COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE

IN SITU TAC
CMEMS ELEMENT

System Integration and Verification Plan

Reference: CMEMS-INS-SIVP
http://dx.doi.org/10.13155/51660

Validated by: Thierry Carval	**Document release number:** V1.4	**Date: 22/05/2018**
Contributors : Carval Thierry, de Alfonso Alonso-Muñoyerro Marta, Chalkiopoulos Antonis, Guyot Corentin, Hammarklint Thomas, Jandt Simon, Manzano Munoz Fernando, Marinova Veselka, Perivoliotis Leonidas, Ringheim Lid Sjur, Sotiropoulou Maria		

CHANGE RECORD

Issue	Date	§	Description of Change	Author
1.0	27/07/2015	all	First version of document, derived from Copernicus Marine In Situ TAC SRD	Thierry Carval
1.1	21/03/2016	all	General revision for CMEMS V3	Thierry Carval Marta de Alfonso Thomas Hammarklint Antonis Chalkiopoulos Lid Sjur Ringheim Veselka Marinova Charles Troupin
1.2	22/04/2017	all	General revision for CMEMS V4	Thierry Carval, Marta de Alfonso
1.3	03/10/2017	all	General revision for Copernicus Marine Phase 2	Thierry Carval
1.4	22/05/2018		General update for the AR/ DR June 2018	Loïc Petit de la Villéon

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

GLOSSARY AND ABBREVIATIONS

Additional terms:

Acronym	Signification
JCOMM	Joint Technical Commission for Oceanography and Marine Meteorology,
Argo , Euro-Argo	International profiling float network (www.argo.net) and its European component (http://www.euro-argo.eu)
EGO, GROOM	International Glider network (http://www.ego-network.org) and its European coordination (http://www.groom-fp7.eu)
GOSUD	International Global Ocean Surface Underway Data (http://www.gosud.org/)
OCEANSITES, EMSO	OceanSITES is a worldwide system of long-term, open-ocean reference stations(OceanSITES is a worldwide system of long-term, open-ocean reference stations) and its European component (http://www.emso-eu.org/)
DBCP, ESURFMAR	Data Buoy collaboration panel (http://www.jcommops.org/dbcp/) and its European component (http://www.eumetnet.eu/e-surfmar)
EMODNet	European Marine Observation and Data Network (EMODnet)(http://www.emodnet.eu/) and the Physical component http://www.emodnet-physics.eu/Portal
SeaDataNet	European Network of National Oceanographic Data Centres (NODCs) (http://www.seadatanet.org/)
TAC	Thematic Assembly Centre
CIS	Central Information System
EUROGOOS , ROOS	The European Global Ocean Observing System (http://eurogoos.eu/) and its Regional Operational Oceanographic System

Applicable and Reference Documents

	Ref	Title	Date / Version
DA 1	CMEMS-INS-SOW	INSTAC SOW Phase 1	Version 1.0 January 2015
DA 2	CMEMS-INS-PRO	INSTAC Proposal Phase 1	V1.0 March 2015

1 OBJECT OF THE DOCUMENT

This document is the Copernicus Marine Environment Monitoring Service for In Situ observations System Integration and Verification Plan Document (CMEMS-INS-SIVP).

2 INTRODUCTION

2.1 Scope

The Copernicus Marine In Situ TAC is the European service integrating data from different sources for the benefit of a European community. Its targeted users are both internal (global and regional MFCs, SST-TAC, SL-TAC, OC-TAC) and external (operational users from member states, European agencies (EEA) or conventions (Ospar, Helcom,..) the research community,…).

It is composed of one global and 6 regional components.

