

**multi-communities**  
**multi-sensors**  
**Earth Observation Processing**  
**(EO-Processing)**  
  
**Appendix B**  
**to Tender Specifications**

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## 1. Abbreviations

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The following table includes a list of abbreviations commonly used in this Technical Specification.

Abbreviation	Definition
AIS	Automatic Identification System
API	Application Programming Interface
BCF	Business Continuity Facility
COTS	Commercial Off The Shelf
CTM	Criticality/Time Matrix
CSN	CleanSeaNet
CSNDC	CleanSeaNet Data Centre
CMC	Control Management Console
EICD	External Interface Control Document
EC	European Commission
EMSA	European Maritime Safety Agency
ENC	Electronic Nautical Chart
EO	Earth Observation
EODC	Earth Observation Data Centre
EU	European Union
FTP	File Transfer Protocol
FWC	Framework Contract
GIS	Geographic Information System
GML	Geography Markup Language
GUI	Graphic User Interface

Abbreviation	Definition
HTTP	Hypertext Transfer Protocol
ICD	Interface Control Document
ICM	Installation and Configuration Manual
ICT	Information and Communications Technology
IdM	Identity Manager (an Oracle application)
IHP	Incident Handling Procedures
INS	Installation Manual
IMDatE	Integrated Maritime Data Environment
IT	Information Technology
IPR	Intellectual Property Rights
LRIT	Long Range Identification and Tracking.
MAP	Maritime Application Portal
MARSURV	Maritime Surveillance
M5D	Message Digest Algorithm
MSS	Maritime Support Services
MSs	Member State(s)
NCA	National Competent Authority
NRT	Near Real Time
OMM	Operational and Maintenance Manual
RDF	Resource Description Framework
REST	REpresentational State Transfer
RPM	Red Hat Package Manager
ROA	Resource Oriented Architecture

Abbreviation	Definition
S2S	System to System
SO	Satellite Owner
SOA	Service Oriented Architecture
SOAP	Simple Object Access Protocol
SP	Service Provider
SRS	Software Requirements Specifications
SSN	SafeSeaNet
STP	Software Test Plan
TDD	Technical Design Document
TF	TeamForge
TS	Technical Specification
UAV	Unmanned Aerial Vehicle
UML	Unified Modeling Language
VAS	Value-Added Service
VDS	Vessel Detection System
WWW	World Wide Web
XML	Extensible Markup Language

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## 2. Glossary

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### 2.1 Terms specific to Maritime domain

The following table includes a glossary of the relevant terms commonly used in this TS and specific to Maritime domain.

Term	Definition
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Term	Definition
AIS	The Automatic Identification System (AIS) is an automatic tracking system used on ships and by vessel traffic services (VTS) for identifying and locating vessels by electronically exchanging data with other nearby ships, AIS base stations, and satellites.
CSN	CSN is a satellite based monitoring system for marine oil spill detection and surveillance in European waters. The service is operated by EMSA and provides a range of detailed information including oil spill alerts to Member States, rapid delivery of available satellite images and oil slick positions. More information at: <a href="https://csndc.emsa.europa.eu/homepublic">https://csndc.emsa.europa.eu/homepublic</a>
EMSA	EMSA provides technical assistance and support to the European Commission and Member States in the development and implementation of EU legislation on maritime safety, pollution by ships and maritime security. To do this, one of EMSA's most important supporting tasks is to improve cooperation with, and between, MSs in all key areas. In addition, the Agency has also been given operational tasks in the field of oil pollution response, vessel monitoring and in long range identification and tracking of vessels. As a body of the EU, the Agency sits at the heart of the EU maritime safety network and collaborates with many industry stakeholders and public bodies, in close cooperation with the EC. More info at: <a href="http://www.emsa.europa.eu">www.emsa.europa.eu</a>
ENC	ENC means the database, standardized as to content, structure and format, issued for use with ECDIS on the authority of government authorized hydrographic offices. The ENC contains all the chart information necessary for safe navigation and may contain supplementary information in addition to that contained in the paper chart (e.g. sailing directions) which may be considered necessary for safe navigation (IMO resolution A.817 (19)).

## 2.2 Terms specific to the Earth Observation domain

The following table includes a glossary of the relevant terms commonly used in this TS and specific to Earth Observation domain.

Term	Definition
Coverage	Coverages represent digital geospatial information representing space/time-varying phenomena.
Dataset	Dataset is a collection of data, vector or raster.
Dataset series	Dataset series is a temporal collection of datasets.
Earth Observation	Earth observation is the gathering of information via remote sensing technologies supplemented by earth surveying techniques, encompassing the collection, analysis and presentation of geospatial data.
Geospatial	Geospatial are data and software components which deal with a geographic attributes.
Geospatial service	Geospatial service is a web service that delivers geospatial data.
GML	The Geography Markup Language (GML) is the XML grammar defined by the Open Geospatial Consortium (OGC) to express geographical features. GML serves as a modelling language for geographic systems as well as an open interchange format for geographic transactions on the Internet.
Metadata	A Metadata is a document, typically in XML format, that describes the content of a dataset or a geospatial service.
Process	A process is a software component that transforms data, provides services, or extracts information.
Raster	Raster dataset is a representation of the plant Earth as a surface divided into a regular grid of cells. Raster models are useful for storing data that varies continuously, as in an aerial photograph, a satellite image, a surface of chemical concentrations, or an elevation surface.
Satellite Operators	Satellite Operators are organizations that operate satellites.
Satellite Owners	Satellite Owners are organizations that operate satellites.



Near-real-time	In the context of its use in CSN the term "near-real-time" refers the delay between the download of satellite images and the availability of this information through the CSNDC web services. This delay shall be less than 30 minutes.
SAR	(As Synthetic Aperture Radar). SAR is a form of radar in which multiple radar images are processed to yield higher-resolution images than would be possible by conventional means. Either a single antenna mounted on a moving platform (such as an airplane or spacecraft or satellite) is used to illuminate a target scene or many low-directivity small stationary antennas are scattered over an area near the target area. The many echo waveforms received at the different antenna positions are post-processed to resolve the target. SAR can only be implemented by moving one or more antennas over relatively immobile targets, by placing multiple stationary antennas over a relatively large area, or combinations thereof. SAR has been extensively used in remote sensing and mapping. SAR images are used in VDS.
Sensors	Sensors Within the context of earth observation, sensors are satellite, UAV, in situ or airborne devices which collect geospatial data.
Service Providers	"Service Providers" are the organizations in charge to analyse an Earth Observation product in order to extract the information expected by the EMSA's EODC and deliver it to the EO-Processing.
Spatial Data Infrastructure	A Spatial Data Infrastructure a set of Geospatial services orchestrated in order to provide a Service.
Vector	Vector dataset is a representation of the planet Earth using points, lines, and polygons. Vector dataset are useful for storing data that has discrete boundaries, such as features, cost lines.

### 2.3 Terms specific ICT or Project Management domain

The following table includes a glossary of the relevant terms commonly used in this TS and specific to ICT or Project Management domain.

Term	Definition
API	In computer programming, an application programming interface (API) is a set of routines, protocols, and tools for building software applications. An API expresses a software component in terms of its operations, inputs, outputs, and underlying types
Application	An application is a software component designed to help the user perform specific tasks.

Building Blocks	A Building Block comprises a set of subsystem that can be configured to fit an application purpose.
Client	A client is a piece of computer hardware or software that accesses a service made available by a server.
Data Centre	A Data Centre is a facility used to house computer systems and associated components, such as telecommunications and storage systems.
JSON	JSON is a lightweight data-interchange format. It is based on a subset of the JavaScript Programming Language
Interfaces	An interface is a shared boundary across which two separate components of system exchange information.
Interoperability	Within this context is the ability of systems to exchange information and accept services from other systems, in order to enable them to operate effectively together.
MD5	The MD5 is a message-digest algorithm is a widely used cryptographic hash function producing a 128-bit (16-byte) hash value, typically expressed in text format as a 32 digit hexadecimal number. MD5 is utilized in this TS to verify data integrity.
Process	A process is a software component that transforms data, provides services, or extracts information.
RDF	RDF is a family of World Wide Web Consortium (W3C) specifications. It has come to be used as a general method for conceptual description or modelling of information that is implemented in web resources.
Server	A server is a running instance of an application (software) capable of accepting requests from a client and giving responses accordingly. Servers can run on any computer including dedicated computers, which individually are also often referred to as "the server"
Service	Service "Means of delivering value to the customer by facilitating the outcomes customer want to achieve, without the ownership of specific costs and risks" (ITIL definition).
System	A system is a set of interacting or interdependent building blocks forming an integrated whole.
System to System	System to system is a type of interaction between two systems governed by specified interfaces.
Solution	The solution is the system implemented by the contractor

Standard	A standard is an established norm or requirement in regard to technical systems. It is usually a formal document that establishes uniform engineering or technical criteria, methods, processes and practices.
Subsystem	A subsystem is a self-contained software component that provides a set of functionalities.
SWOT	A SWOT analysis is a structured method used to evaluate the strengths, weaknesses, opportunities and threats of topic to address.
User interface	Everything designed into an IT system which includes one or more applications which a human being may interact with. This includes, but is not restricted to: display screen, keyboard, mouse, light pen, desktop appearance, illuminated characters, help messages, and how an application program or a Web site invites interaction and responds to it.
Web service	A web service a subsystem designed to support interoperable machine-to-machine interaction over internet.
Workflow	A workflow consists of an orchestrated and repeatable pattern of processes.
XML	XML is a markup language that defines a set of rules for encoding documents in a format which is both human-readable and machine-readable. It is defined by the W3C's XML 1.0 Specification and by several other related specifications, all of which are free open standards.

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### 3. Introduction

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The scope of this document is to define the requirements, hereafter 'Technical Specifications' (TS), which the Earth Observation Processing (EO-Processing) contractor shall implement through a specific contract within the context of Lot1 of the Earth Observation Data Centre procurement.

In this document, each requirement is given a reference number and a priority: higher priority "P1", lower priority "P2". "Informative" is used to create a context for the requirements.

The structure of this document follows the guidelines specified by the Reference Model of Open Distributed Processing (RM-ODP). Four complementary viewpoints of a system are defined. The description of the following viewpoints has been tailored for the scope of this project:

- i. The enterprise viewpoint, which focuses on the technical needs and the expected outcomes of the system.
- ii. The information viewpoint, which focuses on the syntax (data format) and semantics (data meaning) of the information processed by the EO-Processing.
- iii. The service viewpoint, it combines the computational viewpoint the engineering viewpoint. The computational viewpoint enables distribution through functional decomposition on the system into objects which interact at interfaces. It describes the functionality provided by the system and its functional decomposition. The engineering viewpoint, which focuses on the

mechanisms and functions required to support distributed interactions between software components in the system.

- iv. The technology viewpoint, which focuses on the choice of technology of the system. It describes the technologies chosen to provide the processing, functionality and presentation of information.

These viewpoints are introduced by an architecture section that defines the “EODC reference architecture” (see Figure 1 – EODC reference architecture), general principles applicable to all the software components, the integration strategy to adopt, and finally the system attributes to address.

For the Earth Observation Data Centre overall architecture the contractor shall make reference to the background section of the Tender Specification.

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#### 4. Scope

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The Earth Observation Processing shall: Ingest, Transform and Delivery Earth Observation data to the SSN Ecosystem applications. It indeed comprises three building blocks that support several communities (multi-communities) and process several types of sensors (multi-sensors):

1. **Data Ingestion:** Once ordered by EMSA and consequently acquired by the relevant satellite and associated operator/service provider, the EO datasets need to be ingested into the EODC. This building block includes several steps such as: validate data integrity, check data quality, and record the timestamp of the information acquired.
2. **Data Transformation.** Ingested data shall be further transformed in different formats.
3. **Data Delivery:** Finally EO datasets shall be delivered to several SSN Ecosystem applications that making use of EO information through geospatial standard services (W\*S) can address EMSA’s use cases. These applications could be web portals as well as web services (i.e. the EO product distribution).

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#### 5. Objective

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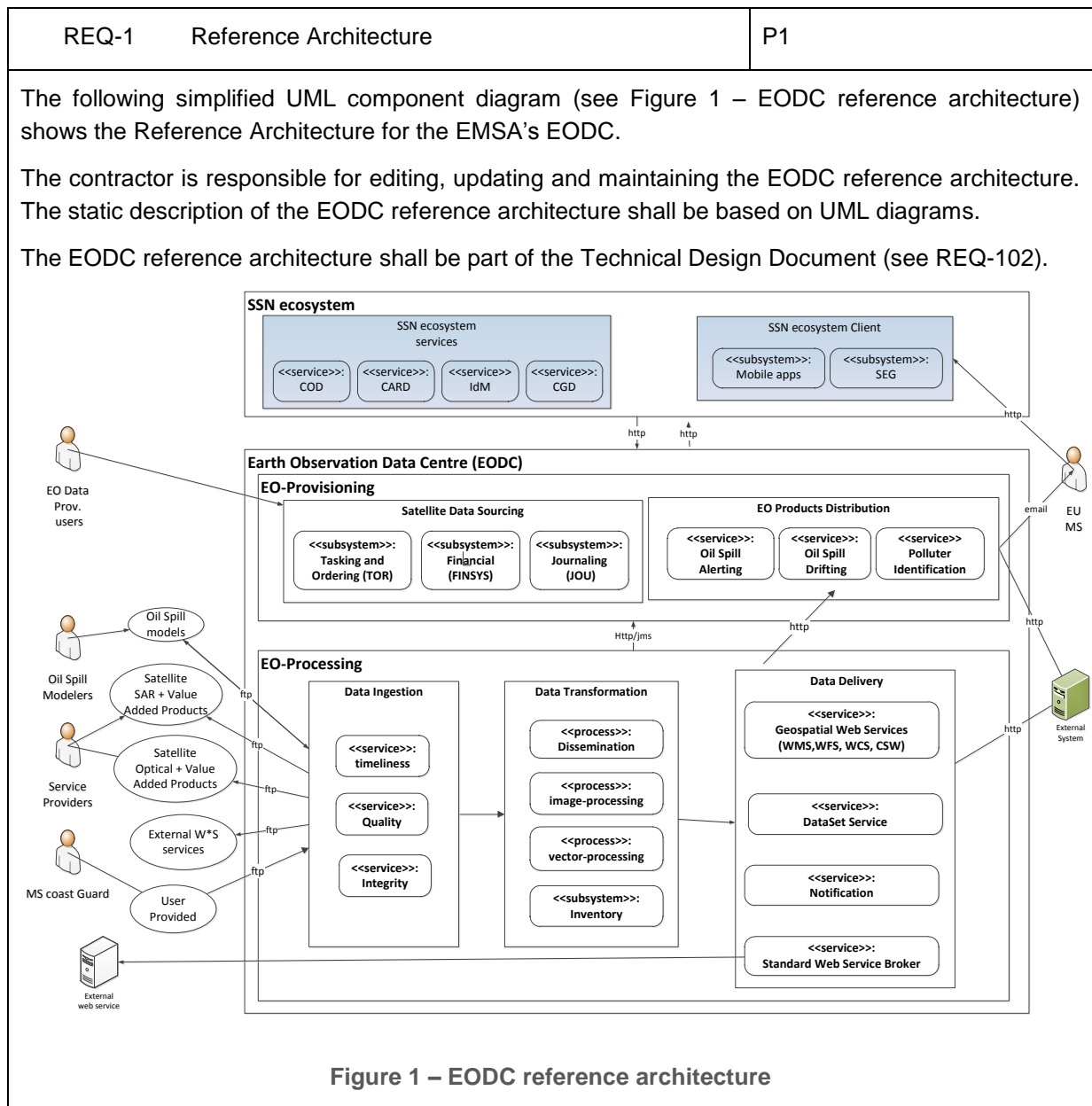
The scope of this TS is to implement a multi-communities and multi-sensors Earth Observation Processing (EO-Processing) that shall:

