

**COMPETITIVE AND SUSTAINABLE GROWTH
(GROWTH)
PROGRAMME**



COMPRIS

**Consortium Operational Management Platform
River Information Services**

**COMPRIS WP9 Consolidated Test Report
- SUMMARY -**

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*In memory of Robert Scherpbier,
His commitment and creativity
is an example for all of us.*

1 INTRODUCTION

1.1 General

The finalisation of COMPRIS will signal the start of an era of implementation and use of RIS related systems integrated on a European scale. Experiences with comparable large projects has shown that it is necessary to have within the project a full-scale test environment, where all the different applications and systems can be tested. For this reasons The Operational Test Platform (OTP) has been defined as a separate work package of the COMPRIS project with the following objectives:

1. Provide an environment to test the existing systems of RIS by industrial partners and operational agencies. The test platform has to be available for simultaneous tests during a period of 3 months to test integrated systems under operational conditions for 1 or 2 months.
2. Provide a physical test platform where new developments of software applications and hardware, clusters and entire systems can be tested on conformity with the RIS concept, functional requirements, compatibility with other applications, the use of standards and the proper use of the MMI.
3. Provide a test platform for all possible partners who wish to test software and hardware that fits into the RIS concept or is supposed to fit into the RIS software.
4. The detailed objectives are closely linked to the scope of the demonstration.

The realisation of these objectives forms the basis of the work that has been done in WP9. This has resulted in three Operational Test Platforms (Nijmegen, Oberwesel and Vienna) that were coupled to each other by a set of centrally located systems on different locations in Europe (called “European Network”). Also approximately 30 ships have been equipped with various systems. These ships sailed through whole Europe to evaluate the usefulness of the river information services offered by the OTP’s and the European Network.

Finally, after intensive integration testing of all applications and systems the test platform was created that enabled to execute all planned tests. This summary presents an overall view of the results of all the effort that has been made.

1.2 Relation to other WP’s

The relations of WP9 to the other WP’s are:

- WP 2 developed the RIS Architecture that has been used as a reference and as a means to provide an indication to which extend the applications and systems covered the specified services.
- WP 3 developed the used ship systems for navigation and information and ECDIS charts.
- WP 4 developed the shore systems part for tracking and tracing and developed the inland AIS, AI-IP and MultiFITT (including the ship system part).
- WP 5 developed the Logistic Data Platform (LDP).
- WP 6 developed the ERI/Cross border systems (including the ship system part).
- WP7 developed guidelines for the user interface, which has been used as reference during testing.
- WP 8 delivered (concept) standards that are used as a reference.
- WP 10 used the integrated and tested applications and system for the presentations and demonstrations.

2 SYSTEM CONCEPT OF THE OTP'S

2.1 Overview

The main system structure of the OTP's consists of (see Figure 1)¹:

1. Three OTP's (shore systems): Nijmegen, Oberwesel, and upper-Danube.
2. European Network comprising of a set of Servers: ERINOT-Server, Voyage plan Server, LDP Server, Position Server, AI-IP Server, RIS/NTS/ENS Server(s). All systems and applications are connected tot the European Network.
3. Ship systems: Radar pilot, ECDIS viewer, Voyage planner, ERI Cross Border software, Position Server Client (PSC), Fuel Consumption (Tempomaat), AIS, AI-IP, and standard browser software (IE).

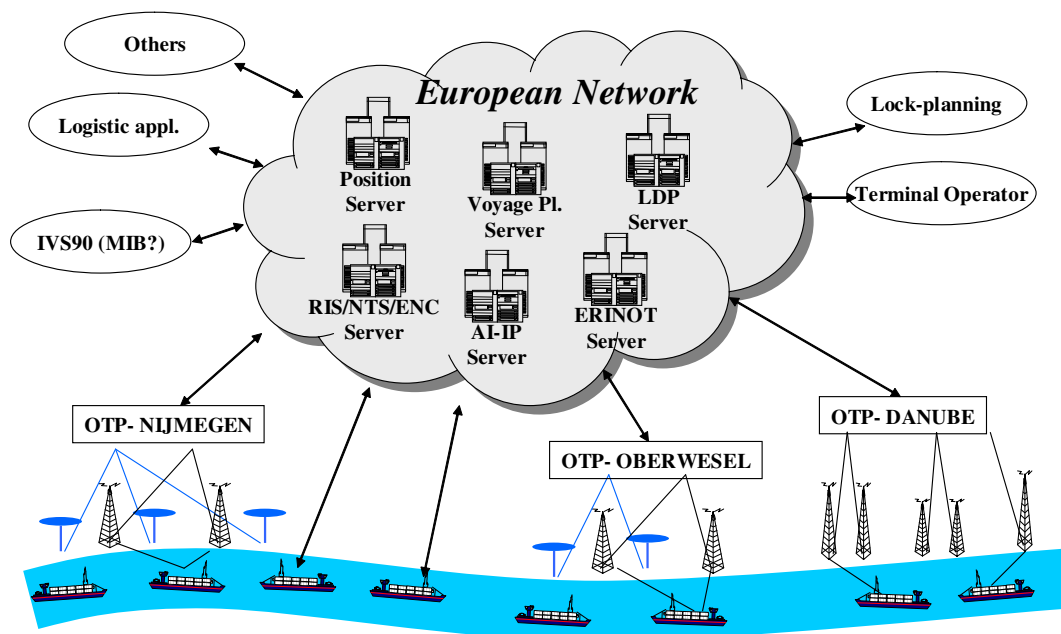


Figure 1 : Overview of system concept used in WP9

2.2 Tracking & Tracing Concept

In Figure 2 the T&T concept used is presented, comprising of different T&T systems. The following situations are incorporated:

- Three VTS-centres. Each one is equipped differently: Radar + AIS, only AIS only Radar.
- An AI-IP Server for tracking & tracing of ships by using mobile communications
- A Position Server as a central server where all position reporting by the various systems is sampled.
- The border-cross point is indicated with a dotted line.
- 7 ships with different configurations used during testing.