- V0: Mersea Heritage T&S product server by the Global component through Coriolis data centre including some European data from Seprise project
- V1, Stream 1: Physical parameters
    - Global Ocean: Real-Time and Delayed mode physical products
    - Mediterranean Sea
    - Arctic
- V1, Stream 2 : Physical parameters + Bio parameters
    - Global component : Ferrybox/research vessels and International Mooring via OceanSites. First version of T&S Delayed mode product
    - Black Sea
    - Baltic sea
    - North West Shelves
    - South West Shelves
- V2 : Delayed Mode T&S profile product in all components
- V3: addition of wave parameters and delayed mode currents
- V4: addition of wave and bgc delayed mode products
- Phase 2: addition of Carbon parameters and HF-Radars data

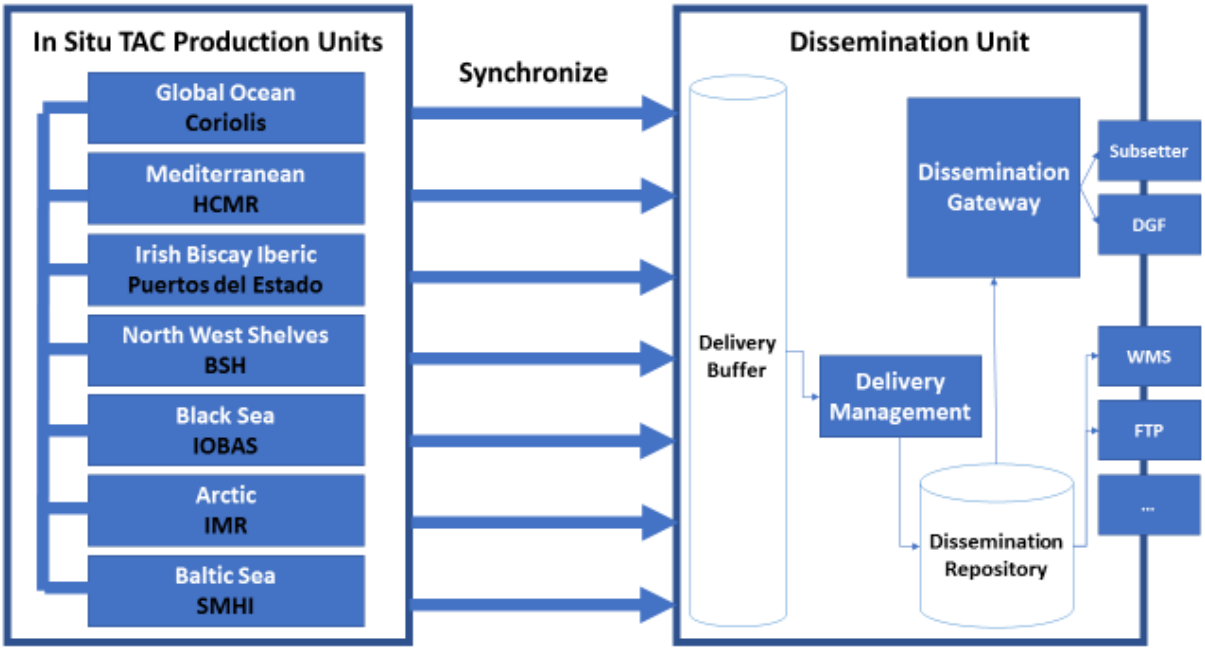

Figure 1: overview of physical architecture of In Situ TAC

2.2 Purpose

This document describes the System Integration and Validation plan processes to ensure that Copernicus Marine In Situ TAC system :

- Provides services as described in the Copernicus Marine Specification Requirements Document (SRD)
- Can operate smoothly with a sustainable activity to fulfill the agreed Service Level Agreements

3 APPLICABLE AND REFERENCE DOCUMENTS

3.1 Applicable Documents

Ref.	Document Name	Document Reference	Issue	Date
DA 3	CMEMS-INS-SOW	INSTAC SOW	V1.0	September 2017
DA 4	CMEMS-INS-PRO	INSTAC Proposal	V1.0	October 2017

Table 1: Applicable documents

3.2 Reference Documents

Ref.	Document Name	Document Reference	Issue	Date
RD.1	Copernicus Marine Glossary of Terms	INSTAC GLOS	V1.0	October 2017

Table 2: Reference documents

4 OVERVIEW OF THE DOCUMENT

This document describes the integration, the verification and the validation processes of the Copernicus Marine In Situ TAC System. It implements top level SIVVP strategy at In Situ TAC level.