- seamless acquire new EO sensors;
- decouple the EODC building blocks;
- provide EO information to a variety of user communities;
- ingest EO packages with very high performance in terms of timeliness and processing rate;
- be able to cope with a moderate increase in expected number of users and data volume without impacting the architecture of the system and simultaneous processing of a number of incoming EO products (scalability);
- validate the data quality in terms of integrity and accuracy;
- harmonize and rationalize EMSA’s technologies by avoiding the duplication deployed technologies;
- decrease the dependency from technological providers by adopting standard solutions;

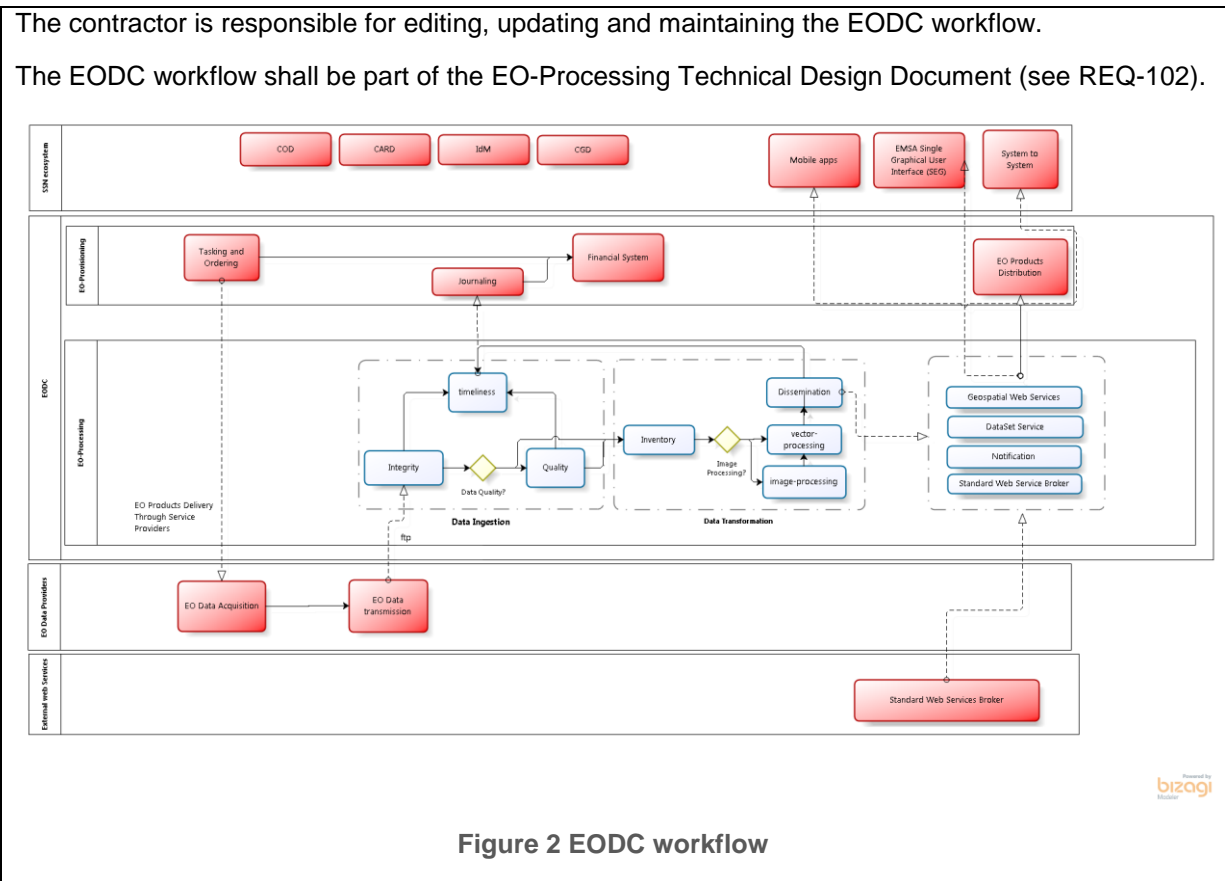
- systematically assess performance of the system (monitoring);
- phasing out the current EODC (ex CSNDC) with the understanding that the capabilities supported today and existing data shall be maintained in the new EO-Processing “Data Ingestion”, “Data Transformation” and “Data Delivery” building blocks.

## 6. Architecture Requirements

### 6.1 Earth Observation Data Centre Architecture



REQ-2	EODC standard workflows	P1
The overall workflow of the EODC is presented in Figure 2 EODC workflow.		



REQ-3	Workflow Management	P1
<p><b>Requirements</b></p> <p>The EODC workflow management shall provide the means to an EMSA workflow administrator to create, execute, and monitor the EODC workflows, as requested for example in the requirements REQ-2.</p> <p>Whether a process is part of a workflow depends on specific conditions. A condition is a combination (AND/OR) of some criteria as for example: type of EO products, type of operation, and data format. This information is embedded either in the data or in the metadata of the EO packages to be processed.</p> <p>The contractor shall propose, install, and configure a tool to manage the EODC workflow. The tool has to be generic enough to add conditions to manage any process included in the EODC reference architecture. The tool should provide a graphical user interface to manage (create, delete or update) the condition to apply at the processes defined within the workflow.</p> <p><b>Expected Deliverables</b></p> <ol style="list-style-type: none"><li>Creation of the standard EODC workflows using the tools.</li></ol> <p><b>Acceptance Criteria</b></p> <ol style="list-style-type: none"><li>End to End test shall be performed to assess this requirement (see REQ-99).</li></ol>		

## 6.2 Integration of the EO-Processing with the SSN ecosystem building blocks

REQ-4	Integration	P1
<p><i>Requirements</i></p> <p>The integration of the EO-Processing with other EMSA's building blocks is governed by the ICD (see REQ-100). The contractor of the EO-Processing system is in charge to manage the EODC ICD.</p> <p>The integration of a component is considered completed when the all the subsystems that belong to the EO-Processing can perform the expected functionalities.</p> <p>The integration tasks include also:</p> <ul style="list-style-type: none"> <li>- Analyse issues reported by EMSA and provide a solution.</li> <li>- Identify bottleneck and troubleshooting the issues reported by EMSA.</li> <li>- Perform tests to verify the integration among the EODC components.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. End to end test is conducted in order to asses if the integration took effect (see REQ-99).</li> </ul>		

REQ-5	SSN ecosystem	P1
<p><i>Requirements</i></p> <p>The contractor is in charge to integrate the EO-Processing building blocks within the SSN ecosystem. The contractor shall take into account the business architecture presented in the Appendix SSN ecosystem.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. Test cases (based on a web service testing application for Service Oriented Architecture, i.e. SOAPUI) with a combination of possible requests from the SSN Ecosystem components to the EO-Processing Data Delivery.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. All the tests cases created shall succeed.</li> </ul>		

REQ-6	Satellite Data Sourcing	P1
<p><i>Requirements</i></p> <p>The contractor is in charge to integrate the EO-Processing building blocks with the "Satellite Data Sourcing" (see REQ-1) (Tasking and Ordering, Financial System, Journaling), whether this building block is the one currently in use in CSNDC (see "CSNDC Interface Control Document"), or it will be procure as a new building block (see the Lot2/Module1 Technical Specification). The integration is governed by the ICD (see REQ-100).</p>		

*Acceptance Criteria*

- i. The end-to-end test is successfully conducted (see REQ-99).

## REQ-7 EO Products Distribution

P1

*Requirements*

The contractor is in charge to integrate the EO-Processing building blocks with the EO Products Distribution (see REQ-1), whether this building block is the one currently in use in CSNDC (see “CSNDC Technical Design Document”) or will be procure as a new building block. The integration is governed by the ICD (see REQ-100).

*Acceptance Criteria*

- i. The end-to-end test is successfully conducted (see REQ-99).

## REQ-8 SEG

P1

*Requirements*

EMSA is implementing the single front-end platform (i.e. a single Graphical User Interface, hereafter SEG). This SSN Ecosystem GUI will be the front-end of the different maritime services, and as such will be the common platform to display and perform operations on, inter-alia, SSN information (e.g. ship, voyage, incident and hazmat data, as well as STMID information), vessel positions (e.g. T-AIS, LRIT, SAT-AIS, VMS, Radar, etc.), Earth Observation related products (e.g. satellite imagery, oil spill detections, vessel detections, etc.), alerts, incidents, and ancillary data (e.g. met-ocean), following the existing business rules.

The EO-Processing provides EO information to this tool through the Data Delivery building block. The contractor is in charge to implement this building block as specified in this TS, and guarantee its integration with the SEG. The integration is governed by the ICD (see REQ-100).

For additional information the bidder shall make reference to the Appendix SEG.

*Expected Deliverables*

- i. A test case with a combination of possible criteria specified into the SEG technical documentation shall be created.

*Acceptance Criteria*

- i. All the tests cases created shall succeed.

## REQ-9 CARD

P1



*Requirements*

When a request is performed against EO-Processing Data Delivery services. The EO-Processing service shall authorize the request against the “Authorization service” exposed by the Central Access Rights Database (CARD).

In case the request is not authorized an answer shall be provided stating the unavailability of the data requested. The answer shall be configurable. Otherwise if the access is granted, the requester shall receive the information.

For additional information about the “Authorization service”, the contractor shall make reference to the Appendix CARD.

*Expected Deliverables*

- i. A package to deploy this subsystem.
- ii. A test case with a combination of possible criteria specified into the CARD technical documentation shall be created.

*Acceptance Criteria*

- i. All the tests cases created shall succeed.

REQ-10	Access and Identity Management (IdM)	P1
<i>Requirements</i> <p>The EMSA Access and Identity Management system provides the authentication capabilities for all the EMSA systems.</p> <p>Whether it is necessary to include this type of information within an EO-Processing workflow, the contractor is in charge to integrate the EO-Processing building blocks with the EMSA Identity Management system, additional information is provided in the Appendix IdM.</p> <p>The contractor shall integrate the IdM with the EO-Processing.</p>		
<i>Acceptance Criteria</i> <ol style="list-style-type: none"> <li>i. The end-to-end test is successfully conducted (see REQ-99).</li> </ol>		

REQ-11	Central Geo-Reference Database (CGD)	P1
<i>Requirements</i> <p>The EMSA geoRegistry service provides through an OGC-WFS interface several types of Area of Interest implemented for a variety of EMSA’s use cases. Whether it is necessary to include this type of information within an EO-Processing workflow, the contractor shall make use of the geoRegistry service.</p> <p>For additional information the contractor shall make reference to the Appendix CGD.</p>		
<i>Acceptance Criteria</i>		

- |  |
|--|
| i. The end-to-end test is successfully conducted (see REQ-99). |
|--|

REQ-12	Integration approach	P1
<p><i>Requirements</i></p> <p>In order to replace the current CSNDC with the new EODC, the overall EODC strategy shall be based on “phased adoption” instead of “big-bang adoption”.</p> <p>Phased adoption means that the deployment of the new component within the EODC will happen in several phases.</p> <p>The EODC architecture shall enable EMSA to evolve and maintain specific building block in a modular manner.</p> <p>The contractor shall guarantee the continuity of the business provided by the CSNDC building blocks not phase-out from the EODC architecture.</p> <p>To implement all the requirements described within this TS three releases shall be planned. During the Design phase the contractor shall propose the list of the requirements that will be part of release 1.0, release 2.0 and release 3.0.</p> <p>The contractor is in charge to draft how to implement the EODC integration approach (Integration plan).</p> <p><i>Expected Deliverables</i></p> <p>i. Integration Plan.</p> <p><i>Acceptance Criteria</i></p> <p>i. An end-to-end test is conducted in any phase of the plan (see REQ-99).</p>		

### 6.3 System Requirements

REQ-13	System Quality	P1
<p><i>Requirements</i></p> <p>The contractor shall design, develop and deploy a solution that implements the following system attributes: availability, interoperability, scalability, maintainability, modularity, portability, recoverability, reliability, robustness, fault tolerance.</p> <p>The contractor shall describe how he intends to: (i) implement, (ii) regularly measure (based on SMART criteria), and (iii) assess the quality of its proposal for each of the requested system attributes. When agreed by EMSA those criteria and their assessment will take effect for the duration of the FWC.</p> <p>The contractor shall present a plan to recovery the situation in case the quality of the system is considered not compliant against the expected outcomes.</p> <p>The contractor is in charge to draft the “system quality” document.</p>		

*Expected Deliverables*

- i. “System Quality” document.

*Acceptance Criteria*

- i. Assess the system quality.