¹ A comprehensive description is given in [TEST PLAN] that is part of the final deliverable of the OTP

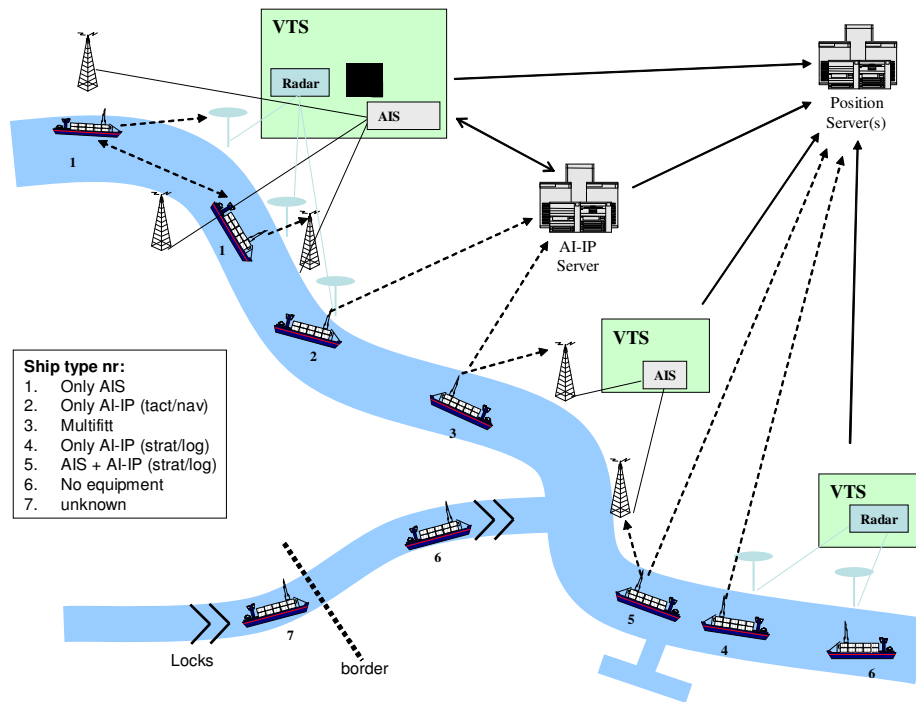


Figure 2 : Tracking & Tracing concept

2.3 Concept of Voyage planning and monitoring

The Voyage Planner application of a ship will act as master. It will contact the Voyage Plan Server for the following data (see Figure 3):

- Network data with respect to the intended route.
- Notice to skippers active for the intended route.

This voyage plan will be send to the Voyage Plan Server. The voyage plan consists of a list of passing points and the ETA of these points, the destination(s), (terminal(s)) and ETA's of the destination(s).

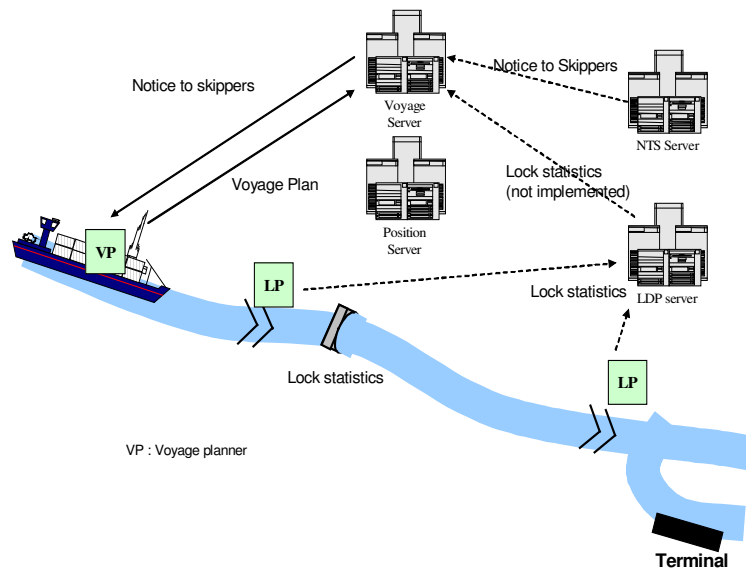


Figure 3 : Voyage Plan concept

2.4 ERI/Cross Border

ERI/Cross Border was used to provide governmental and logistic organisations with the journey, vessel, cargo and crew/passenger information. When a ship passes the administrative border this information will be forwarded to the appropriate governmental organisation. The system concept used in WP 9 is presented in Figure 4. The ERI/Cross Border system works as follows:

- The on board ERI Cross border software sends all the messages to the ERINOT Server.
- Three distribution mechanisms are used to distribute the data.
- As soon as the ship enters a predefined administrative border area all the information will be sent to all the responsible authorities in the next area.