5 OVERALL STRATEGY

5.1 Testing Methodology

The SIVP is performed by a team that is not in charge of the In Situ TAC development. It has a neutral view on the system and is not involved in the implementation process.

The SIVP team's task is to

- Prepare the SIVP document:
  - Organize a test plan that covers each version of the system
  - Define families of tests
  - Define a test plan for each version of the system
  - Describe each test and its expected result
- Define a methodology for testing and setup testing tools and environment to implement it
- Perform campaigns of tests for each version of the system

5.2 Strategy

The In Situ TAC strategy is oriented on SIVP campaign: for each version of the system, a SIVP campaign is performed. The SIVP campaign is composed of a hierarchy of activities: each of them has a dedicated plan.

This hierarchy defines the integration of In Situ TAC components.

On one hand the interfaces between the In Situ TAC and Copernicus Marine will be tested. This is related to the distribution and quality of the products and the monitoring functions. It mainly involves the In Situ TAC Production Units (PUs). This part will be coordinated by Ifremer .The second part is the validation of the different In Situ TAC components for which the internal interfaces need to be tested. This is led by the region leaders.

The validation activity is performed on an active system that is a clone of the next operational configuration.

The link with the Distribution Unit system cannot yet be described in detail, as the DU phase 2 system is new and not yet implemented.

The implementation and validation strategy proposed in this document is based on FTP transfers between the In Situ TAC Production Units (PUs) and the CMEMS Central Distribution Unit (DU). **Each validation campaign will test the FTP transfers between the PUs and the central DU.**

5.2.1 In Situ TAC Interface with Distribution Unit (DU)

The first activity of testing is called the "In Situ TAC interfaces Validation". It is composed of tests of the following components:

- Site and FTP site accessibility,
- FTP File organisation set up,
- File downloaded and opened,
- Monitoring of the transactions

The second phase of tests is dedicated to a “In Situ TAC Organisation” set up and advanced dissemination system which relies on well formed file format and organization :

- Index Files completed,
- Files format correct,
- Files complete listing,
- Timeliness of data file updates
    - Latest directory
    - Monthly directory

The third part controls the “well-formed data files” proposed by the In Situ TAC system:

- Data files format
- Quality of data files (compliance with agreed QC policy)
- Completeness of data files

5.2.2 Testing the regional components

Each PU has to test the interfaces with the DU.

5.2.3 General constrains

The In Situ TAC verification is set up by the definition of these test plans which are prepared from the In Situ TAC architecture described in the ADD. The requirement coverage is done using the Test Document report (TR) insured that each requirement is covered by a passed test.

Regarding SLA requirements, robustness and performance tests are identified so, as expected, In Situ TAC will be compliant with top level SLA requirements. Measurements will be performed at top level tests, in operational mode.

5.3 Tools and Techniques

The validation environment for the In Situ SIVP phase is a clone of the next operational configuration.

Ifremer creates and updates the testing tools SIVP. It performs test campaigns whose results are stored in a report. The SIVP team checks and investigates the series of test reports.

6 COMMON PRINCIPLES FOR SYSTEM INTEGRATION AND VERIFICATION

6.1 Item pass/fail criteria

6.2 Suspension criteria and resumption requirements

The suspension criteria for a test case is the failure of the test procedure implementing it. The testing continues to the next test case, unless its success depends on the failed one. A failed test procedure is resumed when agreed corrections have been applied and agreed non-regression tests are successful.