REQ-14	COTS	P1
<p><i>Requirements</i></p> <p>EMSA considers as advantage a solution that makes use of COTS.</p> <p>COTS could be either open source or proprietary.</p> <p>The contractor shall provide a list of the COTS that will be included in the solution as part of the Reference Architecture proposed by the contractor (technology viewpoints).</p> <p>For each of the COTS included in the solution the contractor shall provide the following information: (1) the type of licence, (2) reference documentation, and (3) the changes at the COTS that are necessary to implement the EO-Processing requirements.</p> <p>During the EODC FWC whereas a new version of the COTS is available, the contractor shall provide a technical assessment in order to evaluate the impact to upgrade the COTS deployed into the EO-Processing. EMSA can request to perform a test to verify the analysis performed by the contractor. If the new version of the COTS can be deployed without changes in the EO-Processing, within the context of the corrective maintenance of this FWC (module 2), EMSA can request to the contractor to upgrade the system with a new version of the COTS.</p> <p>Whereas changes of standard COTS are needed for implementing the EO-Processing capabilities, if it is possible, the contractor shall provide a plan to include those changes in one of the future releases of the COTS.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. COTS report.</li> <li>ii. Technical Assessment.</li> <li>iii. Package to be installed.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. An end-to-end test is conducted (see REQ-99).</li> </ul>		

REQ-15	Service Oriented Architecture	P1
<p>The contractor shall design, implement and deploy a solution following the Service Oriented Architecture approach.</p>		

## 7. Requirements Viewpoints

### 7.1 Enterprise viewpoint

#### 7.1.1 User Communities

REQ-16	User communities	Informative
<p>The Earth Observation System (EO-Processing) will cater to the needs of a wide range of user communities in the maritime domain. These include:</p> <ul style="list-style-type: none"> <li>▪ Border Control.</li> <li>▪ Fisheries Control.</li> <li>▪ Maritime Security and Safety.</li> <li>▪ Customs.</li> <li>▪ General Law Enforcement.</li> <li>▪ Marine Environment.</li> <li>▪ Defence.</li> </ul> <p>Within the context of the EO-Processing a “user community” could be also called “operation”.</p>		

REQ-17	User communities – high level needs	Informative
<p><i>Requirements</i></p> <p>Each user community has a wide set of operational needs that can be tackled using EO services:</p> <ul style="list-style-type: none"> <li>▪ Border Control <ul style="list-style-type: none"> <li>○ Coastal monitoring (detection of points of departure).</li> <li>○ Vessel detection activity.</li> </ul> </li> <li>▪ Fisheries Control <ul style="list-style-type: none"> <li>○ Fish cage and farm detection.</li> <li>○ Detection of non-reporting vessels.</li> <li>○ Characterization of fishing activities.</li> <li>○ Detection of illegal activities.</li> <li>○ Catch unloading and transshipment monitoring.</li> </ul> </li> <li>▪ Maritime Security and Safety <ul style="list-style-type: none"> <li>○ Location of vessels in distress.</li> <li>○ Location of persons in distress.</li> <li>○ Localization of non-reporting vessels.</li> <li>○ SAR support.</li> </ul> </li> </ul>		

- Marine Environment conditions.
- Location of missing vessels.
- Customs
  - Recognized maritime picture.
  - Detection and tracking of vessels of interest.
  - Detection of suspicious activities.
- Marine Environment
  - Pollution detection & Polluter identification (i.e. Oil Spill).
  - Slick evolution.
  - Pollution response support.
- Law enforcement
  - Detection and tracking of vessels of interest.
  - Detection of suspicious activities.
- Defence
  - Shoreline geospatial intelligence services.
  - Extended maritime surveillance.

The list of services is not limitative. New services may arise in the future. The system shall be designed in a way that it possible to configure new services.

### 7.1.2 Key Performance Indicators – KPIs

REQ-18 Product assumptions	Informative
<p>For the purpose of determining the EO-Processing KPIs, and as reference for the acceptance tests to be conducted, the following assumptions are made regarding size of the different products:</p> <ul style="list-style-type: none"> <li>▪ Imagery:               <ul style="list-style-type: none"> <li>○ SAR images: 1 GB single band.</li> <li>○ Optical image 3 GB multiple bands.</li> </ul> </li> <li>▪ Value added products               <ul style="list-style-type: none"> <li>○ Vessel detection product (XML with points): 1 product includes 1000 individual vessel targets.</li> <li>○ Activity detection product (XML with polygons + thumbnail images): 1 product includes up to 100 activity targets.</li> <li>○ Vector Change detection (XML with polygons + thumbnail images): 1 product includes up to 10 change detection targets. It should be noted that change detection is a specific type of activity detection.</li> <li>○ Raster Change Detection (output of a change detection algorithm comparing 2 or</li> </ul> </li> </ul>	

<p>more images). The output can be a raster or a vector layer but in any case, it will be a single object.</p> <ul style="list-style-type: none"> <li>○ Oil spill detection product (XML with polygons + thumbnail images): 1 product includes up to 30 oil spills.</li> <li>○ SAR derived (Wind and Wave): (400x400 km with 50m resolution).</li> </ul> <ul style="list-style-type: none"> <li>▪ User provided           <ul style="list-style-type: none"> <li>○ Incidents (XML plus video and images): 1 product includes 1 individual incident with attached content up to 100MB.</li> <li>○ CSN feedback (XML plus video and images): 1 product includes 1 individual feedback with attached content up to 200 MB.</li> <li>○ Generic Reports (XML plus video and images): 1 product includes 1 individual report with attached content up to 100 MB.</li> </ul> </li> <li>▪ External data: To be defined on a case by case basis.</li> </ul>
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REQ-19	Concurrent satellite acquisitions	P1
<p><i>Requirements</i></p> <p>The EO-Processing shall be able to process the following concurrent acquisitions (data sizes as defined in REQ-18):</p> <ul style="list-style-type: none"> <li>▪ Number of parallel acquisitions for SAR imagery (including additional vessel detection, oil spill and SAR derived products): <u>4 concurrent acquisitions.</u></li> <li>▪ Number of parallel acquisition for optical imagery (including additional vessel detection, activity detection and change detection products): <u>6 concurrent acquisitions.</u></li> <li>▪ Number of parallel acquisitions for Optical and SAR (reflecting a potential scenario of both types of data being delivered, and including all the value added products as defined in REQ-18): <u>8 concurrent acquisitions.</u></li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. EO-Processing is able to ingest and process the abovementioned products in parallel without violating the established performance requirements as defined in REQ-21.</li> <li>ii. End to End test shall be successfully conducted (see REQ-99).</li> </ul> <p>Note that concurrent acquisitions mean that products are made available at the EO-Processing at the same time.</p>		

REQ-20	EO-Processing daily satellite acquisitions	P1
<p><i>Requirements</i></p> <p>The EO-Processing shall be able to process on a daily basis the following number of products (data sizes as defined in REQ-18):</p>		

- Number of acquisitions for SAR imagery (including additional vessel detection, oil spill and SAR derived products): 20 acquisitions.
- Number of acquisitions for optical imagery (including additional vessel detection, activity detection and change detection products): 15 acquisitions.

Number of acquisitions for Optical and SAR (reflecting a potential scenario of both types of data being delivered, and including all the value added products as defined in REQ-18): 35 acquisitions.

*Acceptance Criteria*

- i. EO-Processing is able to ingest and process the abovementioned products in without violating the established performance requirements as defined in REQ-21.
- ii. End to End test shall be successfully conducted (see REQ-99)

REQ-21	EO-Processing– timeliness	P1
<p><i>Requirements</i></p> <p>The EO-Processing shall ingest (T0 is the beginning of the ingestion) and process the following products (as defined in REQ-18), including in the case of concurrent acquisitions as defined in REQ-19, making them available at the respective web services for the delivery (T1), according to the following timeliness:</p> <ul style="list-style-type: none"> <li>▪ SAR and optical imagery products: <ul style="list-style-type: none"> <li>○ Without image processing: 120 seconds (T1-T0)</li> <li>○ With image processing: 120 s for images up to 200 Mb + 1 Minute per additional 200 Mb.</li> </ul> </li> <li>▪ Value added products: 60 seconds (T1-T0) for vessel detection. 30 seconds for the remaining products (with exception for SAR wind and SAR Wave – timeliness will be defined afterwards).</li> <li>▪ User provided products: 10 seconds (T1-T0) (excluding downloading / uploading of rich content information (i.e. images or video)).</li> </ul> <p>T0 is defined as the moment were the products are available at the EO-Processing (i.e. at the EO-Processing FTP or at the W*S used for ingesting the information).</p> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>▪ End to End test shall be successfully conducted (see REQ-99). Timeliness kept in at least 95% of the cases (for a statistically significant sample and following the conditions established in REQ-22).</li> </ul>		

REQ-22	Representative Acquisition Set test	P1
<p><i>Requirements</i></p> <p>The contractor shall prepare Representative Acquisitions Set (at least 5 sets) that comprises a number of acquisitions as defined in the requirement REQ-20. Each acquisition shall be compliant</p>		

<p>with requirement REQ-18.</p> <p>The contractor shall implement a script that runs these Representative Acquisitions Set randomly over a configured amount of minutes. The script shall include also the requirement described REQ-19.</p> <p>In addition to the Representative Acquisitions Set defined by the contractor, EMSA can add other Representative Acquisitions. The number of runs should be at least 40 per dataset.</p> <p><i>Acceptance Criteria</i></p> <p>The acquisition processes is accepted if the all the Representative Acquisition Set are acquired within the timeless defined in the requirement REQ-21.</p>
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7.2 Information viewpoints

7.2.1 Data Sources

REQ-23	Data sources	P1
<p>There are four main data sources that need to be handled by the EO-Processing:</p> <ul style="list-style-type: none"><li>• Optical imagery.<ul style="list-style-type: none"><li>○ Image products.</li><li>○ Value added products.</li></ul></li><li>• Radar imagery (Synthetic Aperture Radar).<ul style="list-style-type: none"><li>○ Image products.</li><li>○ Value added products.</li></ul></li><li>• User Provided information (including content from mobile).<ul style="list-style-type: none"><li>○ User feedback (e.g.: feedback on CleanSeaNet oil spill detections).</li><li>○ Incident data.</li><li>○ Other reports.</li></ul></li><li>• External data from other systems.<ul style="list-style-type: none"><li>○ Oil spill modelling information.</li><li>○ External Standard Web Services and Data (i.e. from Copernicus Marine Services).</li></ul></li></ul> <p>The following figure provides an overview of the different data sources</p> <pre>graph LR     EO[EO DC Data Sources]     EP[External providers] --&gt; EO     UP[User Provided&lt;br/&gt;(including from mobile platforms)] --&gt; EO     OI[Optical Imagery] --&gt; EO     RI[Radary Imagery] --&gt; EO     EP --- EP_L[Model data&lt;br/&gt;Other Services (My Ocean)]     UP --- UP_L[Incident data&lt;br/&gt;Reports (fisheries control, inspection, etc.)&lt;br/&gt;CSN feedbacks]     OI --- OI_L[Basic Products&lt;br/&gt;Value Added Products&lt;br/&gt;All available missions compliant with]     RI --- RI_L[Basic Products&lt;br/&gt;Value Added Products&lt;br/&gt;All available missions compliant with]     OI_L --- OI_LL[Vessel Detection&lt;br/&gt;Activity Detection&lt;br/&gt;Change Detection]     RI_L --- RI_LL[Oil spill detection&lt;br/&gt;Vessel detection&lt;br/&gt;Wake detection]</pre> <p><b>Figure 3 Data Sources</b></p>		



The description of the different data formats (when available) is defined in REQ-101.

REQ-24	Data types	P1
<p>The EO-Processing needs to handle highly variable data types, stemming from the different data sources. These include:</p> <ul style="list-style-type: none"><li>▪ Vector data (point, line, and polygon).</li><li>▪ Raster data (single band, multiband).</li><li>▪ Coverage data (i.e. GeoTIFF, NetCDF, JPEG2000).</li><li>▪ (in future) Rich content (images /video) from users (CSN feedbacks and user provided mobile content).</li><li>▪ (in future) Other content (structured content (i.e. XML), text, etc.).</li></ul> <p>The following figure provides an overview of the different data sources</p>		
<p><b>Figure 4 Data Types</b></p> <p>The description of the different data formats (when available) shall be defined on the basis of REQ-101.</p>		

REQ-25	EO Product	P1
<p><i>Requirements</i></p> <p>An EO product contains information provided or extracted through an observation on the surface of the planet Earth. For example an EO product is a satellite image as well as an oil spill feature detected from a satellite image.</p> <p>A preliminary list of the EO Product to ingest into the EO-Processing is going to be specified in Appendix CSNDC-ICD.</p> <p>The contractor is in charge to implement the necessary EO-Processing subsystem in order to ingest all the EO products as described in the see REQ-100 and REQ-101.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"><li>i. Packages to deploy within the EO-Processing Acquisition and Delivery building blocks.</li></ul> <p><i>Acceptance Criteria</i></p>		

- |   |
|---|
| i. An end-to-end test shall be successfully conducted (see REQ-99). |
|---|

REQ-26	EO Package	P1
<p><i>Requirements</i></p> <p>EO product shall be bounded in packages, a package could contains both vector and raster data. Each package shall be self-contained usually bounded in a compressed file (zip, tar, etc.)</p> <p>A preliminary list of the EO Packages to ingest into the EO-Processing is specified in the Appendix CSNDC-ICD.</p> <p>The contractor is in charge to implement the necessary EO-Processing subsystems in order to ingest all the EO products based on packages as described in the requirements REQ-100 and REQ-101.</p> <p><i>Expected Deliverables</i></p> <p>i. Packages to deploy within the EO-Processing Acquisition and Delivery building blocks.</p> <p><i>Acceptance Criteria</i></p> <p>i. An end-to-end test shall be successfully conducted (see REQ-99).</p>		

REQ-27	EO Acquisition	P1
<p>An EO Acquisition is a combination of different EO products delivered by the SP in a format of EO Packages.</p> <p>The contractor shall implement a system that it is capable to ingest all the EO products that belong to an EO Acquisition and control its completeness (see 7.3.1.1).</p> <p>For example in case of SAR satellite acquisitions for oil spill monitoring, CleanSeaNet Service, EMSA could receive the following packages:</p> <ol style="list-style-type: none"> <li>I. EO product SAR-Native1 image (EOP).</li> <li>II. Oil spill notifications (OSN).</li> <li>III. SAR Derived products (DER).</li> <li>IV. SAR Vessel Detection (DER).</li> <li>V. Oil spill warnings (OSW).</li> <li>VI. Quality notification (QNO).</li> <li>VII. Quality Report (QUA).</li> </ol> <p>Acceptance criteria</p> <p>i. An end-to-end test is conducted (see REQ-99).</p>		

REQ-28	EO Data Schema compliant against OGC-	P1
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SWE	
<p><i>Requirements</i></p> <ul style="list-style-type: none"> <li>i. In order to cope with the requirements to access to different varieties of sensors data, and to alleviate the need to create and support a wide range of sensor specific and community specific data formats, the contractor shall implement the schemas (see REQ-101) compliant against the OGC Sensor Web Enablement (SWE).</li> <li>ii. For derived information from an EOP products, either optical or radar, as for example oil spill feature or the vessel detected, the contractor shall establish a common schema model, this schema model shall be called Derived EO profiles. The Derived EO profile shall be compliant with the SWE-OGC specification.</li> </ul> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. Review version of the schema defined within the CSNDC EICD.</li> <li>ii. Definition of the common schema for EO derived products.</li> <li>iii. Editing the EO derived products Engineering Reports (see <a href="http://www.opengeospatial.org/standards">http://www.opengeospatial.org/standards</a>).</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. EO-Processing's schemas compliant against the OGC SWE specification.</li> </ul>	

### 7.2.2 Data lifespan

REQ-29 Data retention – time span	P1
<p><i>Requirements</i></p> <p>The EO-Processing shall retain all ingested data, available for the delivery (see chapter 7.3.3), for a configurable data retention period (by default 6 months). This data retention policy implies the immediate retrieval of the data for the abovementioned period. After this period the data shall be archived as described in the chapter 7.3.2.1.</p> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. EO-Processing fulfils all defined performance requirements with the data time span period for operational data in the system.</li> </ul>	

### 7.2.3 Data volume

REQ-30 Volume of data	P1
<p><i>Requirements</i></p> <p>It is expected that the EO-Processing shall be able to manage data, and maintain the defined performance, for the time span defined in REQ-29. It is estimated that these levels reach:</p>	

- 1) 4 Terabytes of SAR image products.
- 2) 10 Terabytes of Optical image products.
- 3) 600 GB of user uploaded content.