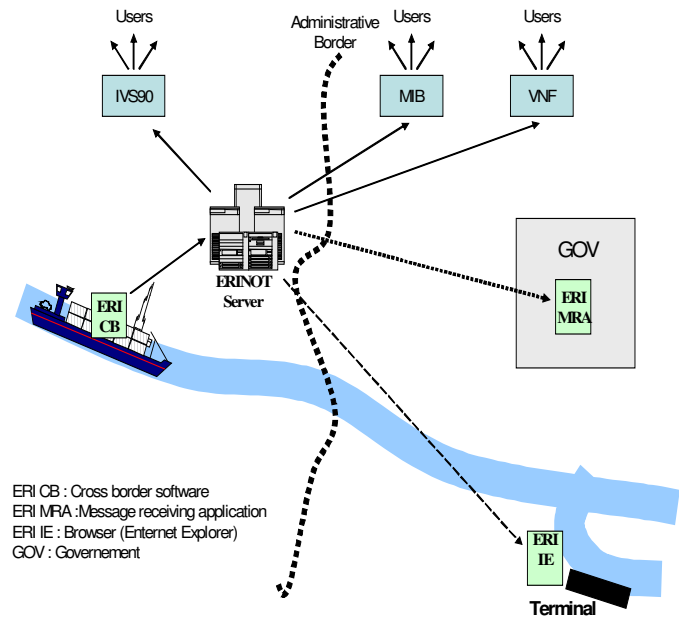


Figure 4 : ERI/Cross border

2.5 Logistic Data Platform

The Logistic Data Platform was a set of web based Servers that supported the following applications (See Figure 5):

- COARRI gateway (converter application).
- Lock passing time statistics database.
- BORIS (Barge Operator River Information Services).
- ERINOT portal/entry (see also ERI).
- Position information (via ERINOT and the Position Server).

The web based Servers are addressable via the LDP gateway, which acts as a portal. This portal creates a 'single point of access' where the user has the same username/password for all the services.

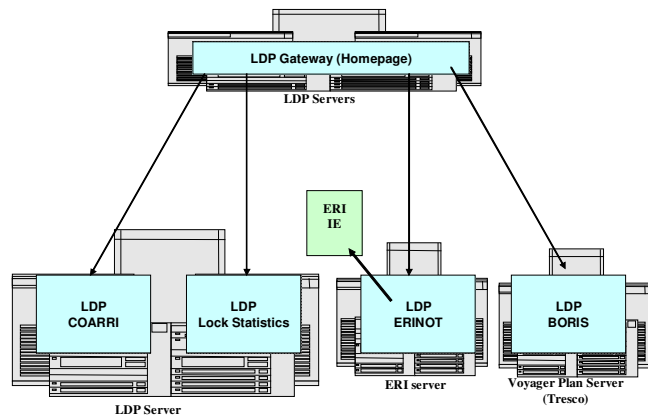


Figure 5 : Logistic Data Platform

2.6 Concept of Ship Borne applications

A total system component concept for ship borne applications is presented (Figure 6). Depending on the application configuration only a subset of the system components is necessary. The following ship borne applications were implemented:

1. Radar pilot 7200.
2. Inland ECDIS viewer.
3. Voyage Planning.
4. Fuel Optimisation (Tempomaat).
5. Position Server Client (AI-IP strategic/logistic).
6. ERI Cross Border (Electronic Reporting).
7. Browser (IE) for web based Servers in the European Network.

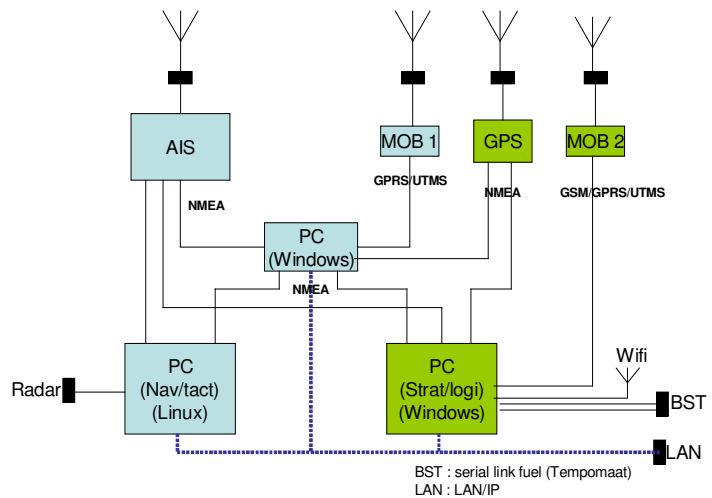


Figure 6 : Overview of the integrated concept of ship borne system

For testing proposes a Mock-up was build which enables to test all configurations before installation on board. Most of these applications need information from sensors/systems. The following are available:

1. GPS sensor.
2. AIS transponder.
3. AI-IP (navigational/tactical).
4. MultiFITT, combination of AIS transponder and AI-IP (navigational/tactical). When within coverage of an AIS base station network it will act as an AIS transponder. When out of range also AI-IP will be active.
5. Fuel sensor for fuel consumption measurement.

3 TESTING IN COMPRIS

3.1 Test approach used

The concept of testing in COMPRIS is a phased bottom-up approach in which different test levels are identified. Each test level has defined test objectives to be met. A higher test level assumes that the test objectives in the lower test level are sufficiently met. This concept has the following advantages:

- It minimizes the needed test effort. All test activities in a certain test level are aimed at a limited set of test objectives.
- The needed test environment/equipment is dedicated and therefore effective for the test activities to be executed on a specific test level.
- Responsibilities for the execution of (part of) the tests can be easily identified and addressed.