6.3 Test deliverables

6.3.1 Input deliverables

- The validation activity is performed on an active system that is a clone of the next operational configuration. The system should be populated with at least one month of activity.
- The reference data files for quality control will be provided.

6.3.2 Output deliverables

The SIVP team delivers a report on each campaign of tests.

6.4 Testing tasks

The In Situ TAC test plan is composed of installation tests, functional tests and the robustness tests.

7 TEST ENVIRONMENT

7.1 Integration Tests

The integration tests are performed on the validation architecture detailed in the ADD (Architecture and Design document).

The main integration test item is the FTP server that will be interfaced with the CMEMS DU (Distribution Unit).

7.2 Verification Tests

All required software listed in the ADD are available for verification tests.

The main verification test item is the FTP server software that will be interfaced with the CMEMS DU (Distribution Unit).

8 TEST CASES SPECIFICATION

8.1 Test Identification

In order to identify a test by a unique key, we define the following nomenclature:

XXX-YYY-FFF-NNN,

where XXX is the test category, YYY a keyword describing the focus in the test, FFF is the functionality and NNN an index number.

There are several test categories:

- Opened Interfaces tests: INT,
- System Organisation: ORG,
- Data validation: DAT : based on operational use cases

Identified focuses are: FTP for FTP access, WEB for http access, FIL for Data File, IDX for index, FOR for data file format, QUA for quality of the data, DIS for disponibility of the data, COM for completeness of data files.

Functionalities are identified by the following keywords:

- MAN for management,
- REQ for requests,
- MON for monitoring,
- INV for inventory.

8.2 Core test plan at PC Level

8.2.1 Open Interfaces tests

Identifier	Wording
INT-FTP-REQ-000	(UC) Get Product
INT-FTP-REQ-010	Check well formed FTP organization for latest data
INT-FTP-REQ-010	Check well formed FTP organization for monthly data

8.2.2 System Organisation tests

Identifier	Wording
ORG-IDX-REQ-000	Get index of monthly file
ORG-IDX-REQ-000	Get index of latest file

Identifier	Wording
ORG-FIL-REQ-010	Get NetCDF vertical profile data files
ORG-FIL-REQ-010	Get NetCDF time-series data files
ORG-FIL-REQ-010	Get NetCDF trajectory data files
ORG-DAT-QUA-000	(UC) Generate Products = Real Time Quality Control
ORG-DAT-QUA-000	(UC) Assess the product Quality
ORG-DAT-QUA-000	(UC) Do measures and build indicators
ORG-DAT-DIS-000	(UC) Deliver the built Product Datasets
ORG-DAT-DIS-000	(UC) Maintain the Product Database
ORG-DAT-QUA-000	(UC) Update Static metadata
ORG-DAT-QUA-000	(UC) Update Dynamic metadata

8.2.3 Performances and Robustness tests

Identifier	Wording
MON-FTP-PER-000	Performance : download time for 50 Mo, 200 Mo, 1 Go datasets
MON-FTP-PER-010	Robustness : repeated download time for 50 Mo, 200 Mo, 1 Go datasets

8.3 Core test plan at Global Component Level

8.3.1 Interfaces tests with regional INS PU

Identifier	Wording
Connectivity	
INT-FTP-REQ-000	Check FTP connectivity success using good login, password and URL
INT-FTP-REQ-010	Check FTP connectivity failed using bad login, password and good URL
INT-FTP-REQ-020	Check dataset product can be loaded by basic means (FTP).
INT-FTP-REQ-030	Check only registered and authorized users may have “Full View" of Products (i.e. DU managers)
INT-FTP-REQ-040	Check DU managers may have “Preview” of Products”
FTP organization	

Identifier	Wording
INT-FTP-REQ-050	Check well formed FTP organization for latest data.
INT-FTP-REQ-060	Check well formed FTP organization for monthly data
INT-FTP-REQ-061	Check well formed FTP organization for history data
INT-FTP-REQ-062	Check well formed FTP organization for REP data