Please note that these values do not include intermediary products used for internal processing purposes and value adding information, for which the size is considered negligible when compared with the abovementioned categories.

*Acceptance Criteria*

- i. EO-Processing is able to ingest process and deliver the abovementioned products in without violating the requested performance described within this Technical Requirements.

#### 7.2.4 Data format

REQ-31	Data Formats	P1
<p>The EO-Processing should maintain a single format for all operational data. If updates are made to the data types (as defined in the REQ-100) the contractor shall implement a subsystem that reformats the existing data to update to the latest version of the respective format definition.</p> <p>When a new data format is implemented there will be a transition period when both formats shall be handled.</p> <p>Acceptance criteria</p> <ol style="list-style-type: none"> <li>i. The databases used in the EO-Processing system are kept in the latest format for all stored products / data types. Upgrading to a new format will trigger a reformatting of existing data (for the time span defined in REQ-29).</li> </ol>		

### 7.3 Service viewpoint

#### 7.3.1 Data Ingestion

REQ-32	Data Ingestion	Information
<p>Within the context of the Data Ingestion EO-Processing building block the contractor shall implement at least the following components:</p> <ul style="list-style-type: none"> <li>- Data Integrity, to validate and data to be ingested in terms of the data model, format, and integrity.</li> <li>- Data Quality, to assess the quality of the data to be ingested against the operational need.</li> <li>- Timeliness, to record the timestamp of the relevant processes during the ingestion.</li> </ul>		

REQ-33	Delivering of the EO products by the SP	P1
<p><i>Requirements</i></p> <p>The EO products to acquire by the EO-Processing are delivered by the SPs to the EO-Processing</p>		

through FTP (see REQ-94). The contractor shall implement a subsystem that download the EO products from the EMSA's FTP service and start the EODC workflow.

*Expected Deliverables*

- i. A Package to deploy this subsystem.
- ii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- iii. Test Plan and test cases implemented.

*Acceptance Criteria*

- i. End to End test shall be successfully managed (see REQ-99).

REQ-34	Compliance-Notification	P1
<p><i>Requirements</i></p> <p>A compliance-notification is an EODC component based on e-mail mechanism. The contractor shall implement a component to configure the EODC's compliance-notifications. The content of a compliance-notification (subject and body) and the list of recipients shall be configurable.</p> <ol style="list-style-type: none"> <li>i. The following macro events trigger e-mail compliance-notifications: <ul style="list-style-type: none"> <li>o Package rejection (see data integrity and quality controls).</li> <li>o Packages not ingested (due to technical issues).</li> <li>o Packages successfully ingested.</li> </ul> </li> <li>• For each event there is dynamic distribution list to generate, which depends for example on the service providers that was in charge to deliver the EO packages.</li> <li>• A compliance-notification shall be issued within 3 seconds since the event is detected (recorded in a log).</li> </ol> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>• A Package to deploy this subsystem.</li> <li>• TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>• Test Plan and test cases implemented.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>• End to End test shall be successfully managed (see REQ-99).</li> </ul>		

REQ-35	User-generated content	P2
<p>The contractor shall implement a component that can ingest, process and deliver User generated content. User-Generated context are, but not limited: CSN feedbacks, reports from mobile devices and all other uploaded content from users (in the future this list could also include information provided by citizen through social media). This component shall deal with:</p>		

- Structured content delivered using web-services (REST, SOAP, API, etc.), including content coming from mobile devices;
- Data packages (for example OGC-geopackage or ESRI geodatabase) that include rich-content attachments. This content will need to be handled by the EO-Processing and includes:
  - Images.
  - Video.
  - Documents.

#### 7.3.1.1 Data Integrity

REQ-36	Integrity of incoming files	Informative
<p>The main scope of Data Integrity component is to check if the incoming EO packages are: uncorrupted, complete and compliant with EMSA protocols and data models and formats.</p> <p>The outcomes of the Data Integrity analyses will be used to ensure that corrupted or not adequate EO packages and files are promptly identified and rejected to avoid ingestion of unsuitable data into the system.</p>		

REQ-37	Completeness of acquisition	Informative
<p>The contractor is in charge to implement a subsystem that shall control and report about the completeness of the ingestion against the expected set of EO packages. Detailed description of EO Acquisitions structure, naming convention and content shall be provided in ICD (see REQ-100). For example currently, in case of SAR satellite acquisitions, EMSA could receive by the SP the following packages:</p> <ul style="list-style-type: none"> <li>▪ EO product SAR-Native1 image (EOP).</li> <li>▪ Oil spill notifications (OSN).</li> <li>▪ SAR derived products (DER).</li> <li>▪ SAR Vessel Detection layer (DER).</li> <li>▪ Activity detection (ACT).</li> <li>▪ Oil spill warnings (OSW).</li> <li>▪ Quality notification (QNO).</li> <li>▪ Quality Report (QUA).</li> </ul> <p>Timeliness of packages arrival is not constant.</p>		

REQ-38	Integrity of incoming files	P1
<p><i>Requirements</i></p> <p>EO data are delivered to EMSA in compressed files using the following formats: .zip, .tar, .tgz.</p> <p>The contractor shall make available a software component capable to do the following:</p> <ul style="list-style-type: none"> <li>▪ Decompress in-coming compressed EO packages considering the mentioned formats.</li> <li>▪ Identified and rejected corrupted files.</li> <li>▪ Handle up to 5 GB compressed files.</li> <li>▪ Handle a number the number of files as described in KPIs chapter (see 7.1.2)</li> <li>▪ Respect the timeliness described in KPIs (see 7.1.2)</li> </ul> <p><i>Expected Deliverables</i></p> <ol style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ol> <p><i>Acceptance Criteria</i></p> <ol style="list-style-type: none"> <li>i. End to End test shall be successfully managed (see REQ-99).</li> </ol>		

REQ-39	Integrity of incoming files – Additional criteria	P2
<p>It will be considered advantageous if the contractor shall make available a software component capable to do the following:</p> <ul style="list-style-type: none"> <li>▪ Handle compressed files bigger than 5 GB.</li> <li>▪ Handle additional compressing format than zip, .tar, .tgz.</li> </ul> <p><i>Expected Deliverables</i></p> <ol style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ol> <p><i>Acceptance criteria</i></p> <ol style="list-style-type: none"> <li>i. End to End test shall be successfully managed (see REQ-99).</li> </ol>		

REQ-40	Compliance of packages data schema	P1
<p><i>Requirements</i></p> <p>The contractor shall make available a software component capable to do the following:</p> <ul style="list-style-type: none"> <li>▪ Check the validity (well formed) of the XML schema for each EO in-coming package.</li> </ul>		

- Check that each EO package's XML is conformal with XML Schema Definition (XSD) provided in the requirements REQ-100.
- Identified and rejected packages that are not valid or non-compliant with the appropriate XSD (see bad folder requirement).

In case this test fails a compliancy-notification shall be issued.

*Expected Deliverables*

- i. A Package to deploy this subsystem.
- ii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- iii. Test Plan and test cases implemented.

*Acceptance Criteria*

- i. End to End test shall be successfully managed (see REQ-99).

REQ-41	List of EO package	P1
<p><i>Requirements</i></p> <p>The contractor shall implement a subsystem to be invoked by the Service Providers before starting the delivery of expected EO packages. The Service Providers shall declare the list of the EO packages that it is going to deliver to the EO-Processing.</p> <p>In case this test fails a compliancy-notification shall be issued.</p> <p><i>Expected Deliverables</i></p> <ol style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ol> <p><i>Acceptance Criteria</i></p> <ol style="list-style-type: none"> <li>i. End to End test shall be successfully managed (see REQ-99).</li> </ol>		

REQ-42	MD5 web service	P1
<p><i>Requirements</i></p> <p>The contractor shall implement a web service to be invoked by the Service Providers before the delivery of the EO Products to the EO-Processing. The Service Providers shall declare the filename (mandatory) and the computed MD5 (mandatory).</p> <p><i>Expected Deliverables</i></p> <ol style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ol>		



*Acceptance Criteria*

- iv. End to End test shall be successfully managed (see REQ-99).

REQ-43	EO product ingestion control	P1
<p><i>Requirements</i></p> <p>The contractor shall implement a control within the EO-Processing Acquisition building block where the EO products acquired by the ingestion can be evaluated against both the declared list of products to ingest (see REQ-41) and the MD5 (see REQ-42).</p> <p>In case a product is not compliant against the above controls a compliancy-notification shall be issued.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. End to End test shall be successfully managed (see REQ-99).</li> </ul>		

REQ-44	EO data packages check based on Reference Identifiers	P1
<p><i>Requirements</i></p> <p>The contractor shall implement a subsystem which checks that EO data packages ingested correspond with EO data packages expected. The list of the expected EO data packages can be obtained using the Reference Identifier querying the Tasking and Ordering.</p> <p>This subsystem shall also perform spatial and temporal control, based on the metadata of the data packages, for example the time and location of the data package ingested are as ordered.</p> <p>In case this control fails a compliancy-notification shall be issued.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. End to End test shall be successfully managed (see REQ-99).</li> </ul>		

## 7.3.1.2 Data Quality

REQ-45	Main scopes	Informative
<p>The main scope of the Quality Component is two-folded:</p> <ul style="list-style-type: none"> <li>i. Check the quality of the EO basic products (optical and radar imagery) against defined image characteristics.</li> <li>ii. Verify the quality of in-coming EO data against ordering specifications defined within the EO-Provisioning building blocks.</li> </ul>		

REQ-46	Quality packages associated to EO satellite acquisitions	Informative
<p>Information regarding quality analyses conducted by EMSA contractors on EO products are contained in two packages (see REQ-37):</p> <ul style="list-style-type: none"> <li>i. Quality Notification (QNO).</li> <li>ii. Quality report (QUA).</li> </ul> <p>Detailed definition of packages and associated XML schemas is available in the attached version of the EICD (see Appendix CSNDC-ICD).</p> <p>EMSA will require service providers to conduct additional and more stringent quality check before delivering EO products. The parameters defining the outcomes of quality analyses will be included in the quality packages.</p>		

REQ-47	Quality of the delivered EO products	Informative
<p>EO acquisitions and added value products are tasked and ordered in the Satellite Data Sourcing building block. During this phase several parameters are defined, such as (preliminary list of control):</p> <ul style="list-style-type: none"> <li>i. Area of interest (Aoi).</li> <li>ii. Acquisition time interval (start date/time – stop date time).</li> <li>iii. Requested satellite mission (platform, sensor).</li> <li>iv. Delivery category.</li> <li>v. Image Processing level.</li> <li>vi. Imaging Bands.</li> <li>vii. Mapping projection.</li> <li>viii. Cloud cover threshold.</li> <li>ix. Image Resolution.</li> </ul> <p>These pieces of information are stored in the data provision interface (TOR) database. The contractor is in charge to implement a module to access to this information based on SOA</p>		

approach.

The list of these controls is considered preliminary and it could be extended by EMSA in the future.

The implementation of this preliminary list of controls is considered part of this specific contract. Additional controls to implement on top of this preliminary list shall be considered as part of the system evolution, and therefore they are out of the scope of this specific contract.

REQ-48	Quality checks based on the metadata	P1
<p><i>Requirements</i></p> <p>The contractor shall implement a subsystem that performs the following quality checks</p> <ul style="list-style-type: none"> <li>i. Control quality parameters of EO basic products contained in QNO and QUA packages provided by EMSA EO service providers. This will be achieved by comparing quality values contained in QNO and QUA packages against reference values and thresholds (e.g. cloud coverage in an optical image shall be less than 20%).</li> <li>ii. Verify that the characteristics of a specific EO acquisition are aligned with ordering requirements. This will be achieved by comparing ordering parameters against acquisition parameters contained in image's metadata.</li> </ul> <p>In case this control fails a compliancy-notification shall be issued.</p> <p>This (these) software component(s) will be mainly used off-NRT (Near Real Time) and, therefore, the performance may not respect timeliness provided in 7.1.2.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. End to End test shall be successfully managed (see REQ-99).</li> </ul>		

REQ-49	Quality checks based on data	P2
<p><i>Requirements</i></p> <p>Quality checks defined in REQ-48 rely on outputs of quality analysis conducted by third parties (i.e. EMSA EO service providers).</p> <p>The contractor shall implement a subsystem that performs additional checks on acquired EO products to verify quality parameters.</p> <p>The contractor can optionally propose a single or multiple software components capable to verify:</p> <ul style="list-style-type: none"> <li>i. Cloud covers percentage.</li> <li>ii. Radiometric quality.</li> </ul>		

- iii. Positional accuracy considering given RCPs (Reference Control Points).
- iv. Matching coverage against defined Areas of Interest.

The contractor shall provide technical documentation describing how he intends to perform these controls.

This software component will be used off-NRT (Near Real Time) and, therefore, the performance may not respect timeliness provided in 7.1.2.

*Expected Deliverables*

- i. Technical documentation describing envisioned procedures to accommodate the quality checks.

*Acceptance Criteria*

- i. End to End test shall be successfully managed (see REQ-99).

### 7.3.1.3 Timeliness

REQ-50 – TimeStamp	P1
<p><i>Requirements</i></p> <p>The contractor shall implement a subsystem for recording the timestamp of all the EO-Processing processes when an ingestion of an EO product takes place. At least the following TimeStamp need to be processed.</p> <ul style="list-style-type: none"> <li>i. When the MD5 service is called</li> <li>ii. When the EO product is completely uploaded on the ftp service</li> <li>iii. When any of the EO-Processing Acquisition subsystems is completed</li> <li>iv. When the image-processing completed</li> <li>v. When the Dissemination is completed</li> </ul> <p>The recording of the timestamp can be configurable (ON/OFF). If it is OFF none of the processes timestamps are recorded. To switch from ON/OFF mode shall not require restarting neither the EO-Processing system nor any related components.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. End to End test shall be successfully managed (see REQ-99).</li> </ul>	

REQ-51 – timeliness web service	P1
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*Requirements*

The contractor shall implement a subsystem where it is possible to request the TimeStamp of each EO data package associated with a reference identifier.