The following test levels were used:

1. *Level 1 tests.* The test objective is to verify the appropriate functioning of the individual parts of hardware and software according by the detailed design of these components.
2. *Level 2 tests.* The test objective is to verify the appropriate function of a (sub) system, comprising of the different hardware and software components.
3. *Level 3 tests* (called OTP-installation tests). The test objective is to verify the correct functioning of the (sub) system in the intended OTP environment.
4. *Level 4 tests.*(called OTP-integration Tests).The test objective is to verify the correctness of connections and information exchange. These technical oriented tests focuses on all interfaces and co-ordination of the installed systems/applications.
5. *Level 5 tests* (called OTP-RIS function tests). The test objective is to verify the functionality of the total system, also involving tests such as correctness tests, performance, tests, usability tests etc. These tests are performed using the total set of coupled systems.

The level 5 tests comprises of two types of tests called Level 5A tests and Level 5B tests. The fundamental difference between tests of level 5A en tests of level 5B is summarised in the following table.

Level 5A, focus on :	Level 5B, focus on:
1. Individual functions	1. Continuity of RIS support
2. Co-ordination of systems/applications	2. Co-ordination of users
3. Correctness	3. Usability
4. Snap-shot type of test	4. Process-chain type of test

3.2 Development process of Level 5A tests

The development of level 5A test was divided in the following steps:

1. Identification of Test Groups.
2. Identification and definition of Test Cases for each test group.
3. Development of Test Procedures for each Test Case.

For the development of the required test documentation a structured/standardised approach was used. This resulted in a standard format of description for all Level 5A Test Cases and Level 5A Test Procedures.

3.3 Development process of Level 5B tests

The development of the level 5B tests is based on a *scenario approach*. This scenario approach focused on the skipper, responsible for the transport. This scenario starts with the loading of cargo, the voyage with all navigational topics and the arrival in the port of destination and unloading of cargo. The scenario uses the (sub) systems of the OTP, depending on the activities to be performed.

The scenarios were executed by using an instruction sheet. This instruction sheet guided the user (skipper) through all necessary actions to use the applications and systems. The instruction sheet was delivered in an application on the ship borne systems. During the tests the user has filled in evaluation sheets with his remarks and comments on the usability of the applications and systems. The evaluation sheet was completed after each time the scenario had ended.

3.4 Organisation

All integration and test-activities are organised by WP 9 under guidance of work package leader of WP 9. The test organisation consisted of the following teams:

1. *System Integration Team (SIT)*. The SIT coordinated the integration of the different systems and applications to a fully integrated COMPRIS environment. The SIT also coordinated the development of the necessary test documents and the execution of the tests at the OTP's
2. *Test Teams*. Test teams developed the test documents and executed the level 5 tests The following test teams were established:
 - a. Test team ship borne systems (level 5A tests).
 - b. Test team Tracking and tracing (level 5A tests).
 - c. Test team Electronic reporting and cross border (level 5A tests).
 - d. Test team of logistic data platform (level 5A tests).
 - e. Test team ship scenario (level 5B tests).
3. *OTP Test Coordinators*. A Test Coordinator in each OTP coordinated the local integration (level 4 tests) in the OTP's and coordinated the tests.

The following table gives an overview of the test groups identified and the systems that are subject to the tests of the individual test group.

Test Group	Systems/applications assigned to the test group
Ship borne	Radar pilot, ECDIS viewer, Voyage planner, Position Server Client, AIS transponder, AI-IP client, MultiFITT, Fuel optimiser, ENC, NTS
Vessel Tracking and Tracing	AIS shore based systems, Radar/AIS sensor fusion, Radar/AI-IP fusion, Tact. Exchange traffic info, Tracking Servers, AI-IP Server, Position Server
ERI/CB	ERINOT Server, MRA, Position Server
LDP & other	BoRIS application, COARRI application, ERINOT & Position data, Lock statistics

4 GENERAL CONCLUSIONS AND RECOMMENDATIONS

4.1 Usability for full operational use

A significant part of the systems are developed to demonstrate the RIS concept. This means that only the essential functions and services have been realised and that the used ICT-infrastructure was limited. Requirements that are mandatory for full-scale operational use such as authorisation mechanisms (security, privacy), reliability requirements, maintainability requirements, performance requirements etc. are in general neglected and also have not been subject of testing.

Therefore no general conclusions can be drawn on the usability of these systems for full scale European wide operational use on a 24 hours/7 days a week basis.

4.2 Usability of RIS Architecture

Although the WP2 Architecture gives the best available description now available, the usability of this Architecture had its limitations *with respect to the determination of the RIS coverage achieved*. In a short evaluation of the results two fundamental causes were identified:

- *The difference in abstraction*. The WP 2 architecture is described on a certain level of abstraction. The testes however were testing real systems and applications with clearly defined functions and system boundaries.
- *RIS boundary definition*. In many cases it was not clear what the RIS boundary was. Is the RIS boundary the services provided by systems and applications or is the RIS boundary defined as the services provided by an organisation, *including* the services provided by systems and applications?

It is recommended that the RIS Architecture is evaluated and refined in order to provide a harmonised level of abstraction and a clear boundary definition to be used as a base for the implementation of RIS and the elaboration of criteria for RIS conformance

4.3 Additional standard needed for Voyage Plan Data

In COMPRIS many new standards have been developed such as the new Inland ECDIS standard, Inland AIS standard, NTS standard, ERI standard, RIS-index etc. However, during the testing of the total RIS-systems it became apparent that an important standard on voyage plan data was missing.