8.3.2 PU Organisation tests

Identifier	Wording
Index files	
ORG—DAT-DIS-000	Check the generated index file is the same as the existing index file on FTP
Data files format	
ORG-DAT-QUA-000	Check the system acquired input data and processed them
ORG-DAT-QUA-010	Check the system sends an automatic warning to the Support Operator if data format or content is not valid
ORG-DAT-QUA-020	Check the system sends an automatic warning to the Support Operator if a received data flow is not accessible
Quality of data files (compliance with agreed QC policy)	
ORG-DAT-QUA -030	Check the RTQC is done only on the new data acquired
ORG-DAT-QUA -040	Check function applying Real-Time Quality Control Flags is not activated when a platform is absent
ORG-DAT-QUA -050	Check the system assesses the product quality
RTQC for vertical profiles: Argo, CTD, XBT	
ORG-DAT-QUA -060	Check the system detects bad date
ORG-DAT-QUA -070	Check the system detects bad location
ORG-DAT-QUA -080	Check the system detects bad position on land.
ORG-DAT-QUA -090	Check the system detects bad speed.
ORG-DAT-QUA -100	Check the system detects bad global range
ORG-DAT-QUA -110	Check the system detects bad regional range.
ORG-DAT-QUA -120	Check the system detects bad pressure increasing.
ORG-DAT-QUA -130	Check the system detects bad spike.
ORG-DAT-QUA -140	Check the system detects bad bottom spike.
ORG-DAT-QUA -150	Check the system detects bad Gradient
ORG-DAT-QUA -160	Check the system detects bad digit rollover
ORG-DAT-QUA -170	Check the system detects stuck value
ORG-DAT-QUA -180	Check the system detects bad density inversion.

Identifier	Wording
ORG-DAT-QUA -190	Check the system detects bad gross salinity or temperature sensor drift.
ORG-DAT-QUA -200	Check the system detects frozen profile.
ORG-DAT-QUA -210	Check the system detects bad deepest pressure
RTQC for vertical profiles: Gliders and AUVs	
ORG-DAT-QUA -220	Check the system detects bad date.
ORG-DAT-QUA -230	Check the system detects bad location
ORG-DAT-QUA -240	Check the system detects bad position on land.
ORG-DAT-QUA -250	Check the system detects bad speed.
ORG-DAT-QUA -260	Check the system detects bad global range.
ORG-DAT-QUA -270	Check the system detects bad regional range.
ORG-DAT-QUA -280	Check the system detects bad instrument sensor range
ORG-DAT-QUA -290	Check the system detects bad spike.
ORG-DAT-QUA -300	Check the system detects bad gradient.
ORG-DAT-QUA -310	Check the system detects stuck value.
ORG-DAT-QUA -320	Check the system detects frozen profile.
ORG-DAT-QUA -330	Check the system detects bad deepest pressure
RTQC for time series	
ORG-DAT-QUA -340	Check the system detects bad date.
ORG-DAT-QUA -350	Check the system detects bad location
ORG-DAT-QUA -360	Check the system detects bad regional range.
ORG-DAT-QUA -370	Check the system detects bad pressure increasing.
Timeliness of data file updates	
ORG—DAT-DIS-010	Check the PU generates statistic variation of file number per month
ORG—DAT-DIS-020	Check the system sends error when there are no data on the latest directory
ORG—DAT-DIS-030	Check the system sends error when there are no data on the monthly directory

Identifier	Wording
ORG—DAT-DIS-040	Check the PU generates statistic variation of file number per day
Completeness of data files	
ORG—DAT-COM-000	Check the number of generated file is the same that the number of platform in input data In Situ.
ORG—DAT-COM-010	Check the generated file contains all parameters corresponding to the platform

8.3.3 Performances and Robustness tests

Identifier	Wording
MON-FTP-PER-000	Performance: download time for 50 Mo, 200 Mo, 1 Go datasets
MON-FTP-PER-010	Robustness: repeated download time for 50 Mo, 200 Mo, 1 Go datasets

8.4 Core test plan at Arctic Component Level

Similar to the Global Component.

