



# Clustering activities plan

## report

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<b>Deliverable No.:</b>	D6.1
<b>Work Package No.:</b>	WP1
<b>Date:</b>	31 <sup>st</sup> March 2017
<b>Project No.:</b>	727982
<b>Classification:</b>	Public
<b>File name:</b>	LINCOLN_Deliverable 6.1_Cluster
<b>Number of pages:</b>	10

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Status of deliverable

Action	By	Date (dd.mm.yyyy)
Submitted (author(s))	Lucia Ramundo	31.03.2017
Responsible (WP Leader)	Sergio Terzi	31.03.2017
Approved by Peer reviewer		

Revision History

Date (dd.mm.yyyy)	Revision version	Author	Comments
20.03.2017	V1	Lucia Ramundo	
28/03/2017	V2	Jordi Solé	
31/03/2017	V3	Chrysostomos Stylios	

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### Abbreviations and Acronyms:

CAE	Computer Aided Engineering
DMU	Digital Mock-Up
HOLISHIP	HOListic optimisation of SHIP design and operation for life-cycle
HPC	High Performance Computing
IoT	Internet of Things
LCC	Life Cycle Cost
LCA	Life Cycle Assessment
LCCA	Life Cycle Cost Analysis
LCT	Life Cycle suite of Tools
LINCOLN	Lean Innovative Connected Vessels
SHIPLYS	Ship Lifecycle Software Solutions
VVF	Virtual Vessel Framework



## 1. Introduction

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This deliverable presents a summary of the planned joint activities among the HOLISHIP, SHIPLYS and LINCOLN projects, funded in 2016 by the European Commission under the Horizon 2020 programme (Transport and Blue Growth work programmes) and regarding the maritime sector.

EU Commission has identified those projects to work as a cluster to maximize the H2020 programme impact.

The HOLISHIP and SHIPLYS projects included some cluster activities in their implementation plan during their grant agreement preparation. LINCOLN, instead, provides a clustering activities plan in this deliverable, taking into consideration the previous agreed activities between HOLISHIP and SHIPLYS projects.

## 2. The Cluster projects

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The three cluster projects present several innovations in the vessel design approach. They use ICT and IoT (Internet of Things) tools and advanced design and life-cycle approaches to improve and enhance the vessel design, production and operational capabilities of the European maritime companies. In particular, they all develop ICT tools and platforms and use LCA (Life cycle Cost Assessment) and LCC (Life Cycle Cost) methods, in order to design vessels in a more holistic way and considering the whole vessel lifecycle. The three projects make large use of virtual modelling, prototyping and testing approaches to reduce the vessel development time to market and minimizing the testing costs of traditional towing tank tests.

### 2.1. LINCOLN project - Grant Agreement: 727982

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LINCOLN (Lean Innovative Connected Vessels) objective is to provide three new concepts of added-value specialized vessels able to run requested services for several maritime sectors in the most effective, efficient, economic valuable and eco-friendly way.

To reach its goals, LINCOLN will develop three types of completely new vessel concepts at TRL5, through dynamic simulation model testing:

- a) The first is a Multi-platform Catamaran to serve as: Service crew vessel and Multipurpose survey vessel, optimized for Ocean energy and Aquaculture. LINCOLN will develop a new people transfer system which will be able to improve safety during people transfer, will have reduced operational costs and will be eco-friendly.
- b) The second is a Module-Based High Speed Patrol Boat Platform that is reconfigurable to adapt to the different operational requirements of Patrol and Security operators. Here LINCOLN will develop one platform, where different vessels can be designed for several markets, built as series production at low cost and will enable the new "Vessel as a Service" business model.
- c) The third one is an Emergency Response and Recovery Vessels series for Coastal Rescue activities, with integrated electronics, IoT connectivity and an enhanced and low-cost Integrated Dynamic Position System, which will help rescue operators during their activities, thus enhancing safety and security.

All three vessels will share the same design methodology, IoT tools and HPC simulation approach:



1. A lean fact-based design model approach, which combines real operative data at sea with lean methodology, to support the development and implementation of the vessel concepts;
2. IT customized tools to enable the acquisition and usage of field data, coming from an IoT platform, to provide business services to different stakeholders, such as vessels designers, ship builders, ship operators, port and maritime authorities, insurance companies and so on;
3. High Performance Computing Simulation for early vessel design improvement and testing.

