentication, resistance to tempering etc.) of the various subsystems and components.

3.3 Central databases & services

The full implementation of the eIWT architecture above, independently of the technical solutions and other implementation options for the eIVU and eIWC, relies on two distinct central databases, operated under the responsibility of the European Commission:

1. The European Hull Data Base (EHDB): a data base, repository of all information concerning the IWT vessels (i.e. unique number, classification, technical characteristics, particular requirements, vessel certificates etc.). The data in the current implementation of EHDB are not enough[12] for an effective eIWT implementation. However, given that the legal and technical requirements of EHDB are under revision, it is important that the eIWT requirements are taken in due consideration so that they are implemented in an updated EHDB.
2. A European Crew Qualification Database (ECQD): a database / registry of the professional qualifications of all EU crew members. Such a central registry is foreseen in the proposal for a European Directive on the recognition of the professional qualifications in IWT sector [8], where all MS competent authorities are supposed to push (record) the data on the IWT crew professional qualifications they issue, upgrade or retract. It is important that this registry is designed and set-up taking into account all eIWT requirements.

Further to the two central databases as above, the functionality of eIWT will be substantially enhanced if it has access to inland ECDIS (i-ECDIS) and other RIS services. In particular, it would be very useful if i-ECDIS could provide information on the special conditions and the crewing requirements both at the voyage planning phase and while navigating, so as to:

- Assist the boatmaster at the voyage planning phase
- Update the crew eSRB automatically also with the data regarding the stretches with specific risk.

It is understood that such information is not readily available in ECDIS but, given adequate resources, such information could be mapped in an additional layer and be available to eIWT and other applications.

3.4 eIWT in DINA

The Commission Communication on *A Digital Single Market Strategy* highlights that digitization offers unprecedented opportunities to economic sectors such as transport. The concept of *eTransport* points to the role of legislation to support access to traffic and transport data within specific modes such as *River Information Services (RIS)* and the need for further development, which, for inland waterways, will take place in the framework of a *Digital Inland Waterway Area (DINA)*, involving *Digital Multimodal Nodes (DMN)* and *Corridor Information Pipelines*. These strategic initiatives, planned for 2017, aim at unlocking the

[12] For example: no copies of certificates

potential of and interconnecting information systems on infrastructure, people, vessels, management and cargo components in inland waterways.

As part of these strategies, the Commission envisages to propose to review Directive 2005/44/EC on River Information Services (2017) to ensure that RIS fully contributes in a coordinated way to the integrated management of inland-waterway transport related services. It will focus on the further development of RIS, in a broader context, including logistics, cargo and people. Hence, novel approaches need to be developed for interlinking data from various sources, by improving data gathering through smart, monitoring-enabled vessels and cargo, by linking workers-related data with vessel operations, by developing ITS-enabled tools for supporting vessel operations and by devising strategies for improved data collection, management and broader use of inland waterway related data including also in interconnection with ITS systems covering other modes of transport.

It is evident that the eIWT concept, as outlined in Figure 2 above, is one of the cornerstones to the DINA strategy, especially if the more ambitious 3rd scenario is implemented. In fact, eIWT, even at its minimum functionality (eSRB and eLBK), will link digitally the vessel crew (in terms of identity, professional qualifications, sailing time and (optionally) working time) to the vessel (in terms of identity, state, voyage, particular conditions etc.).

A somewhat broader implementation of eIWT could place it at the center of DINA. In Figure 3 below, the positioning of eIWT in respect to the major DINA components is shown. In addition to the basic data exchange with the *Hull DB* (EHDB) and the *Professional Qualification Register(s)* (i.e. ECQD in Figure 2 above), shown in thick green arrows, connection should be established with RIS, eventual navigation aids and corporate cargo management tools.

It must be noted that, if the *working time* functionality will be implemented within eIWT, in addition to eSRB and eLBK, this will be a step towards linking the vessel and the crew with the corporate environment (i.e. calculation of crew retributions etc.).

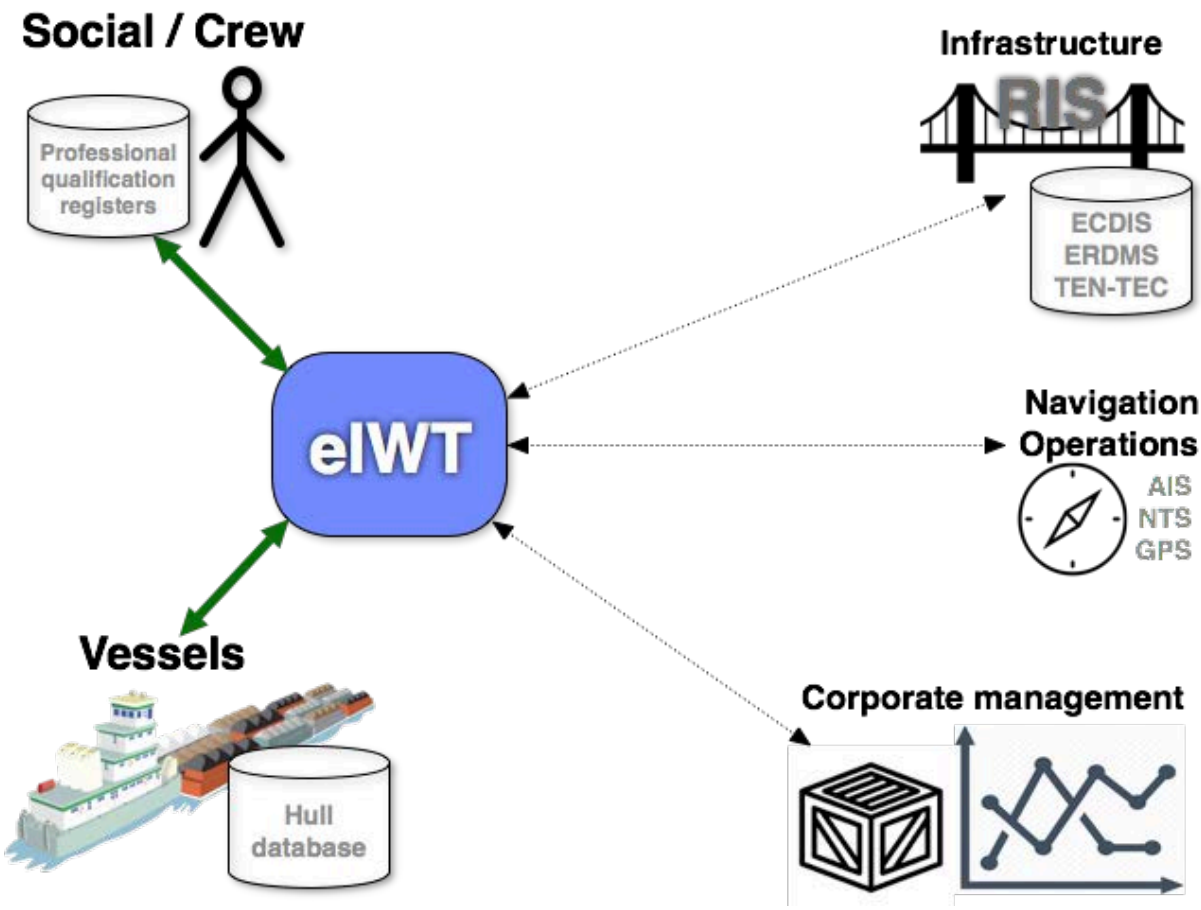


Figure 3: eIWT concept positioning within DINA

4 Use-cases

Following the definition of the eIWT architecture as described in section 3 above, prior to the definition of technical requirements such as information or data fields etc., it has been decided to proceed with a more detailed examination and definition of some characteristic use-cases (UC), which would then lead to more detailed functional and, subsequently, technical requirements. After consultation with a number of IWT stakeholders, the following use-cases were selected:

1. Vessel initialisation
2. Crew card initialisation
3. Voyage initialisation & end
4. Crew embarking & disembarking (sailing tracking)
5. Control / inspection by the competent authorities
6. Professional qualification upgrade
7. Professional qualification revocation
8. Inland navigation vessel certificate update or revocation

An additional use-case, not included in the minimum[13] required functionalities but which is pertinent to social and safety regulations and could be useful for corporate and other purposes, is that of the:

9. Working time registration (optional? corporate?)

These nine use-cases were analysed, based on the input from relevant stakeholders through dedicated templates, staring with the current (i.e. manual) procedures and practices, proceeding with the definition of the eIWT assisted procedures. The final aim was that of identifying the benefits, eventual loopholes and defining the functional requirements, which, ideally, could be the object of standardization. Thus, for each UC, we proceeded as follows:

a. Identified the actors (i.e. boatmaster, crew, certifying authority, controlling authority, corporate manager, IT manager, IT provider, etc.)
b. Described the current (i.e. manual) procedures (identification of the crew and checking of their professional qualifications, control).
c. Defined the possible eIWT assisted procedures, taking into consideration the manual procedures as well as any evident enhancements.

