NET4mPLASTIC PROJECT

WP5 – Act. 5.3 EWS setting and calibration

D 5.3.1

Data Centre Hardware and Network Facility implemented

June, 2022 - Version 2.1

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Partners involved	LP - University of Ferrara (UNIFE);
	PP2 – Marche Region;
	PP3 – Hydra Solutions srl
	PP8 – University of Split, Faculty of Civil Engineering, Architecture and Geodesy (UNIST – FGAG)
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INDEX

Acronyms / Abbreviations

ACRONYM	DEFINITION
EWS	Early Warning System
MP	Microplastic
OBU	On board Unit
PP	Project Plan
PT	Project team
TC	Technical task coordinator
TGS-ML	Technical Subgroup on Marine litter, European Union expert group On marine litter
TM	Task Manager
UML	Unified Modelling Language
WP	Work package
ACT	Activity
OBU	On-board unit
UAV	Unmanned aerial vehicle
DB	Database
DBMS	Database Management System
APP	Application
HW	Hardware
SW	Software
GIS	Geographic information system
ICT	Information and communications technology
WEB	World Wide Web
WebGIS	Geographic Information Systems available on web platforms

1   INTRODUCTION

1.1 Background of the project

The main goal of the NET4mPLASTIC project is to achieve an efficient monitoring system for plastic and MP distribution along the Croatian and Italian coastal and marine areas in order to improve the environmental coastal and marine sea quality conditions.

According to doc R1, the WP5 deals with the design implementation of the EWS - Early Warning System including:

- a control centre, based on system hardware and network (Prosoft), and a EWS application (Hydra Solutions) integrated with the transport model and external systems (such as the oceanographic model - (Marche Region);
- Integrated Marine Drone, for collection of MP - microplastic, and geolocalized water indicators on the route (Hydra Solutions);
- Integrated Marine OBU, a unit to be installed on board of ships for improved MP collection with geolocalized water indicators on the route (Hydra Solutions).

The design shall be carried out with the modern system engineering approach based on UML - Unified Modelling Language (Hydra Solutions). UNITS and RERA SD will provide data for the first set up of the platform related to MP. Based on this WP, the transport model will be developed in WP4. The development of the EWS platform integrated with the transport model will be done in WP5.

The activities planned for WP5 are the following:

- development of the EWS - Early Warning System data centre platform and integration with the transport model (WP4)
- development of the UAV/marine drone for real-time data acquisition
- testing and calibration
- business simulation for testing the solution with real users –
- final assessment of the solution, including a CBA–cost benefit analysis and the preparation of the business plan.

The main expected output will be:

- EWS integrated platform, implemented and tested

- Training for the required personnel and users - Assessment of the platform.

The required main software modules of the EWS platform will be:

- MP Transport model, providing data with distribution and concentration,
- MP WebGIS platform, for: a) Display MP data (historical, actual forecast, 24-72h forecast) b) Early warning provision, based on the transport model c) Data entry, recording & replay
- MP DB, the DB for collecting data
- A mobile APP, for starting/closing the field activities and for data reporting
- Firmware for marine remote units - Integration with external system, for meteorological/other data

The coordinator will be Hydra Solutions. The EWS SW platform will be developed by Hydra Solutions, with the support of Marche Region for the transport model, and Prosoft for localization, the ICT implementation, the integrated testing, training and support for maintenance activities. UNITS will coordinate the assessment of the platform. The other partners involved will give contribution for data entry, as target user, and for preparation of the required documentation. The user target group will be based on the main project partners, institution, regions and councils. They will be involved in the design stage for collecting the main needs, for testing and user training of the solution. The target group will be required to use the system during the business simulation, and provide feedback.