It is recommended that an European Voyage Plan Data standard is developed. The reason of the importance of the Voyage Plan Data Set is that it links the logistical world to the traffic management and navigation world.

4.4 Security and authorisation

In the tested systems and applications in COMPRIS this issue is treated in different ways. When implementation to full set of operational RIS systems, this issue have to be addressed and harmonised requirements has to be defined, as well as of code of conducts to be agreed upon between governments and industry. If this is not achieved the success of RIS will be seriously hampered because parties will be reluctant tot use the offered RIS services by the various systems and applications.

It has to be noted that implementation of security and authorisation in a system is an integral part of system design that is not easily implemented afterwards. Harmonised requirements from the level of the users, on the level of applications up to detailed technical level on networks, firewall

etc. has to be agreed upon in order to build the systems correctly and to avoid the problems addressed above.

It is recommended that harmonised requirements and codes of conducts are developed for all systems and applications in the first stage of implementation that can be used by system and application developers as a detailed guideline in order to guarantee the required level of security on the accessibility of the systems, protection of data, authorisation and the interoperability of the systems.

4.5 Confusing time stamp messages

During testing several discrepancies were found related to “time”. These discrepancies originated from different time standards used in messages and the localization of the test platforms. GPS and AIS use UTC time, other applications use the “system time of the PC” or local time.

It is recommended to base all time related functionality on UTC- time e.g. for all time related functions of a system and for all interfaces and message/data exchange between systems, including time synchronisation mechanisms.

4.6 Data redundancy in systems

During the set-up of testing equipment it became clear that many applications/systems are using more or less the same data. This resulted in entering the same data in different applications, thereby introducing the risk of inconsistencies. Less obvious for users but more disturbing is the use of “reference tables” which contain the same or similar data in different formats.

It is recommended to put special emphasis on this subject before RIS implementation on an European scale starts. Decisions have to be made which systems are responsible for which data and how this data is transmitted to other systems. The decisions to be made should be harmonised on a European scale.

4.7 Functional redundancy between applications

Systems and applications show overlaps in functionality. From a user or a systems integrator point of view, some of these overlaps may seem unnecessary or even undesired.

It is recommended that system- and application builders continue to coordinate their efforts in a similar way as they did this for the COMPRIS-project. Authorities and the industry can both benefit if a platform for coordinating these efforts would be available.

4.8 Use of modern equipment and instruments

In the current situation on board of a vessel, equipment is connected to sensors such as GPS by a serial interface NMEA 0183. These types of interfaces are not widely supported by PC's or laptops anymore and will be phased out. Moreover the serial interface technology hampers the use of more advanced technologies and the introduction of modern system architectures such as the client-server architecture. The introduction of NMEA 2000 will not solve these problems as it is still based on the serial link concept.

It is recommended that research is done on this subject and to develop guidelines in the use of (technical) standards and the definition of drivers and API's and that this is agreed upon with the industry. Only in this way a manageable situation can be created in which different applications from various vendors can be used in a satisfactory way.

4.9 Mixture of safety related and non safety related equipment

In several cases the integration of applications created a situation where safety related equipment and/or applications was combined with non-safety related equipment and/or applications. When integrating safety-related and non-safety related components, the specifications of the resulting combination may have to be downgraded to the safety level of the component with the lowest qualifications. This is clearly an undesired effect and should be addressed by authorities demanding certification in the first place.

It is recommended that research is done on this subject; it would be beneficial to develop guidelines or adapt standards for systems integrators using these certified system components.

4.10 Tracking & Tracing

In the COMPRIS project several Tracking and Tracing systems were developed, each based on a different approaches and solutions. Depending on the intended use of the position the required accuracy, reliability and update frequency of the position is different. These systems are not easily interoperable because they are based on fundamentally different approach and use of technology, therefore hampering the European wide implementation of one of the most important functions of RIS.

It is recommended that a harmonised approach is chosen that can be implemented on a European scale that is based on a clear choice of a system concept stating how (non) integration shall be applied and which technology is used for which purpose.

The value of position reporting can be enhanced considerably if the intentions of the ship are known: his voyage plan. When the voyage plan is available together with the current position voyage monitoring is possible. Voyage monitoring can be used for optimising the use of bridges, locks etc. and incident management.

Therefore it is recommended that the chosen T&T solution is also interoperable with voyage planning, voyage plan data and electronic reporting..

4.11 Electronic Reporting

The Electronic Reporting system worked well and experience was gained in using this system during COMPRIS. The emphasis is now in further implementing the system as one services supporting the logistic chain.

It is recommended to extent the system to a complete electronic manifest that can be used by more parties in order to optimise the logistic information flow. It is also recommended that further developments is done in coordination with the chosen concept of Tracking and Tracing and voyage planning to maximise added value of the information and avoid problems with respect to interoperability and unnecessary data redundancy between the different system which introduces the risk of inconsistency.

4.12 Logistic data platform

If one looks to the area of logistic functions described in the functional Architecture of WP2 it is clear that in COMPRIS only a few functions have been covered. This means that overall limited experience is gained in the logistic area.

It is therefore recommended to address special research projects in the logistic area to guarantee proper integrating with other RIS functionality and avoid unnecessary complications caused by non-coordinated system development.