These steps (a to c above) are object of the current report, while the successive steps (d to i below) will be the object of successive reporting.

d. Derive the necessary information content (i.e. crew name, photo, qualification, barge certificates)
e. Define the information placeholders (i.e. card, vessel unit)
f. Define the information flows
g. Derive the functional requirements for 4 and 5, taking into account considerations like availability, security, privacy etc.
h. Propose some technical options
i. Elaborate on possible standards to be adopted

4.1 UC1: Vessel initialization

In UC1 on *vessel initialisation* are included all the administrative procedures necessary for a new IWT vessel to be put in operational condition, excluding everything that has to do with the crew.

[13] i.e. eSRB and eLBK functionalities

UC1 is based on information provided primarily by the federal waterway & shipping administration of Germany.

4.1.1 Actors

The main actor types involved with the initialization of a vessel are as follows:

1. Ship-owner: a company (usually) or a physical person that owns the vessel or a representative of the *owner*. [article 2.03 of RVIR or the Annex 2 of Dir 2006/87/EC]
2. Inspection body: the national authority that is responsible for issuing the authorization / certificates allowing the vessel to operate – on some occasions private bodies dully delegated.
3. Classification society: recognized private companies that approve / certify certain categories of vessels (i.e. tankers).
4. European Commission: regulator; authority responsible for the operation and maintenance of the European Hull Database.
5. eIVU manufacturer: commercial companies (typically computer systems providers) that manufacture the non-initialised vessel units according to the requested standards and provide them to the *eIVU distributor*.
6. eIVU installator: approved specialized company or public entity empowered by the *inspection body* to install the eIVU on the assigned vessel and initialize it, collecting any service fees or duties (like, for example, in [ES-TRIN annex 5, section 7]). The *installator* is also responsible for the maintenance of the eIVUs.

4.1.2 Current procedures

The necessary actions / procedures that must be taken in order that an IWT vessel be considered operational are as follows:

1. If the design is new, the *ship-owner* consults the *inspection body* and, possibly, a *classification society* for the design approval of the new vessel.
2. At the stage of building (keel) an ownership certificate is obtained through a court decision (German paradigm).
3. The *ship-owner* requests an initial inspection and certification by the *inspection body*. A dossier on the particular vessel is opened by the *inspection body*.
4. A European Identification Number [ES-TRIN Annex 1] is given by the *inspection body* [Article 2.18 of Annex 2 of Dir. 2006/87/EC].
5. An initial vessel inspection takes place, during which, if everything OK, the inland navigation vessel certificate number is given by the *inspection body* and is engraved on the vessel hull. For vessels built to carry dangerous goods an additional inspection carried out by a *classification society* regarding the ADN requirements.
6. The Inland Navigation Vessel Certificate (often referred to as *Rhine or community certificate*) plus any appendixes according to the vessel type, is issued and must be kept on board at all times. Copy of the certificate exists at the *inspection body* archives. Relevant data (like ENI, validity period etc.) is pushed by most national *inspection bodies* also to the EHDB.
7. A Crewing Requirements certificate (national and/or Rhine, sometimes included as part of the *inland navigation certificate*) is issued and must be kept on board at all times. Copy of the certificate exists at the *inspection body* archives.

8. The *ship-owner* buys the Vessel Logbook (LBK) [i.e. annex A.1 of the Rhine Personnel Regulations] and presents it to the *inspection body* for initialization.

4.1.3 eIWT procedures

The basic modifications that the introduction of the eIWT system will introduce to the above 'manual' procedures are highlighted below:

1. As with current procedures above.
2. As with current procedures above.
3. As with current procedures above.
4. Together with the *European Identification Number (ENI)*, a unique token (code, secure card or similar) is given by the *national inspection body*, permitting the unique and unambiguous association of the new vessel to the eIWT vessel unit (eIVU).
5. As with current procedures above.
6. An *inland navigation vessel certificate* (plus any appendixes according to the vessel type) is issued in electronic form and kept at the *inspection body* archives. A paper copy is handed to the *ship-owner* for information.
7. A *crewing certificate* (national and/or Rhine) is issued in electronic form and kept at the *national inspection body* archives. A paper copy is handed to the *ship-owner* for information.
8. The *ship-owner* buys the eIWT vessel unit (eIVU) and mandates the *eIVU installator* to install it on board. He initialises it using the unique token provided during procedure 3 above.
9. The *inspection body* uploads the electronic version of the *inland navigation vessel* and the *crewing* certificates to the European Hull Database (EHDB).
10. The vessel's *eIVU* downloads the data pertinent to the particular vessel from the *EHDB*. The authenticity of the electronic certificates in the vessel's eIVU is ensured by a digital certificate documenting the synchronization process.
11. Periodically, the eIVU connects to the EHDB in order to check for updated information and, if necessary, updates its data with those in EHDB. A log of the update checks is kept in eIVU and the EHDB. Failure to synchronise over a long period of time should be a matter of concern and trigger control actions.

4.1.4 Notes / issues

Currently, the Rhine / Community and the crewing certificates, in their paper form, are kept on board and are considered to be the original, legally binding documents. In the case of the electronic certificates, it is proposed that the original, legally binding documents are those kept in the electronic archives of the issuing authorities. The electronic documents found either at the EHDB or on board at the eIVU are certified / authenticated copies of the original documents. As such, they should be digitally protected against fraud or accidental misuse.

The following solution is proposed as most appropriate for maximum functionality while ensuring authenticity, integrity and minimise the risk of fraud:

- The issuing *inspection body* updates the EHDB that, in turn, updates the eIVU of the vessel.
- Each eIVU has read-only access only at its own EHDB data. An eIVU can send to the EHDB a synchronisation request, in which case the EHDB uploads the all data pertinent to the particular vessel, updating / overwriting existing information.
- Vessel crew have read-only access to the eIVU vessel pertinent certificates.

- Unique root cryptographic key, generated, propagated and maintained following the *digital tachograph* paradigm, serves to generate further keys so as to enforce the appropriate access rights to the eIWT systems as well as to the EHDB and, later, the ECQD[14].

There are some important issues that must be dealt with prior to apply the eIWT procedures:

- Extension of the minimum set of data uploaded in EHDB, which now is insufficient for the eIWT requirements. It should include the complete *Inland Navigation Vessel Certificate* data set and, possibly, PDF documents.
- Deal with the issue of the accessibility and acceptance of e-certificates outside EU (i.e. Serbia)

If the eIVU is to be connected to the Inland AIS, the installation will require a specific type-approval because ES-TRIN foresees that only type-approved equipment can be connected to the Inland AIS device [Annex 5 of ES TRIN, section IV on minimum requirements, requirements for installation and performance tests for Inland AIS equipment in inland navigation, article 2, paragraph 6]. Type-approval of eIUV is certainly advantageous in many ways, especially if interlinked to navigation or safety related services, but it can raise significantly its acquisition and maintenance costs.

4.2 UC2: Crew card initialisation

This use-case includes all necessary steps/procedures that a certain IWT crew, presumably having already the necessary professional qualifications (education, physical fitness, etc.) performs in order to issue a functional eIWT crew card, hereon referred as *Electronic Inland Worker's Card (eIWC)*.