The expected reports within WP5 are the following:

- D 5.1.4 –Hardware and Network Integration Report (Report): this deliverable will provide a report with details on integration of the network and other hardware required for the system;
- D 5.1.5 –Test procedures and reporting (Report): this deliverable will provide the procedures for testing the data centre and the integrated solution in the test bed environment, and the reporting of the tests done to assure the quality of the solution provided;
- D 5.1.6 –Hardware & Network Maintenance Manual (Document); this deliverable will provide the manual for the maintenance of the hardware and the network of the system;
- D 5.1.7 –Software User and Maintenance Manual (Document); this deliverable will provide the manual for the maintenance of the software and the User manual for the operators
- D 5.2.4 – Marine OBU / Drone Test Procedure and Report (Document): this deliverable will provide the procedures for testing the drones and the OBU, and the reporting of the tests done to assure the quality of the solution provided;
- D 5.2.5 –Marine OBU / Drone Maintenance Manual (Document); this deliverable will provide the manual for the maintenance of the Drone and OBU;
- D 5.2.6 – Marine OBU / Drone User Manual (Document); this deliverable will provide the User manual for the operators;
- D 5.3.1 – Data Centre Hardware and Network Facility implemented (Hardware, report), in this deliverable is relevant to the implementation of the data centre for the integrated solution, hardware and the network facility, and the preparation of the AS BUILT document describing the data centre facility;
- D 5.3.2 – Remote Units and Data Centre Communication Test Procedure and Report (Document); this deliverable will provide the procedures for testing the communication integration between remote units and the data centre, and the relevant reporting of the tests done to assure the quality of the solution provided;
- D 5.3.3 – Data Centre Test Procedure and Report (Document): this deliverable will provide the procedures for testing the features of the solution provide in the data centre, and the relevant reporting of the tests done to assure the quality of the solution provided, that will be done in cooperation with the main stakeholders;
- D 5.3.4 – Integrated System Final Test Procedure and Report (Document): this deliverable will provide the procedures for the integrated test cases testing the integrated solution, and the relevant reporting of the tests done to assure the quality of the solution provided, that will be done in cooperation with the main stakeholders.

- D 5.4.1 – Training documentation (document): this deliverable is relevant to the implementation of the required documentation for performing training to the personnel involved in the business simulation (as defined in the WP3.3 and the design of the solution);
- D 5.4.2 – Training assessment (report): this deliverable is relevant to the implementation of the training to be done for the personnel involved in the business simulation, with a reporting on evaluation of the training;
- D 5.4.4 – Questionnaire for platform assessment (report) this deliverable is relevant to the preparation of a questionnaire for evaluation of the platform from the user point of view involved in the business simulation;
- D 5.4.5 –Cost Benefits Analysis – CBA of the platform (Document); this deliverable will provide a final document with lessons learnt during the real use of the platform, an evaluation of the benefits of the platform, and costs for full exploitation of the solution, including the future recommendations on potential improvement, and including a business plan for a full implementation of the platform.

1.2 Purpose of the report

This document describe the **deliverable D.5.3.1 – Data Centre Hardware and Network Facility implemented**, following the implementation of the EWS, according to the activity 5.1 - Implementation of the platform (HW, SW) with field and laboratory data , and the activity 5.2, Development of the UAV/marine drone for real-time data acquisition, and is dealing with the implementation of the data centre for the integrated solution, hardware and the network facility, and the preparation of the AS BUILT document describing the data centre facility.

This deliverable is within the activity 5.3 of the Net4mPlastic project - EWS setting and calibration, that is focused on the EWS setting and calibration. The main tasks planned in this activity are the following:

- Definition of integrated test cases including functional test, communication tests, performance tests of software applications and communication lines
- Tuning of the methods to collected data from sensors and/or laboratory equipment to choose/define optimal input method
- Implementation of the Data Centre in the final location; ICT operation and performance parameters will be monitored and adjusted accordingly
- Final integrated test will be performed in cooperation with the main stakeholders

The coordinator of this activity is PROSOFT, in cooperation with HYDRA, UNIST-FGAG, UNIFE, UNITS, MARCHE

The purpose of this document is summarized as follows:

- Description of the data centre hardware
- Description of network facilities
- As built description