The subsystem shall implement the following search criteria: by EO product filenames OR by range of date/time.

The timeliness subsystem shall return all the TimeStamp collected during the ingestion process of the all EO data packages that matches the search criteria.

The results of the search criteria shall be presented in HTML and they shall be also downloadable in XML format.

The subsystem shall reply in less than 1 second for search requests based on product filenames, reference identifier and package type, in less than 5 seconds for search request based on a range of 1 week.

The binding protocols to be supported by this service shall be REST.

*Expected Deliverables*

- i. A Package to deploy this subsystem.
- ii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- iii. Test Plan and test cases implemented.

*Acceptance Criteria*

- i. End to End test shall be successfully managed (see REQ-99).

REQ-52	Timeliness queue	P1
<i>Requirements</i> <p>The contractor shall implement a subsystem that provides the time stamps also through a message pattern architecture mechanism (i.e. Java Message Service - JMS) in order to provide the expected information to the Journaling (JOU) or its further evolution.</p> <p>The exchange of the time stamp message shall be configurable (ON/OFF). If it is OFF none of the processes' timestamp is recorded and exchanged with the JOU. To switch from ON/OFF mode shall not require restarting neither the EO-Processing system nor any related components.</p>		
<i>Expected Deliverables</i> <ul style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ul>		
<i>Acceptance Criteria</i> <ul style="list-style-type: none"> <li>i. End to End test shall be successfully managed (see REQ-99).</li> </ul>		

REQ-53	Re-ingestion timestamp	P1
<p><i>Requirements</i></p> <p>In case an EO product is re-ingested, the same EO package is acquired more than one time, and the timestamp recording is ON a new entry is created in the timeliness component without modify or overwriting the TimeStamp recorded of EO products already ingested. The first ingestion timestamp has to be tagged as reference timestamp, it might be used for the price and budget computation (out of the scope of this specific contract).</p> <p>If there are more than one timestamp recorded for an EO product, the timeliness subsystem (see REQ-51) shall provide all the timestamps recorded for those products.</p> <p><i>Acceptance Criteria</i></p> <p>i. End to End test shall be successfully managed (see REQ-99).</p>		

REQ-54	Performance Overview	P1
<p><i>Requirements</i></p> <p>The contractor shall implement a subsystem in order to return the following information based on date/time range search criteria:</p> <ol style="list-style-type: none"> <li>Total number of EO products within the search range.</li> <li>For each EO product acquired within the search range the following information has to be provided: T0 and T1 as indicated in the requirement REQ-21.</li> </ol> <p>The subsystem shall reply in less than 5 seconds for a request based on a search range of 1 week.</p> <p>The results of the search criteria shall be presented in HTML and they shall be also downloadable in XML format.</p> <p>The binding protocols to be supported by this service shall be REST.</p> <p><i>Expected Deliverables</i></p> <ol style="list-style-type: none"> <li>A Package to deploy this subsystem.</li> <li>TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>Test Plan and test cases implemented.</li> </ol> <p><i>Acceptance Criteria</i></p> <p>i. Cross check the information provided by this web service with the one recorded in the timeliness subsystem.</p>		

### 7.3.2 Data Transformation

REQ-55	Data Transformation	Information
Within the context of the Data Ingestion EO-Processing building block the contractor shall		

implement at least the following components:

- Inventory to manage the data archiving policy.
- Image-processing, to transform raster data.
- Vector-processing, to transform vector data.
- Disseminator, to feed the Data Delivery services with the data ingested into the EO-Processing Data Delivery building block.

Specific requirements for the above mentioned subsystems are described within the context of this chapter.

### 7.3.2.1 Inventory

REQ-56	EO-Processing data access policy	P1
<p><i>Requirements</i></p> <p>The contractor shall implement the following data management policy (data are taken at time T0):</p> <ol style="list-style-type: none"> <li>i. Data with less than a configurable amount of days (T1, by default 6 months) shall be made available via DIRECT RETRIEVAL;</li> <li>ii. Data from T0 to a configurable amount of days (T2, T2&gt;T1, by default 5 years) shall be made available via DELAYED RETRIEVAL;</li> <li>iii. Data older than T2 shall be made available via MANUAL RETRIEVAL.</li> </ol> <p>DIRECT RETRIEVAL. Data can be accessed by EO-Processing's clients (either GUI or S2S) through the EO-Processing Delivery Services, the SLA applicable for this service are described in this technical specification.</p> <p>DELAYED RETRIEVAL. Data is retrieved within a time delay which could reach several hours, up to a day. The data products are not necessarily directly accessible, but stored such, that they can be reconstructed and made available to the user with a certain delay. The user shall request to restore the data using a graphical user interface which again is mostly web based or via S2S communication ready to access the data through EO-Processing Delivery Services upon their restore. The system will provide the data automatically without any manual intervention.</p> <p>MANUAL RETRIEVAL/ARCHIVING. Data is retrieved offline, with the manual intervention of an operator at EMSA, in a few days/weeks. In principle like delayed retrieval, but the request for the data will be made offline in a not standardised manner, e.g. via email to an EMSA account. This applies particularly, when products are requested which are of non-standard nature and need specific processing. However this manual retrieval can require a lot of resources and therefore it is good to design the systems such that most data retrievals will be performed via the immediate or delayed scheme.</p> <p>MANUAL RETRIEVAL/ARCHIVING is considered data that is backed-up and is not directly accessible by the system. This data and related supporting systems are managed by EMSA and do not fall under the scope of this procurement.</p> <p>The contractor shall implement a subsystem that allows the EO products and information ingested into the EO-Processing to be accessible via DIRECT RETRIEVAL (up to T1) and DELAYED RETRIEVAL (up to T2).</p> <p>The status of the dataset shall be documented in the dataset metadata. When an EO product is</p>		

eligible for been MANUAL TREIVAL/ARCHIVING the system shall move the product in a specific folder. EMSA is in charge to manage the EO products in such folder.

All the timings (i.e. T1 and T2) defined in this requirement shall be configurable. A new configuration shall not require the restarting of the system.

*Expected Deliverables*

- i. Software component/module implementing the EO-Processing data access policy.
- ii. Specific Test Plan to address the EO-Processing data access management policy implementation.

*Acceptance Criteria*

- i. To be evaluated upon each delivery/upgrade of the EO-Processing by executing the restore activities.
- ii. Successful run of the End to End test as specified in the section 5 of this document.

REQ-57 – Inventory	P1
<p><i>Requirements</i></p> <ul style="list-style-type: none"> <li>i. The contractor shall implement a subsystem that inventories all the EO packages ingested into the EO-Processing in order to be accessible via DIRECT RETRIEVAL and DELAYED RETRIEVAL.</li> <li>ii. While the catalogue service (see requirement REQ-85) deals with the description of the EO products ingested, this module deal with the storing capability of the physical files (for example in the current CSNDC implementation the storing capability is based on NetApp solution). These two services, inventory and catalogue shall contain consistent information. The catalogue metadata shall record the information where the EO products are stored.</li> <li>iii. The contractor shall propose an inventory that deals with DIRECT RETRIEVAL and DELAYED RETRIEVAL.</li> </ul> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. End to End test shall be successfully managed (see REQ-99).</li> </ul>	

REQ-58 Data packages	P1
<p>The data management policy described in this specification is applicable to all the data packages as described REQ-100.</p>	



<b>REQ-59</b>	EO-Processing data access functionalities	P1
<p><i>Requirements</i></p> <p>In order to limit the data to be managed for the DIRECT delivery, the subsystem that implements the EO-Processing data access policy shall implement the following functionalities:</p> <p><b>ON-DEMAND</b></p> <ol style="list-style-type: none"> <li>1- Disable for the EO packages the DIRECT RETRIEVAL based on data/time criteria: <ol style="list-style-type: none"> <li>a. Move all the EO packages older than T1 from the DIRECT RETRIEVAL inventory to the DELAYED RETRIEVAL inventory.</li> <li>b. Remove from the EO-Processing Data Delivery services all the EO information, raster and vector explicitly needed for DIRECT RETRIEVAL and which are older than T1.</li> <li>c. Update the metadata of the EO products catalogued with the status and inventory information (only DELAYED RETRIEVAL).</li> </ol> </li> <li>2- Disable the EO packages as specified in the point 1 based on package file name.</li> <li>3- Disable the EO package as specified in the point 1 based on EO Acquisition (therefore all the EO products and EO information associated to a satellite order form identifier).</li> </ol> <p><b>AUTOMATIC</b></p> <ol style="list-style-type: none"> <li>4- If the automatic mode is set ON the functionalities specified in the point 1 shall be executed at regular interval (every day at 01:00 AM UTC). The data management automatic mode shall be configurable (ON/OFF). To switch from one mode to the other shall not require restarting neither the EO-Processing system nor any related components.</li> </ol> <p><i>Expected Deliverables</i></p> <ol style="list-style-type: none"> <li>i. Software component/module implementing the EO-Processing data access policy.</li> <li>ii. Detailed test plan for the data moved from DIRECT RETRIEVAL to the DELAYED RETRIEVAL.</li> </ol> <p><i>Acceptance Criteria</i></p> <ol style="list-style-type: none"> <li>i. The data moved will be checked for validation and correctness in a sample approach. This sample approach will be detailed during project execution.</li> </ol>		

<b>REQ-60</b>	Restore of data	P1
<p><i>Requirements</i></p> <p>The contractor shall implement restore functionalities as following:</p> <ol style="list-style-type: none"> <li>i. The EO-Processing shall develop the functionalities of restoring the data from the DELAYED RETRIEVAL to the DIRECT RETRIEVAL.</li> <li>ii. This restore functionality shall ensure that once the data is back in the DIRECT RETRIEVAL, the data provides the same information as when it was originally in the DIRECT RETRIEVAL.</li> </ol>		

- iii. The restore functionality can be executed based on the data/time interval (for example all the EO acquisition that took place from 18/09/2014 13:30 to 28/09/2014 17:45).
- iv. The restore functionality can be executed based on EO acquisition (order form identifier) or also based on the EO package file name.
- v. Two types of notifications have to be generated when a restoring is requested. A notification that informs the user that the restoring request is accepted (within 10 minutes), and a notification that informs the users that the restoration is completed.

#### *Expected Deliverables*

- i. A Package to deploy this subsystem.
- ii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- iii. Test Plan and test cases implemented.

#### *Acceptance Criteria*

- i. To be evaluated upon each delivery/upgrade of the EO-Processing by executing the restore activities.
- ii. An acquisition shall be restored within 1 minute. Up to 1000 acquisitions the restoring performance shall be linear, for example for 75 acquisitions, 1 minute each = 75 minutes.

### 7.3.2.2 Image Processing

REQ-61	Image processing	Informative
<p>The main scope of the image processing component is to create all the conditions for an optimized display of EO products. This includes:</p> <ul style="list-style-type: none"> <li>▪ Appropriate and efficient visual representation of raster pixels values.</li> <li>▪ Corrected geo-location in a geo-referenced environment.</li> </ul>		

REQ-62	Brief description of EO SAR products utilized by EMSA	Informative
<p>SAR acquisitions are level 1 (SAR-Native1) product consisting of native, geo-referenced SAR images with azimuthal resolution ranging from 100m to 1m or less. SAR images are available in all possible combinations of polarisations e.g. either single (HH or VV), dual (HH+VV or VV+VH) or cross polarisation (HV or VH), according to the tasking of the satellite. Satellite platforms currently utilized by EMSA include: Radarsat-2, CosmoSky-Med, TerraSAR-X, Sentinel-1. Additional Radar satellites may shortly enter in the portfolio of EMSA.</p>		

REQ-63	Brief description of EO optical products utilized	Informative
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by EMSA	
Optical satellite acquisitions are panchromatic or multispectral with resolutions ranging from 30m to 0.3m or less. The processing levels range from geo-referenced to ortho-rectified. Optical satellites currently utilized by EMSA are: Worldview-1, Wordview-2, Worldview-3, GeoEye-1, SPOT 6/7 and Pleiades 1A/1B, DEIMOS-1 and 2, FORMOSAT-2, and LANDSAT-8.	

REQ-64	Formats	Informative
<p>Formats requested for the representation of satellite imagery include:</p> <ul style="list-style-type: none"> <li>i. GeoTIFF (including BigTIFF).</li> <li>ii. JPG2000 (ISO/IEC 15444 Lossless).</li> <li>iii. SAR Level-1 B (Sentinel-1, RS-2, TSX and Cosmo SkyMed).</li> <li>iv. Raw images and other satellite native formats as defined by satellite operators (to be defined).</li> </ul> <p>EMSA may also request EO service providers to provide Pyramidal Views (PVs) instead of original image. Note: PV files are GeoTIFFs that contain a pyramidal structure used to enhance visualization.</p>		

REQ-65	Image characteristics	Informative
<p>Satellite acquisitions are represented by single-band raster datasets (e.g. panchromatic images) or multi-band raster datasets (e.g. multi-spectral images).</p> <p>Pixel depth of the images is 8-bit and 16-bit although, exceptionally, 32-bit-images may be utilized by EMSA.</p> <p>All the images utilized by EMSA are in WGS84 system.</p>		

REQ-66	Creation of pyramid visualization of EO basic products in GeoTIFF format	P1
<p><i>Requirements</i></p> <p>Pyramidal visualizations (PVs) of EO products in GeoTIFF format (optical and radar) shall be produced to enhance performance of raster datasets visualization. The following characteristics for the creation of PVs are to be considered as reference, however, the contractor can propose different solutions for ensuring the EO-Processing processing performance:</p> <ul style="list-style-type: none"> <li>i. The interpolation for the creation of the lower resolution levels shall be bilinear convolution.</li> <li>ii. The minimum number of pyramidal levels for each band shall be equal to three.</li> <li>iii. PVs of multispectral images shall be supported.</li> </ul>		

- iv. The PVs shall be created with pixel depth of 8bit or higher.
- v. PVs layers shall be created in a compressed format unless this processing step severely impacts the performance of the system. The contractor shall define the most appropriate compressing format (e.g. Jpeg).
- vi. PVs shall be created in case of BigTIFF
- vii. Information provided in Brief description of EO basic products utilized by EMSA shall be considered in the design of the software component.
- viii. Respect timeliness as defined in KPIs (7.1.2).

*Expected Deliverables*

- i. A Package to deploy this subsystem.
- ii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- iii. Test Plan and test cases implemented.

*Acceptance Criteria*

- i. End to End test shall be successfully managed (see REQ-99).