The eIWC is not necessarily a smartcard nor a physical card. It can be a virtual card, i.e. a token (password, OTP, biometric feature or combination) to access the eIWT functions related to the crew. What follows is, to a large extent, independent from the technical implementation of eIWC.

4.2.1 Actors

The actors involved in UC2 are as follows:

1. Crew: physical persons qualified to serve as crew in IWT vessels
2. Competent authority: national authority responsible for issuing the eIWC. Typically, it should be the same authority that is responsible for issuing the paper professional qualifications certificates after having checked all necessary documents (diplomas, service record books, etc.) according to the national and/or international legislation.
3. European Commission: regulator, authority responsible for operation and maintenance of the European Crew Qualification Database (ECQD) along with the *Hull database (EHDB)*.
4. Card provider: commercial companies that manufacture the non-initialised cards according to the requested standards and provides them to the *distributor*.
5. eIWC distributor: company or public entity empowered by the issuing authority to initialize each eIWC and distribute it to the rightful crew member, after checking his credentials and collecting any eventual service

[14] European Crew Qualifications Database: European database/registry hosting the professional qualifications of all IWT crews.

fees or duties. The distributor is also responsible for the maintenance and substitution of the cards.

4.2.2 Current procedures

Not applicable.

4.2.3 eIWT procedures

Any person having all the requirements for serving as *crew* should apply for an eIWT crew card (eIWC). He/she might be either:

- A newcomer, with all the necessary documents and certificates necessary to start an IWT crew career, or
- An established IWT crew[15], with established qualification levels and service track record properly documented on his/hers SRB

In all cases, he/she must undergo the following steps/procedures in order to get his/hers personal eIWC:

1. The *crew* submits a request to his/her national *competent authority* for an eIWC, furnishing all the necessary documents (or other proof) for his/her identity and professional qualification levels, including the SRB, if available.
2. The *competent authority*, checks at the *European Crew Qualification Database (ECQD)* for an eventual duplicate eSRB entry. If no such entry exists and on positive verification of the *request*, it opens a unique electronic dossier for the particular *crew*, according to its own rules and procedures. At the same time, it registers the eSRB application request at the *ECQD*. It then proceeds with the establishment of electronic service record book (eSRB), indicatively comprising:
   - Identification data like name, surname, date & place of birth, nationality, national ID number, etc.
   - Picture, possibly according certain standards (i.e. passport, driving licence etc.)
   - Current qualification level
   - Current service track record
3. The *competent authority* deactivates[16] the original SRB (possibly also other professional qualification certificates) and provides the *crew* with certified printouts of his/hers eSRB that serve also as provisory documents until the completion of step 6 below. It also provides the *crew* with a token through which he/she can access electronically all his/her personal information at the *European Crew Qualification Database (ECQD)*. From that point on, the official, legally binding documents are those in digital form (eSRB) in the archives of the issuing *competent authority*.
4. The *competent authority* uploads/synchronises the eSRB data to the European Crew Qualification Database (ECQD), maintained by the EC.
5. The *competent authority* produces the specific *crew's* eIWC or, in alternative, it delegates the *eIWC distributor* to do so.
6. The *crew* receives/retrieves his/hers eIWC from the *competent authority* or the delegated *eIWC distributor* and, using the token provided by the *national authority*, proceeds to its initialisation. From that point on, the eIWC is

[15] Boatmasters, do not need an SRB; a helmsman can renounce further upgrade and, therefore, does not need registrations on his SRB.

[16] Stamps, perforates or use other method to clearly and unambiguously mark the non-validity of the SRB; this is because crew will be reluctant to handle their SRBs as they represent a piece of personal history.

operational within the eIWT system, among other things serving fully as professional qualification certificate and eSRB.

4.2.4 Notes / issues

Data stored on central or national databases should be the strict necessary to avoid data protection and privacy issues. Example: proof of medical fitness, once validated, is not kept (at least electronically). The only electronic information kept on the *eIWC* and central DB is fit, not fit, reduced ability, restrictions etc. and expiration date.

4.3 UC3: Voyage initialisation & end

By the term *voyage* we mean any travel of the inland vessel between two port facilities, the first of which is considered to be the voyage starting point and the second one is considered as the end point, no matter the number of intermediate port facility calls.

In general, it is the boatmaster who defines the *voyage* and sets up the *voyage planning*. Any vessel, at any moment, can be at only at one *voyage*.

A new *voyage* does not necessarily start automatically at the end of the previous *voyage*. There may be a temporal gap between two consecutive voyages if, for example, the vessel remains idle in a port. However, there can be no substantial spatial gaps between two consecutive voyages. Any new *voyage* begins, in principle, where the last *voyage* ended.

The vessel can also change position inside a port without the need to initiate a new *voyage*. Such movements are tracked by the vessel's *eIVU* and recorded as *movements* on the vessel's eLBK.

4.3.1 Actors

The main actors involved in UC3 are as follows:

1. Boatmaster
2. Office on shore (traffic management)
3. Shipping company

4.3.2 Current procedures

1. Shipping company provides request for a commercial operation necessitating a voyage
2. Boatmaster sets up the voyage planning, involving:
   - Navigation planning (usually consistent with RIS Technologies like AIS and ERI and making use of common reference tables for the location data)
   - Stowage planning (note: stowage software is often used for safety, stability, dangerous goods location on-board)
   - Crewing planning (where to embark and disembark crew, according to the specific crewing requirements – choice of proper operating mode); requirements may differ regarding the navigation sector and the type of vessel.
3. Updates the LBK with vessel voyage and crewing information.
4. At the voyage end, the boatmaster ensures that the LBK is properly filled.

4.3.3 eIWT procedures

At voyage start, the *boatmaster*:

1. Logs-in as a boatmaster.
2. Initializes the voyage within the *vessel unit (eIVU)*. A voyage file is opened within the eIVU file system, where all subsequent information concerning the voyage (vessel and crew related) are stored until the completion of the voyage.
3. Sets-up the navigation part of voyage planning within the eIVU. Data available through the Inland AIS, i-ECDIS or in the ERI software are used automatically. The specific sectors of navigation (KSS) are registered in advance [Articles 7.05 - 7.07 of the Rhine personnel regulations].
4. Enters the planned formations (i.e. convoys etc.) according the possibilities listed in the *vessel certificate* [box 15]. The vessel equipment standard [S1 or S2 according to ES-TRIN chapter 31] is already available in the eIVU and taken into consideration automatically.
5. Sets-up the crewing planning according to the desired *operating mode*. The eIVU, according to the navigation planning and the vessel equipment standards, furnishes the crewing requirements along the route. [Articles 3.16 and 3.17 of the Rhine personnel regulations; chapter 31 of ES-TRIN]. The system acquires and associates to the *voyage* automatically the *crew card (eIWC)* data[17] of any crew already present on-board.
6. Planning deficiency warning: the eIVU, having all the necessary and up-to-date information on the voyage path, vessel crewing requirements according to the cargo, operating mode, and eventual special conditions, signals to the *boatmaster* any potential deficiencies regarding either the crew or the vessel expected along the planned route.
7. Operational deficiency warning: the eIVU, having all the necessary and up-to-date information on the vessel position, crewing requirements, exploitation mode, and eventual actual special conditions, signals to the *boatmaster* any actual deficiencies. The warning is not transmitted anywhere but it is logged in the eIVU voyage file. The *boatmaster* remains responsible for the crewing on board.

During the voyage:

8. The *boatmaster* indicates the intermediate stops or other events to be logged to the eLBK according the current regulations. Location information is given automatically by the *eIVU*.
9. The eIVU, based on GPS positional data and i-ECDIS information, updates at regular intervals both the vessel eLBK and the crew eSRBs.

At voyage end, the *boatmaster*:

10. Checks that the eLBK entries, compiled automatically by the eIVU, are correct. In case of discrepancies, the *boatmaster* should be able to correct by manually editing and/or overwriting some fields. However, each and every manual intervention should be logged at the eIVU.
11. Closes the voyage, triggering the following actions:
    - The eLBK part concerning the particular voyage is finalised: the relative pages are permanently stored in the eIVU and are no more available for editing.