4.13 Use of a structured test approach

During the first stage of COMPRIS a structured test approach was developed. The concept behind this test approach was based on common knowledge of, and experiences with the testing of large scale systems and accepted test methods and standards provided by the IEEE foundation. This resulted in an effective and efficient test process, certainly taking in account that these tests had to be executed by different organisations by persons with a different background and in different countries.

It is recommended that for future projects concerning large distributed and complicated system (such as implementation of RIS) this approach is introduced and tailored to the specific situation.

4.14 Expert group for System Integration on European scale

The individual work packages did their work focussed to their specific research goals and objectives. Their attention was aimed at the development of standards and applications to implement these standards etc. There existed the risk that the total set of individual applications and (sub) systems did not create a total harmonised RIS on a technical level. For this the System Integration Team was installed (SIT). The SIT analysed all products under development in the different work packages and defined an overall system concept, which comprised of all applications and (sub) systems. It is proved to be essential that an overall system concept was available. Without this it was impossible to create a test environment that was capable to demonstrate the RIS concept in an integrated way through whole Europe.

It is from this experience that it is recommended to install an expert group, comprising of system architects with in depth knowledge of the existing systems in the different countries and experience in the information technology field to support and coordinate on a technical level the final implementation of RIS in Europe in the coming years. This expert group should have the authority to propose standards with respect to RIS-conformity for on board equipment and interoperability of the (shore based) systems. It is important that this group comprises of representatives of governmental organisations as well as industry.

5 EXPERIENCES WITH LEVEL 4 INTEGRATION TESTS

5.1 General

In the other WP's the focus was aimed on the definition of standards and functionality to be realized. After this, developers of the applications worked together under the coordination of the WP 9 System Integration Team (SIT), addressing all the issues to be solved as mentioned above, finally producing the software, networks, installing hardware etc. After this during the process of integration (Level 4 tests) all these applications and (sub) system to one RIS was a major effort.

During integration many technical problems and errors were detected and corrected:

- Many errors detected were caused by insufficient and unsystematic testing of the individual units (the so called Level 1-3 tests). Some of these errors were “show-stoppers” as reprogramming of software was needed and of course re-testing. *The amount of these errors can be reduced by a better quality assurance and more rigid testing procedures by the developer of the application.*

- Other errors has a more fundamental character caused for instance by the mismatch of definitions and interpretation of standards, use of different technologies in different (sub) systems and applications. These errors were show-stoppers and forced to redesign the subsystem as well as and reprogram the software. *These errors originate from an insufficient process of overall design and lack of structured, detailed agreements on a technical level.*

5.2 Mock-up integration problems

The “mock-up” of the ship systems was built especially for testing various combinations of equipment and applications. Typical problems that had to be solved were:

- Applications were not designed to share system resources with other applications.
- The use of the NMEA (spell this abbreviation out)- interfaces was problematic. For sharing a single source with many applications no real stable solution was found.
- Problems mentioned under the first and second bullet resulted in the situation that the MultiFITT-concept could not be demonstrated fully on the mock-up.
- Some versions of the applications were not properly tested. A considerable amount of time was spent on testing different versions of applications.

5.3 Shore based OTP integration problems

During integration many problems have to be solved. Some examples:

- In general most problems occurred when different system networks had to be coupled to other networks due to different policies of the network owners regarding the security of data. It usually ended up in a tailor-made solution for each connection.
- Problems occurred when the AI-IP server had to be coupled to the AIS network since the AIS network was not equipped to accept AIS data from other systems other than AIS transponders.
- Specific problems of data exchange originated from the misinterpretation of the inland AIS standard.
- In all OTP locations interface problems were detected and corrected with the sending of information by the tracking server to the position server.

5.4 ERI/ERINOT integration problems

The basis to set-up a connection between two authorities for interchange information is clear. There are several documents, which give a comprehensive description how to implement this.

All the partners want to implement VPN (Virtual Private Network)-connection, however:

- The most common problem is that the partners want to use their own system. These systems have different vendor versions of the VPN software and as a result no connection worked properly.
- Not all the partners are using the same reference tables or are using old versions off the table. This caused sometimes problems of inconsistency. The result is that the interchange of data is not working properly, therefore hampering the reliability of the system.
- The objectives on which the different systems are designed are not the same. The consequence is that systems have a total different system design and not also capable to store all the information available of the message. The lost of data is the result within the information flow.
- In some countries the law and regulations generate specific data exchange problems, therefore hampering a standardised implementation and data is lost.

6 SUMMARY TEST RESULTS LEVEL 5A TESTS

6.1 Ship borne systems tests

- Voyage Planner* All functions were available and found to be working except support for items such as Planning a trip based on a desired time of arrival, planning administration, Dynamic updating of plans, Previewing future trips, reviewing older trips. Usability is strongly related to the accuracy and quality of data describing fairways and sailing aspects of the fairways.
- NTS on the ECDIS viewer*
NTS via ERI Several sources of the same notices were compared and were found to provide the same data most of the time, but not always. Updating of NTS on different servers (even within one country) seems not consistent. One would expect NTS to be presented in the area or on the fairway for which they are valid. This mechanism did not seem to work fully yet. Some of the NTS did not really comply with the intention of the standard. This is caused by incorrect data input by the authorities. Retrieving NTS using the ERI-application seems unnecessary when there is an ECDIS viewer that does the same.
- Navigation* The division of skipper's workplace in the wheelhouse into a workplace for *NAVIGATION* and a workplace for *INFORMATION / ADMINISTRATION* is a good choice. AIS has been found as an ideal supplement to radar during the operationally and tactical navigation. An improvement of the target tracking was clearly visible after sensor fusion of radar with AIS. The considerations regarding safety issues AI_IP as a navigational tool is subject to debate. But it is certainly suitable for T&T applications.