This new design approach and innovative services portfolio will be demonstrated with the three vessels designed and delivered in the project. Moreover, LINCOLN will assess, study and validate an integrated LCA (Life cycle Cost Analysis) and LCC (Life Cycle Cost) strategy, to guarantee sustainability to vessels concepts and the proper environmental attention inside the maritime industry.

The results of LINCOLN will be disseminated and exploited to bring back EU yards to the edge of innovation.

The consortium is formed by 16 partners (leading European maritime companies and service providers, academia and research institutions and technology transfer organizations) from 6 EU countries (Cyprus, Greece, Germany, Italy, Norway and Spain) and is led by Politecnico di Milano:

- Politecnico di Milano – Coordinator of the project (Italy) - University
- CTN (Spain) – Research & Technology Centre
- Hubstract SRL (Italy) – Communication Company
- Techno Pro (Spain) – Ship Designer
- BIBA (Germany) - Research & Technology Centre
- Holonix (Italy) – IoT provider
- Sintef (Norway) - Research & Technology Centre
- CINECA (Italy) – HPC simulation Research Centre
- Hydrolift (Norway) – Ship Builder
- Super Toys (Greece) – Designer & Ship Builder
- Inventas (Norway) – Ship Designer
- TOI/Zerynth (Italy) – IoT provider
- CTI (Greece) – Technology provider
- BALance (Germany) – Business analyst
- Aresa (Spain) – Ship Builder
- CETRI (Cyprus) – ICT provider

LINCOLN has been funded under the Blue Growth work programme. It started in October 2016 and it will last for 3 years. It is coordinated by Sergio Terzi and Lucia Ramundo, as project manager, from Politecnico di Milano. More details are available at the project official website: [www.lincolnproject.eu](http://www.lincolnproject.eu).

## 2.2. HOLISHIP project - Grant Agreement: 689074

HOLISHIP (HOListic optimisation of SHIP design and operation for life-cycle) project addresses urgent industry needs (e.g. insufficient knowledgebase, inadequate lead time for complete optimisation cycles, incomplete interplay between different design disciplines) developing innovative design methodologies, integrating design requirements (technical constraints, performance indicators, life-cycle cost, environmental impact) at an early design stage and for the entire life-cycle in an integrated design environment. Design integration will be implemented in practice by the development of integrated design software platforms and demonstrated by digital mock-ups and industry led



application studies on the design and performance of ships, marine equipment and maritime assets in general.

HOLISHIP will specifically address the following main objectives:

1. Develop Software (s/w) tools for multi-objective and multi-disciplinary holistic system optimisation and integration to design ships and offshore structures for life-cycle operation.
2. Develop and test a Virtual Vessel Framework (VVF) to be used in the optimisation of ship operation and concept validation studies resulting in more efficient and safe ships.
3. Improve ship design through improved operational feedback from complex ship systems into the design loop.
4. Achieve measurable life-cycle cost reductions through innovative holistic ship design and demonstrate this for typical European maritime industry applications.
5. Reduce ship development time and costs through innovative design optimisation and integration of software procedures.
6. Demonstrate methods to find optimal and innovative ship configurations according to measurable technical performances and ship's operational performance indicators.
7. Proceed to the full exploitation of the VVF after completion of the project to ensure continued use by the European maritime industry and improvements of the VVF.
8. Disseminate and exploit the results gained from the project for the benefit of the European maritime industry, the university education and training of young and other professionals.

Achieving these objectives, the following project results will become available:

- a) Framework of methods and an integrated software platform for the multi-objective, multi-disciplinary and multi-fidelity optimisation of ship design and ship operation, coupling existing and novel design software tools to improve ship design and operation while reducing the design and development time.
- b) Library of multi-fidelity models and software tools for application in design optimisation or in simulated virtual vessel operation.
- c) Virtual Vessel Framework for embedded ship simulation.
- d) A series of eight (8) Application Cases with associated Digital Mock-Ups (DMU), demonstrating the HOLISHIP design approach and for exploitation by the HOLISHIP industrial end users.