[17] The data related to the crew on-board (including navigation, working or resting time) exists independently of the voyage. Crew navigation time does not necessarily coincide with the voyage time.

- The eIVU *voyage file* is closed and can no more be edited, deleted or changed, apart from specific parts concerning a-posteriori notes or memos.

4.3.4 Notes / issues

Crewing requirements are not harmonized along waterways. Moreover, no database with national requirements exist. It is advisable to map the crewing requirements along all the waterways and have them either as part of a GIS or Inland Navigation Charts [i-ENC]. Although this is not simple, given the dependability of the crewing requirements on many factors, it is perfectly feasible and may, ultimately, lead to their simplification.

Voyage planning information could be sent automatically with the inland AIS. [Rhine Police Requirements Article 4.07 and 12.01]. For some vessel types, there is a reporting requirement [i.e. Rhine Police Requirements Article 12.01] related to the cargo and to the voyage. This report could be assembled automatically in electronic form in eIVU and forwarded to the ERI system without the boatmaster having to enter the same data multiple times.[18]

Movements (i.e. vessel displacements that do not necessitate a voyage initialization) must be defined and properly prescribed both in spatial and temporal terms.

The on-board crew related data (including navigation, working or resting time) exists independently of the voyage. Crew navigation time does not necessarily coincide with the voyage time. *Crew* can embark at a certain point during voyage XX and disembark during voyage YY. The system acquires automatically the *crew card (eIWC)* data of any crew embarking at a certain point or already present on-board at the moment of the voyage initialization and associates it to the current (open) *voyage.* In the same way, the system acquires and associates automatically the disembarkation of any crew along a certain voyage (see section 4.4 below).

The eIWT system is expected to automate, to a great extent, the task of the boatmaster, especially in what regards repetitive tasks like filling the LBK or the SRBs. However, the system should allow many of the tasks quoted in section 4.3.3 above, like the *voyage planning*, to be done retroactively, within reasonable limits, in order not to distract the vigilance of the boatmaster during the delicate navigation phases like when departing from a port.

4.4 UC4: Crew embarking & disembarking

This use-case maps what happens when *crew* embarks and disembarks to/from a vessel. By the terms *embarkation* and *disembarkation* we understand the acts of taking and leaving service on-board of a vessel. This is not necessarily linked with a particular voyage.

---

[18] On the river Rhine, the Inland AIS is not used to send Voyage related information but the Inland AIS device offers this possibility. On the Rhine, voyage related information is communicated with the ERI Software (BICS – www.bics.nl). Voyage planning information is sent automatically to the Inland AIS and to the software used for the electronic reporting (ERI software). Indeed, some police regulations [Rhine Police Requirements Article 4.07 and 12.01] make mandatory the usage of Inland AIS or an electronic reporting according to the ERI Standard. The requested data contains often voyage related information and in it therefore necessary to ensure consistency between the RIS Tools (Inland AIS, ERI) and the eIVU.

4.4.1 Actors

The main actors involved in UC4 are:

1. Boatmaster
2. Crew other than boatmaster
3. Competent authorities

4.4.2 Current procedures

On *crew* embarking, the *boatmaster*:

1. Requests the SRB of the embarking *crew* and checks his/her identity and professional qualifications.
2. Places and keep the embarking crew's SRB in a safe place in the wheelhouse, typically until the end of the service or the term of the labour contract or any other arrangement[19].
3. Registers the variation in the vessel crew composition in the vessel LBK, [Rhine personnel regulations - Article 3.13].

On *crew* disembarking, the *boatmaster*:

4. Enters/completes/signs the proper data in the SRB of the disembarking *crew*, [Rhine personnel regulations - Article 3.06 (6)], with the exception of a disembarking helmsman, in whose SRB (page 10) is written and signed: "does not wish to obtain the skipper's certificate".
5. Registers the variation in the vessel crew composition in the vessel LBK.

4.4.3 eIWT procedures

On *crew* embarking:

1. The *boatmaster* requests the *crew card (eIWC)* of the embarking *crew* and checks his/her identity. He then inserts it (or sweeps it through) the vessel's eIVU card reader(s). The system checks the validity[20] of the eIWC (in particular if it has been suspended) and reads the crew qualification and data.
2. Optionally, the system uploads[21] a minimum set of data (like crew card number, vessel number, location and time stamp) to the ECQD so as to check for and avoid duplicate or parallel use of the same credentials.
3. The crew embarkation is registered in eIVU and the *voyage file*. The vessel crew composition in the vessel's eLBK is updated automatically.
4. The *boatmaster* leaves the embarking crew's eSRB in the eIVU slot or, in alternative (case of unique card or proximity reader), he keeps it in a safe place in the wheelhouse until the end of the service, the voyage or the term of the labour contract or any other arrangement.

On *crew* disembarking:

5. The eIVU, based on the registered actual route, specific conditions etc. acquired through ECDIS and RIS services, automatically updates the eIWC of the disembarking crew, registering all necessary data (km of sailing, specific conditions etc.) on the eSRB.

---

[19] At a crew member request, the boatmaster should return the SRB to holder promptly and at any time.

[20] On-line, through the ECQD, if connection is available, otherwise through the latest known blacklist. In alternative, the last eIWC – ECQD synchronization time-stamp can provide a good indication for the eIWC validity. Failure of a particular eIWC to synchronize for a long time can raise doubts on its validity.

[21] If connection is not available, the operation is queued for later.

6. The boatmaster controls the service record data in the eIWC of the disembarking *crew*. In case of a discrepancies, failure of the automatic registration etc., he has the possibility to correct / overwrite the automatic registration. However, this action is recorded on a log file both at the *crew card (eIWC)* and the *vessel unit (eIVU)*.
7. The *boatmaster* digitally signs the eSRB (embedded in the eIWC), thus finalizing the disembarking crew eSRB update and signalling the disembarkation of the *crew* member. The time stamp of the disembarkation is registered both at the eIVU and the disembarking crew's eIWC.
8. The disembarkation is registered at the *voyage file* and the variation in the vessel crew composition is written in the vessel's eLBK.
9. On first occasion (i.e. when there is connection) the system uploads the disembarkation information to the ECQD. It also updates the disembarking crew eSRB data on ECQD. This data serve to the national *competent authorities* for the crew qualification update. Failure of the eIVU to update the ECQD resident eSRB data of the disembarking crew (due to a communication failure or any other reason) will generate an alarm at the first synchronisation attempt of the eIWC with the ECQD and will trigger corrective actions as required.
10. The eSRB residing at the ECQD are periodically synchronised with the issuing *competent authorities'* archives. Each *competent authority* periodically signs the eSRB updates, updating the *crew* professional qualifications according the rules in place.

4.4.4 Notes / issues

It is important to note that whatever crew related official data (i.e. required / prescribed by a regulation) is written both at the vessel unit (eIVU), the European professional qualifications registry (ECQD) and the crew card (eIWC). The later should be synchronized[22] with the ECQD through regular updates either through a PC at home or, preferably, while in the eIVU. Crew has always a read-only access to his data, both at his card and those at the ECQD.

Procedures must be put in place for updating the crew data by the national competent authority if need arises (change of address, change of administrative data or other).

Whatever information regarding the crew is registered during the voyage other than the official ones, as in paragraph above, like working or rest time, corporate etc. are erased automatically on disembarkation.

When voyage data is registered in eLBK and eSRB, what is important is to check the information consistency, not the exact vessel positioning or trajectory.

Crew card has info on physical a mental fitness certificates including their expiration dates. This information is transferred, together with the crew qualifications to the eIVU so that the boatmaster knows and acts accordingly.

4.5 UC5: Controls & inspections

The use of electronic tools is not supposed to radically change the current control & inspection procedures. In particular, electronic tools shall not give rise to an increased surveillance. In no way vessel, crew or voyage data shall be transmitted to the authorities nor shall they serve for profiling or prioritizing controls.

[22] One-way only synchronisation, from the ECQD to the eIWC.