REQ-67 Creation of enhanced visualization strategies/processes for EO basic products in Jpeg2000 format	P1
<p><i>Requirements</i></p> <ul style="list-style-type: none"> <li>i. Wavelet-compressed raster file formats, such as JPEG 2000, are flexible and scalable due to fast access to various resolutions of the image without having to create and store pyramids (standard optimization structures for GeoTIFF images).</li> <li>ii. It will be considered advantageous if the contractor proposes visualization enhancement strategies / processes for JP2000 format.</li> <li>iii. These enhancement should abide to the characteristics reported in Brief description of EO basic products is considered and ensure that the necessary KPIs are respected.</li> <li>iv. The contractor shall, in any case, provide a description of the considered approaches.</li> </ul> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. End to End test shall be successfully managed (see REQ-99).</li> </ul>	

REQ-68 Creation of GeoTIFF images from satellite	P1
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native products	
<p><i>Requirements</i></p> <p>The contractor shall implement a software component that can process into GeoTIFF or JPEG 2000:</p> <ul style="list-style-type: none"> <li>i. SAR Satellite images in native format.</li> <li>ii. Native proprietary formats, such as MrSid and ECW.</li> </ul> <p>The incidence angle radiometric correction shall be part of the processing.</p> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. End to End test shall be successfully managed</li> </ul>	

REQ-69 Management of raw images, satellite native format and other image compression formats	P2
<p><i>Requirements</i></p> <p>It is considered an advantageous if the contractor is able to implement a software component that can handle:</p> <ul style="list-style-type: none"> <li>iii. Raw images (e.g. non-pansharpened multi-spectral bands).</li> <li>iv. Native proprietary formats, such as MrSid and ECW.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>ii. End to End test shall be successfully managed (see REQ-99).</li> </ul>	

REQ-70 Visualization requirements for EO products	P1
<p><i>Requirements</i></p> <p>The contractor shall consider the following requirements in terms of EO product visualization:</p> <ul style="list-style-type: none"> <li>i. Single band images shall be represented in greyscale.</li> <li>ii. A histogram stretch solution to enhance the appearance of the single-band image. While a histogram-equalized stretching is to be considered as reference solution, the contractor can propose a different solution for ensuring the EO-Processing processing performance.</li> <li>iii. Multiband images shall be represented in RGB composite render. If the raster datasets has wavelength information and/or band indexing then it shall be displayed accordingly.</li> <li>iv. No data (background colour) shall be visualized as transparent (no colour).</li> <li>v. Each band participating in the composite shall be properly stretched to enhance the appearance of the image. While a histogram-equalized stretching is to be considered as reference, the contractor can propose a different solution for ensuring the EO-Processing processing performance.</li> <li>vi. If an image has internally stored stretch, this information shall be used to perform</li> </ul>	

<p>stretching.</p> <p>vii. Respect timeliness as defined in KPIs (7.1.2).</p> <p><i>Expected Deliverables</i></p> <p>i. A Package to deploy this subsystem.</p> <p>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</p> <p>iii. Test Plan and test cases implemented.</p> <p><i>Acceptance Criteria</i></p> <p>i. End to End test shall be successfully managed (see REQ-99).</p>
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REQ-71 Geometrical corrections of SAR images using a displacement vector	P1
<p><i>Requirements</i></p> <p>Geometrical corrections are needed to correct distortions present in SAR images.</p> <p>i. Raster images shall be shifted using a correction vector (displacement vector) provided in the QNO package according to the ICD (see REQ-100).</p> <p>ii. Respect timeliness as defined in KPIs (7.1.2).</p> <p><i>Expected Deliverables</i></p> <p>i. A Package to deploy this subsystem.</p> <p>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</p> <p>iii. Test Plan and test cases implemented.</p> <p><i>Acceptance Criteria</i></p> <p>i. End to End test shall be successfully managed (see REQ-99).</p>	

### 7.3.2.3 Vector Processing

REQ-72 Vector processing	P1
<p><i>Requirements</i></p> <p>i. The default data encoding for the EO products ingested into the EO-Processing is described in the ICD. The current implementation largely uses the XML encoding (or GML in case of spatial information). The contractor shall implement the necessary tasks to transform the default encoding format to another format (i.e. from GML to JSON).</p> <p>ii. The contractor shall provide a tool that provides the means transform vector data in different format (mainly from GML to JSON)</p> <p>iii. This transformation can be processed on-fly or cached. On-fly means the data is</p>	

transformed when the services that expose the data is invoked. Pre-processed means the transformation is pre-processed and cached. In case of cached transformation the contractor shall guarantee that changes on a source data are propagated to the transformed data.

*Expected Deliverables*

- i. A Package to deploy this subsystem.
- ii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- iii. Test Plan and test cases implemented.

*Acceptance Criteria*

- i. For each of the points specified in this requirement a test shall be conducted and it shall succeed.

#### 7.3.2.4 Dissemination

REQ-73 – Dissemination Service	P1
<p><i>Requirements</i></p> <ol style="list-style-type: none"> <li>i. The outcomes of the Acquisition process shall feed one or more Delivery Services. The type of Delivery service to feed depends on the EO product type (see REQ-75), for example raster data has to be delivered through the WMS service, and this software component is in charge to feed the EO-Processing Map Service.</li> <li>ii. The contractor shall describe in the Technical Design Document the dissemination interaction among the Dissemination and the Delivery services. Furthermore the contractor shall specify for each of the EO products the service that is going to be used for the delivery of the data.</li> <li>iii. The contractor shall design and implement the interactions among Data Ingestion, Transformation and Delivery building blocks in a manner that they are decoupled. In order to implement this requirement the contractor shall use a SOA integration approach (preferable web services or queue based).</li> </ol> <p><i>Expected Deliverables</i></p> <ol style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ol> <p><i>Acceptance Criteria</i></p> <ol style="list-style-type: none"> <li>i. End to End test shall be successfully managed (see REQ-99).</li> </ol>	

REQ-74 EO information	Informative
<p>When an EO package is ingested, processed, transformed the information that contains is delivered through one or several EO-Processing Data Delivery services. For example the EOP package</p>	

contains satellite images to be delivered as a Map Service and the metadata of the satellite images to be delivered as a catalogue Service. The information delivered through the EO services is called EO information.

### 7.3.3 Data Delivery

REQ-75 – Delivery Services	Informative
<p><i>Requirements</i></p> <p>The Delivery Service is in charge to provide the EO information to the EO-Processing's clients through Standard Web Services.</p> <p>The services deployed into the EO-Processing Delivery Services building block can be invoked by both Graphical User Interfaces (GUI) (see Appendix SEG) and other Systems in order to establish a System to System communication.</p> <p>The type of EO data delivered by the EO-Processing Delivering services is described in the chapter 7.2.1.</p> <p>The type of standard services to be deployed into the EO-Processing Delivery Services comprise:</p> <p>Map service</p> <ul style="list-style-type: none"> <li>i. Raster data ingested into the EO-Processing shall be delivered by this service and/or a tile version of this service (at least Satellite Images)</li> <li>ii. For multi-polarisation SAR images or multi-spectral images, it shall be possible to access, any of the images</li> <li>iii. For added values products based on multiple acquisitions such as change detection, it shall be possible to access all images used as input or output of the process.</li> </ul> <p>Coverage service</p> <ul style="list-style-type: none"> <li>iv. Coverage data ingested into EO-Processing shall be delivered by this service (at least Satellite Images)</li> </ul> <p>Feature service</p> <ul style="list-style-type: none"> <li>v. Vector data ingested into the EO-Processing shall be delivered by the service (at least Oil Spill, Vessel Detected, Derived products, Activity Detection, User Feedback, and Incident Data).</li> </ul> <p>Catalogue Service</p> <ul style="list-style-type: none"> <li>vi. Metadata ingested into, or created by the EO-Processing, shall be delivered by this service (all the data ingested into the EO-Processing)</li> </ul> <p>Notification Service</p> <ul style="list-style-type: none"> <li>vii. When an acquisition takes place a notification can be sent</li> </ul> <p>DataSet Service</p> <ul style="list-style-type: none"> <li>viii. All the EO products (dataset) ingested into the EO-Processing shall be accessible by a</li> </ul>	



REST interfaces to download or visualize their metadata.

#### Standard Service Broker

- ix. This service federates external standard services (for example Map, Coverage, Feature, Catalogues, Notification and DataSet services) invoke-able by the EO-Processing clients.

#### User uploaded content service

- x. This service will have to handle user uploaded content (CSN feedbacks, reports from mobile devices and all other uploaded content from users). The content includes:
  - a. XML information coming from web services (SOAP, REST, etc.).
  - b. Data packages (these included attached information to the reports and are usually associated with rich content types (images, videos, documents, etc.)).

#### Expected Deliverables

- i. In this chapter detailed requirements are included for each of the aforementioned service.

#### Acceptance Criteria

- i. End to End test shall be successfully managed (see REQ-99).

REQ-76 – Quality of Service	Informative
<p>The quality of service shall be evaluated against the following criteria:</p> <p>Performance - The maximum response time for sending the initial response in normal situation for a defined set of requests.</p> <p>Capacity - The minimum number of simultaneous requests to be served in accordance with the quality of service performance criteria.</p> <p>Availability - The probability that the service is available is a percentage of the overall time. It is computed based on the following criteria: 24 hours per days, 7 days per week, and 365 days per years.</p> <p>Compliance against the standard - Within the context of the EO-Processing tender the interoperability of the geospatial products is measured against the compliance of Open Geospatial Consortium (OGC) specifications, and the INSPIRE Implementing Rules. When applicable the compliance of the COTS against other standards shall be assessed (i.e. OASIS or W3C standards).</p>	

REQ-77 – OGC compliance	P1
<p><i>Requirements</i></p> <p>The OGC Testing Facility web page (<a href="http://cite.opengeospatial.org/teamengine">http://cite.opengeospatial.org/teamengine</a>) lists the OGC standards for which certification tests are available and explains the procedure for running those tests. The contractor is in charge to test the compliance of the geospatial products proposed against</p>	

OGC specifications using the OGC testing facilities.

*Expected Deliverables*

- i. Results of the OGC certification tests.

*Acceptance Criteria*

- i. The geospatial products proposed by the contractor shall pass the OGC tests.

REQ-78 – INSPIRE compliance	P1
<p><i>Requirements</i></p> <p>The compliancy against INSPIRE shall be reported in a document. The contractor shall draft a document that assesses the compliancy of the geospatial solution proposed against the relevant INSPIRE Implementing Rules, and the Technical Guidelines. In case it is applicable the contractor shall make use of the INSPIRE metadata validator (see <a href="http://inspire-geoportal.ec.europa.eu/">http://inspire-geoportal.ec.europa.eu/</a>).</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. INSPIRE compliancy report.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. EMSA is in charge to validate the “INSPIRE compliancy report”.</li> </ul>	

REQ-79 – Other Standards compliance	P1
<p><i>Requirements</i></p> <p>If a COTS proposed within the solution of the contractor is declared compliant against a standard, the contractor shall draft a document that assess the compliancy of the declared standard. In case it is applicable the contractor shall make use of tools to validate the compliancy against the declared standard.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. Standard compliancy report.</li> <li>ii. If applicable a report of the standard tests.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. EMSA is in charge to validate if the compliancy of the standard.</li> </ul>	

REQ-80 – Reference Coordinate System	P1
<p><i>Requirements</i></p> <p>All positions data shall be stored in Latitude and Longitude WGS84.</p> <p>When it is not differently specified the following projections needs to be implemented in the delivery</p>	

services:

- Mercator
- Universal Transverse Mercator (UTM)
- Polar

*Expected Deliverables*

- i. n/a

*Acceptance Criteria*

Included in the test scenario of each service.

### 7.3.3.1 Map Service

REQ-81 – Map Service	P1
<p><i>Requirements</i></p> <ul style="list-style-type: none"> <li>i. For serving georeferenced raster images, as such satellite images, the contractor shall implement a Web Map Service (WMS) as part of the EO-Processing architecture.</li> <li>ii. By default all the raster images ingested into EO-Processing shall be automatically delivered through a WMS.</li> <li>iii. Due to the high amount of the EO products that are going to be ingested into the EO-Processing. The contractor shall describe the solution that it intends to implement for efficiently managing the capabilities of this service.</li> <li>iv. The request shall be based on varying format (at least PNG, GeoTIFF, and JPEG) parameters.</li> <li>v. The binding protocols to be supported by this service are: GET-KVP (mandatory), REST (mandatory), POST-XML (optional), and SOAP-XML (optional).</li> </ul> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>vi. A Package to deploy this subsystem.</li> <li>vii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>viii. Test Plan and test cases implemented.</li> </ul> <p><i>Acceptance Criteria</i></p> <p>In order to accept the WMS service the following test cases needs to be created:</p> <ul style="list-style-type: none"> <li>ix. GetCapabilities <ul style="list-style-type: none"> <li>a. The request shall be based on varying the WMS version parameters.</li> </ul> </li> <li>x. GetMap; <ul style="list-style-type: none"> <li>a. The image created shall be at least of 470 Kilobytes image (e.g. 800x600 pixels with a colour depth of 8 bits).</li> </ul> </li> </ul>	

- b. The reference request shall request only 1 layer at a time.
  - c. The request shall be based on varying BBOX parameters.
  - d. The request shall be based on varying CRS.
  - e. The response of the service shall be valid according to the source data of the service and to the parameters in the capabilities for the requested area, i.e. min max scale.
  - f. A blank image is not valid if data is present for the given request parameters (BBOX, scale, etc.).
- xi. GetFeatureInfo
- a. The reference request shall request only 1 layer at a time.
  - b. The request shall be based on varying BBOX parameters.
  - c. The request shall be based on varying CRS.
  - d. The response of the service shall be valid according to the source data of the service and to the parameters in the capabilities for the requested area, i.e. min max scale.
- xii. Sample Reference Request
- a. It is composed of 10% GetCapabilities, 10% GetFeatureInfo, and 80% Get Map requests.

The WMS service is accepted if the Sample Reference Request contains 50 different requests and it is run against the WMS simulating 50 virtual users that repeat the queries within 6 hours. For such Sample Reference Request 90% of the requests shall reply within 6 seconds (maximum time 12 seconds), and the availability of the service shall be 100%. The WMS service shall be compliant against the “Technical Guidance for the implementation of INSPIRE View Services version 3.1” and the “OpenGIS Web Map Service (WMS) Implementation Specification 1.1.1 and 1.3.0”.