The proposed HOLISHIP synthesis model follows modern Computer Aided Engineering (CAE) procedures and integrates techno-economic databases, calculation and optimisation modules and s/w tools along with a complete virtual model [Virtual Vessel Framework – VVF] which will allow the virtual testing before the building phase of a new vessel. Modern GUI and information exchange systems will allow the exploration of the huge design space to a much larger extent than today and will lead to new insights and promising new design alternatives. The coverage of the ship systems will not be limited to conceptual design, but extend also to relevant major on board systems / components. Their assessment in terms of life-cycle performance is expected to build up further knowledge of suitable outfitting details, this being a highly relevant aspect especially for the outfitting-intensive products of European Shipyards.

For achieving its goals, HOLISHIP formed a team of complementary partners contributing “cutting edge” expertise in all relevant areas affecting the design and particularly life-cycle aspects of maritime products: HSVA (coordinator), ALS Marine, AVEVA, BALANCE, Bureau Veritas, Cetena, CMT, CNR, Damen, Danaos, DCNS, DLR, DNVGL, Elomatic, Epsilon, FhG-AGP, Fincantieri, Friendship Systems, HSB, IRT SystemX, ISL, Lloyds Register, MARIN, Marintek, Meyerwerft, Navantia, NTUA-SDL, RR-AS, RR-PE,



Sirehna, SMILE FEM, Starbulk, TNO, TRITEC, Uljanik, Univ. Genoa, Univ. Liege, Univ. Strathclyde, van der Velde, IRT-Systemx

HOLISHIP started in September 2016 and will last 4 years. It is coordinated by Jochen Marzi and Apostolos D. Papanikolaou, as senior scientific advisor, from HSVA. More detailed information is available in the project's dedicated web site at [www.holiship.eu](http://www.holiship.eu).

### 2.3. SHIPLYS project - Grant Agreement: 690770

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SHIPLYS (Ship Lifecycle Software Solutions) project gathers a team of 12 leading maritime companies and research facilities from several European countries in order to develop simulation and modelling tools that will minimise the time and costs involved in ship design and production.

The main objective of SHIPLYS is to improve the competitiveness of the European shipyards by supporting SME naval architects, shipbuilders and ship-owners to survive in the world market by:

- improving their capability to reduce the time and costs of design and production
- developing the ability to reliably produce better ship concepts through virtual prototyping
- meeting the increasing requirements for LCCA (Life Cycle Cost Analysis), environmental assessments, risk assessments and end-of-life considerations as differentiators.

Calculation and modelling tools currently used to overcome these needs are difficult to use and time consuming, especially for SMEs. To address these challenges, SHIPLYS project partners will produce new techniques for quick, reliable multi-disciplinary modelling capability for the marine industry.

The development work in the project applies to two main areas:

- a. virtual prototyping and simulation modelling, and
- b. the SHIPLYS life cycle suite of tools (called SHIPLYS LCTs) that include LCCA, environmental assessments, risk assessments and multi-criteria decision support modules.

The idea is to develop and integrate rapid virtual prototyping tools with life cycle tools that will be compatible with existing early design software, such as FORAN, Ship Constructor and others. These rapid prototyping tools will be able to establish a model in short timeframe which will bring benefit of investigating multiple alternatives easily and efficiently.

The SHIPLYS consortium is led by TWI Ltd and comprises 12 partners in total, representing different sectors:

- three shipyards: Ferguson Marine Engineering Ltd. (UK), Varna Maritime (Bulgaria), Astilleros de Santander SA (Spain)
- an international marine engineering specialist: BMT Group Ltd. (UK) and its operating companies BMT SMART (UK), a vessel performance management systems provider, and BMT Nigel Gee Ltd (UK), a leading independent naval architecture and marine engineering design consultancy.
- two SMEs providing naval architecture and supply chain solutions: as2con-Alveus d.o.o. (Croatia), Atlantec Enterprise Solutions GmbH (Germany)
- three Universities: University of Strathclyde (UK), Instituto Superior Tecnico (Portugal), National Technical University of Athens (Greece)
- two industrial R&D institutions: TWI Ltd. (UK), Fundacion Centro Tecnologico Soermar (Spain)
- one standards and validation body: Lloyd's Register EMEA (UK).

The project started in September 2016 with a duration of 3 years. It is coordinated by Ujjwal Bharadwaj, from TWI. More information on the project is available on the public website at <http://www.shiplys.com/>.





### 3. Cluster activities plan

The LINCOLN project coordinator and project manager have taken the following actions to get in contact with the coordinators of HOLISHIP and SHIPLYS projects and prepare a first clustering activities plan.