6.2 Vessel Tracking and Tracing

- Traffic image on inland ECDIS viewer ashore* The vessel information exchanged via the AIS network(s) was displayed correctly within the Radarpilot Inland ECDIS Viewer as well as within the TRESKO Inland ECDIS Viewer.
- AIS range testing* In OTP Nijmegen three base stations has been installed providing an uninterrupted coverage. In practice the range was ca 50 % more as the calculated range. In OTP Oberwesel one base station was installed together with VHF-repeaters. This created a good coverage in this mountainous area with many curves. This solution can be used when the traffic is not too dense that more base stations are needed. In OTP Danube area a set of different base stations were installed with gaps in coverage. The measured ranges gives a good indication how many base stations will be needed for full coverage.
- Display of strategic traffic image* The strategic traffic image was created by using AIS data from VTS areas, manual identification of VTS tracks, GSM/GPRS transmitted data, INMARSAT data and IVS90 data (estimated position). This data was send to the position server that acts as a database. The result was that it was possible to present an accurate strategic image on very long ranges (whole Europe) with a time delay of 15 minutes and therefore was an effective tool for T&T. It also can support calamity abatement.
- Onboard navigational support from* On board navigational support from the VTS centre was created by sending the so called 'VTS-footprint' message from the VTS centre to ships equipped with AIS. This VTS-footprint message incorporated radar tracks of ships not

<i>VTS Centre</i>	equipped with AIS. However, the radar system of the VTS centre created (temporary) false tracks. These false tracks were also sent in the VTS-footprint message. This resulted in a very confusing image of the traffic on the on board ECDIS display. It is therefore recommended not to use the VTS-footprint messages in inland navigation.
<i>Display of Ships status</i>	The display of the standard radar track was enhanced with the inland AIS messages. The display of the blue sign was regarded as a valuable enhancement of the current VTS policy. The display of the blue cone is also valuable information in case of calamity abatement. The signs were set up manually in the transponder as well as on the ship itself. It is recommended that there is a coupling between the displaying of the blue sign outside on the ship and the creation of the inland AIS message to avoid inconsistency and confusion. Debate on the results is necessary on the usefulness of displaying vessel type and euro-number for the VTS operator.
<i>Display actual traffic image</i>	The display of actual (tactical) traffic image was performed by the fusing of AIS data with radar tracks. The AIS data from ships equipped with an AIS transponder was always correctly fused with the radar tracks. The AIS data from ships equipped with the AI-IP client did not always lead to correct fusion with the radar tracks. This was probably caused by erratic delays in the transmission of the AIS data via the public mobile network.
<i>MultiFITT</i>	Data received via MultiFITT were compared with the original data also sent via AIS/VHF. The ship position was displayed on the Inland ECDIS viewer on shore, correct transmission and conversion of the data via MultiFITT (GPRS/IP) was checked. In test the switch-back was realised also during ship turning to show the speed and correctness of the data. Fully seamless switch over back to AIS with correct ship position was observed.
<i>Cross Border AIS data exchange</i>	These tests were aimed at the local and international exchange of AIS data, in particular the exchange of tactical traffic information is between Budapest and Vienna. It was demonstrated that all specifications with respect to administrative users are fulfilled. Additionally some amendments have been undertaken due to the usability of the user interface.
<i>Behaviour in mixed traffic areas</i>	These tests were aimed at the mixed use of maritime AIS and Inland AIS transponders and access their interoperability. It was possible to exchange reliably AIS data between these two transponder types. No problems were detected.

6.3 Electronic Reporting & Cross Border Tests

<i>EDIFACT</i>	Although the EDIFACT messages are well accepted in the industry, it is deemed necessary that more modern technologies are used. XML or ebXML adaptation can be seen as an important step for the future with respect to message standardisation.
<i>Usability of BICS</i>	BICS comprises a lot of usable functions and a huge potential in operation. Some bugs are still included within the software and within the mailbox system. If some functionality is adapted to the specific user needs then it will be very usable and successful. Languages should be reviewed in detail. After the familiarisation phase BICS will for sure be easily usable and will ease the daily business of skippers and /or fleet operators.

<i>Add additional receivers (e.g. logistic stakeholders)</i>	Within the data representation (reports) as received by the ‘additional receivers’ which can be included within BICS, it is difficult to filter out the relevant information within short time due to the presentation of the information. Maybe these data can also be inserted in a nice form (e.g. Excel table or Word document) and then sent to the additional receivers.
<i>ISRS location-codes</i>	It was observed that the messages sent by BICS contain the ISRS location-codes and additionally the full name of the location, whereas the code does not always comply with the Standard for Electronic Ship Reporting. The reason is that not all the countries have provided location codes according to the standard yet.
<i>electronic reporting across borders</i>	It was successfully tested and demonstrated that electronic reporting across borders works on a technical level. But this does not imply that the procedures for reporting are well defined in every country. Especially the handling of the cross border messages (CUSCAR, PAXLST) is a challenge for the future, because the data contained in these messages are not intended to be used by competent RIS authorities, due to legal regulation concerning the privacy of data.