REQ-82 – Map Tile Service	P1
<p><i>Requirements</i></p> <ul style="list-style-type: none"> <li>i. For serving georeferenced raster images, as such satellite images, the contractor shall implement a Web Map Tile Service (WMTS) as part of the EO-Processing architecture.</li> <li>ii. All the raster images ingested into EO-Processing shall be automatically delivered through a WMTS. However EMSA can define specific criteria to implement for feeding this service,</li> <li>iii. In this case, if it is possible, the contractor shall implement the criteria through the tool described into the requirement REQ-3.</li> <li>iv. The request shall be based on varying format (at least PNG, GeoTIFF, and JPEG) parameters.</li> <li>v. Due to the high amount of the EO products that are going to be ingested into the EO-Processing. The contractor shall describe the solution that it intends to implement for efficiently managing the capabilities of this service.</li> <li>vi. The binding protocols to be supported by this service are: GET-KVP (mandatory), and</li> </ul>	

REST (mandatory).

*Expected Deliverables*

- vii. A Package to deploy this subsystem.
- viii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- ix. Test Plan and test cases implemented.

*Acceptance Criteria*

In order to accept the WMTS service the following test cases needs to be created:

- x. GetCapabilities
  - a. The request shall be based on varying the WMTS version parameters.
- xi. GetTile;
  - a. The image created shall be at least of 470 Kilobytes image (e.g. 800x600 pixels with a colour depth of 8 bits).
  - b. The reference request shall request only 1 layer at a time.
- xii. Sample Reference Request
  - a. It is composed of 10% GetCapabilities and 90% GetTile requests.

The WMTS service is accepted if the Sample Reference Request contains 50 different requests and it is run against the WMS simulating 50 virtual users that repeat the queries within 6 hours. For such Sample Reference Request 90% of the requests shall reply within 3 seconds (maximum time 9 seconds), and the availability of the service shall be 100%. The WMTS service shall be compliant against the “Technical Guidance for the implementation of INSPIRE View Services version 3.1” and the “OpenGIS Web Map Service (WMS) Implementation Specification 1.0.0”.

### 7.3.3.2 Coverage Service

REQ-83 – Coverage Service	P1
<p><i>Requirements</i></p> <ul style="list-style-type: none"> <li>i. For serving georeferenced coverage images, as such satellite images, the contractor shall implement a Web Coverage Service (WCS) as part of the EO-Processing architecture.</li> <li>ii. All the raster images ingested into the EO-Processing shall be automatically delivered through a Web Coverage Service (WCS). However EMSA can define specific criteria to implement for feeding this service, in this case, if it is possible, the contractor shall implement the criteria through the tool described into the requirement REQ-3.</li> <li>iii. Due to the high amount of the EO products that are going to be ingested into the EO-Processing. The contractor shall describe the solution that intends to implement for efficiently managing the capabilities of this service.</li> <li>iv. The binding protocols to be supported by this service are: GET-KVP (mandatory), POST-XML (mandatory), REST (mandatory), and SOAP-XML (optional).</li> </ul> <p><i>Expected Deliverables</i></p>	

- i. A Package to deploy this subsystem.
- ii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- iii. Test Plan and test cases implemented.

#### *Acceptance Criteria*

In order to accept the WCS service the following test cases needs to be created:

- i. GetCapabilities.
  - a. The request shall be based on varying the WCS version parameters.
- ii. GetCoverage.
  - a. The image created shall be at least of 470 Kilobytes image (e.g. 800x600 pixels with a colour depth of 8 bits).
  - b. The reference request shall request only 1 coverage at a time.
  - c. The request shall be based on varying BBOX parameters.
  - d. The request shall be based on varying TIME parameters.
  - e. The request shall be based on varying CRS.
  - f. The request shall be based on varying format (at least GeoTIFF and JPEG2000) parameters.
  - g. The response of the service shall be valid according to the source data of the service and to the parameters in the capabilities for the requested area, i.e. min max scale.
  - h. A blank image is not valid if data is present for the given request parameters (BBOX, scale, etc.).
- iii. Sample Reference Request.
  - a. It is composed of 10% GetCapabilities and 90% GetCoverage requests.

The WCS service is accepted if the Sample Reference Request is composed by 50 different requests and it is run against the WCS simulating 50 virtual users that repeat the queries within 6 hours. For such Sample Reference Request 90% of the requests shall reply within 3 seconds (maximum time 9 seconds), and the availability of the service shall be 100%. The WCS service shall be compliant against the “Technical Guidance for the implementation of INSPIRE View Services version 3.1” and the “OpenGIS Web Coverage Service (WCS) Implementation Specification 2.0 and 1.0.0”.

#### **7.3.3.3 Feature Service**

REQ-84 – Feature Service	Informative
<i>Requirements</i> <ul style="list-style-type: none"> <li>i. For serving geographical features, as such georeferenced points, polygons, etc., the contractor shall include a Web Feature Service (WFS) as part of the solution architecture.</li> <li>ii. All the feature ingested into the EO-Processing shall be automatically delivered through WFS. However EMSA can define specific criteria to implement for feeding this service, in</li> </ul>	

this case, if it is possible, the contractor shall implement the criteria through the tool described into the requirement REQ-3.

- iii. The binding protocols to be supported by this service are: GET-KVP (mandatory), POST-XML (mandatory), REST (mandatory), and SOAP-XML (optional).

#### *Expected Deliverables*

- i. A Package to deploy this subsystem.
- ii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- iii. Test Plan and test cases implemented.

#### *Acceptance Criteria*

In order to accept the WFS service the following test cases needs to be created:

- i. GetCapabilities.
- ii. DescribeFeatureType.
- iii. GetFeature.
  - a. The request shall be based on varying bounding box and temporal parameters.
  - b. In case of WFS with points the number of features in the response shall be at least 500.
  - c. In case of WFS polygons the number of features in the response shall be at least 10.
- iv. Sample Reference Request.
  - a. It is composed of 10% GetCapabilities, 10% DescribeFeatureType and 80% GetFeature (70% points and 30% polygons).

The WFS service is accepted if the Sample Reference Request is composed by 50 different requests and it is run against the EO-WFS simulating 50 virtual users that repeat the queries within 6 hours. For such Sample Reference Request, the 90% of the queries shall reply within 3 seconds (maximum time 9 seconds), and the availability of the service shall be 100%. The EO-WFS service shall be compliant against the “Technical Guidance for the implementation of INSPIRE Download Services version 3.1” and the “OpenGIS Web Feature Service (WFS) Implementation Specification 1.1.0 and 2.0.2”.

#### 7.3.3.4 Catalogue Service

REQ-85 –Catalogue Service	P1
<i>Requirements</i> <ul style="list-style-type: none"> <li>i. The contractor shall define the EO-Processing metadata profile to be used in order to manage the description of all the EO products ingested into the EO-Processing.</li> <li>ii. For all the EO products ingested a description (metadata) shall be created based on point 1. The list of possible EO products to catalogue shall be described within ICD (see REQ-100).</li> <li>iii. The metadata of the EO products ingested shall be inserted into an OGC - Catalogue Service Web (CSW).</li> </ul>	

- iv. The following preliminary list of possible status for the EO products shall be managed in the metadata: pending, catalogued, archived, anomaly. A product is pending if its acquisition is planned in the future; a product is catalogue when the metadata is ingested; a product is archived when it is removed from the on-line services, and finally the product is in anomaly if the acquisition went wrong or will not take place. This list of possible status for the EO products shall be configurable and extensible. As soon as a product is pending a metadata shall be recorded into the catalogue, the contractor shall extract this information from the Satellite Data Provision subsystem. The metadata of the EO products shall record the status for its lifespan into the EO-Processing.
- v. The catalogue service shall support OpenSearch specification.
- vi. The binding protocols to be supported by this service are: GET-KVP (mandatory), POST-XML (mandatory), REST (mandatory), and SOAP-XML (optional).

#### *Expected Deliverables*

- i. A Package to deploy this subsystem.
- ii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- iii. Test Plan and test cases implemented.

#### *Acceptance Criteria*

All the functionalities requested will be tested for all the of different EO products.

Furthermore in order to accept the CSW service the following test cases needs to be created:

- i. GetCapabilities.
- ii. GetRecordsById.
  - a. The request shall be based on existing identifier in the catalogue.
- iii. GetRecords.
  - a. The filter shall be based on PropertyName=AnyText, Literal=dataset, and with varying BBOX.
- iv. Sample Reference Request.
  - a. It is composed of 10% GetCapabilites, 10% GetRecordsById and 80% GetRecords.

The CSW service is accepted if the Sample Reference Request contains 50 different requests and it is run against the CSW simulating 50 virtual users that repeat the queries within 6 hours. For such Sample Reference Request, the 90% of the queries shall reply within 3 seconds (maximum time 9 seconds), and the availability of the service shall be 100%.

The CSW service shall be compliant against the “Technical Guidance for the implementation of INSPIRE Discovery Services version 3.0” and the “OpenGIS Web Catalogue Service (CSW) - EO Application Profile for CSW 2.0.2”.

#### **7.3.3.5 Geoportal**

REQ-86 – Geoportal	P1
<i>Requirements</i> The contractor shall implement a geoportal tool for the EO products where at least the following	



functionalities are provided:

- i. A user interface in order to perform queries based on these criteria and their combination: free text (to be applied to all the metadata elements); EO products' type; status of the products; geographic (based on bounding box) and temporal data/time range. The results of a query shall be presented on a map and as well as on a list of records. When user selects a record the tools shall show the correspondent bounding box on the map. When user select an element on the map or a record in the list all the metadata element associated to the item selected shall be visualized.
- ii. The geoportal shall make use of the catalogue service as described in the requirement REQ-85.
- iii. The contractor shall implement an interface to manage the metadata and all their elements:
  - a. update all the elements of the metadata catalogued.
  - b. delete a metadata catalogued.
  - c. insert manually all the element of a metadata.
  - d. Import and export metadata compliant with the EO-Processing metadata profile.
- iv. The contractor shall implement a tool to validate the metadata to be catalogued. In case the validation fails the tool shall report the elements that are not compliant with the EO-Processing metadata profile.

#### *Expected Deliverables*

- i. A Package to deploy this subsystem.
- ii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- iii. Test Plan and test cases implemented.

#### *Acceptance Criteria*

All the functionalities requested will be tested for all the of different EO products metadata.

### 7.3.3.6 Packages Notification

REQ-87 Packages Notification	P1
<i>Requirements</i> <ol style="list-style-type: none"> <li>i. There are two different types of notification: metadata and data. The metadata notification sends the metadata of the EO packages ingested or created by the EO-Processing. The data notification sends the EO packages ingested.</li> <li>ii. The notification service shall push a notification to one or multiple end points (URL).</li> <li>iii. The binding protocols to be supported by this service are: POST-XML (mandatory), REST (mandatory), SMTP (mandatory), SMS (optional), and SOAP-XML (optional).</li> <li>iv. The encoding of the notification shall support: text (UTF-8), Atom, and RSS (or geoRSS).</li> <li>v. All the EO packages ingested into the EO-Processing shall be automatically notified by a metadata notification. However EMSA can define specific criteria to implement for issuing a notification, in this case, the contractor shall implement the criteria through the tool</li> </ol>	

described into the requirement REQ-3.

*Expected Deliverables*

- i. A Package to deploy this subsystem.
- ii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- iii. Test Plan and test cases implemented.

*Acceptance Criteria*

- i. End to End test shall be successfully managed (see REQ-99).

### 7.3.3.7 DataSet Service

REQ-88 – DataSet Service	P1
<p><i>Requirements</i></p> <ul style="list-style-type: none"> <li>i. All the EO products ingested into the EO-Processing shall be automatically exposed by REpresentational State Transfer (REST) interface over HTTP protocol.</li> <li>ii. The contractor shall specify both Uniform Resource Name (URN) and Uniform Resource Locator (URL) (therefore Uniform Resource Identifier URIs) to univocally identify and expose all the EO products delivered by the EO-Processing. In order to make the URIs not tightly coupled to a specific URI structure, the contractor, upon the agreement with EMSA, shall adopt a standard approach to describe REST services.</li> <li>iii. The REST service shall take into account: <ul style="list-style-type: none"> <li>a. The concept of operations (see REQ-16).</li> <li>b. The spatial concept as area of interest, as for example the water sovereignty of the EU Member States.</li> <li>c. The temporal concepts based on dates, weeks, months and years.</li> <li>d. The EO products specified in the ICD (see the ICD).</li> </ul> </li> <li>iv. The REST URL to access at the EO products shall be recorded in the metadata of the EO products catalogued (see REQ-85).</li> <li>v. All the EO products (dataset) ingested into the EO-Processing shall be accessible by a REST interfaces to download, and visualize in different formats: HTML and RDF.</li> <li>vi. The contractor shall keep the information published through this service up-to-date (for example when an EO product is achieved its accessibility through the REST interface needs to be removed). In case the EO product requested is archived a web form for restoring the EO product is visualized, if the user request to restore the EO product an e-mail is sent to a configurable e-mail account.</li> </ul> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. A Package to deploy this subsystem.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this subsystem.</li> <li>iii. Test Plan and test cases implemented.</li> </ul> <p><i>Acceptance Criteria</i></p>	

- |   |
|---|
| <ul style="list-style-type: none"> <li>i. The contractor shall create a script that query the CSW and extracts 500 different REST URL from the metadata of the EO products catalogued.</li> <li>ii. The script shall simulate 50 virtual users that concurrently perform the REST queries extracted from the CSW against the DataSet service. The script shall run for 6 hours. The 90% of the queries shall reply within 3 seconds (maximum time 9 seconds), and the availability of the service shall be 100%.</li> </ul> |
|---|

#### 7.3.3.8 Broker Service

REQ-89 – Standard Service Broker	P1
<p><i>Requirements</i></p> <p>This service federates standard external services (for example Map, Coverage, Feature, Catalogues) to be invoked by the EO-Processing clients:</p> <ul style="list-style-type: none"> <li>i. The contractor shall provide the means to federate instances of standard external services.</li> <li>ii. The type of external services configurable are described in summary in requirement REQ-75 and in details in the requirements of this chapter (for example an external map service that is compliant with the requirement REQ-81).</li> </ul> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. A package to deploy this service.</li> <li>ii. TDD, ICD and OMM shall contain relevant information about this service.</li> <li>iii. Test Plan and test cases implemented with the EMSA's tests tool according the acceptance criteria.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. For each of the points specified in this requirement a test shall be conducted and it shall succeed.</li> </ul>	

#### 7.3.4 Migration

REQ-90 Service Migration Phases	P1
<p><i>Requirements</i></p> <p>The contractor shall implement the “parallel adoption” to migrate the CSNDC Acquisition and Delivery building blocks to the EO-Processing, therefore:</p> <ul style="list-style-type: none"> <li>- The current CSN DC service will be kept running until formal validation and approval of the EO-Processing.</li> <li>- The current CSN DC service will run in parallel with the EO-Processing service to ensure EMSA comparison capabilities to be used for formal validation of the EO-Processing service.</li> <li>- The Service Migration Phase encompasses an Early Life Support (ELS) activity:</li> </ul>	

- Expected duration: 2 months – this duration needs to be agreed during project development. The ELS duration can be extended upon an EMSA request.
- Includes parallel services of CSN DC and EO-Processing;
- Contractor responsible for bug-fixing, fine-tuning, configuration adjustments and overall technical corrections/improvements in the EO-Processing system during the ELS. The support should be, preferably, on-site, but remote access capabilities can be putted in place upon prior agreement with EMSA.
- The ELS starts from the moment the system is deployed in production and begin to receive data;
- The go-live day is defined as the day when the EO-Processing is fully accepted and the CSN DC system is stopped.