1.3 Reference documentation

No	Title	Rif/Report N.	Published by
[R1]	**APPLICATION FORM - NET4mPLASTIC Project - New Technologies for macro and Microplastic Detection and Analysis in the Adriatic Basin** 2014 - 2020 Interreg V-A Italy - Croatia CBC Programme Call for proposal 2017 Standard - NET4mPLASTIC Priority Axis: Environment and cultural heritage	Application ID: 10046722, dated 30/06/2017	Lead applicant: UNIVERSITY OF FERRARA
[R2]	D 5.1.4 –Hardware and Network Integration Report		ACT5.1 – Net4Mplastic
[R3]	D 5.1.5 –Test procedures and reporting (Report)		ACT5.1 – Net4Mplastic
[R4]	D 5.1.6 –Hardware & Network Maintenance Manual		ACT5.1 – Net4Mplastic
[R5]	D 5.1.7 –Software User and Maintenance Manual		ACT5.1 – Net4Mplastic
[R6]	D 5.2.4 – Marine OBU / Drone Test Procedure and Report		ACT5.2 – Net4Mplastic
[R7]	D 5.2.5 –Marine OBU / Drone Maintenance Manual		ACT5.2 – Net4Mplastic
[R8]	D 5.2.6 – Marine OBU / Drone User Manual		ACT5.2 – Net4Mplastic
[R9]	D 3.3.1 – EWS Requirements definitions based on the stakeholders and users' needs, through questionnaires and specific meeting		ACT3.3 – Net4Mplastic
[R10]	D 3.3.2 – EWS Hardware Architecture and network design (central Data Centre Hardware Architecture Client/Server, Data network architecture and related communication segments)		ACT3.3 – Net4Mplastic
[R11]	D 3.3.3 – EWS Software Architecture design (data modelling software, GIS applications, early warning detection software, etc.), the Relational Database to manage all collected data with related meta data, the communication Front-End for web		ACT3.3 – Net4Mplastic

	remote access, the Data Centre Software Interfaces for users		
[R12]	D 3.3.4 – EWS Hardware and other software Components Specifications design (Integrated Marine Drone and Marine OBU, with details of required components (hardware and firmware), firmware and other software components (mobile apps for managing the drones and for remote mobile activities).		ACT3.3 – Net4Mplastic
[R13]	D 3.3.5 - Report and database provision with all the collected data		ACT3.3 – Net4Mplastic

2 IMPLEMENTATION OF THE DATA CENTRE FOR THE INTEGRATED SOLUTION

2.1 Introduction

The purpose of this chapter is to describe the data centre for the integrated solution that has been implemented, the architecture, the location.

2.2 Architecture

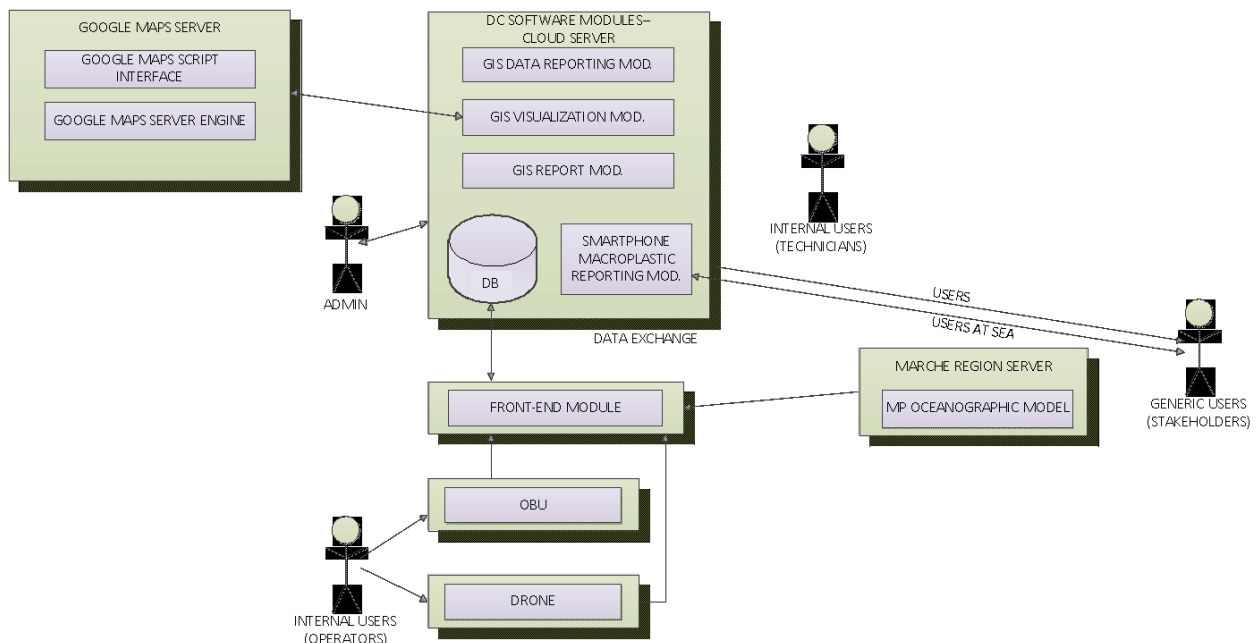Final deployed Hardware Architecture is shown below