4.5.1 Actors

1. Enforcement bodies: (water)police, inland navigation inspectorates or other national enforcement bodies
2. Enforcement officers: persons representing or acting on behalf of an *enforcement body*; also referred as *controlling officers*
3. Boatmaster
4. Crew, other than boatmaster
5. Company: ship-owner or operator
6. European Commission: regulators, EHDB and ECQD operators
7. National *competent authorities* (crew) and *inspection bodies* (vessel)
8. Waterway manager

4.5.2 Current procedures

We can distinguish two types of inspections: police and administrative.

In general, they are not announced. They are usually performed when the vessel is in operation. Sometimes controls are scheduled on prior profiling information and are focused on particular aspects (i.e. navigation times or safety equipment).

1. *Enforcement officers* (mostly 2 or more) board the vessel.
2. The *boatmaster* is asked to show all required documents: vessel certificates with all annexes (LBK, radar, sonar, safety equipment like inland AIS or stability calculation equipment for container vessels, etc.), crew related documents (SRB, ID etc.), cargo documents.
3. Consistency check of the real situation in respect to the documents provided.
4. If inconsistencies are found they are dealt with sanctions as follows:
   - Advice (minor problems)
   - Warning – official, registered but no punishments
   - Fine (paid directly or at a later stage)
   - Court case initiated
5. Then, in order to redress the situation or prevent it in the future, possible measures include:
   - Temporary suspension of a vessel or boatmaster certificate (directly by law enforcement or indirectly through the national authority)
   - Withdraw of the vessel or the boatmaster certificate by the *inspection* or the *competent authority*
   - Seizure of the vessel or other equipment or goods (temporary)
   - Vessel immobilisation
   - Temporary ban from the business

4.5.3 eIWT procedures

1. Identical as with the current procedures above.
2. The *enforcement officer* logs in the eIVU using his *eIWT control card*. The access is registered both in the eIVU and the card of the enforcement officer. The enforcement officer can see the logs of eventual previous controls, thus avoiding unnecessary duplicate checks or focusing on eventual omissions signalled by previous controls.
3. The *enforcement officer* checks the electronic documents at the eIVU. He has the authority to copy on his card whatever documents he may require for further investigation or evidence. The boatmaster is asked to show any documents or certificates that are not in the eIVU, such as cargo documents or crew IDs.

4. The *enforcement officer* can access, through the eIVU, the EHDB and the ECQD, in order to check the validity / consistency of the documents residing either in the eIVU or the eIWCs of the embarked crew. This could be the case if either the eIVU or any of the EIWCs has not been synchronised since a long time. Otherwise, identical as with the current procedures above.
5. Identical as with the current procedures above.
6. Measures taken in order to redress the situation or prevent it in the future, as indicated in the current procedures above, should be registered on the enforcement officer's *eIWT control card* as well as on the eIVU and/or the eIWC depending if they relate to the vessel or a crew member. Both the boatmaster and the concerned have read access to these notes. They cannot delete or modify them but can add comments. It must be noted that these entries are simple logs without any legal value / consequences. They serve as reminders to the boatmaster, company or crew as well as in case of subsequent controls / inspections. They are automatically deleted after a certain period of time.
7. In case of a serious measure (like revocation or withdrawal of a certificate or a professional qualification), the enforcement officer requests its enforcement to the national inspection or competent authority, which, if it agrees, proceeds to the enforcement and updates the EHDB or the ECQD and are propagated to the eIVU or the eIWC during the subsequent synchronisation processes.

4.5.4 Notes / issues

Inspectors, be it water police officers or national *competent authorities* and *inspection bodies* inspectors, will be equipped with eIWT cards with special rights, hereon referred to as *eIWT control cards*. Once on board, these cards provide the inspectors with read access rights to all eIVU files like:

- Vessels certificates,
- Embarked crew professional qualifications, current *working state* (see section 4.9) and working time history.
- Voyage file.

It will also give them writing access files to:

- A special section of the eIVU file system, where the inspector(s) can write whatever conclusions, comments and/or recommendations regarding the vessel. The boatmaster and the company have read access to this section but cannot delete modify it. They can only add comments.
- A special section of the eIWC file system, where the inspector(s) can write whatever notes or recommendations regarding a particular crew member. Both the boarmaster, the crewmember concerned and the company have read access to this eIWC section but cannot delete modify it. They can only add comments.

The inspectors, once on board, through the eIVU, can access both the EHDB and the ECQD to check the validity of the certificates stored in the eIVU or the crews eIWCs. It is important to note that these controls can be performed only while on-board of the vessel. In no way can such controls take place outside the onboard inspection / controls like, for example, remotely from the water police headquarters. This is ensured by the fact that in order for the controllers / inspectors to access EHDB or ECQD data they need the token of both their control cards and those of the concerned eIVU or eIWC.

The list of documents that must be on board is not harmonized between the several police regulations [Rhine Police requirements Art 1.10]. The eIWT could serve for such a harmonization or, at least, the definition of a lowest common denominator.

4.6 UC6: Professional qualification upgrade

This use-case includes all necessary steps/procedures that a certain IWT crew, presumably having achieved all the necessary requirements for the upgrade of his professional qualifications, performs in order to upgrade his professional qualifications and register them to his *Electronic Inland Worker's Card (eIWC)*.

4.6.1 Actors

The actors involved in UC6 are as follows:

1. Crew: established crew in IWT vessels not having reached the highest qualification or not having renounced to the upgrade of their qualifications
2. Competent authority: national authority responsible for updating the crew qualifications. Typically, it should be the same authority that is responsible for issuing and updating the paper professional qualifications certificates after having checked all necessary documents (diplomas, service record books, etc.) according to the national and/or international legislation.
3. European Commission: regulator, authority responsible for administration and maintenance the European Crew Qualification Database (ECQD) along with the *Hull database (EHDB)*.

4.6.2 Current procedures

1. The concerned *crew* checks his/her SRB if the conditions for the upgrade of his/her qualifications are met i.e. navigation time, years, eventual exams or training etc. according to the applied regulations (Rhine or national legislation).
2. He/she presents his/her SRB (and any other documents required) to a *competent authority* requesting the upgrade of his/her professional qualification.
3. The *competent authority*, after checking the SRB and eventual additional documents furnished, proceeds to the upgrade of the concerned crew's professional qualification. Usually, this is done without any delay and the qualification upgrade is signalled on the SRB, except for the case of an upgrade towards *boatmaster*, in which case a boatmaster's patent is issued. The boatmaster can keep his/hers SRB in case he/she needs to update his/her knowledge of specific sectors (KSS)

4.6.3 eIWT procedures

The professional qualification archives, including the eSRB, residing at the ECQD are periodically checked by the issuing *competent authorities*, which sign the eSRB updates, updating the *crew* professional qualifications at their own archives according the rules in place. These updates are then pushed at the ECQD, through which the eIWC cards are also updated.

The updates of the eIWC cards can be done during embarkation via a eIVU synchronization or at home, provided that the crewmember has the technical capacity to read and write on the card.

4.6.4 Notes / issues

When voyages are registered in eLBK and eSRB, what is important is to check the information consistency, not the exact vessel positioning or sailing trajectory. Sailing time, number of crossings and stretches (km) of specific sectors (KSS) could be automatically registered by the eIVU (connected to GPS and i-ECDIS services) thus avoiding bureaucratic work for the boatmaster and possibilities of errors or fraud.

4.7 UC7: Professional qualification revocation

This UC refers to a possible revocation or downgrade of the professional qualification of a certain crew member following a fraud or a serious incident. This revocation can be temporary or permanent. Hereon, the term revocation we will imply anyone of the following measures:

1. Permanent revocation of the professional qualifications i.e. the capacity to embark as crew on an IWT vessel.
2. Provisory revocation of the professional qualifications i.e. the capacity to embark as crew on an IWT vessel.
3. Downgrade of the professional qualifications: in this case crew has the possibility to embark but at a lower grade. He / she has the opportunity to return to the original qualifications level by accumulating experience and upgrading according to the rules in place.
4. Permanent downgrade: in this case crew has the possibility to embark but at a lower grade. He / she has cannot to return to the original qualifications level.