The contractor is requested to present his proposal for the Go-Live phase detailing the expected activities that will be involved, including the Early Life Support.

*Expected Deliverables*

- i. The contract shall present a technical proposal to implement the “parallel adoption” strategy. Upon agreement with EMSA, the contractor is responsible for implementing it;
- ii. CSNDC Acquisition and Delivery phase-out by the SSN ecosystem.

*Acceptance Criteria*

- i. Go-Live phase accepted and closed with the EO-Processing service in production and CSN DC service closed.

REQ-91	Data Migration	P1
<p><i>Requirements</i></p> <p>Data migration</p> <ol style="list-style-type: none"> <li>i. Based on the go-live final date, the CSNDC's 6 months earlier data shall be migrated to EO-Processing.</li> <li>ii. Older CSNDC data (older than 6 months counting from the go-live date of EO-Processing) is not considered in the scope of this project. However CSNDC data can be ingested into the system.</li> <li>iii. Type of data to be migrated is all the EO packages as per defined in Appendix CSNDC-ICD.</li> </ol> <p><i>Expected Deliverables</i></p> <ol style="list-style-type: none"> <li>i. CSN data migrated to new EO-Processing system.</li> <li>ii. Report on data migrated between systems.</li> <li>iii. Detailed test plan for the data migration activity.</li> </ol> <p><i>Acceptance Criteria</i></p> <ol style="list-style-type: none"> <li>i. The data migrated will be checked for validation and correctness in a sample approach.</li> </ol>		

This sample approach will be detailed during project execution.
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## 7.4 Technology viewpoint

### 7.4.1 System Implementation Requirements

REQ-92	Technical Landscape compliancy	P1
<p><i>Requirements</i></p> <p>The contractor shall design and implement a system compliant with EMSA's System and Application Technical Landscape as presented in the General Conditions of the draft Framework contract.</p> <p>If the contractor intends to propose a deviation from the Technical Landscape, EMSA could accept it. The contractor shall justify the proposal.</p> <p>This is particular important in order to meet the performance requested in the TS.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. Compliancy report of the EO-Processing System against the EMSA's system landscape.</li> </ul>		

REQ-93	Business Continuity Facilities	P1
<p><i>Requirements</i></p> <p>In terms of Business Continuity, the contractor shall implement a system be BCF complaint as specified within the EMSA's System and Application Technical Landscape. Overall the EO-Processing must have:</p> <ul style="list-style-type: none"> <li>i. SLA of 24/7 with 97.5% of availability.</li> <li>ii. Resolution time for Incidents: 4 hours.</li> <li>iii. Release Point Objective (RPO) of 8 hours.</li> <li>iv. Total recovery time: 12 hours.</li> </ul> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. EO-Processing certified for EMSA's BCF.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. Perform fail-over/back and switch-over/back tests from EMSA site to BCF site. Ensure that the system runs as expected in both sites after the fail over/back and switch-over/back actions.</li> </ul>		

REQ-94	File Transfer Protocol	P1
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*Requirements*

EMSA's will expose external interfaces to the service providers based GridFTP protocol.

The EO-Processing system must be able to connect to EMSA's gridftp servers to access the service providers delivered packages. This connection will be performed internal to EMSA's network.

Communications using the GridFTP protocol are to be encrypted using the functionalities of the protocol itself. Using as minimum SSH based security.

The amount of data that is to be transferred using GridFTP (satellite images) is to be controlled in order to avoid bandwidth exhaustion that will likely cause a service degradation (or even a denial of service condition) to all other applications and corporate services that depend on the availability and performance of EMSA Internet links.

*Requirements*

- i. EO-Processing capable of connecting to EMSA's gridftp.
- ii. The image transfer is to be controlled based on the time of transfer and the amount of data is sent or received (transfers throughput).

*Acceptance Criteria*

- i. EO-Processing capable of accessing the service providers delivered packages.
- ii. Configurations will be checked for the correct settings and/or traffic will be analysed.

REQ-95	Interface for the configuration parameters	P1
<i>Requirements</i> <p>The all system parameters, as described in the section 7.1 and 7.2 of this TS, shall be configurable through a Graphical User Interface. The list of the parameters configurable has to be defined within the context of the Design phase.</p> <i>Expected Deliverables</i> <ol style="list-style-type: none"> <li>i. List of parameters in the Technical Design Document</li> </ol> <i>Acceptance Criteria</i> <ol style="list-style-type: none"> <li>i. An end-to-end test is conducted.</li> </ol>		

REQ-96	IP filtering access policy	Informative
<i>Requirements</i> <p>In the scope of the ftp/gridftp and/or specific system to system interfaces, the communications to the exposed services should be protected by IP filtering (note that this filtering does not replace proper authentication mechanisms).</p> <i>Expected Deliverables</i> <ol style="list-style-type: none"> <li>i. Access from unknown parties to the system to system interfaces is disallowed.</li> </ol>		

*Acceptance Criteria*

- i. Attempts from an external IP address that should be disallowed will be attempted.

REQ-97	SSL	Informative
<p><i>Requirements</i></p> <p>All interaction in system to system (with the exception of GridFTP based communications) and user to system communications need to be protected by SSL. For system to system the communications are 2-way SSL protected and for user to system they are (at minimum) 1-way SSL protected. The communications encryption is terminated (for the incoming communications) and started (for the outgoing communications) in EMSA's reverse proxies.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. All internal communications are in plain text, all external communications are to be decrypted (incoming) and encrypted (outgoing) using the reverse proxies.</li> </ul> <p><i>Acceptance Criteria</i></p> <ul style="list-style-type: none"> <li>i. The solution is able to use our reverse proxies for handling SSL.</li> </ul>		

REQ-98	Technical Requirements	P1
<p><i>Requirements</i></p> <p>The following recommendations are to be followed during the development of the EO-Processing system:</p> <ul style="list-style-type: none"> <li>i. The EO-Processing system components should be owned by a non-root OS user. When possible or applicable, all the system components on a specific machine/server should be owned by the same OS user. In case some deviations are needed (example: RH Linux standard services), these need to be detailed and justified.</li> <li>ii. In case it is necessary to have authentication on middleware components (example: accessing a JMS in WebLogic) a dedicated user should be used. The user used to access these components cannot be the administrator user.</li> <li>iii. The contractor is requested to avoid software distributions by rpm. The software distribution formats are to be agreed with EMSA during project execution.</li> <li>iv. The configuration files must not include passwords in clear text. Solution to cope with this requirement may vary and must be agreed with EMSA.</li> <li>v. When using non-compiled languages (such as php or perl), the code needs or be updated to the minimum version compatible with the Red Hat distribution of the Red Hat Linux in use in the system. The code should be optimized to minimize, as much as possible, the consumption of memory when executing.</li> <li>vi. The EO-Processing system should include and implement log rotation rules/processes and clean-up mechanisms to avoid filling up the system components/machines with old/useless data.</li> </ul>		

- vii. The error shall be reported in the logs of the subsystem that fails.
- viii. The verbosity of the logs shall be configurable.
- ix. If a subsystem fails processing an EO product, the product shall be moved in a dedicated folder, “Bad Folder”. The EO products in the “Bad folder” shall be kept for a configurable amount of days after then deleted.
- x. The EO-Processing subsystem that fails shall provide relevant information to the EMSA’s monitoring tools (see the EMSA’s technical Landscape) so that the error shall be detected and promptly addressed.

#### *Expected Deliverables*

- xi. A Package to deploy this subsystem.
- xii. TDD, ICD and OMM shall contain relevant information about this subsystem.
- xiii. Test Plan and test cases implemented.

## 8. Tests Specification

REQ-99	End to End test	P1
<p><i>Requirements</i></p> <p>The contractor is in charge to create a 10 test cases where the following steps of an acquisition are performed:</p> <ol style="list-style-type: none"> <li>1. Planning.</li> <li>2. Ordering.</li> <li>3. Acquiring.</li> <li>4. Delivering.</li> <li>5. Financial.</li> <li>6. Oil Spill Alerting.</li> <li>7. Oil Spill Drifting.</li> </ol> <p>The steps 1 and 2 have to be included only for the tests about the interaction between the integrity subsystem and the ordering of satellite images subsystem.</p> <p>The step 5 has to be included only for the tests about the interaction between the Data Ingestion (timeliness subsystem) and the financial subsystem.</p> <p>The steps 6 and 7 have to be included only for the tests about the integration of the EO-Processing Data Delivery with the alerting and drifting components.</p> <p>The tests shall include workflow with different paths to be tested (see requirement REQ-3).</p> <p>The steps 1, 2, 5, 6, 7 and shall make of either the current CSNDC components or the components procured within the context of the Module 2 of the current FWC.</p> <p>The 10 test cases shall cover all the possible EO products and EO-Processing acquisition described</p>		



in this technical specification and documented also in the

*Expected Deliverables*

- i. Test cases

## 9. Documentation

REQ-100 Interface Control Document	P1
<p><i>Requirements</i></p> <p>The contractor shall edit and maintain the Interface Control Document (ICD). The ICD specifies the meaning of the information to exchange and the schemas which specifies the syntax of the information to exchange (see REQ-101).</p> <p>The ICD shall describe the interfaces between EO-Processing subsystems and the interaction with other systems, the protocol for invoking the interfaces, and the data models of the information exchanged.</p> <p>For each of the interface implemented, the ICD shall provide examples how to invoke the interface and the responses.</p> <p>The contractor shall propose a structure of the ICD and update the relevant information from the current CSNDC's EICD (see Appendix CSNDC-ICD).</p> <p>Changes at the ICD have to be approved by EMSA.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. The EO-Processing ICD version 1.0</li> </ul>	

REQ-101 Data Model Management	P1
<p><i>Requirements</i></p> <p>The contractor shall edit and maintain the data models developed or managed by the EO-Processing.</p> <p>The contractor shall provide a UML description of the data models managed by the EO-Processing.</p> <p>Request For Change to the EO-Processing data model shall be managed in UML by a tool. The current tools adopted by EMSA Enterprise Architect, during the Kick-off meeting EMSA will inform the contractor about the tool to adopt. The purchase of this tool is out of the scope of this contract.</p> <p>Changes to the UML data models shall create automatically a new version of the data schema.</p> <p>The contractor is in charge to create and maintain the schema of the EO products to ingest into the EO-Processing.</p> <p>An initial list of the data models to manage is provided in the Appendix CSNDC-ICD.</p> <p>Changes at the EODC data model have to be approved by EMSA.</p> <p><i>Expected Deliverables</i></p>	

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|---|
| <ul style="list-style-type: none"> <li>i. The EO-Processing Data Model documentation.</li> <li>ii. The EO-Processing Data Model UML version 1.0.</li> </ul> |
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REQ-102	Technical Design Document	P1
<p><i>Requirements</i></p> <p>The contractor shall edit and maintain the Technical Design Document (TDD).</p> <p>The TDD describes the architecture, the modules, and interaction among the EO-Processing modules.</p> <p>The contractor shall edit the document adopting a structured approach. EMSA recommends structuring the document taking into account a structured methodology (as for example the Reference Model of Open Distributed Processing (RM-ODP)).</p> <p>Changes at this document have to be approved by EMSA.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>ii. The EO-Processing TDD version 1.0.</li> </ul>		

REQ-103	Operational and Maintenance Manual	P1
<p><i>Requirements</i></p> <p>The contractor shall edit and maintain the Operational Maintenance Manual (OMM).</p> <p>The OMM defines the procedures for the effective operation, maintenance the EO-Processing system components.</p> <p>The OMM shall describe how to: (i) monitor the status of the subsystem, (ii) manage (delete, modify, insert) data in the system, (iii) start and stop the system and its components, (iv) maintain the data.</p> <p>Changes at this document have to be approved by EMSA.</p> <p><i>Expected Deliverables</i></p> <ul style="list-style-type: none"> <li>i. The EO-Processing OMM version 1.0.</li> <li>ii. Wiki version of the document.</li> </ul>		

REQ-104	Incident Handling Procedure	P1
<p><i>Requirements</i></p> <p>The contractor shall edit and maintain the Incident Handling Procedure (IHP).</p> <p>The IHP is aimed at providing a quick guide to address the most common incidents of the EO-Processing.</p> <p>The document shall be organised in a form of troubleshooting guide, e.g. with the following sections:</p>		

- A list of possible incidents, from the user perspective, with reference to the possible causes
- For each of the possible causes, identified with a unique label, there is a quick procedure to be executed in order to:
  - Check if that was actually the cause of the incident.
  - Resolve the incident.

As such, the document is addressed to the typical activities carried out by the 1<sup>st</sup> and/or 2<sup>nd</sup> line of Operations Support.

The document does not address all complex cases, such as a defect in the SW or other complex situations which require a 3<sup>rd</sup> line intervention. Therefore the typical workflow is:

- An incident occurs and is drawn to the attention of the Operation Support.
- The Operations Support investigates using this troubleshooting guide.
- If the incident cannot be resolved, it is escalated to the 3<sup>rd</sup> line (the EO-Processing Contractor).

Changes at this document have to be approved by EMSA.

*Expected Deliverables*

- i. The EO-Processing IHP version 1.0.
- ii. wiki version of the document.

REQ-105 Installation Manual	P1
<p><i>Requirements</i></p> <p>The contractor shall edit and maintain the Installation Manual (INS).</p> <p>The contractor shall provide the INS for all the components that needs to be deployed in the EMSA infrastructure assuming that all and only the components described in the EMSA technical landscape will be made available by EMSA.</p> <p>The INS shall describe the installation procedure in terms of sequential steps.</p> <p>Changes at this document have to be approved by EMSA.</p> <p><i>Expected Deliverables</i></p> <ol style="list-style-type: none"> <li>i. The EO-Processing INS version 1.0.</li> </ol> <p><i>Acceptance Criteria</i></p> <ol style="list-style-type: none"> <li>i. An EO-Processing instance in one of the EMSA's environment is deployed in the EMSA infrastructure.</li> </ol>	

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## 10. Appendices

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The contractor shall make reference to the Tender Specification Appendices.