6.4 Logistic Data Platform tests

<i>Boris</i>	The application is suitable for the pre-trip planning for dry and liquid bulk as well as for containers. The provided information suggests the feasible possibilities to transport the certain type and amount of cargo from – to chosen destinations. The application can calculate the appropriate vessel type. The algorithm for cubes/pallets and impartial colli, is not available yet, as is the information about regular container lines (and was not specified as such).
<i>Hull data</i>	The information provided by EU hull database complies in general with the Minimal Data Set, with exception of provision of contact details, like owner / operator. The contact details are missing due to the legal aspects in different countries and/or available sources. Due to the fact that the contact data are missing, the tool cannot be used for the logistical purposes in a way to look for a suitable vessel of the certain transport.
<i>ERINOT</i>	The access rights of logistical actors to the ERINOT server are limited from the content point of view. Logistical actors are allowed to access ERINOT message information with limitations to certain location, shipment or based on the ownership of data. The reliability of access to the limited (by the role of the user) information was evaluated as correct
<i>Lock statistics</i>	The application provides information about waiting and passing times at locks. It calculates the statistical indicators based on the raw data. It does not provide actual waiting times at locks. The application can be used partly (the opening hours of bridges in not incorporated in the application) for the trip planning purposes when the possible delays are influencing the times of the transportation.

7 SUMMARY TEST RESULTS LEVEL 5B TESTS

7.1 Introduction

The main purpose of the tests was to allow the skippers to gain experiences with the RIS-services offered. The skippers were asked to use the services and applications as often as possible and to write down their experiences. In the table below the major “scenes” of a voyage have been include, as a scenario, limited to those points which are relevant for the tests.

Scene of the ship scenario	Software						Communication				
	ERI BICS	Route -planning	BICS- report	Cross Border	Inland ECDIS		Email	VHF	AIS-IP	AIS	Pos C
Retrieving/Consulting Notices To Skippers (NTS)	•	•					•				
Provisional planning of voyage		•									
Entering into a charter											
Departure from mooring-place			•				•		•	•	•
Sailing to loading place(out of reach of traffic post)									•	•	•
Sailing to loading place (within reach of traffic post)									•	•	•
Reporting to OTP (Operational Test Platform) by mariphone											
Arrival at port									•	•	•
Arrival at terminal									•	•	•
Loading									•	•	•
End of loading											
Receipt of bill of lading/document											
Retrieving/Consulting Notices To Skippers (NTS)	•	•					•				
Planning definitive voyage		•									
Sending planning		•					•				
Departure from loading place			•				•		•	•	•
Sailing (out of reach of traffic post)									•	•	•
Sailing (within reach of traffic post)									•	•	•
Reporting to OTP (Operational Test Platform) by mariphone								•			
Retrieving/ Consulting Notices To Skippers (NTS)	•	•					•				
Checking planning of voyage while sailing.		•							•	•	•
Sending an update of planning		•					•				
Sending documents on passing a border											
Arrival at port									•	•	•
Sailing to loading place (out of reach of traffic post)									•	•	•
Sailing to unloading place (within reach of traffic post)									•	•	•
Arrival at terminal									•	•	•
Submitting bill of lading/document											
Unloading											
Receipt of discharge certificate									•	•	•

7.2 Test Results

The following experiences were derived from the evaluation sheet from the skippers:

<i>Notices To Skippers</i>	When collecting Notices To Skippers, he/she receives all the notices for a particular day. Skippers have stated that they are very interested in notices, which only apply to the route taken or to be taken by them.
<i>Voyage Plan</i>	Many testers use the route planner for every voyage (89%). In about 60% of the cases the advice generated by the route planner was followed. In many of these cases there was in fact no alternative route.
<i>ECDIS viewer</i>	In 80% of the voyage the skippers used the Tresco software, though not permanently. 51% of the skippers reported that they always used the software. In 20% of the voyages on which reports were received the Tresco application was not used. In 15% of the reports received it was stated that problems occurred with this application.
<i>Position</i>	During their voyages the skippers were frequently able to follow on-screen the position information supplied by the application. When the application was used they nearly always checked whether the position on the chart matched their actual position. A number of times this comparison revealed differences.
<i>AIS</i>	In 33% of the reports received skippers reported that the positions of their own barges were always shown in the application. In 63% of the reports it was stated that the skippers own position was “usually” shown.
<i>AI-IP</i>	Two barges reported on the use of AI-IP. The position of their own barge was usually correctly represented on the screen.
<i>GPRS</i>	GPRS was used for all kinds of purposes, such as automatic sending of messages and retrieving Notices to Skippers, e-mail and Internet (surfing). Connections sometimes failed and in some cases this caused the pc to crash. The cause of this was the used mobile card and the software version used. It turned out that an automatic switch from UMTS to GPRS did not work well.

7.3 Conclusions

From the evaluation it was concluded that:

- Generally speaking, the tests went well after some initial problems had been solved. The testers were able to get acquainted with and gain experience with new systems.
- It is strictly necessary that users of applications have proper operating instructions in their native language at their disposal.
- It is also necessary that there is a good helpdesk service, certainly for primary support. But users must be assured of proper secondary and possibly tertiary support as well. The shipping industry operates 24 hours a day, during the entire year.
- It is of vital importance to software developers to receive regular and structured feedback from users.
- GPRS was frequently used for all kinds of applications. It has been established that the operation of GPRS was not reliable in all cases. The availability of permanent access to the Internet is a necessary condition for the proper functioning of RIS. A solution must be found for switching and roaming problems.
- The testers were positive about tracking and tracing systems such as AIS en AI-IP. The results are encouraging, but supplementary life tests are necessary.