4.7.1 Actors

The actors involved in UC7 are as follows:

1. Crew: established crew in IWT vessels whose qualifications are to be revoked
2. Competent authority: national authority responsible for issuing and updating the crew professional qualifications according to the national and/or international legislation.
3. European Commission: regulator, authority responsible for administration and maintenance the *European Crew Qualification Database (ECQD)*.
4. Controlling officer(s): officers from police, water police or other national controlling / enforcing authority

4.7.2 Current procedures

With reference to the Rhine regulations [Rhine personnel regulations – Article 7.20 to 7.25], a patent can be temporarily suspended by a *competent authority* under the following conditions:

- In doubt on the revocation of the patent of a certain crew, it opts for a suspension and fixes the duration of such suspension
- Automatically on the absence of a physical and mental fitness certificate, 3 months after the expiration of the validity of such certificates and until their renewal
- If a *competent authority* is in doubt about the physical or mental aptitude of a crew, it informs the *issuing competent authority* and can suspend the patent until the later decides on the basis of new medical certificates.

- A suspended patent must be handed over to the *competent authority* to be kept over the suspension period.

A patent can be revoked for a number of reasons by the competent authority on a number of reasons and conditions. The main reasons are:

- The physical or mental non-aptitude
- Repeated violations of important safety regulations or prescriptions like i.e. operating with an alcohol blood content beyond the limit prescribed in the legislation in force.

In any case, it involves the physical confiscation of the patent by the competent authority.

4.7.3 eIWT procedures

The *competent authority* responsible for issuing and updating the professional qualifications of a crew whose professional qualification certificates are to be revoked, downgraded or suspended, proceeds in updating the file of the particular crew in its own archives. Data fields must include some information on the reasons for the revocation as well the date(s) from/until which the revocation is effective. It then pushes these changes to the *European Crew Qualification Database (ECQD)*.

These changes i.e. downgrade of the professional qualifications or revocation (permanent or temporary) will be pushed to the *crew card (eIWC)* of the crew in question on the occasion of the first synchronization with the ECQD at home or through the *vessel unit (eIVU)*.

4.7.4 Notes

In case of revocation during a *voyage*, provisions must exist to permit the continuation of the crew functions for a certain time, until a replacement is found. In no way this grace time can be extended beyond the planned completion of the *voyage*.

It is possible that, according to national legislation, an official notification (i.e. via registered letter) to the crew in question is required prior or in parallel to the electronic revocation procedures.

4.8 UC8: Inland navigation vessel certificate revocation

Any valid Community inland navigation certificate may be withdrawn by the competent authority which issued or renewed it if the craft ceases to comply with the technical requirements specified in its certificate. Any decision to refuse to issue or renew a Community inland navigation certificate shall state the grounds on which it is based. The person concerned shall be notified thereof and of the appeal procedure and its time limits in the Member State concerned [Dir 2006/87/EC].

There are 3 possible types of *inland navigation vessel certificate* revocation:

1. Temporary revocation / suspension to fix minor technical issue on board
2. Complete revocation in case of manifest danger (after a serious accident)
3. Vessel scraping

Hereon, the term *revocation* will refer to any of these 3 above categories.

4.8.1 Actors

The main actors involved with UC 8 are:

1. Boatmaster
2. Owner: company owing / operating the vessel
3. Inspection body: national authority responsible for issuing and updating the vessel *inland navigation certificates*.
4. European Commission: regulator, authority responsible for administration and maintenance the *European Hull Database (EHDB)*.
5. Controlling officer(s): officers from police, water police or other national controlling / enforcing authority

4.8.2 Current procedures

1. Controlling authorities proceed with some random control on board, as well as specific / targeted controls like in case of accidents. [Article 17 of directive 2006/87/EC / Articles 2.11 and 2.13 of the Rhine vessel inspection regulations]
2. In case of minor deficiencies, the vessel owner is requested to take corrective measures, failure of which may result to an *inland navigation certificate* revocation.
3. In case of serious deficiencies or of failure to take the necessary corrective measures, the *inland navigation vessel certificate* is temporary suspended or withdrawn [Annex VIII of the directive 2006/87/EC / Rhine police requirements]. The controlling officer(s) withholds the *inland navigation certificate* and inform, within 7 days, the authority which has issued the certificate or which has last renewed it, stating in the reasons of the revocation. They may also prescribe measures enabling the vessel to proceed safely to a place where it will be either inspected and/or repaired.
4. The *inland navigation vessel certificate* is withdrawn by the authority / *inspection body* which issued or renewed it, if the craft ceases to comply with the technical requirements specified in its certificate. [Article 16 of the directive 2006/87/CE or Article 2.13 of the Rhine vessel inspection regulations]
5. The vessel owner is notified in order to take all necessary measures to remedy the situation or appeal according the legislation in force.

4.8.3 eIWT procedures

1. Same as point 1 in section 4.8.2 above. In addition, the controls / inspections are logged in the vessel's eIVU.
2. Same as point 2 in section 4.8.2 above. In addition, recommendations of the controls / inspections are registered in the vessel's eIVU.
3. The controlling officer(s) / inspectors, log in the eIVU using their *eIWT authority-type cards* and register the *inland vessel certificate* provisory suspension in the eIVU, along with any temporary provisions or rectification measures or other proposals (i.e. certificate revocation). This suspension is pushed automatically to the EHDB, through which the relevant inspection body (authority of issuance or of last renewal) is notified along with the reasons and the controlling authorities proposals.
4. After examining the case, the *inspection body* responsible for issuing and updating the *inland navigation vessel certificate* for the vessel in question decides on the appropriate measures (nothing, temporary, conditional or permanent revocation) and proceeds in updating the file of the particular vessel in its own archives. Data fields must include information on the

reasons for the revocation as well the date(s) from/until when the revocation is effective. It then pushes these changes to the *European Hull Database (EHDB)*.

5. The revocation (permanent or temporary) is pushed to the *vessel unit (eIVU)* of the vessel in question on the occasion of the first synchronization with the EHQD. Failure to synchronize over a long period of time may raise suspicions during an eventual inspection and trigger additional controls by the inspection authorities directly to the EHQD (see section 4.5 on *controls & inspections*).

4.8.4 Notes / issues

In case of revocation during a *voyage*, provisions must exist to permit the voyage continuation but in no way this grace period can be extended beyond the planned completion of the *voyage*.

It is possible that, according to national legislation, an official notification (i.e. via registered letter) to the vessel owner is required prior or in parallel to the electronic revocation procedures.

An upper limit for the provisory certificate suspension must be established, after which further revocation must be issued by an *inspection body*. Procedures should be established in case of disagreement between *controlling authorities* and the *inspection body*.

4.9 UC9: Working time registration

Working time registration is strictly regulated for purposes of safety (minimum crewing requirements), social policy (allowable working times, rest time, etc.) and, optionally, for corporate reasons (salary retribution, retributions, allowances etc.). UC9 deals with working time registration exclusively for reasons having to do with safety and social regulations, i.e. documenting that a vessel navigating in the Union's waterways has the proper crew, according the specific crewing requirements and that each crew member works under working conditions ensuring the proper and safe fulfillment of his/her functions. Eventual use of these recordings by the *company* and/or the *crew* for other purposes is out of the scope of the present work.

For the purpose of the working time registration, the *crew* (incl. the boatmaster) can be in <u>one</u> of the following *working states*:

1. On-board working
2. Off-board working
3. On-board resting
4. Off-board resting.

4.9.1 Actors

1. <u>Crew</u>
2. <u>Boatmaster</u>: he is responsible for registering the timekeeping / working status of all crew members.
3. <u>Company</u>: it can use the same data for the corporate timesheets.
4. Enforcement / controlling <u>authority</u>.

4.9.2 Current procedures

1. Company <u>timesheet registration</u>: in principle should be done at daily basis; no single template; it can be paper or computer-based (usually corporate

accounting / logistics). Any given vessel should have on-board the working records of all crew for the particular voyage.