8.5 Core test plan at Baltic Component Level

Similar to the Global Component.

8.6 Core test plan at NWS Component Level

Similar to the Global Component.

8.7 Core test plan at SWS Component Level

Similar to the Global Component.

8.8 Core test plan at Mediterranean Sea Component Level

Similar to the Global Component.

8.9 Core test plan at Black Sea Component Level

Similar to the Global Component.

8.10 Monitoring test plan

8.10.1 Open Interfaces tests

What are the installed components?

Identifier	Wording
INT-INS-MON-000	(UC) Monitor System

8.10.2 System Organisation tests

Identifier	Wording
ORG-INS-MON-000	(UC) Monitor production
ORG-INS-MON-100	(UC) Monitor In Situ TAC Services
ORG-INS-MON-200	(UC) Transaction accounting
ORG-INS-MON-300	(UC) Monitor Requests

8.10.3 Performances and Robustness tests

Identifier	Wording
ROB-INS-MON-000	Failure of the monitoring manager

9 TEST USER MANUAL

This chapter describes the way Ifremer Test Framework (ITF), Mantis and word are used together during the SIVP phase.

Ifremer prepares a Test Document (TD) to each Production Unit.

Test cases are described according to test plans and category. Each test case is identified by its identifier and includes:

- A summary
- The main steps
- The expected results
- The assigned requirements

Once all tests are described, an analysis is processed to verify that all requirements are covered by at least a test case.

The Test Documents (TD) are distributed to the seven Production Unit managers.

Then in each PU, the TD series of tests are performed with a description for each test detailed execution in a Word test sheet (see Annex A).

Test Results are described in ITF. If anomalies are detected, a bug report is reported in Mantis bugtracker.

The Test Document is complete when all tests have been applied and that Mantis anomalies have been fixed.

10 ANNEX A: SIV SCHEDULE

This section will include the SIV test execution schedule when available.

11 ANNEX B: TEST REPORTS

The Test Report documents are used to report the results obtained in each test campaign. For each test performed, the following details should be included:

- Identification of items tested,
- Identification of tests executed (accordingly Test Cases),
- Results on a test execution (is it compliant with the expected results?),
  - Detailed results generated (data files)
  - Problems encountered
  - Rationale for decisions
- Conclusions.

Test Steps

<Describe the different steps of the test, and the expected result for each step. This heading will be used during the execution of the test, and will be included in the Tests Results Document.>

Test Ident : *<FFT-NNN>*

Step Number	Step Description	Expected Result	Comment	OK/ NOK
1				
2				
3				
4				

Decision

☒ Accept ☐ Accept with Conditions ☐ Refused

Figure 2: Template for Test Report

12 ANNEX C: NON-CONFORMANCE / CHANGE PROPOSAL REPORT

Description	Responsible	Date
Cause		
Analysis	**Responsible**	**Date**
Cost/Time To implement:	**Impact: High Medium Low**	
Decision: Go No Go	**Authorized by:**	**Date:**
Solution	**Responsible**	**Date**
Tested/Verified by:	**Date:**	

Figure 3: Template for Non-conformance / Change Proposal Report

13 ANNEX D: SRD REQUIREMENTS VS VERIFICATION TESTS TRACEABILITY MATRIX

This section is the template of traceability matrix cross-referencing the system requirements described in the SRD document and the test procedures described in this document.

SRD Requirement ID	Test Case ID

Table 3: Verification Coverage

14 ANNEX E: ADD REQUIREMENTS VS INTEGRATION TESTS TRACEABILITY MATRIX

This section is the template of traceability matrix cross-referencing the interfaces and design requirements described in the ADD document and the test procedures described in this document.

ADD Requirement ID	Test Case ID

Table 4: Integration Coverage