1. In October 2016, LINCOLN project manager had some e-mails exchange with the HOLISHIP and SHIPLYS coordinators to get know each other and to organize a first cluster web meeting.
2. On 11th October 2016, a LINCOLN project presentation via web was organized.
3. On 4<sup>th</sup> November LINCOLN sent a power point project presentation to SHIPLYS coordinator and on 8<sup>th</sup> November the presentation was also sent to HOLISHIP coordinator.
4. On 8th November 2016, LINCOLN project invited the HOLISHIP and SHIPLYS coordinators to join its advisory board.
5. On 10th March 2017, a clustering activities meeting was organized to agree about an initial plan for clustering activities.

Here follow the initial clustering activities plan:

Activity Type	Activity Description
Cluster Meeting	The first cluster physical meeting among the 3 projects coordinators will take place at TRA2018, April 16-19, 2018, Vienna
Workshop/Project Review	The 3 projects coordinators ask the EU PO to have the mid-term project review at month 18 in a close interval of days, so that the 3 projects can organize in Brussels a joint workshop addressing the project achievements and progresses at that time and the next steps. LINCOLN cluster deliverable (D6.1) will include this proposal which will be presented to the PO in April 2017, during the project presentation to the PO, Ms Renata Kadric.
Final projects event	A possible joint final project event in 2019 will be discussed between LINCOLN and SHIPLYS projects during the cluster meeting either at TRA2018 or in Brussels in 2018. HOLISHIP project would participate as part of its dissemination plan, as the project will close in 2020.
Communication	The feasibility of a cluster LinkedIn page will be examined by the LINCOLN project manager, Lucia Ramundo. A proposal about it will be shared with HOLISHIP and SHIPLYS projects in order to decide if and how to proceed.
Communication	LINCOLN project will link SHIPLYS and HOLISHIP projects website into its new website. The HOLISHIP and SHIPLYS coordinators will send to Lucia Ramundo their project vectorial LOGO and a short description of the projects as well. The profile of the coordinators of the 2 projects will be linked from the advisory board page too.
Dissemination	HOLISHIP coordinators have offered the possibility to the other 2 cluster projects to write and include 2 chapters about their project results in their planned book on holistic approach to vessel design, optimisation and innovation. The book will be published in two volumes by SPRINGER (Vol. I at the end of 2018 and Vol. II at the end of 2020). Apostolos Papanikolaou, who is the book editor, will discuss the details with the LINCOLN and SHIPLYS coordinators as soon as possible.
Training	SHIPLYS has offered the opportunity to LINCOLN and HOLISHIP projects partners to join their training sessions for free. The content and timing of the sessions necessarily depend on developments within the project. When more information is available, Ujjwal Bharadwaj will send a possible calendar to



Activity Type	Activity Description
	LINCOLN and HOLISHIP coordinators in order to share it with their partners, so as to plan the “when” and “where” to join.
Advisory Board	Both LINCOLN and SHIPLYS have their own advisory board and there was decided to have a cross-participation: - LINCOLN Advisory Board: Prof. Apostolos D. Papanikolaou (HOLISHIP Scientific Advisor) and Dr. Ujjwal Bharadwaj (SHIPLYS coordinator) have joined the LINCOLN Advisory Board. - SHIPLYS advisory board: Prof. Sergio Terzi (LINCOLN coordinator) has joined the SHIPLYS advisory board. He will be assisted by the LINCOLN project manager, Lucia Ramundo. - The Advisory boards meetings will be held separately from the clusters meeting and will be agreed among the projects Advisory board members.

**Table 1: Clustering activities plan**

Further activities will be discussed during the physical cluster meeting at TRA2018 conference, in particular:

1. determine further virtual meetings so that have an exchange of information about projects implementation and achieved results.
2. Wherever possible, encourage setting-up sub-cluster among the partners of all 3 projects based on their expertise and interest (vessels designers; ICT providers; Technology providers etc.)
3. Encourage organize further joint dissemination events such as sharing information of one project to the events organized by the others or others participate; organize joint participation at exhibitions/fairs; co-organize joint special sessions at international conferences and events .

Lucia Ramundo communicated the LINCOLN D6.1 deliverable about the cluster activities to HOLISHIP and SHIPLYS projects coordinators for a final review before the submission to EU.