2. In order for these records to be valid they should be signed by both parties, i.e. *crew* and *boatmaster* (representing the *company*). This should be done, in principle, on daily basis. Even when system is computerized, timesheet printouts are produced and signed and, as such, give right to salary.

4.9.3 eIWT procedures

1. The *boatmaster* registers in the vessel's unit (eIVU) the fact that a crew member took service by inserting/sweeping the crewmember's card (eIWC) in the eIVU card reader. A subset of the eIWC card data is copied to the crew member voyage file in the eIVU and are kept there for the duration of the voyage or employment contract. Data copied include:
   - Crew card (eIWC) *unique number*,
   - Name and surname,
   - Picture stored in eIWC,
   - Qualification, including knowledge for specific sectors (KSS)
   - Qualification upgrade state
   - Physical fitness state (fit and/or conditions or restrictions),
   - Accumulated working time during the last 12 months (15 months?)
   - History of working/rest time[23] of the last 31 days.
2. The ID of the crew appears to the working time registration program of the eIVU and the boatmaster can assign to each crew one of the 4 *working states* mentioned above. The default *working state* is that of *on-board working*.
3. The *boatmaster* assigns the *working state* (i.e. on-board working, off-board working, on-board resting or off-board resting) of each crew either real-time or proactively or retroactively within ±24 hr margin. This means that he can plan ahead for 24 hours and /or change the *working state* of the crew members (including his own) for the last 24 hours. The *working time* history is registered synchronously at the eIVU and the eIWC (or crew file). The default *working state* (i.e. if no other state is assigned) is that of *on-board working*.
4. The system keeps track of working and rest time statistics and signals to the boatmaster eventual infractions or derogations of the working / rest time rules. These are registered in the voyage log file, together with any notes from the boatmaster on the reasons for such infractions / derogations.
5. On a crew disembarkation, the working time history is copied to the eIWC and the crewmember's timesheets on the eIVU are finalized and cannot be edited or touched any more.

The working-time data registered on the crewmember's voyage file can serve to update the company working crew bookkeeping logistics in conformity with the applicable corporate rules and agreements.

4.9.4 Notes / issues

The working-time history as registered on the eIVU and the crewmember's eIWC should kept for at least 13 months both at the vessel unit and on the crewmember's card.

[23] Time resolution is in minutes

5 Preliminary impact assessment

This section provides some preliminary data and qualitative evaluations on the foreseen impact of the electronic tools provided that they are fully applied as conceived and described on the sections above. By no means can it replace the formal impact assessment foreseen prior to the introduction of EU legislation.

This section is based on extensive interaction with the *river commissions* and the main IWT professional associations and stakeholders. It also levers on the *survey on the use of ICT on-board of IWT vessels* [9].

5.1 ICT in inland water transport

According to [9], 98% of the barges have either a PC or a tablet on board. Moreover, 95% of the skippers claim at least a basic knowledge of PC use among them the 25% claiming a good knowledge. Almost 80% use the PC for professional reasons on a daily basis while, among them 40% at least 1 hour per day. 96% of them access internet and have at least one e-mail address.

Access to internet is done mostly over the mobile network. The WiFi and the mobile network coverage varies greatly from country to country. In Belgium and the Netherlands there is virtually complete coverage while in France the coverage (WiFi or mobile) is about 65%.

Extensive interaction with IWT stakeholders and professional associations, as well as results from [9], indicate that the sector is willing to increasingly use ICT technologies but has some demands / expectations mainly in what concerns the WiFi and GSM connectivity along the waterways. More precisely, the WiFi and GSM (preferably 4G or 3G) coverage should be broadened and roaming costs should be eliminated or lowered.

These statistics indicate that, in principle, <u>no major problem is to be expected with either the usability of the eIWT system by the IWT vessel crew or with the required connectivity</u>. Most vessels are already equipped with potent PCs along with sophisticated navigation aids and display screens. However, this fact may cause <u>some concerns</u> on the introduction of eIVU, especially if it is introduced as yet another separate box, in addition to the existing navigation, safety and communication equipment.

5.2 Claimed eIWT advantages

The most notable advantages claimed by the eIWT implementation are outlined in the following sections:

5.2.1 Electronic instead of paper documents

All certificates related both to the *vessel* and the *crew* become electronic, eliminating paperwork almost entirely. The originals reside with the national authorities, i.e. the *inspection bodies* and the *competent authorities*. The whole system becomes <u>more secure, controllable and flexible</u>.

The transition towards electronic documents is a further <u>driver for simplification and harmonization</u> of rules and regulations.

5.2.2 Automatic coupling of vessel and crew data

The vessel data (position, planned and actual voyage, special conditions, crewing requirements etc.) and the crew data (professional qualifications, specific knowledge, working time etc.) are coupled automatically within the eIVU. The boatmaster needs only to verify, eventually introduce any corrections and digitally sign the eLBK and the eSRBs. His work is thus greatly alleviated from many of his repetitive bureaucratic tasks.

Furthermore, the system becomes more secure from errors and fraud.

5.2.3 Single point of access for IWT vessel documents

Vessel owners, operators, boatmasters and controllers can access, preferably through the *vessel unit (eIVU)*, all certificates and data regarding their own vessel(s) only through the *European hull database (EHDB)*, to which all vessel document updates are being pushed by the *inspection bodies*.

The national *inspection bodies* retain all their current authority, which they can exercise more efficiently through the EHDB, without the need to communicate on an ad-hoc basis with other *inspection* or *enforcement bodies*. The only additional task / responsibility is that of pushing the new or renewed vessel documents / certificates to the EHDB.

The original documents are those in the issuing *inspection body* archives. Certified copies exist in electronic form in the *vessels units* and are updated automatically in case of changes.

5.2.4 Single point of access for IWT crew

Crew, operators, boatmasters and controllers can access, preferably through the *vessel unit (eIVU)*, all certificates and data regarding the crew professional qualifications only through the *European professional qualification registry (ECQD)*, where all qualification document updates (upgrades or revocations) will be pushed by the *competent authorities*.

The national *competent authorities* retain all their current authority, which they can exercise more efficiently through the ECQD, without the need to communicate on an ad-hoc basis with other *competent authorities* or *enforcement bodies*. The only additional task / responsibility is that of pushing the new or renewed vessel documents / certificates to the EHDB.

The original documents will be those in the issuing *competent authority* archives. Certified copies of the crew qualification and SRB exist in electronic form in the of *crew card* and are updated automatically in case of changes (upgrades or revocations).

Crew do not need to bring their SRB or their *crew card (eIWC)* to the *competent authorities* for validation and upgrade as this is done automatically through the ECQD.

5.2.5 Single point of access for infrastructure requirements

Although not necessary, it would add significantly to the eIWT functionality and ease of use if all GIS relevant data concerning the waterways (i.e. water levels, bridge clearance, crewing requirements, special sector requirements) could be accessed by the eIVU both at the voyage planning and while navigating through a single point of access/interface such as i-ECDIS. This should alleviate the voyage planning task of the boatmaster significantly.

5.3 eIWT costs

5.3.1 Investment cost for IWT operators

In principle, the initial investment cost for IWT operators can be minimal. All eIVU functions can be implemented on a standard PC with the necessary I/O and communication modules, according to the specific implementation options. Given that practically all vessels are already equipped with a PC, the implementation cost can be limited to:

- Installation of the dedicated software,
- Eventual upgrade of the hardware and acquisition of peripherals
- Certification & training

However, if the sector opts for a type-approval, given that the eIVU can be linked to other safety critical equipment (i.e. AIS), the implementation costs for the operators can rise significantly.

It is estimated that the total cost for the initial implementation of the system can be anywhere from 1-5 k€ per vessel, according to the chosen implementation options.

5.3.2 Running costs for IWT operators

The main running (operational) cost will be that of licensing and maintenance of the eIVU. Again, if the eIVU is type-approved, thus being serviced only by authorized installers (like the tachograph paradigm), the running costs can be somewhat higher. However, this cost will be largely compensated by the gains in efficiency, mainly in what regards the boatmaster, whose workload on repetitive bureaucratic tasks will diminish significantly.