Figure 1 – Architecture

During the course of the project, the HW concept underwent some changes mainly related to the selection of a cloud server platform to host Data Centre Software Modules instead of physical servers. The Oceanographic Numerical Model developed for the Net4mPlastic resides on Marche Region Server Infrastructure.

For the purpose of Development and testing, of all Web GIS Software modules and GIS DBMS have been hosted by Cloud hosting service provider, whilst the Oceanographic model runs on Marche Region servers. The integration of GIS visualization model is achieved with the services offered by Google Maps.

With the decision to implement the solution on the cloud platform, the need for migration and deployment of the platform from the development and close environment to another final location, i.e., the Marche Region HW infrastructure, ceased. The basic premise for the platform functionality and accessibility is the availability of the Internet and Internet Web services.

3 DESCRIPTION OF DATA CENTRE FACILITY

The purpose of this chapter is to describe the data centre facility for the integrated solution that has been implemented with the main components.

3.1 Web/Presentation Server

Location: Cloud Server

Item	Server	Requested	Implemented
SG-1	**Data Centre WEB/GIS Environment**	**Cloud Resources**	**Cloud Resources**
SG-1.1	Dedicated memory		
SG-1.2	Dedicated Storage		
SG-1.3	Bandwidth		
SG-1.4	FTP access	yes	yes
SG-1.5	Operative System	WIN/LINUX	Linux
SG-1.6	Web Server	Apache HTTP Server	Apache HTTP Server
SG-1.7	GIS Server	Google Maps Server	Google Maps Server
SG-1.8	Availability	24x7	98,98%

3.2 Database Server

Location: Cloud Server

Item	Server	Requested	Implemented
SD-1	**DBMS**		
SD-1.1	Installed DBMS	MySQL	MySQL
SD-1.2	User space Size	1 TB	
SD-1.3	DB Spatial extension		
SD-1.4	Availability	24x7	99,98%

3.3 Storage

File Storage is a repository for all files related to activities that took place during the project and to which there are references in the GIS database of the Net4mplastic platform. It contains reports, images, videos

and other data on conducted sampling campaigns and analysis of micro and macroplastics in the sea and biota. During the test phase it is moved from Basecamp to UNIFE cloud storage.

Location: Cloud Storage

Item	Description	Requested	Implemented
CS-L1	Repository for files referenced in DB	Cloud Storage	UNIFE Google Cloud Storage Net4mPLASTIC_Public https://drive.google.com/drive/folders/11jyAiHCuf3etZXRyV0EXQ0dF9DwoxrC8?usp=sharing
CS-L1.1	capacity	2 TB	unlimited
CS-L1.1	availability	24x7	24x7
CS-L1.1	lifetime	minimum 3 years	Minimum 5 years