The expected overhead in connection costs (WiFi or GSM) will be negligible, given that boatmasters already use intensively GSM connections for voice and data transmission.

5.3.3 Cost for the EU and MS administrations

This is expected to be, by large, the most significant cost both for the initial implementation and the operation of the eIWT system. It is associated mainly with the security and interoperability requirements as well as with the cost of setting up and maintaining of the EHDB, the ECQD and the additional i-ECDIS layers required.

The closer paradigm to get a rough estimation of such costs (which can easily reach few M€) is that of the *digital tachograph* for road transport.

5.4 Likely impacts

5.4.1 Economic

The economic impact of the introduction of eIWT, although difficult to quantify, is expected to be significant and affect a range of Commission policies relevant to market and growth. More in particular:

- It will increase the efficiency and thus the competitiveness of the IWT sector
- It will have a positive impact on SMEs both in what regards the SMEs of the IWT sector as well as the ICT SMEs that will fill in the new eIWT related products and services.

- By enhancing the efficiency and competitiveness of a transnational sector such as IWT, eIWT will contribute towards the achievement of the Single Market.
- eIWT will most certainly contribute towards a deeper and fairer monetary union by providing:
  - seamless integration of national administrative services such as the national *inspection* and *enforcement bodies* and *competent authorities* and
  - single EU-wide windows for vessel and professional qualification services

5.4.2 Social

The likely social impact of eIWT is mostly concentrated on the employment and the working conditions of the eIWT sector through increased transparency and controllability that reduce the possibility of fraud and social dumping, resulting to a fairer competition in the sector and more attractive working conditions.

eIWT, by increasing the controllability and accountability of the sector, is also expected to increase the security in IWT, in particular towards fraud and terrorist threats.

5.4.3 Environmental

IWT is one of the 'greenest' and safest transport modes. eIWT, by increasing the sectors efficiency and competitiveness, implicitly has a positive environmental impact, especially if it manages to shift some of the road transport load towards the waterways.

5.4.4 Fundamental rights

The use of ICT tools of any kind represents an implicit risk to privacy and personal data protection. However, eIWT is designed in such a way so as to minimize such risks.

From the other hand, eIWT will likely result to much simpler and efficient interrelations between a portion of EU citizens (i.e. vessel owners, operators and crew) and the public administration. It will also lead to a fairer competition and fairer working conditions within the IWT sector.

Overall, the positive effects of the eIWT introduction are expected to be much more important that any potential threat to privacy.

5.4.5 Simplification & administrative burden

One of the most important impacts expected from eIWT is that on the simplification of the bureaucratic procedures and the administrative burden in the IWT sector. Besides the explicit reduction of the administrative burden of the IWT vessel operators, boatmasters, crew and public entities involved, due to the replacement of the paper-based documents and the automation of many procedures, the implementation of eIWT will be a major opportunity/driver for harmonization and simplification of the variety of rules and regulations that hamper the IWT sector.

6 Next steps

6.1 PROMINENT demo

PROMINENT H2020 project has undertaken to implement an eSRB demo following the eIWT architecture and requirements. The eIWT architecture and use-cases have been discussed with the project coordinator (STC) during a dedicated bilateral meeting at Rotterdam. The need for a practical and usable demo that the users will appreciate has been stressed. A specific proposal on what exactly the project will implement is being planned on the basis of the present report.

6.2 eIWT workshop

As a follow-up of eIWT project, it was decided to have a workshop at the JRC Ispra premises, on September 6-8 2016, together with the CESNI professional qualifications working group meeting (CESNI/QP) that are regularly hosted by CCNR in Strasbourg. This should permit:

- The participation of all important stakeholders from member states, professional associations and shipping industry
- The good preparation of an effective workshop that promises concrete results, since all stakeholders will be able to have the eIWT final report well ahead of the workshop, so as to study it and be able to make concrete proposals.

These meetings have already been announced by CCNR. DG MOVE will distribute this report to all potential participants so that they have the opportunity to study before the workshop.

Whatever changes or amendments are discussed and agreed upon during the workshop, they will be considered for a new version of the report due for October 2016, hoping to a large consensus among the IWT stakeholders. If that is the case, the report will be the base for development of eIWT functional standards.

References

[1] European Commission, **Towards quality inland waterway transport - NAIADES II**, COM(2013) 623 final
[2] AQUAPOL, **Report on legislation issues**, 2007
[3] PLATINA 2, **D3.2: Concepts for Electronic Service Record Books**, April 2015-06-10
[4] CCNR, **Règlement relative au personnel de la Navigation sur le Rhin (RPN)**, 2015
[5] JW Bishop, JP Nordvik, **Digital Tachograph System European Root Policy Version 2.1**, JRC, 2009
[6] F Andritsos, I Coisel, R Satta, **Identity management in ports: synthesis & conclusions**, JRC, 2014
[7] Council Directive 2014/112/EU implementing the **European Agreement of working time in IWT**, 19 Dec 2014
[8] Commission Proposal for Directive on the **Recognition of Professional Qualifications in Inland Navigation**, Feb 2016
[9] Promotie Binnenvaart Vlaanderen VZW, **Survey on the use of ICT on-board of IWT vessels**, 2016

Abstract

The Commission adopted in February 2016 a proposal for a Directive on the recognition of professional qualifications in inland navigation. The proposal sets a new competence based approach, which will allow the recognition of qualifications across the EU and provide for new career opportunities.

The Commission proposal foresees the harmonisation of the format and procedure related to Service Record Books (SRBs) and logbooks (LBKs) at EU level and facilitates the electronic exchange of information through the setting up of registers and a central database. In doing so, it paves the way for the introduction of electronic tools, with a view to reduce the administrative burden whilst rendering the documents less prone to tampering. There is a need for a reliable tool for crew members' professional record facilitating the implementation of the future Directive on the recognitions of professional qualifications and, optionally, providing a platform for additional IWT electronic services.

In this context, JRC provides to the Commission, through the eI2WT project specific assistance for the characterization of options for an architecture covering, as a minimum, electronic SRB and LBK.

This report (D.3 – Requirements) is the 3rd and final deliverable of the study. It has the purpose of outlining the functional requirements of the eIWT system, as conceived and outlined already at the inception report (D.1). The eIWT functional requirements are structured in nine (9) use-cases that describe in the best way all practical aspects and implications of eIWT. They have been the object of extensive consultation with the relevant stakeholders.

A preliminary qualitative evaluation of the foreseen impact of the electronic tools when fully applied is provided.

The concept and basic architecture of eIWT, which will aggregate and link information regarding the crew and the vessel, can indeed be one of the main implementation tools for DINA (Digital Inland Navigation Area), an initiative launched by the Commission with the aim of further integrating and rationalizing the digital services related to IWT.

Europe Direct is a service to help you find answers to your questions about the European Union.

Freephone number (*)**:**

00 800 6 7 8 9 10 11

(*) The information given is free, as are most calls (though some operators, phone boxes or hotels may charge you).

More information on the European Union is available on the internet (http://europa.eu).

HOW TO OBTAIN EU PUBLICATIONS

Free publications:

- one copy:
  via EU Bookshop (http://bookshop.europa.eu);
- more than one copy or posters/maps:
  from the European Union's representations (http://ec.europa.eu/represent_en.htm);
  from the delegations in non-EU countries (http://eeas.europa.eu/delegations/index_en.htm);
  by contacting the Europe Direct service (http://europa.eu/europedirect/index_en.htm) or
  calling 00 800 6 7 8 9 10 11 (freephone number from anywhere in the EU) (*).

  (*) The information given is free, as are most calls (though some operators, phone boxes or hotels may charge you).

Priced publications:

- via EU Bookshop (http://bookshop.europa.eu).

LB-NA-28074-EN-N

JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.

EU Science Hub
ec.europa.eu/jrc

@EU_ScienceHub

EU Science Hub - Joint Research Centre

Joint Research Centre

EU Science Hub

Publications Office

doi:10.2788/19691

ISBN 978-92-79-61297-8